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RECHERCHES

SUR QUELQUES GÉNÉRALISATIONS D'UNE

IDENTITÉ INTÉGRALE D'ABEL

PAR

NIELS NIELSEN

D. KGL. DANSKE VIDENSK. SELSK. SKRIFTER, 7. RÆKKE, NATURVIDENSK. OG MATH. AFD. V. 1



KØBENHAVN

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Introduction.

La démonstration *rigoureuse* que C. NEUMANN¹⁾ a donnée pour l'existence des séries de carrés des fonctions cylindriques est extrêmement élégante.

En effet, en appliquant sa formule intégrale

$$(J^n(x))^2 = \frac{2}{\pi} \cdot \int_0^{\pi} J^{2n}(2x \cos \varphi) d\varphi, \quad (\alpha)$$

n étant un entier non négatif, l'illustre géomètre allemand a déduit de la formule

$$\left(\frac{x}{2}\right)^{2n} = \sum_{s=0}^{s=\infty} \frac{(2n+2s) \Gamma(2n+s)}{s!} \cdot J^{2n+2s}(x) \quad (\beta)$$

le développement correspondant de x^{2n} selon des carrés des fonctions cylindriques.

En essayant de généraliser cette méthode ingénieuse, j'ai vu son analogie avec celle que SCHLÖMILCH²⁾ a appliquée dans la démonstration *non rigoureuse* de ses séries selon des fonctions cylindriques, méthode qui transforme, à l'aide d'une identité intégrale due à ABEL, une série de FOURIER en la série de fonctions cylindriques susdite.

Or, pour pouvoir généraliser la méthode de NEUMANN j'avais avant tout à généraliser la formule susdite d'ABEL et cela d'une manière différente de celle de M. N. DE SONIN³⁾.

En effet, il est évident que la généralisation de la formule d'ABEL, trouvée par l'éminent géomètre russe, ne permet pas de transformer la série (β) en une autre selon des produits de deux fonctions cylindriques.

Dans mes premières recherches sur les séries *neumanniennes* et *kaptegniennes*⁴⁾ j'ai réussi à trouver une généralisation de la formule d'ABEL qui m'a permis de transformer directement une série de fonctions cylindriques de cette forme

¹⁾ Leipziger Sitzungsberichte 1869, p. 221—256. Mathematische Annalen, t. 3, p. 581—610; 1871.

²⁾ Zeitschrift für Math. und Phys., t. 2, p. 155—158; 1856.

³⁾ Mathematische Annalen, t. 16, p. 48; 1880. Acta Mathematica, t. 4, p. 171—175; 1884.

⁴⁾ Annales de l'Ecole Normale (3), t. 18, p. 39—75; 1901. Handbuch, p. 316—320; 1904.

$$f(\rho x) = \sum_{s=0}^{s=\infty} a_s(\rho) J^{2s}(a_s x) \quad (7)$$

en une autre qui contient des produits de deux fonctions cylindriques, savoir

$$f(\rho x) = \sum_{s=0}^{s=\infty} b_s(\rho) J^{s+\nu}(a_s x) J^{s-\nu}(a_s x), \quad (8)$$

ν étant un paramètre fini quelconque.

Cependant la formule (8) ne possède pas la généralité désirable, parce que la somme des paramètres des deux fonctions cylindriques est un entier.

Dans le présent mémoire j'ai complètement résolu le problème indiqué dans toute sa généralité.

En effet, j'ai trouvé une généralisation de l'identité d'ABEL qui nous permet de transformer une série de fonctions cylindriques quelconques en une autre qui procède selon des produits de deux fonctions cylindriques dont les paramètres ont une somme quelconque. De plus j'applique la formule de M. DE SONIN pour obtenir une transformation intéressante d'une série *neumannienne* de fonctions ultrasphériques.

Dans le Chapitre III j'étudie une équation différentielle nouvelle, déduite de ma généralisation très étendue de la formule (a), et quelques intégrales définies nouvelles qui s'y rattachent.

Copenhague, le 17 septembre 1906.

Niels Nielsen.

CHAPITRE I.

Applications aux fonctions sphériques.

§ 1. Généralisations de l'identité d'Abel.

Supposons que le rayon de convergence r de la série de puissances

$$f(x) = a_0 + a_1 x + a_2 x^2 + \dots + a_n x^n + \dots \quad (1)$$

soit plus grand que zéro, puis mettons pour abrégé :

$$F(x) = \int_0^{\frac{\pi}{2}} f(x \cos \varphi) (\sin \varphi)^{2\rho} d\varphi, \quad \Re(\rho) > -\frac{1}{2}; \quad (2)$$

l'intégrale *eulérienne* de première espèce

$$\int_0^{\frac{\pi}{2}} (\cos \varphi)^a (\sin \varphi)^b d\varphi = \frac{1}{2} \cdot \frac{\Gamma\left(\frac{a+1}{2}\right) \Gamma\left(\frac{b+1}{2}\right)}{\Gamma\left(\frac{a+b}{2} + 1\right)}, \quad (3)$$

où il faut admettre $\Re(a) > -1$, $\Re(b) > -1$, donnera immédiatement pour $F(x)$ cette série de puissances

$$F(x) = \frac{\Gamma\left(\rho + \frac{1}{2}\right)}{2} \cdot \sum_{s=0}^{s=\infty} \frac{\Gamma\left(\frac{s+1}{2}\right) a_s}{\Gamma\left(\frac{s}{2} + \rho + 1\right)} \cdot x^s \quad (4)$$

qui a également son rayon de convergence égal à r .

Appliquons ensuite l'autre formule *eulérienne*

$$\Gamma(a) \Gamma(1-a) = \frac{\pi}{\sin a\pi}, \quad (5)$$

nous aurons par le même procédé :

$$\int_0^{\frac{\pi}{2}} F(x \sin \psi) (x \sin \psi) (tg \psi)^{2\rho} d\psi = \frac{\pi}{2 \cos \rho\pi} \cdot \sum_{s=0}^{s=\infty} \frac{a_s x^{s+1}}{s+1},$$

d'où, en vertu de (1) et (2), cette identité intégrale :

$$\frac{\pi}{2 \cos \rho\pi} \cdot f(x) = D_x \int_0^{\frac{\pi}{2}} \int_0^{\frac{\pi}{2}} f(x \cos \varphi \sin \psi) (x \sin \psi) (tg \psi)^{2\rho} (\sin \varphi)^{2\rho} d\varphi d\psi, \quad (6)$$

où il faut admettre généralement $\frac{1}{2} > \Re(\rho) > -\frac{1}{2}$.

Cela posé, il est facile de voir que la formule de CAUCHY

$$\int_0^{\frac{\pi}{2}} (\cos \varphi)^a \cos(b\varphi) d\varphi = \frac{\pi \Gamma(a+1)}{2^{a+1} \Gamma\left(\frac{a+b}{2}+1\right) \Gamma\left(\frac{a-b}{2}+1\right)}, \quad \Re(a) > -1, \quad (7)$$

nous conduira à une identité analogue à (6).

A cet effet, mettons pour abrèger:

$$G(x) = \int_0^{\frac{\pi}{2}} f(x \cos \varphi) (\cos \varphi)^\nu \cos(\rho\varphi) d\varphi, \quad \Re(\nu) > -1; \quad (8)$$

nous aurons tout d'abord, en vertu de (7), pour $G(x)$ la série de puissances

$$G(x) = \pi \cdot \sum_{s=0}^{s=\infty} \frac{\Gamma(\nu+s+1) a_s x^s}{2^{\nu+s+1} \Gamma\left(\frac{\nu+\rho+s}{2}+1\right) \Gamma\left(\frac{\nu-\rho+s}{2}+1\right)}, \quad (9)$$

qui a aussi son rayon de convergence égal à r .

Appliquons ensuite la formule (3), il résulte:

$$\int_0^{\frac{\pi}{2}} G(x \sin 2\psi) (x \sin 2\psi)^{\nu+1} (\cot \psi)^\rho d\psi = \frac{\pi}{2} \cdot \sum_{s=0}^{s=\infty} \frac{x^{\nu+s+1}}{\nu+s+1},$$

d'où finalement cette autre identité intégrale:

$$f(x) = \frac{2x^{-\nu}}{\pi} \cdot D_x \int_0^{\frac{\pi}{2}} \int_0^{\frac{\pi}{2}} f(x \cos \varphi \sin 2\psi) (\cos \varphi)^\nu \cos(\rho\varphi) (x \sin 2\psi)^{\nu+1} (\cot \psi)^\rho d\varphi d\psi, \quad (10)$$

où il faut supposer généralement $\Re(\nu) > -1$, $\Re(\nu-\rho) > -2$.

Or, il est très facile de généraliser beaucoup les deux formules (6) et (10) que nous venons de démontrer pour une fonction qui est supposée holomorphe aux environs de l'origine.

A cet effet, supposons que $f(x)$ soit développable en série comme suit:

$$f(x) = a_0 p_0(x) + a_1 p_1(x) + \dots + a_n p_n(x) + \dots, \quad (11)$$

où les fonctions $p_r(x)$ sont holomorphes aux environs de l'origine, puis supposons que la série (11) soit *uniformément* convergente dans un domaine du plan des x qui contient le point $x = 0$; des théorèmes très connus concernant la différentiation et l'intégration terme à terme d'une série infinie¹⁾ montreront que les deux formules susdites sont également applicables à cette fonction plus générale.

Nos deux formules en question (6) et (10) sont applicables à des fonctions beaucoup plus générales encore; cependant le cas susdit suffit pour nos recherches suivantes.

¹⁾ U. DINI: Grundlagen für eine Theorie der Funktionen einer veränderlichen reellen Grösse, pp. 523, 528; 1892.

Posons $\nu = \rho = 0$, les deux formules susdites deviennent évidemment identiques; ce cas particulier est dû à ABEL¹⁾, tandis que la formule plus générale (6) a été trouvée par M. N. DE SONIN²⁾. Quant à la formule (10), elle est de moi; dans mon *Traité des fonctions cylindriques*³⁾ je n'ai donné que le cas particulier qui correspond à $\nu = 0$.

Dans ce qui suit nous avons souvent besoin de diviser en deux parties chacune des identités que nous venons de développer.

A cet effet, posons d'abord:

$$F(x) = \int_0^{\frac{\pi}{2}} f(x \cos \varphi) (\sin \varphi)^{2\rho} d\varphi, \quad (12)$$

nous aurons inversement:

$$f(x) = \frac{2 \cos \rho \pi}{\pi} \cdot D_x \int_0^{\frac{\pi}{2}} F(x \sin \psi) (x \sin \psi) (\operatorname{tg} \psi)^{2\rho} d\psi; \quad (12 \text{ bis})$$

posons ensuite:

$$G(x) = \int_0^{\frac{\pi}{2}} f(x \cos \varphi) (\cos \varphi)^\nu \cos(\rho \varphi) d\varphi, \quad (13)$$

nous aurons de même inversement:

$$f(x) = \frac{2}{\pi x^\nu} \cdot D_x \int_0^{\frac{\pi}{2}} G(x \sin 2\psi) (x \sin 2\psi)^{\nu+1} (\cot \psi)^\rho d\psi. \quad (13 \text{ bis})$$

§ 2. Transformation d'une série de fonctions $P^{\nu, n}(x)$.

Comme première application de l'identité intégrale § 1, (6), nous avons à transformer la série de fonctions ultrasphériques⁴⁾

$$f(ax) = \Gamma(\nu) \cdot \sum_{s=0}^{s=\infty} (\nu + 2s) A^{\nu, 2s}(a) P^{\nu, 2s}(x) \quad (1)$$

qui est supposée convergente sous les conditions suivantes:

A. x doit être situé dans un domaine K (à une ou à deux dimensions) dans le plan des x qui contient le point $x = 0$.

¹⁾ Journal de Crelle, t. 1, p. 155; 1826. Œuvres t. I, p. 99. ABEL donne, sous une autre forme, notre formule (6) dans le cas particulier, où ρ est supposé réel, de sorte que $\frac{1}{2} > \rho > -\frac{1}{2}$, tandis que M. DE SONIN indique la formule générale.

²⁾ Mathematische Annalen, t. 16, p. 48; 1880. Acta Mathematica, t. 4, p. 171; 1884.

³⁾ Handbuch der Theorie der Zylinderfunktionen, p. 380; 1904.

⁴⁾ Voir mon mémoire intitulé: Recherches sur les fonctions sphériques, p. 47 (285). Mém. de l'Acad. Royale de Danemark, 7^e série, t. 2; 1906.

B. a doit être situé dans un domaine L (à une ou à deux dimensions) dans le plan des a qui contient le point $a = 0$.

C. La convergence dans le domaine L doit être uniforme.

Cela posé, mettons dans (1) $x \cos \varphi$ au lieu de x et $a \sin \psi$ au lieu de a , il résulte cette autre formule:

$$f(ax \sin \psi \cos \varphi) = \Gamma(\nu) \cdot \sum_{s=0}^{s=\infty} (\nu + 2s) A^{\nu, 2s} (a \sin \psi) P^{\nu, 2s} (x \cos \varphi), \quad (2)$$

où la série infinie qui figure au second membre de (2) est *uniformément* convergente, si nous faisons varier dans l'intervalle de 0 à $\pi : 2$ (les valeurs extrêmes 0 et $\pi : 2$ y comptées) les deux variables réelles φ et ψ . Remarquons encore que les deux fonctions

$$a \sin \psi \cdot (\operatorname{tg} \psi)^{2\rho}, \quad (\sin \varphi)^{2\rho}$$

sont intégrables toutes deux de 0 à $\pi : 2$, pourvu que $\frac{1}{2} > \Re(\rho) > -\frac{1}{2}$; il est évident que l'opération § 1, (6) est applicable terme à terme à la série infinie qui figure au second membre de (2).

Quant au résultat ainsi obtenu, il s'agit de déterminer tout d'abord l'intégrale définie

$$J = \int_0^{\frac{\pi}{2}} P^{\nu, 2n} (x \cos \varphi) (\sin \varphi)^{2\rho} d\varphi. \quad (3)$$

A cet effet, introduisons l'expression ordinaire de $P^{\nu, 2n}(x)$, savoir:

$$P^{\nu, 2n}(x) = \frac{1}{\Gamma(\nu)} \cdot \sum_{s=0}^{s=n} \frac{(-1)^s \Gamma(\nu + 2n - s)}{s! (2n - 2s)!} \cdot (2x)^{2n - 2s}, \quad (4)$$

la formule § 1, (4) donnera immédiatement:

$$J = \frac{\Gamma(\rho + \frac{1}{2})}{2 \Gamma(\nu)} \cdot \sum_{s=0}^{s=n} \frac{(-1)^s \Gamma(2n - s + \nu) \Gamma(n - s + \frac{1}{2})}{s! \Gamma(2n - 2s + 1) \Gamma(n - s + \rho + 1)} \cdot x^{2n - 2s};$$

appliquons maintenant la formule *eulérienne*

$$\sqrt{\pi} \Gamma(a) = \Gamma\left(\frac{a+1}{2}\right) \Gamma\left(\frac{a}{2} + 1\right) \cdot 2^{a-1}, \quad (5)$$

il résulte après une légère transformation:

$$J = \frac{(-1)^n \sqrt{\pi} \Gamma(\rho + \frac{1}{2}) \Gamma(\nu + n)}{2 \Gamma(\nu) \Gamma(\rho + 1) \cdot n!} \cdot F(\nu + n, -n, \rho + 1, x^2) \quad (6)$$

où F désigne la série hypergéométrique ordinaire.

Cela posé, mettons pour abrégé :

$$\mathfrak{A}^{\nu, \rho, n}(a) = \frac{\Gamma(\nu + n)}{n!} \cdot D_a \int_0^{\frac{\pi}{2}} A^{\nu, 2n}(\alpha \sin \phi) (\alpha \sin \phi) (\operatorname{tg} \phi)^{2\rho} d\phi; \quad (7)$$

nous aurons ce théorème général :

I. La série de fonctions ultrasphériques (1) peut être transformée en une série de fonctions hypergéométriques comme suit :

$$\frac{\pi}{\cos \rho \pi} f(ax) = \frac{\sqrt{\pi} \Gamma(\rho + \frac{1}{2})}{\Gamma(\rho + 1)} \cdot \sum_{s=0}^{s=\infty} (-1)^s (\nu + 2s) \mathfrak{A}^{\nu, \rho, s}(a) F(\nu + s, -s, \rho + 1, x^2), \quad (8)$$

où il faut admettre $\frac{1}{2} > \Re(\rho) > -\frac{1}{2}$, tandis que les coefficients \mathfrak{A} se déterminent à l'aide de (7); les deux séries (1) et (8) sont en même temps convergentes ou divergentes.

Quant au champ commun de convergence des deux séries (1) et (8), il est évident que (8) est convergente où l'est (1). Or, prenons pour point de départ (8), puis mettons-y $x \sin \phi$ au lieu de x et $a \sin \phi$ au lieu de a , l'identité § 1, (6) nous conduira immédiatement à la série de fonctions ultrasphériques (1). Telle est la démonstration complète de notre théorème susdit.

§ 3. Application aux séries de C. Neumann.

Supposons particulièrement que la fonction $f(x)$ que nous venons d'étudier dans le § 2 soit *paire* et holomorphe aux environs du point $x = 0$, de sorte que la série de puissances correspondante

$$f(x) = a_0 + a_1 x^2 + a_2 x^4 + \dots + a_n x^{2n} + \dots \quad (1)$$

ait le rayon de convergence r , puis supposons $|a| < r$; la série de fonctions ultrasphériques § 2, (1) deviendra une série *neumannienne* et elle est certainement convergente à l'intérieur de l'ellipse

$$\frac{\xi^2}{\left(\frac{r}{|a|}\right)^2} + \frac{\eta^2}{\left(\frac{r}{|a|}\right)^2 - 1} = 1, \quad x = \xi + i\eta \quad (2)$$

qui a son centre dans l'origine et ses foyers dans les deux points $(\pm 1, 0)$; dans ce qui suit nous désignons par $E(r, a)$ l'aire située à l'intérieur de l'ellipse (2)¹⁾.

Le coefficient général $A^{\nu, \rho, 2n}(a)$ de la série *neumannienne* qui représente la série de puissances $f(ax)$ se détermine par l'expression²⁾

¹⁾ A la p. 53 (291) de mon mémoire cité p. 7 j'ai indiqué une équation fautive de l'ellipse de convergence (2). En effet, l'ellipse que j'ai indiquée est plus petite que (2). La raison de cette équation inexacte est à chercher dans le théorème démontré p. 32 (270) du mémoire susdit.

²⁾ Recherches sur les fonctions sphériques, p. 47 (285).

$$A^{\nu, 2n}(a) = \sum_{s=0}^{s=\infty} \frac{(2n+2s)! a_{n+2s}}{s! \Gamma(\nu+2n+s+1)} \cdot \left(\frac{\alpha}{2}\right)^{2n+2s}, \quad (3)$$

ce qui donnera pour $\mathfrak{A}^{\nu, \rho, n}(\alpha)$, en vertu de § 2, (7) et des formules *eulériennes* § 1, (3) et § 2, (5), cette expression analogue :

$$\mathfrak{A}^{\nu, \rho, n}(\alpha) = \frac{\Gamma\left(\frac{1}{2} - \rho\right) \Gamma(\nu + n)}{n! \sqrt{\pi}} \cdot \sum_{s=0}^{s=\infty} \frac{(n+s)! \Gamma(\rho + n + s + 1)}{s! \Gamma(\nu + 2n + s + 1)} \cdot a_{n+2s} \cdot \alpha^{2n+2s}. \quad (4)$$

Appliquons ensuite la formule *eulérienne* § 1, (5), puis mettons pour abrégér :

$$B^{\nu, \rho, n}(\alpha) = \frac{\Gamma(\nu + n)}{\Gamma(\rho + 1)} \cdot \sum_{s=0}^{s=\infty} \frac{\Gamma(\rho + n + s + 1)}{\Gamma(\nu + 2n + s + 1)} \cdot \binom{n+s}{s} a_{2n+2s} \cdot \alpha^{2n+2s}, \quad (5)$$

il est très facile de démontrer cet autre théorème général :

II. *Pour la série de puissances (1) nous obtenons ce développement en série de fonctions hypergéométriques :*

$$f(ax) = \sum_{s=0}^{s=\infty} (-1)^s (\nu + 2s) B^{\nu, \rho, s}(a) \cdot F(\nu + s, -s, \rho + 1, x^2), \quad (6)$$

où les deux paramètres ν et ρ sont des quantités finies quelconques différentes des négatifs entiers, tandis que le coefficient général B se détermine à l'aide de (5). La série (6) est convergente où l'est la série *neumannienne* correspondante, savoir dans le domaine $E(r, a)$.

En effet, il ne nous reste plus qu'à étudier les conditions susdites des deux paramètres ν et ρ . Quant à ν , la condition susdite est évidente par ce qu'elle est nécessaire pour l'existence de la série *neumannienne* elle-même.

Étudions maintenant le paramètre ρ ; la formule (6) est certainement démontrée pourvu que $\frac{1}{2} > \Re(\rho) > -\frac{1}{2}$. Introduisons ensuite cette autre série de puissances :

$$g(x) = \sum_{s=0}^{s=\infty} \frac{2 \Gamma(\rho + s + 1)}{\Gamma(\rho + \frac{1}{2}) \Gamma(s + \frac{1}{2})} \cdot a_{2s} x^{2s}$$

qui à le même rayon de convergence que la série donnée $f(x)$ elle-même, nous aurons, en vertu de § 1, (3) :

$$f(x) = \int_0^{\frac{\pi}{2}} g(x \cos \varphi) (\sin \varphi)^{2\rho} d\varphi, \quad \Re(\rho) > -\frac{1}{2}. \quad (7)$$

Cela posé, étudions la série *neumannienne* correspondante

$$g(ax) = \sum_{s=0}^{s=\infty} (\nu + 2s) B_s(a) P^{\nu, 2s}(x), \quad (8)$$

qui est valable dans le domaine $E(r, a)$; les deux identités (7) et § 2, (6) nous conduiront immédiatement à la formule (6), de sorte que cette dernière formule est applicable pour $\Re(\rho) > -\frac{1}{2}$.

Nous nous bornerons ici à ce développement, parce que la démonstration de (6) pour $\Re(\rho) \leq -\frac{1}{2}$ sera assez pénible à cause des valeurs limites qu'il faut introduire.

§ 4. Séries de fonctions $F(\nu + n, -n, \rho + 1, x)$.

Étudions maintenant plus amplement la série § 3, (6).

A cet effet, posons $x^2 = y$, $a^2 = \beta$; il s'agit tout d'abord de déterminer ce que deviendra l'ellipse $E(r, a)$ ayant l'équation § 3, (2), savoir, en posant $r^2 = \rho$:

$$\frac{\xi^2}{\left(\frac{\rho}{|\beta|}\right)} + \frac{\eta^2}{|\beta| - 1} = 1; \quad (1)$$

posons ensuite $y = \xi_1 + i\eta_1$, il résulte

$$\xi_1 = \xi^2 - \eta^2, \quad \eta_1 = 2\xi\eta, \quad (2)$$

de sorte qu'il ne nous reste qu'à éliminer de (1) et (2) les deux coordonnées ξ et η , ce qui s'effectuera sans peine; nous aurons par là l'équation suivante:

$$\frac{\left(\xi_1 - \frac{1}{2}\right)^2}{\left(\frac{\rho}{|\beta|} - \frac{1}{2}\right)^2} + \frac{\eta_1^2}{|\beta| \left(\frac{\rho}{|\beta|} - 1\right)} = 1 \quad (3)$$

qui représente une ellipse ayant son centre en $\left(\frac{1}{2}, 0\right)$ et ses foyers aux deux points $(0, 0)$ et $(1, 0)$, tandis que son plus grand axe est égal à $\rho : |\beta| - \frac{1}{2}$.

Dans ce qui suit nous désignons par $\mathfrak{E}(\rho, \beta)$ l'aire située à l'intérieur de l'ellipse (3).

Supposons maintenant que la série de puissances

$$f(x) = a_0 + a_1x + a_2x^2 + \dots + a_nx^n + \dots \quad (4)$$

ait son rayon de convergence égal à r , puis mettons pour abrégé:

$$A^{\nu, \rho, n}(a) = \frac{\Gamma(\nu + n)}{\Gamma(\rho + 1)} \cdot \sum_{s=0}^{s=n} \frac{\Gamma(\rho + n + s + 1)}{\Gamma(\nu + 2n + s + 1)} \cdot \binom{n + s}{s} a_{n+s} a^{n+s}; \quad (5)$$

nous aurons cet autre théorème général:

III. Pour la série de puissances (4) nous obtenons ce développement en série de fonctions hypergéométriques:

$$f(ax) = \sum_{s=0}^{s=\infty} (-1)^s (\nu + 2s) A^{\nu, \rho, s}(a) F(\nu + s, -s, \rho + 1, x), \quad (6)$$

où les paramètres ν et ρ ne doivent pas être égaux à un négatif entier, mais étant du reste complètement arbitraires. Le coefficient général A se détermine à l'aide de (5), et la série (6) est convergente dans le domaine $\mathfrak{G}(r, a)$.

La série (6), qui est certainement nouvelle, est évidemment de même nature que les séries *neumanniennes*.

En effet, les deux formules (6) et § 2, (1) sont des identités *formelles* qui permettent de déduire *formellement* les séries de fonctions P ou F en développant chacune des puissances qui figurent aux premiers membres des formules susdites. Mais d'un autre côté, les séries ainsi obtenues et la série de puissances donnée ne possèdent pas le même champ de convergence.

Considérons par exemple les trois fonctions particulières

$$f(x) = \frac{1}{2+x}, \quad f(x) = \frac{1}{4+x^2}, \quad f(x) = \frac{1}{1+4x^2}$$

qui sont toutes les trois holomorphes aux environs du point $x = 0$; les ellipses de convergence des séries *neumanniennes* correspondantes ont, pour $a = 1$, les équations

$$\frac{\xi^2}{4} + \frac{\eta^2}{3} = 1, \quad \frac{\xi^2}{5} + \frac{\eta^2}{4} = 1, \quad \frac{\xi^2}{\left(\frac{5}{4}\right)} + \frac{\eta^2}{\left(\frac{1}{4}\right)} = 1,$$

tandis que les séries tirées de (6) en mettant $a = 1$ sont convergentes à l'intérieur des ellipses suivantes:

$$\frac{\left(\xi_1 - \frac{1}{2}\right)^2}{\left(\frac{9}{4}\right)} + \frac{\eta_1^2}{2} = 1, \quad \frac{\left(\xi_1 - \frac{1}{2}\right)^2}{\frac{21}{4} - \sqrt{5}} + \frac{\eta_1^2}{5 - \sqrt{5}} = 1, \quad \frac{\left(\xi_1 - \frac{1}{2}\right)^2}{\left(\frac{6 - 2\sqrt{5}}{4}\right)} + \frac{\eta_1^2}{\left(\frac{5 - 2\sqrt{5}}{4}\right)} = 1.$$

Comme applications directes de (6), considérons d'abord la formule élémentaire

$$x^n = \frac{\Gamma(\rho + n + 1)}{\Gamma(\rho + 1)} \cdot \sum_{s=0}^{s=n} (-1)^s \binom{n}{s} \cdot \frac{(\nu + 2s) \Gamma(\nu + s)}{\Gamma(\nu + n + s + 1)} \cdot F(\nu + s, -s, \rho + 1, x) \quad (7)$$

qui est valable dans toute l'étendue du plan des x ; en second lieu la fonction cylindrique de première espèce donnera ce développement très connu¹⁾:

$$\left(\frac{2}{\sqrt{ax}}\right)^\rho J^\rho(\sqrt{ax}) = \left(\frac{2}{\sqrt{a}}\right)^\nu \cdot \sum_{s=0}^{s=\infty} \frac{(\nu + 2s) \Gamma(\nu + s)}{s! \Gamma(\rho + 1)} \cdot J^{\nu+2s}(\sqrt{a}) \cdot F(\nu + s, -s, \rho + 1, x) \quad (8)$$

applicable pour des valeurs finies quelconques de x et de a .

¹⁾ Handbuch der Theorie der Zylinderfunktionen, p. 275; 1904.

§ 5. Séries des fonctions hypergéométriques générales.

Comme une application plus importante du théorème III, nous tirons directement de § 4, (6), après une légère modification des significations, ce développement d'une fonction hypergéométrique générale :

$$F(a, \beta, \gamma, xy) = \frac{1}{\Gamma(a)} \cdot \sum_{s=0}^{s=\infty} \binom{-\beta}{s} \cdot \frac{\Gamma(a+s) \Gamma(\delta+s)}{\Gamma(\delta+2s)} \cdot y^s \cdot \left. \begin{array}{l} \\ \\ \end{array} \right\} (1)$$

$$\cdot F(a+s, \beta+s, \delta+2s+1, y) \cdot F(\delta+s, -s, \gamma, x),$$

où la série ainsi obtenue est convergente dans le domaine $\mathfrak{E}(1, y)$, et où il faut admettre $|y| < 1$; de plus, il faut supposer que ni γ ni δ ne sont égaux à un négatif entier.

Posons particulièrement dans (1) $x = 1$, ce qui est permis, puis remplaçons y par x ; la formule de GAUSS

$$F(a, \beta, \gamma, 1) = \frac{\Gamma(\gamma) \Gamma(\gamma - a - \beta)}{\Gamma(\gamma - a) \Gamma(\gamma - \beta)} \quad (2)$$

donnera :

$$\frac{\Gamma(a) \Gamma(\beta)}{\Gamma(\gamma)} \cdot F(a, \beta, \gamma, x) = \frac{1}{\Gamma(\delta - \gamma + 1)} \cdot \sum_{s=0}^{s=\infty} \frac{\Gamma(a+s) \Gamma(\beta+s) \Gamma(\delta - \gamma + s + 1)}{s! \Gamma(\gamma+s) \Gamma(\delta+2s)} \cdot \left. \begin{array}{l} \\ \\ \end{array} \right\} (3)$$

$$\cdot x^s \cdot F(a+s, \beta+s, \delta+2s+1, x),$$

formule qui est valable, pourvu que $|x| < 1$; on voit que l'hypothèse $\delta = \gamma$ donnera, en vertu de (3), cette formule plus élégante :

$$\frac{\Gamma(a) \Gamma(\beta)}{\Gamma(\gamma)} \cdot F(a, \beta, \gamma, x) = \sum_{s=0}^{s=\infty} \frac{\Gamma(a+s) \Gamma(\beta+s)}{\Gamma(\gamma+s) \Gamma(\gamma+2s)} \cdot x^s \cdot F(a+s, \beta+s, \gamma+2s+1, x). \quad (4)$$

Cela posé, cherchons ensuite dans les deux membres de (1) les coefficients de la puissance x^n , puis mettons x et γ au lieu de y et δ , il résulte ce développement :

$$x^n = \sum_{s=0}^{s=\infty} \frac{(-1)^s \Gamma(a+n+s) \Gamma(\beta+n+s) \Gamma(\gamma+2n+s)}{s! \Gamma(\gamma+2n+2s) \Gamma(a+n) \Gamma(\beta+n)} \cdot x^{n+s} \cdot \left. \begin{array}{l} \\ \\ \end{array} \right\} (5)$$

$$\cdot F(a+n+s, \beta+n+s, \gamma+2n+2s+1, x),$$

valable, pourvu que $|x| < 1$.

Considérons maintenant la série de puissances

$$f(x) = a_0 + a_1 x + a_2 x^2 + \dots + a_n x^n + \dots, \quad (6)$$

dont le rayon de convergence est égal à r , puis développons, en vertu de (5), toutes les puissances qui figurent au second membre de (6), nous aurons une série à double entrée \mathcal{A} , dont les séries horizontales sont les développements susdits, ordonnés

de sorte que tous les termes qui contiennent la même fonction hypergéométrique forment les séries verticales de J ; il est évident que les séries verticales de J se présentent sous cette forme:

$$h_n = x^n \cdot F(a+n, \beta+n, \gamma+2n+1, x) \cdot \frac{(-1)^n \Gamma(a+n) \Gamma(\beta+n)}{\Gamma(\gamma+2n)} \cdot \left. \begin{array}{l} \\ \sum_{s=0}^{s=n} \frac{(-1)^s \Gamma(\gamma+n+s)}{(n-s)! \Gamma(a+s) \Gamma(\beta+s)} \cdot a_s \end{array} \right\} (7)$$

Supposons maintenant $|x| < 1$ et $|x| < r$, les séries horizontales et les séries verticales de J seront convergentes comme des séries de puissances, de sorte qu'il est permis de sommer d'abord les séries verticales, ce qui donnera le théorème suivant:

IV. *La série de puissances (6) est développable en série de fonctions hypergéométriques comme suit:*

$$f(x) = \sum_{s=0}^{s=\infty} (-1)^s A_s x^s \cdot F(a+s, \beta+s, \gamma+2s+1, x), \quad (8)$$

où nous avons posé pour abrégier:

$$A_n = \frac{\Gamma(a+n) \Gamma(\beta+n)}{\Gamma(\gamma+2n)} \cdot \sum_{s=0}^{s=n} \frac{(-1)^s \Gamma(\gamma+n+s)}{(n-s)! \Gamma(a+s) \Gamma(\beta+s)} \cdot a_s, \quad (9)$$

tandis qu'il faut supposer que γ n'est pas égal à zéro ni à un négatif entier. La série (8) est convergente pourvu que nous ayons à la fois $|x| < 1$, $|x| < r$.

Ce théorème général, qui est certainement nouveau, présente un intérêt particulier, parce que la série (8) est applicable à des fonctions qui ont un point ordinaire dans le point $x = +1$, lequel est singulier pour les fonctions hypergéométriques.

Remarquons encore que la série (8) est à considérer comme une généralisation très étendue des séries *neumanniennes* de première espèce selon des fonctions cylindriques.

En effet, prenons pour point de départ la formule de P.-A. HANSEN¹⁾:

$$\left(\frac{x}{2}\right)^{-\nu} \cdot J^{\nu}(x) = \frac{1}{\Gamma(\nu+1)} \cdot \lim F\left(k, k', \nu+1, -\frac{x^2}{4kk'}\right), \quad (10)$$

où il faut faire croître au delà de toute limite les deux paramètres k et k' , puis mettons dans (8) et (9) $(-1)_s a_{2s} (kk')^s$ au lieu de a_s et $-x^2 : (kk')$ au lieu de x , nous aurons *formellement* ce développement:

$$\sum_{s=0}^{s=\infty} a_{2s} \left(\frac{x}{2}\right)^{2s} = \left(\frac{2}{x}\right)^{\gamma} \cdot \sum_{s=0}^{s=\infty} b_s J^{\gamma+2s}(x), \quad (11)$$

¹⁾ Handbuch der Theorie der Zylinderfunktionen, p. 10; 1904.

où nous avons posé pour abrégé :

$$b_n = (\gamma + 2n) \cdot \sum_{s=0}^{s=n} \frac{\Gamma(\gamma + n + s)}{(n-s)!} \cdot a_{2s}; \quad (12)$$

c'est-à-dire précisément la série *neumannienne* de première espèce¹⁾.

Du reste, il est facile de rendre rigoureuse cette démonstration de l'existence des séries *neumanniennes*; cependant une telle démonstration rigoureuse ne présente aucun intérêt particulier, parce que nous connaissons déjà à fond les séries en question.

§ 6. Autres propriétés des séries de fonctions sphériques.

Dans mes *Recherches sur les fonctions sphériques*²⁾ j'ai déduit quelques propriétés communes des coefficients de la série *neumannienne*

$$f(ax) = \Gamma(\nu) \cdot \sum_{s=0}^{s=\infty} (\nu + s) A^{\nu, s}(a) P^{\nu, s}(x); \quad (1)$$

en terminant ces recherches sur la transformation de la série (1) il me semble utile de développer d'autres propriétés des coefficients susdits en démontrant ce théorème :

V. Les coefficients $A^{\nu, n}(a)$ qui figurent au second membre de (1) satisfont à ces deux équations fonctionnelles :

$$(\nu + n + 1) A^{\nu+1, n}(a) = A^{\nu, n}(a) - A^{\nu, n+2}(a) \quad (2)$$

$$a D_a A^{\nu+1, n}(a) = n A^{\nu, n}(a) + (n + 2\nu + 2) A^{\nu, n+2}(a), \quad (3)$$

et cela quelle que soit la fonction $f(x)$.

Pour démontrer la formule (2) prenons pour point de départ l'identité³⁾

$$(s + \nu) P^{\nu, s}(x) = \nu (P^{\nu+1, s}(x) - P^{\nu+1, s-2}(x))$$

nous aurons, en vertu de (1) :

$$f(ax) = \Gamma(\nu + 1) \cdot \sum_{s=0}^{s=\infty} (A^{\nu, s}(a) - A^{\nu, s+2}(a)) \cdot P^{\nu+1, s}(x);$$

car nous aurons toujours pour n positif entier⁴⁾

$$P^{\nu, -n}(x) = 0.$$

Posons ensuite dans (1) $\nu + 1$ au lieu de ν , puis remarquons qu'une fonction ne peut être développée que d'une seule façon dans une série *neumannienne* pour

¹⁾ Handbuch der Zylinderfunktionen, p. 272.

²⁾ loc. cit. p. 53 (291).

³⁾ loc. cit. p. 15 (253).

⁴⁾ loc. cit. pp. 34 (272), 14 (252).

laquelle le paramètre ν a une valeur déterminée; nous trouvons immédiatement la formule (2).

En second lieu appliquons l'identité¹⁾

$$2(\nu + n)xP^{\nu, n}(x) = (n + 1)P^{\nu, n+1}(x) + (n + 2\nu - 1)P^{\nu, n-1}(x);$$

nous aurons, en vertu de (1):

$$2xf(ax) = \Gamma(\nu) \cdot \sum_{s=0}^{s=\infty} (sA^{\nu, s-1}(a) + (s + 2\nu)A^{\nu, s+1}(a)) \cdot P^{\nu, s}(x), \quad (4)$$

où nous avons à poser $A^{\nu, -1}(a) = 0$.

Cela posé, différencions par rapport à x la formule (1), puis appliquons les identités¹⁾

$$D_x P^{\nu, n}(x) = 2\nu \cdot P^{\nu+1, n-1}(x), \quad P^{\nu, 0}(x) = 1,$$

nous aurons:

$$af^{(1)}(ax) = 2\Gamma(\nu + 1) \cdot \sum_{s=0}^{s=\infty} (s + \nu + 1)A^{\nu, s+1}(a) \cdot P^{\nu+1, s}(x); \quad (5)$$

posons ensuite dans (1) $\nu + 1$ au lieu de ν , une différentiation par rapport à a donnera:

$$xf^{(1)}(ax) = \Gamma(\nu + 1) \cdot \sum_{s=0}^{s=\infty} (s + \nu + 1)D_a A^{\nu+1, s}(a) \cdot P^{\nu+1, s}(x),$$

d'où en multipliant par x la formule (5), puis appliquant la transformation (4), nous aurons immédiatement la formule (3).

Remarquons en passant que les formules (2) et (3) sont des généralisations des équations fonctionnelles que j'ai prises comme définitions des fonctions *cylindriques*²⁾.

En effet, mettons:

$$A^{\nu, n}(a) = i^n \left(\frac{2}{a}\right)^\nu C^{\nu+n}(a),$$

nous aurons, en vertu de (2) et (3), si nous posons encore $n - 1$ au lieu de n :

$$\begin{aligned} \frac{2(\nu + n)}{a} \cdot C^{\nu+n}(a) &= C^{\nu+n-1}(a) + C^{\nu+n+1}(a) \\ 2D_a C^{\nu+n}(a) &= C^{\nu+n-1}(a) - C^{\nu+n+1}(a); \end{aligned}$$

c'est-à-dire que la fonction $C^{\nu+n}(a)$ coïncide avec la fonction cylindrique de première espèce $J^{\nu+n}(a)$.

¹⁾ Recherches sur les fonctions sphériques, pp. 34 (272), 14 (252).

²⁾ Handbuch der Zylinderfunktionen, p. 1.

CHAPITRE II.

Applications aux fonctions cylindriques.

§ 7. Sur la fonction de Lommel.

Il est intéressant, ce me semble, que notre première généralisation de l'identité d'ABEL est également applicable à une série de fonctions cylindriques. Pour effectuer la transformation correspondante, nous avons à prendre pour point de départ la formule intégrale

$$\int_0^{\frac{\pi}{2}} \frac{J^a(x \cos \varphi) (\sin \varphi)^{2b-1}}{(\cos \varphi)^{a-1}} d\varphi = \frac{\Gamma(b)}{2 \cos b\pi} \cdot \left(\frac{2}{x}\right)^b \cdot \Pi^{a-b, a+b}(x), \quad (1)$$

où $\Pi^{\nu, \rho}(x)$ désigne la fonction de LOMMEL, savoir :

$$\Pi^{\nu, \rho}(x) = \cos \frac{\pi}{2} (\nu - \rho) \cdot \sum_{s=0}^{s=\infty} \frac{(-1)^s \left(\frac{x}{2}\right)^{\rho+2s}}{\Gamma\left(\frac{\rho+\nu}{2} + s + 1\right) \Gamma\left(\frac{\rho-\nu}{2} + s + 1\right)}, \quad (2)$$

tandis qu'il faut admettre $\Re(b) > 0$. La formule (1) peut être démontrée si nous introduisons la série ordinaire qui représente la fonction cylindrique $J^a(x)$, et si nous appliquons ensuite l'intégrale *eulérienne* de première espèce § 1, (3).

Il saute aux yeux que la fonction de LOMMEL est une généralisation de la fonction cylindrique de première espèce; nous aurons en effet :

$$\Pi^{a, a}(x) = J^a(x), \quad \Pi^{a, -a}(x) = \cos a\pi \cdot J^a(x); \quad (3)$$

dans ce qui suit nous avons à faire usage de ces autres cas particuliers de la fonction de LOMMEL :

$$\Pi^{\nu}(x) = \Pi^{\nu, 0}(x) = \cos \frac{\nu\pi}{2} \cdot \sum_{s=0}^{s=\infty} \frac{(-1)^s \left(\frac{x}{2}\right)^{2s}}{\Gamma\left(s + \frac{\nu}{2} + 1\right) \Gamma\left(s - \frac{\nu}{2} + 1\right)} \quad (4)$$

$$X^{\nu}(x) = \Pi^{\nu, 1}(x) = \sin \frac{\nu\pi}{2} \cdot \sum_{s=0}^{s=\infty} \frac{(-1)^s \left(\frac{x}{2}\right)^{2s+1}}{\Gamma\left(s + \frac{3+\nu}{2}\right) \Gamma\left(s + \frac{3-\nu}{2}\right)} \quad (5)$$

$$Z^{\nu}(x) = \lim_{\rho=\nu+1} \frac{\Pi^{\nu, \rho}(x)}{\cos \frac{\pi}{2} (\nu - \rho)} = \sum_{s=0}^{s=\infty} \frac{(-1)^s \left(\frac{x}{2}\right)^{\nu+2s+1}}{\Gamma\left(s + \frac{3}{2}\right) \Gamma\left(s + \nu + \frac{3}{2}\right)}. \quad (6)$$

Appliquons ensuite la méthode ordinaire, nous obtenons cette autre formule intégrale analogue à (1) :

$$\int_0^{\frac{\pi}{2}} \frac{Z^a(x \cos \varphi) (\sin \varphi)^{2b-1} d\varphi}{(\cos \varphi)^{a-1}} = \frac{\Gamma(b)}{2 \sin b\pi} \cdot \left(\frac{2}{x}\right)^b \cdot P^{a-b, a+b+1}(x), \quad (7)$$

où il faut admettre aussi $\Re(b) > 0$.

Cela posé, il est évident que la formule (1) nous permet de déduire directement une suite d'intégrales définies qui contiennent la fonction de LOMMEL, en transformant simplement des intégrales correspondantes contenant une fonction cylindrique.

Or, de telles intégrales étant restées inaperçues jusqu'à présent, il nous semble utile de les développer ici dans leur ensemble.

1°. La formule élémentaire¹⁾

$$\int_0^{\frac{\pi}{2}} J^\nu(x \cos \varphi) (\cos \varphi)^{\nu+1} (\sin \varphi)^{2\rho-1} d\varphi = \frac{2^{\rho-1} \Gamma(\rho)}{x^\rho} \cdot J^{\nu+\rho}(x),$$

où il faut admettre $\Re(\rho) > 0$ et $\Re(\nu) > -1$, donnera immédiatement, après une légère modification des significations, la formule correspondante

$$\int_0^{\frac{\pi}{2}} P^{\nu, \rho}(x \cos \varphi) (\cos \varphi)^{\nu+1} (\sin \varphi)^{2\sigma-1} d\varphi = \frac{\Gamma(\sigma)}{2} \cdot \left(\frac{2}{x}\right)^\sigma \cdot P^{\nu+\sigma, \rho+\sigma}(x), \quad (8)$$

où il faut admettre $\Re(\sigma) > 0$, $\Re(\rho + \nu) > -2$; du reste, il est très facile de déduire directement la formule (8).

2°. L'intégrale fondamentale de M. H. WEBER²⁾

$$\int_0^\infty J^\nu(tx) t^\rho dt = \frac{2^\rho}{x^{\rho+1}} \cdot \frac{\Gamma\left(\frac{\nu+\rho+1}{2}\right)}{\Gamma\left(\frac{\nu-\rho+1}{2}\right)}, \quad (9)$$

où il faut admettre x positif réel, $\Re(\nu + \rho) > -1$ et $\Re(\rho) < \frac{1}{2}$, donnera comme formule correspondante celle-ci:

$$\int_0^\infty P^{\nu, \rho}(tx) t^\sigma dt = \frac{\pi}{2} \cdot \frac{\Gamma\left(\frac{1+\rho+\sigma}{2}\right) \cos \frac{\rho-\nu}{2} \pi}{\Gamma\left(1+\frac{\nu-\sigma}{2}\right) \Gamma\left(1+\frac{\nu+\rho}{2}\right) \Gamma\left(\frac{1}{2}-\nu\right) \cos \frac{\pi}{2}(\rho+\sigma)} \cdot \left(\frac{2}{x}\right)^{\sigma+1}, \quad (10)$$

où il faut admettre x positif réel, $\Re(\rho - \nu) > 0$, $\Re(\rho + \sigma) > -1$ et $1 > \Re(2\sigma + \rho - \nu)$, conditions qui s'accordent bien avec la série (2) et la série asymptotique obtenue pour $P^{\nu, \rho}(x)$ ³⁾.

3°. La représentation intégrale⁴⁾

$$(-1)^n \int_y^\infty J^\nu(tx) (t^2 - y^2)^{n-1} t^{\nu+1} dt = \frac{(n-1)! 2^{n-1} y^{\nu+n}}{x^n} \cdot J^{\nu+n}(xy)$$

¹⁾ Handbuch der Zylinderfunktionen, p. 181. ²⁾ p. 189. ³⁾ p. 228. ⁴⁾ p. 222.

donnera après une légère modification des significations :

$$(-1)^n \int_y^\infty H^{\nu, \rho}(tx) (t^2 - y^2)^{n-1} t^{\frac{\nu+\rho}{2}+1} dt = \frac{(n-1)! 2^{n-1} y^{n+\frac{\nu+\rho}{2}}}{x^n} \cdot H^{\nu+n, \rho+n}(xy), \quad (11)$$

où il faut admettre x positif réel, n positif entier et $\Re(\nu + \rho + 4n) < 3$.

La formule (1) admet de très belles applications aux intégrales discontinues que j'ai étudiées dans le chapitre XVIII de mon *Traité des fonctions cylindriques*.

4°. Considérons en premier lieu la formule¹⁾

$$\int_0^\infty \frac{J^\sigma(y\sqrt{x^2+t^2})}{(t^2+z^2)^{\frac{\sigma}{2}-p}} \cdot J^\nu(tx) t^{\nu+2n+1} dt = 0, \quad (12)$$

où il faut admettre $x > y \geq 0$, tandis que n et p sont des entiers non négatifs et $\Re(\nu+n) > -1$, $\Re(\sigma-\nu) > 2n+2p+1$, nous aurons immédiatement la formule correspondante

$$\int_0^\infty \frac{H^{\rho, \sigma}(y\sqrt{t^2+z^2})}{(t^2+z^2)^{\frac{\sigma}{2}-p}} \cdot J^\nu(tx) t^{\nu+2n+1} dt = 0, \quad (13)$$

où il faut admettre $x > y \geq 0$, $\Re(\nu+n) > -1$, $\Re(\rho+\sigma-2\nu) > 4n+4p+2$, $\Re(\rho) > \Re(\sigma)$.

5°. En second lieu, la formule analogue²⁾

$$\int_0^\infty \frac{J^\sigma(y\sqrt{t^2+z^2})}{(t^2+z^2)^{\frac{\sigma}{2}-p}} \cdot Y^\nu(tx) t^{\nu+2n} dt = 0, \quad (14)$$

où il faut admettre $x > y \geq 0$, $\Re(\nu+n) > -1$, $\Re(\sigma-\nu) > 2n+2p-1$, tandis que n et p sont des entiers non négatifs, donnera :

$$\int_0^\infty \frac{H^{\rho, \sigma}(y\sqrt{t^2+z^2})}{(t^2+z^2)^{\frac{\sigma}{2}-p}} \cdot Y^\nu(tx) t^{\nu+2n} dt = 0, \quad (15)$$

formule qui est valable pourvu que $x > y \geq 0$, $\Re(\nu+n) > -1$, $\Re(\rho+\sigma-2\nu) > 4n+4p-2$, $\Re(\rho-\sigma) > 0$.

6°. Prenons maintenant pour point de départ la formule³⁾

$$\left. \begin{aligned} & \int_0^\infty \frac{J^\sigma(y\sqrt{t^2+z^2})}{(t^2+z^2)^{\frac{\sigma}{2}-p}} \cdot \frac{J^\nu(tx) t^{\nu+2n+1}}{t^2+u^2} dt = \\ & = (-1)^n \frac{\pi}{2} \cdot \frac{J^\sigma(y\sqrt{z^2-u^2})}{(z^2-u^2)^{\frac{\sigma}{2}-p}} \cdot H_1^\nu(xui) u^{\nu+2n} \cdot e^{\frac{\nu+1}{2}\pi i}, \end{aligned} \right\} \quad (16)$$

¹⁾ Handbuch der Zylinderfunktionen, p. 252. ²⁾ p. 252. ³⁾ p. 257.

qui est valable pourvu que $x > y \geq 0$, $\Re(\nu + n) > -1$, $\Re(\sigma - \nu) > 2n + 2p - 2$, tandis que n et p sont des entiers non négatifs, nous aurons la formule correspondante:

$$\left. \begin{aligned} & \int_0^x \frac{H^{\rho, \sigma}(y\sqrt{t^2+z^2})}{(t^2+z^2)^{\frac{\sigma}{2}-p}} \cdot \frac{J^\nu(tx)t^{\nu+2n+1}}{t^2+u^2} dt = \\ & = (-1)^n \frac{\pi}{2} \cdot \frac{H^{\rho, \sigma}(y\sqrt{z^2-u^2})}{(z^2-u^2)^{\frac{\sigma}{2}-p}} \cdot H_1^\nu(xui)u^{\nu+2n} \cdot e^{\frac{\nu+1}{2}\pi i}, \end{aligned} \right\} (17)$$

où il faut admettre $x > y \geq 0$, $\Re(\nu + n) > -1$, $\Re(\rho + \sigma - 2\nu) > 4n + 4p - 2$, $\Re(\rho) > \Re(\sigma)$.

La fonction H qui figure dans les deux dernières formules est la fonction de HANKEL, savoir:

$$H_1^\nu(x) = J^\nu(x) + iY^\nu(x).$$

Cela posé, mettons dans (17) $z = u$, ce qui est permis, l'intégrale ainsi obtenue aura pour $p > 0$ la valeur zéro; dans le cas particulier $p = 0$ nous aurons au contraire:

$$\left. \begin{aligned} & \int_0^x \frac{H^{\rho, \sigma}(y\sqrt{t^2+z^2})}{(t^2+z^2)^{\frac{\sigma}{2}+1}} \cdot J^\nu(tx)t^{\nu+2n+1} dt = \\ & = (-1)^n \frac{\pi y^\sigma z^{\nu+2n} \cos \frac{\pi}{2}(\sigma - \rho)}{2^{\sigma+1} \Gamma\left(\frac{\sigma+\rho}{2}+1\right) \Gamma\left(\frac{\sigma-\rho}{2}+1\right)} \cdot H_1^\nu(xzi)e^{\frac{\nu+1}{2}\pi i}. \end{aligned} \right\} (18)$$

Posons encore dans (17) $u = 0$, la valeur de l'intégrale ainsi obtenue sera égale à zéro, pourvu que $n > 0$ et $\Re(\nu) > -n$; dans le cas particulier $n = 0$ nous aurons au contraire:

$$\int_0^x \frac{H^{\rho, \sigma}(y\sqrt{t^2+z^2})}{(t^2+z^2)^{\frac{\sigma}{2}}} J^\nu(tx)t^{\nu-1} dt = \frac{2^{\nu-1} \Gamma(\nu)}{x^\nu z^\sigma} \cdot H^{\rho, \sigma}(yz). \quad (19)$$

7°. Étudions en dernier lieu la formule analogue à (16)¹⁾:

$$\left. \begin{aligned} & \int_0^x \frac{J^\sigma(y\sqrt{t^2+z^2})}{(t^2+z^2)^{\frac{\sigma}{2}-p}} \cdot \frac{Y^\nu(tx)t^{\nu+2n}}{t^2+u^2} dt = \\ & = (-1)^{n-1} \frac{\pi}{2} \cdot \frac{J^\sigma(y\sqrt{z^2-u^2})}{(z^2-u^2)^{\frac{\sigma}{2}-p}} \cdot H_1^\nu(xui)u^{\nu+2n-1} \cdot e^{\frac{\nu+1}{2}\pi i}, \end{aligned} \right\} (20)$$

où il faut admettre $x > y \geq 0$, $\Re(\nu + n) > -\frac{1}{2}$, $\Re(\sigma - \nu) > 2n + 2p - 1$, tandis que n et p doivent être des entiers non négatifs; nous aurons:

¹⁾ Handbuch der Zylinderfunktionen, p. 257.

$$\left. \begin{aligned} & \int_0^x \frac{H^{\rho, \sigma}(y\sqrt{t^2+z^2})}{(t^2+z^2)^{\frac{\sigma}{2}-p}} \cdot \frac{Y^\nu(tx)t^{\nu+2n}}{t^2+u^2} dt = \\ & = (-1)^{n-1} \frac{\pi}{2} \cdot \frac{H^{\rho, \sigma}(y\sqrt{z^2-u^2})}{(z^2-u^2)^{\frac{\sigma}{2}-p}} \cdot H_1^\nu(xui)u^{\nu+2n-1} \cdot e^{\frac{\nu+1}{2}\pi i}, \end{aligned} \right\} (21)$$

où il faut admettre $x > y$, $\Re(\nu+n) > -\frac{1}{2}$, $\Re(\rho+\sigma-2\nu) > 4n+4p-1$, $\Re(\rho) > \Re(\sigma)$.

Posons ensuite dans (21) $u = z$, l'intégrale ainsi obtenue aura pour $p > 0$ la valeur zéro; pour $p = 0$ nous aurons au contraire:

$$\left. \begin{aligned} & \int_0^x \frac{H^{\rho, \sigma}(y\sqrt{t^2+z^2})}{(t^2+z^2)^{\frac{\sigma}{2}+1}} \cdot Y^\nu(tx)t^{\nu+2n} dt = \\ & = (-1)^{n-1} \frac{\pi y^\sigma z^{\nu+2n-1} \cos \frac{\pi}{2}(\sigma-\rho)}{2^{\sigma+1} \Gamma\left(\frac{\sigma+\rho}{2}+1\right) \Gamma\left(\frac{\sigma-\rho}{2}+1\right)} \cdot H_1^\nu(xzi) \cdot e^{\frac{\nu+1}{2}\pi i}. \end{aligned} \right\} (22)$$

§ 8. Séries de fonctions de Lommel.

Prenons maintenant pour point de départ la formule intégrale § 7, (1); il est très facile de démontrer ce théorème général:

VI. *Supposons que la série de fonctions cylindriques*

$$f(ax) = \left(\frac{2}{x}\right)^\rho \cdot \sum_{s=0}^{s=\infty} A_s(a) J^\nu(p_s x) \quad (1)$$

satisfasse aux conditions énumérées dans le § 2, nous aurons ce développement en série de fonctions de Lommel:

$$f(ax) = \frac{I'(\sigma) \operatorname{tg} \sigma \pi}{\pi 2^\nu} \cdot \left(\frac{2}{x}\right)^{\rho+\sigma} \cdot \sum_{s=0}^{s=\infty} \mathfrak{A}_s(a) \cdot \frac{H^{\nu-\sigma, \rho+\sigma}(p_s x)}{p_s^\sigma}, \quad (2)$$

où nous avons posé pour abrégé

$$\mathfrak{A}_n(a) = a^{\nu-\rho-1} \cdot D_a \int_0^{\frac{\pi}{2}} \frac{A_n(a \sin \varphi) (\operatorname{tg} \varphi)^{2\sigma-1}}{(\alpha \sin \varphi)^{\nu-\rho-2}} d\varphi, \quad (3)$$

tandis qu'il faut supposer $0 < \Re(\sigma) < 1$). Ces conditions remplies, la série (2) est convergente, pourvu que la série donnée (1) le soit.

En effet, posons

$$F(ax) = \left(\frac{2}{ax}\right)^{\nu-\rho-1} f(ax),$$

¹⁾ Il faut remarquer que dans (2) $H^{\nu-\sigma, \rho+\sigma}(x)$ contient le facteur $\cos \sigma \pi$.

il résulte, en vertu de (1):

$$F(ax) = \left(\frac{2}{x}\right)^{\nu-1} \cdot \sum_{s=0}^{s=\infty} \frac{A_s(a)}{a^{\nu-\rho-1}} \cdot J^{\nu}(p_s x),$$

de sorte que la méthode expliquée dans le § 2 nous conduira immédiatement au but.

Le théorème VI que nous venons de démontrer nous permet des applications nettes aux séries de FOURIER-DINI et de SCHLÖMILCH.

1°. *Séries de Fourier-Dini*: Supposons ν égal à un nombre réel plus grand que -1 , puis désignons par p_s les racines (toutes réelles) de l'équation transcendante:

$$\left(\frac{2}{x}\right)^{\nu} J^{\nu}(x) = 0,$$

M. DINI¹⁾ a démontré l'existence d'une série de la forme

$$f(ax) = \sum_{s=0}^{s=\infty} A_s(a) J^{\nu}(p_s x), \quad 0 < x < 1, \quad (4)$$

de sorte que nous avons à poser dans (1) $\rho = 0$ pour appliquer nos formules générales au développement (4).

Comme exemple des séries de M. DINI j'ai donné entre autres ce développement²⁾:

$$\frac{x^{\rho} \cdot \cos \frac{\pi}{2}(\nu - \rho)}{\Gamma\left(\frac{\rho + \nu}{2} + 1\right) \Gamma\left(\frac{\rho - \nu}{2} + 1\right)} = \sum_{s=0}^{s=\infty} \left(\frac{2}{p_s}\right)^{\rho+1} \cdot \frac{H^{\nu, \rho+2}(p_s)}{J^{\nu+1}(p_s)} \cdot J^{\nu}(p_s x), \quad (5)$$

ce qui donnera, en vertu de § 7, (1)

$$K \cdot x^{\rho+\sigma} = \sum_{s=0}^{s=\infty} \left(\frac{2}{p_s}\right)^{\rho+\sigma+1} \cdot \frac{H^{\nu, \rho+2}(p_s)}{J^{\nu+1}(p_s)} \cdot H^{\nu-\sigma, \rho+\sigma}(p_s x), \quad (6)$$

où nous avons posé pour abrégier

$$K = \frac{\Gamma(\sigma) \cdot \cos \sigma\pi \cos \frac{\pi}{2}(\nu - \rho)}{2 \Gamma\left(\frac{\rho + \nu}{2} + 1\right) \Gamma\left(\frac{\rho - \nu}{2} + 1\right)}. \quad (6 \text{ bis})$$

2°. *Séries de Schlömilch*³⁾: Dans ce cas nous avons à poser dans (1) $p_s = s$, $\rho = \nu$.

La formule § 7, (7) montre du reste clairement que notre théorème permet de transformer une série plus générale de la forme⁴⁾

$$f(ax) = \left(\frac{2}{x}\right)^{\nu} \cdot \sum_{s=1}^{s=\infty} (A_s(a) J^{\nu}(sx) + B_s(a) Z^{\nu}(sx)) \quad (7)$$

¹⁾ Handbuch der Zylinderfunktionen, p. 353. ²⁾ p. 356. ³⁾ p. 356. ⁴⁾ p. 348.

en une autre de cette forme:

$$f(ax) = \left(\frac{2}{x}\right)^{\rho+\sigma} \left(\sum_{s=1}^{s=\infty} \mathfrak{A}_s(a) P^{\nu-\sigma, \rho+\sigma}(sx) + \sum_{s=1}^{s=\infty} \mathfrak{B}_s(a) P^{\nu-\sigma, \rho+\sigma+1}(sx) \right). \quad (8)$$

Remarquons en passant que la méthode qui nous a donné le théorème VI nous conduira de l'intégrale définie

$$\int_a^b J^\nu(tx) F(t, y) dt = x^\sigma \cdot \Xi(xy) \quad (9)$$

à cette autre:

$$\int_a^b P^{\nu-\sigma, \nu+\rho}(tx) t^{-\rho} K(t, y) dt = \frac{\pi \cot \rho \pi}{2 \Gamma(\rho)} \cdot x^{\rho+\sigma} \cdot \Xi(xy), \quad (10)$$

où nous avons posé pour abrégé

$$K(t, y) = y^{\nu-\sigma-1} \cdot Dy \int_0^{\frac{\pi}{2}} F(t, y \sin \phi) (y \sin \phi)^{2+\sigma-\nu} \cdot (\operatorname{tg} \phi)^{2\rho-1} d\phi. \quad (11)$$

Nous connaissons une suite d'intégrales définies du genre (9); cependant les fonctions correspondantes (11) deviendront si compliquées que la transformation susdite ne présentera qu'un intérêt assez médiocre.

§ 9. Sur le produit de deux fonctions cylindriques.

Appliquons maintenant à la série ordinaire qui représente la fonction cylindrique de première espèce la formule générale § 1, (9), puis appliquons ce développement¹⁾:

$$J^a(x) J^b(x) = \sum_{s=0}^{s=\infty} \frac{(-1)^s \binom{a+b+2s}{s}}{\Gamma(a+s+1) \Gamma(b+s+1)} \cdot \left(\frac{x}{2}\right)^{a+b+2s}, \quad (1)$$

nous aurons immédiatement la formule élégante:

$$\frac{J^{\frac{\nu+\rho}{2}}(x) J^{\frac{\nu-\rho}{2}}(x)}{\pi} = \frac{2}{\pi} \cdot \int_0^{\frac{\pi}{2}} J^\nu(2x \cos \varphi) \cos(\rho \varphi) d\varphi, \quad (2)$$

valable pourvu que $\Re(\nu) > -1$.

On connaît depuis longtemps des cas particuliers de (2)²⁾; néanmoins la formule générale (2) est nouvelle.

Appliquons maintenant l'intégrale de BESSEL³⁾

$$J^\nu(x) = \frac{2 \cdot \left(\frac{x}{2}\right)^\nu}{\sqrt{\pi} \Gamma\left(\nu + \frac{1}{2}\right)} \cdot \int_0^{\frac{\pi}{2}} \cos(x \sin \phi) (\cos \phi)^{2\nu} d\phi, \quad (3)$$

¹⁾ Handbuch der Zylinderfunktionen, p. 20. ²⁾ p. 63. ³⁾ p. 51.

où il faut admettre $\Re(\nu) > -\frac{1}{2}$; nous aurons, en vertu de (2), pour le produit de deux fonctions cylindriques cette intégrale double:

$$J^{\frac{\nu+\rho}{2}}(x) J^{\frac{\nu-\rho}{2}}(x) = \frac{4 \cdot x^\nu}{\sqrt{\pi^3} \cdot \Gamma\left(\nu + \frac{1}{2}\right)} \cdot \int_0^{\frac{\pi}{2}} \int_0^{\frac{\pi}{2}} \cos(2x \sin \psi \cos \varphi) (\cos \varphi)^\nu (\cos \psi)^{2\nu} \cos(\rho \varphi) d\varphi d\psi, \quad (4)$$

où il faut admettre $\Re(\nu) > -\frac{1}{2}$.

Remarquons encore en passant que la formule § 1, (13 bis) donnera cette inversion de la formule intégrale (2):

$$J^\nu(x) = \frac{1}{2} D_x \int_0^{\frac{\pi}{2}} J^{\frac{\nu+\rho}{2}}\left(\frac{x \sin 2\psi}{2}\right) J^{\frac{\nu-\rho}{2}}\left(\frac{x \sin 2\psi}{2}\right) (x \sin 2\psi) (\cot \psi)^\rho d\psi, \quad (5)$$

où il faut admettre $\Re(\nu - \rho) > -2$.

Il saute aux yeux que la formule intégrale (2) est applicable à la plupart des intégrales que nous avons transformées dans le § 7.

1°. L'intégrale de M. WEBER § 7, (9) donnera après une légère modification des significations cette autre formule:

$$\int_0^x J^\nu(tx) J^\rho(tx) t^\sigma dt = \frac{2^\sigma x^{-\sigma-1} \Gamma\left(\frac{1+\nu+\rho+\sigma}{2}\right) \Gamma(-\sigma)}{\Gamma\left(\frac{1+\nu-\rho-\sigma}{2}\right) \Gamma\left(\frac{1-\nu+\rho-\sigma}{2}\right) \Gamma\left(\frac{1+\nu+\rho-\sigma}{2}\right)}, \quad (6)$$

où il faut admettre $x > 0$, $\Re(\nu + \rho + \sigma) > -1$ et $\Re(\sigma) < 0$; la formule (6) est très connue¹⁾; mais notre démonstration est nouvelle. Remarquons en passant que ce développement de la formule (6) nous donnera une nouvelle démonstration de la formule de GAUSS concernant la valeur de $F(a, \beta, \gamma, 1)$.

2°. Les intégrales § 7, (12) et (14) donnent de même immédiatement ces deux autres

$$\int_0^x \frac{J^{\frac{\sigma+\tau}{2}}(y\Omega) J^{\frac{\sigma-\tau}{2}}(y\Omega)}{\Omega^{\sigma-2p}} \cdot J^\nu(tx) \cdot t^{\nu+2n+1} dt = 0, \quad (7)$$

$$\int_0^x \frac{J^{\frac{\sigma+\tau}{2}}(y\Omega) J^{\frac{\sigma-\tau}{2}}(y\Omega)}{\Omega^{\sigma-2p}} \cdot Y^\nu(tx) \cdot t^{\nu+2n} dt = 0, \quad (8)$$

où nous avons posé pour abrégé:

$$\Omega = \sqrt{t^2 + z^2}, \quad (9)$$

tandis qu'il faut ajouter aux conditions précédentes ces deux autres: $x > 2y$ et $\Re(\sigma) > -1$.

¹⁾ Handbuch der Zylinderfunktionen, p. 194.

3°. Posons encore pour abrégé :

$$\omega = \sqrt{z^2 - u^2}; \quad (10)$$

les deux formules § 7, (16) et (20) donnent ici ces formules analogues :

$$\left. \begin{aligned} & \int_0^x \frac{J^{\frac{\sigma+\tau}{2}}(y\Omega) J^{\frac{\sigma-\tau}{2}}(y\Omega)}{\Omega^{\sigma-2p}} \cdot \frac{J^\nu(tx) t^{\nu+2n+1}}{t^2 + u^2} dt = \\ & = (-1)^n \frac{\pi}{2} \cdot \frac{J^{\frac{\sigma+\tau}{2}}(y\omega) J^{\frac{\sigma-\tau}{2}}(y\omega)}{\omega^{\sigma-2p}} \cdot H_1^\nu(xui) \cdot u^{\nu+2n} \cdot e^{\frac{\nu+1}{2}\pi i} \end{aligned} \right\} (11)$$

$$\left. \begin{aligned} & \int_0^x \frac{J^{\frac{\sigma+\tau}{2}}(y\Omega) J^{\frac{\sigma+\tau}{2}}(y\Omega)}{\Omega^{\sigma-2p}} \cdot \frac{Y^\nu(tx) t^{\nu+2n}}{t^2 + u^2} dt = \\ & = (-1)^{n-1} \frac{\pi}{2} \cdot \frac{J^{\frac{\sigma+\tau}{2}}(y\omega) J^{\frac{\sigma-\tau}{2}}(y\omega)}{\omega^{\sigma-2p}} \cdot H_1^\nu(xui) \cdot u^{\nu+2n-1} \cdot e^{\frac{\nu+1}{2}\pi i}. \end{aligned} \right\} (12)$$

Mettons ensuite dans (11) $u = z$, l'intégrale ainsi obtenue deviendra égale à zéro pour $p > 0$; le cas particulier $p = 0$ donnera au contraire :

$$\left. \begin{aligned} & \int_0^x \frac{J^{\frac{\sigma+\tau}{2}}(y\Omega) J^{\frac{\sigma+\tau}{2}}(y\Omega)}{\Omega^{\sigma-2p+2}} \cdot J^\nu(tx) t^{\nu+2n+1} dt = \\ & = \frac{(-1)^n \pi y^\sigma z^{\nu+2n} 2^{-\sigma-1}}{\Gamma\left(\frac{\sigma+\tau}{2} + 1\right) \Gamma\left(\frac{\sigma-\tau}{2} + 1\right)} \cdot H_1^\nu(xzi) e^{\frac{\nu+1}{2}\pi i}. \end{aligned} \right\} (13)$$

Posons enfin dans (11) $u = 0$, la valeur de l'intégrale ainsi obtenue est zéro pourvu que $n > 0$ et $\Re(\nu) > -n$; dans le cas particulier $n = 0$ nous aurons :

$$\int_0^x \frac{J^{\frac{\sigma+\tau}{2}}(y\Omega) J^{\frac{\sigma-\tau}{2}}(y\Omega)}{\Omega^\sigma} \cdot J^\nu(tx) t^{\nu-1} dt = \frac{2^{\nu-1} \Gamma(\nu)}{x^\nu z^\sigma} \cdot J^{\frac{\sigma+\tau}{2}}(yz) J^{\frac{\sigma-\tau}{2}}(yz). \quad (14)$$

§ 10. Séries de produits de deux fonctions cylindriques.

Comme une application beaucoup plus importante encore de la formule intégrale § 9, (2) nous avons à démontrer le théorème :

VII. *Supposons que la série de fonctions cylindriques*

$$x^\nu f(ax) = \sum_{s=1}^{s=\infty} A_s(a) J^{\nu_s}(p_s x) \quad (1)$$

satisfasse aux conditions énumérées dans le § 2, nous aurons cet autre développement :

$$x^\mu f(ax) = \sum_{s=1}^{s=\infty} \mathfrak{A}_s \left(\frac{a}{2}\right) J^{\frac{\nu_s + \rho}{2}}(p_s x) J^{\frac{\nu_s - \rho}{2}}(p_s x), \quad (2)$$

où nous avons posé pour abrégier :

$$a \mathfrak{A}_n(a) = D_a \int_0^{\frac{\pi}{2}} A_n(a \sin 2\psi) (a \sin 2\psi)^{\mu+1} (\cot \psi)^\rho d\psi. \quad (3)$$

La série (2) est certainement convergente, pourvu que x et a soient situés dans des domaines K_1 et L_1 obtenus en multipliant K par $\frac{1}{2}$ et L par 2 par rapport aux points $x = 0$ et $a = 0$ respectivement.

On voit que le théorème VII est une conséquence immédiate des formules § 9, (2) et § 1, (10).

Inversement, prenons pour point de départ la formule (2), le même procédé nous conduira à (1), si nous appliquons la formule § 9, (5).

Il est évident que le théorème VII est d'une portée très étendue, parce que la série (1) contient les deux suites de nombres quelconques ν_s et p_s . Nous avons à étudier plus amplement les séries suivantes :

1°. *Les séries de C. Neumann*: Posons dans (1) $\nu_s = \nu + s - 1$, $p_s = 1$ et $\mu = \nu$; la série ainsi obtenue est la série *neumannienne* de première espèce, de sorte que notre théorème nous conduira immédiatement aux séries *neumanniennes* de seconde espèce.

Il est très intéressant, ce me semble, de constater que les premiers rudiments des transformations générales que nous venons d'étudier ici se trouvent dans le mémoire de C. NEUMANN¹⁾, où l'illustre géomètre démontrait pour la première fois l'existence de ses séries de seconde espèce correspondant à $\nu = 0$.

2°. *Les séries de M. W. Kapteyn*: Dans le cas $\nu_s = p_s = \nu + s - 1$ et $\mu = \nu$ notre théorème général nous conduira des séries *kapteynniennes* de première espèce à celles de seconde espèce.

3°. *Les séries de Schlömilch* obtenues de (1) en y mettant $\mu = \nu = \nu_s$ et $p_s = s$ nous donnent des séries analogues selon des produits de deux fonctions cylindriques.

4°. *Les séries de Fourier-Dini* peuvent être appliquées comme dans le § 8.

Or, il faut remarquer que le théorème VII ne détermine pas toujours le champ de convergence complet de la série (2). En effet, il est bien connu que les deux séries *neumanniennes* qui représentent la même fonction, holomorphe aux environs de l'origine, ont le même champ de convergence.

Pour mettre en pleine lumière la question concernant les champs de convergence des deux séries *neumanniennes* qui représentent la même fonction désignons

¹⁾ Mathematische Annalen, t. 3, p. 581—610; 1871.

par K et K_1 les deux champs mentionnés dans notre théorème VII, puis supposons que le développement

$$x^\rho = \sum_{s=0}^{s=\infty} a_s J^{\nu_s} (p_s x) \quad (4)$$

soit convergent dans le domaine K ; nous aurons immédiatement, en vertu de § 1, (7) et § 9, (2) cet autre développement:

$$\frac{\Gamma(\rho+1) x^\rho}{\Gamma\left(\frac{\rho+\sigma+1}{2}\right) \Gamma\left(\frac{\rho-\sigma+1}{2}\right)} = \sum_{s=0}^{s=\infty} a_s J^{\frac{\nu_s+\sigma}{2}} (p_s x) J^{\frac{\nu_s-\sigma}{2}} (p_s x) \quad (5)$$

qui est certainement convergent dans le domaine K_1 .

Supposons maintenant que la série (4) soit la série *neumannienne* de première espèce, les deux domaines K et K_1 coïncident tous deux avec la partie finie du plan des x , ce qui est la raison de la coïncidence des domaines de convergence K et K_1 pour les deux séries *neumanniennes* qui représentent la même fonction.

Pour donner aussi une application de l'intégrale double § 9, (4), remarquons qu'une formule générale que j'ai développée dans mon *Traité de fonctions cylindriques*¹⁾ donnera immédiatement ce développement:

$$\left. \begin{aligned} & \sum_{s=0}^{s=\infty} \frac{(-1)^s \varepsilon_s J^{\frac{\nu+\rho}{2}}(sx) J^{\frac{\nu-\rho}{2}}(sx)}{(sx)^\nu} = \\ & = \frac{4}{|x| \cdot \sqrt{\pi} \Gamma\left(\nu + \frac{1}{2}\right)} \cdot \sum_{s=1}^{s=p} k_s^{2\nu} \cdot \int_0^1 \frac{\cos(\rho \arcsin k_s z) (1-z^2)^{\nu-\frac{1}{2}}}{(1-k_s^2 z^2)^{\frac{\nu+1}{2}}} dz, \end{aligned} \right\} (6)$$

où x désigne une quantité réelle, telle que

$$\pi\left(p - \frac{1}{2}\right) \leq |x| < \left(p + \frac{1}{2}\right)\pi, \quad (7)$$

p étant un positif entier, tandis que nous avons posé pour abrégé:

$$k_s = \sqrt{1 - \frac{(2s-1)^2 \pi^2}{4x^2}};$$

quant à ε_s , il faut poser $\varepsilon_0 = 1$, mais $\varepsilon_s = 2$ pour $s \geq 1$.

L'accent fixé au signe Σ qui figure au second membre indique qu'il faut prendre la moitié du terme qui correspond à $s = p$, dans le cas particulier où l'égalité a lieu dans la limite inférieure de (7).

Dans le cas particulier où $-\frac{\pi}{2} < x < +\frac{\pi}{2}$, la somme de la série infinie qui figure au premier membre de (6) est égale à zéro.

Posons particulièrement dans (6) $\nu = 0$, $\rho = 1$, nous retrouvons la formule élémentaire très connue:

¹⁾ Handbuch der Zylinderfunktionen, p. 340.

$$\sum_{s=1}^{s=\infty} \frac{(-1)^{s-1} \sin(2s x)}{s} = x - \frac{x}{|x|} \cdot \sum_{s=1}^{s=p_1'} \pi, \quad (8)$$

tandis que l'hypothèse $\nu = \rho = 0$ conduira à une autre formule particulière que j'ai développée dans mon *Traité*¹⁾ sus-indiqué. Nous aurons dans ce cas la formule

$$\sum_{s=0}^{s=\infty} (-1)^s \varepsilon_s (J^0(sx))^2 = \frac{4}{\pi \cdot |x|} \cdot \sum_{s=1}^{s=p_1'} F\left(\frac{\pi}{2}, k_s\right), \quad (9)$$

où $F\left(\frac{\pi}{2}, k\right)$ désigne l'intégrale elliptique complète de première espèce, tandis que l'hypothèse $\nu = \rho = 1$ donnera la formule analogue

$$\sum_{s=0}^{s=\infty} \frac{(-1)^s \varepsilon_s}{sx} \cdot J^0(sx) J^1(sx) = \frac{8}{\pi \cdot |x|} \cdot \sum_{s=1}^{s=p_1'} k_s^2 E\left(\frac{\pi}{2}, k_s\right), \quad (10)$$

où $E\left(\frac{\pi}{2}, k\right)$ désigne l'intégrale elliptique complète de seconde espèce.

Remarquons en passant qu'il est très facile de démontrer ces théorèmes concernant des cas particuliers de la série (6):

1°. *Supposons que ν et ρ soient des entiers non négatifs de la même parité, la somme de la série (6) s'exprime sous forme finie à l'aide des intégrales elliptiques complètes.*

2°. *Dans le cas, où ν et ρ sont des entiers non négatifs de parité différente, la somme de la série (6) est un polynôme entier de π .*

3°. *Supposons que ν et ρ soient des nombres rationnels parmi lesquels un au moins est fractionnaire, la somme de la série (6) s'exprime sous forme finie à l'aide des intégrales hyperelliptiques.*

Remarquons en passant que l'intégrale § 8, (9) peut également être transformée à l'aide de la formule § 1, (10), mais qu'une telle transformation ne présente qu'un intérêt médiocre.

CHAPITRE III.

Sur une équation différentielle linéaire.

§ 11. Équation du quatrième ordre obtenue pour $C^\nu(x) \cdot C^\rho(x)$.

Il est évident que la méthode que j'ai appliquée dans mon *Traité* des fonctions cylindriques en m'appuyant sur un cas particulier de la formule intégrale § 9, (2) est également applicable à la formule générale. De plus, il est évident que cette méthode généralisée nous donnera sur-le-champ les équations différentielles que j'ai

¹⁾ Handbuch der Zylinderfunktionen, p. 347.

obtenues pour les produits de deux fonctions cylindriques en suivant une méthode un peu plus longue.

Pour obtenir l'équation différentielle à laquelle le produit de deux fonctions cylindriques quelconques doit satisfaire nous avons à prendre pour point de départ l'équation différentielle de BESSEL.

$$z^{(2)} + \frac{1}{x} z^{(1)} + \left(a^2 - \frac{a^2}{x^2} \right) z = 0, \quad z = J^a(ax),$$

ce qui donnera en vertu de la formule intégrale § 9, (2) pour la fonction

$$y = J^{\frac{a+b}{2}}(x) J^{\frac{a-b}{2}}(x)$$

cette équation non homogène :

$$y^{(2)} + \frac{1}{x} y^{(1)} - \frac{a^2}{x^2} y = U, \quad (1)$$

où nous avons posé pour abréger :

$$U = -\frac{2}{\pi} \cdot \int_0^{\frac{\pi}{2}} J^a(2x \cos \varphi) (2 \cos \varphi)^2 \cos(b \varphi) d\varphi. \quad (1 \text{ bis})$$

Introduisons maintenant dans l'intégrale U la série ordinaire qui représente la fonction $J^a(x)$, nous aurons en vertu de § 1, (8) :

$$U = -4 \cdot \sum_{s=0}^{s=\infty} \frac{(-1)^s \binom{a+2s}{s} \left(\frac{x}{2}\right)^{a+2s}}{\Gamma\left(s+1+\frac{a+b}{2}\right) \Gamma\left(s+1+\frac{a-b}{2}\right)} \cdot \frac{(a+2s+1)(a+2s+2)}{(a+2s+2)^2 - b^2};$$

appliquons ensuite l'identité évidente

$$\frac{m(m-1)}{m^2 - x^2} = 1 + \frac{x-1}{2} \cdot \frac{1}{m-x} - \frac{x+1}{2} \cdot \frac{1}{m+x},$$

puis mettons pour abréger :

$$U^{a,b}(x) = \sum_{s=0}^{s=\infty} \frac{(-1)^s \binom{a+2s}{s} \left(\frac{x}{2}\right)^{a+2s}}{\Gamma\left(s+1+\frac{a+b}{2}\right) \Gamma\left(s+1+\frac{a-b}{2}\right)} \cdot \frac{1}{a+b+2s+2}, \quad (2)$$

nous aurons, en vertu de (1) :

$$y^{(2)} + \frac{1}{x} y^{(1)} + \left(4 - \frac{a^2}{x^2} \right) y = (2b+2) U^{a,b}(x) - (2b-2) U^{a,-b}(x). \quad (3)$$

Cela posé, remarquons que la définition (2) donnera immédiatement ces deux identités :

$$D_x \left[\left(\frac{x}{2} \right)^{b+2} \cdot U^{a,b}(x) \right] = \frac{1}{x} \cdot \left(\frac{x}{2} \right)^{b+2} \cdot J^{\frac{a+b}{2}}(x) J^{\frac{a-b}{2}}(x) \quad (4)$$

$$D_x \left[\left(\frac{x}{2} \right)^{b+2} \cdot U^{a,-b}(x) \right] = \frac{1}{x} \left(\frac{x}{2} \right)^{b+2} \cdot \left(J^{\frac{a+b}{2}}(x) J^{\frac{a-b}{2}}(x) + 2b U^{a,-b}(x) \right), \quad (5)$$

puis multiplions par $\left(\frac{x}{2} \right)^{b+2}$ les deux membres de (3), une différentiation par rapport à x donnera cette autre équation différentielle:

$$\left. \begin{aligned} y^{(3)} + \frac{3+b}{x} \cdot y^{(2)} + \left(4 + \frac{1+b-a^2}{x^2} \right) y^{(1)} + \left(\frac{4+4b}{x} - \frac{a^2 b}{x^3} \right) y = \\ = -\frac{4}{x} \cdot b(b-1) U^{a,-b}(x). \end{aligned} \right\} \quad (6)$$

Multiplions ensuite par $\left(\frac{x}{2} \right)^{3-b}$ les deux membres de (6); une nouvelle différentiation par rapport à x donnera finalement, si nous posons encore

$$\frac{a+b}{2} = \nu, \quad \frac{a-b}{2} = \rho,$$

l'équation différentielle cherchée:

$$\left. \begin{aligned} y^{(4)} + \frac{6}{x} y^{(3)} + \left(4 + \frac{7-2\nu^2-2\rho^2}{x^2} \right) y^{(2)} + \left(\frac{16}{x} + \frac{1-2\nu^2-2\rho^2}{x^3} \right) y^{(1)} + \\ + \left(\frac{8}{x^2} + \frac{(\nu^2-\rho^2)^2}{x^4} \right) y = 0 \end{aligned} \right\} \quad (7)$$

qui admet certainement comme intégrale particulière la fonction $y = J^\nu(x) J^\rho(x)$.

Remarquons maintenant que les signes des deux paramètres ν et ρ peuvent être choisis arbitrairement; il est évident que l'équation différentielle (7) a comme intégrale complète la fonction

$$y = c_1 J^\nu(x) J^\rho(x) + c_2 J^\nu(x) Y^\rho(x) + c_3 Y^\nu(x) J^\rho(x) + c_4 Y^\nu(x) Y^\rho(x), \quad (8)$$

où les c_s désignent des constantes arbitraires, fonctions de ν et ρ .

§ 12. Équations différentielles du troisième ordre.

Revenons maintenant à l'équation différentielle § 11, (6); il est clair que les deux cas particuliers $b = 0$, $b = 1$ présentent un intérêt particulier, par ce que ces deux valeurs de b font disparaître le second membre de l'équation susdite.

1°. $b = 0$; posons $a = 2\nu$, il en résulte cette équation:

$$y^{(3)} + \frac{3}{x} y^{(2)} + \left(4 + \frac{1-4\nu^2}{x^2} \right) y^{(1)} + \frac{4}{x} y = 0 \quad (1)$$

qui admet comme intégrale complète la fonction

$$y = c_1 (J^\nu(x))^2 + c_2 J^\nu(x) Y^\nu(x) + c_4 (Y^\nu(x))^2. \quad (2)$$

En effet, introduisons dans (1) la série

$$y = \sum_{s=0}^{s=\infty} a_s \cdot x^{k+2s}, \quad (3)$$

puis appliquons la formule *eulérienne* concernant la fonction $\Gamma(2a)$; nous aurons, en vertu de § 9, (1), ces trois intégrales particulières:

$$(J^\nu(x))^2, \quad (J^{-\nu}(x))^2, \quad J^\nu(x) J^{-\nu}(x),$$

ce qui nous conduira immédiatement à l'intégrale complète (2).

2°. $b = 1$; nous aurons ici l'équation différentielle analogue à (1):

$$y^{(3)} + \frac{4}{x} y^{(2)} + \left(4 + \frac{2-a^2}{x^2}\right) y^{(1)} + \left(\frac{8}{x} - \frac{a^2}{x^3}\right) y = 0, \quad (4)$$

équation qui admet certainement comme intégrale particulière la fonction

$$y_1 = J^{\frac{a+1}{2}}(x) J^{\frac{a-1}{2}}(x). \quad (5)$$

Pour déterminer maintenant deux autres intégrales particulières de (4), introduisons-y la série (3); nous aurons la formule réursive

$$(k+2s+1)(k+2s+a)(k+2s-a)a_s + 4(k+2s)a_{s-1} = 0,$$

et pour k les valeurs suivantes:

$$k = a, \quad k = -a, \quad k = -1.$$

L'hypothèse $k = a$ nous conduira à l'intégrale (5), tandis que $k = -a$ donnera cette autre intégrale particulière:

$$y_2 = J^{\frac{1-a}{2}}(x) J^{-\frac{a+1}{2}}(x). \quad (6)$$

L'intégrale qui correspond à $k = -1$ se détermine sous la forme suivante:

$$y_3 = \sum_{s=0}^{s=\infty} \frac{(-1)^s \binom{2s}{s} \left(\frac{x}{2}\right)^{2s-1}}{\Gamma\left(s + \frac{1-a}{2}\right) \Gamma\left(s + \frac{1+a}{2}\right)},$$

ce qui nous conduira à considérer ce cas particulier de § 9, (1):

$$J^{\frac{a-1}{2}}(x) J^{-\frac{a+1}{2}}(x) = \sum_{s=0}^{s=\infty} \frac{(-1)^s \binom{2s-1}{s}}{\Gamma\left(s + \frac{1-a}{2}\right) \Gamma\left(s + \frac{1+a}{2}\right)} \cdot \left(\frac{x}{2}\right)^{2s-1};$$

appliquons ensuite l'identité évidente

$$\binom{2s-1}{s} = \frac{1}{2} \cdot \binom{2s}{s}, \quad s \geq 1,$$

nous aurons en vertu de la formule *eulérienne* § 1, (5) pour y_3 cette autre expression :

$$y_3 = J^{\frac{a-1}{2}}(x) J^{-\frac{a+1}{2}}(x) - \frac{\cos \frac{a\pi}{2}}{\pi x}. \quad (7)$$

Combinons maintenant les deux intégrales y_1 et y_3 ; la définition de la fonction cylindrique de seconde espèce $Y^\nu(x)$ donnera cette autre intégrale particulière de (4) :

$$y_4 = J^{\frac{a-1}{2}}(x) Y^{\frac{a+1}{2}}(x) + \frac{1}{\pi x}. \quad (8)$$

Quant à l'intégrale (6), appliquons l'identité

$$J^{-\nu}(x) = \cos \nu\pi J^\nu(x) - \sin \nu\pi Y^\nu(x),$$

et la formule fondamentale de LOMMEL :

$$Y^{\nu-1}(x) J^\nu(x) - Y^\nu(x) J^{\nu-1}(x) = \frac{2}{\pi x};$$

nous aurons cette autre intégrale particulière de (4) :

$$y_5 = Y^{\frac{a-1}{2}}(x) Y^{\frac{a+1}{2}}(x), \quad (9)$$

de sorte que nous avons démontré ce théorème qui est certainement nouveau :

VIII. *Supposons différent de zéro le paramètre a , l'intégrale complète de l'équation (4) se présente sous la forme*

$$y = c_1 J^{\frac{a-1}{2}}(x) J^{\frac{a+1}{2}}(x) + c_2 Y^{\frac{a-1}{2}}(x) Y^{\frac{a+1}{2}}(x) + c_3 \left(J^{\frac{a-1}{2}}(x) Y^{\frac{a+1}{2}}(x) + \frac{1}{\pi x} \right). \quad (10)$$

Dans le cas particulier $a = 0$ nous aurons :

$$J^{\frac{1}{2}}(x) J^{-\frac{1}{2}}(x) = - Y^{\frac{1}{2}}(x) Y^{-\frac{1}{2}}(x) = \frac{\sin 2x}{\pi x};$$

pour obtenir dans ce cas une troisième intégrale particulière de (4) nous pouvons prendre la fonction

$$\frac{J^{\frac{a+1}{2}}(x) J^{\frac{a-1}{2}}(x) - J^{\frac{1-a}{2}}(x) J^{-\frac{1+a}{2}}(x)}{\sin a\pi},$$

ce qui donnera, pour $a = 0$, l'intégrale cherchée sous la forme

$$y_6 = \sqrt{\frac{1}{x}} \cdot \left(\cos x \cdot (D_\nu J^\nu(x))_{\nu = \frac{1}{2}} + \sin x \cdot (D_\nu J^\nu(x))_{\nu = -\frac{1}{2}} \right). \quad (11)$$

§ 13. Représentations intégrales de $C^\nu(x) \cdot C^{\nu+1}(x)$.

Dans mon *Traité des fonctions cylindriques* j'ai étudié d'un point de vue général une classe d'intégrales définies parmi lesquelles la suivante :

$$x^{-\omega} \mathfrak{S}(xy) = \int_0^\infty C^\nu(tx) t^\rho (t^2 + y^2)^\sigma dt, \quad \omega = \rho + 2\sigma + 1 \quad (1)$$

est une des plus simples; la fonction $\mathfrak{S}(x)$ qui figure au premier membre de (1) satisfait à cette équation différentielle du troisième ordre :

$$\mathfrak{S}^{(3)}(x) + \frac{3-2\omega}{x} \cdot \mathfrak{S}^{(2)}(x) + \left(\frac{(\omega-1)^2 - \nu^2}{x^2} - 1 \right) \mathfrak{S}^{(1)}(x) + \frac{2\sigma}{x} \cdot \mathfrak{S}(x) = 0. \quad (2)$$

Posons ensuite dans l'équation différentielle § 12, (4):

$$y = x^{-\alpha} \cdot z$$

et dans l'équation ainsi obtenue px au lieu de x , nous aurons l'équation différentielle

$$\left. \begin{aligned} z^{(3)} + \frac{4-3\alpha}{x} \cdot z^{(2)} + \left(4p^2 + \frac{(\alpha-1)(3\alpha-2)-\alpha^2}{x^3} \right) z^{(1)} + \\ + \left(\frac{4p^2(2-\alpha)}{x} - \frac{(\alpha-1)(\alpha-\alpha)(\alpha+\alpha)}{x^3} \right) z = 0, \end{aligned} \right\} \quad (3)$$

qui admet comme intégrale complète la fonction

$$\left. \begin{aligned} z = x^\alpha \left(c_1 J^{\frac{\alpha+1}{2}}(px) J^{\frac{\alpha-1}{2}}(px) + c_2 Y^{\frac{\alpha+1}{2}}(px) Y^{\frac{\alpha-1}{2}}(px) + \right. \\ \left. + c_3 \left(J^{\frac{\alpha-1}{2}}(px) Y^{\frac{\alpha+1}{2}}(px) + \frac{1}{\pi px} \right) \right). \end{aligned} \right\} \quad (4)$$

Cela posé, il est évident que les équations différentielles (2) et (3) deviennent identiques sous les conditions suivantes :

$$\begin{aligned} p &= \frac{i}{2}, & 4-3\alpha &= 3-2\omega, & \alpha-2 &= 2\sigma \\ (\alpha-1)(3\alpha-2)-\alpha^2 &= (\omega-1)^2 - \nu^2 \\ (\alpha-1)(\alpha-\alpha)(\alpha+\alpha) &= 0, \end{aligned}$$

de sorte que nous avons à étudier séparément ces trois cas différents :

- 1°. $\alpha = \rho = \omega = 1, \quad \sigma = -\frac{1}{2}, \quad \alpha = \nu, \quad p = \frac{i}{2}$
- 2°. $\alpha = \alpha, \quad \rho = \frac{\alpha-1}{2}, \quad \sigma = \frac{\alpha}{2} - 1, \quad \omega = \frac{3\alpha-1}{2}, \quad \nu = \frac{\alpha+1}{2}, \quad p = \frac{i}{2}$
- 3°. $\alpha = -\alpha, \quad \rho = -\frac{\alpha+1}{2}, \quad \sigma = -\frac{\alpha}{2} - 1, \quad \omega = -\frac{3\alpha+1}{2}, \quad \nu = \frac{1-\alpha}{2}, \quad p = \frac{i}{2}$.

Or, il saute aux yeux que les deux derniers cas coïncident, de sorte que nous n'avons qu'à étudier les deux premiers cas.

§ 14. Étude de l'intégrale $\int_0^{\infty} O^{\nu}(tx) t(t^2 + y^2)^{-\frac{1}{2}} dt$.

Dans le premier cas indiqué au § 13 nous aurons une formule de la forme

$$\int_0^{\infty} \frac{J^{\nu}(tx) t dt}{\sqrt{t^2 + y^2}} = y \cdot \left[c_1 J^{\frac{\nu+1}{2}}\left(\frac{xyi}{2}\right) J^{\frac{\nu-1}{2}}\left(\frac{xyi}{2}\right) + c_2 J^{-\frac{\nu+1}{2}}\left(\frac{xyi}{2}\right) J^{\frac{1-\nu}{2}}\left(\frac{xyi}{2}\right) + \right. \\ \left. + c_3 \left(J^{\frac{\nu-1}{2}}\left(\frac{xyi}{2}\right) J^{-\frac{\nu+1}{2}}\left(\frac{xyi}{2}\right) - \frac{2 \cos \frac{\nu\pi}{2}}{i\pi xy} \right) \right], \quad (1)$$

où les coefficients c_s sont des fonctions de ν , indépendantes à la fois de x et de y .

Pour déterminer ces trois coefficients inconnus, remarquons tout d'abord que l'intégrale qui figure au premier membre de (1) a un sens sous les conditions suivantes: x réel et non négatif, $\Re(\nu) > -2$, et qu'elle représente dans ce cas une fonction *analytique* de ν .

Multiplions ensuite par $x^{-\nu}$ les deux membres de (1), puis faisons converger à zéro la variable positive x ; l'intégrale ainsi obtenue aura un sens pourvu que $-2 < \Re(\nu) < -1$, ce qui donnera pour $y = 1$:

$$\frac{\left(\frac{i}{4}\right)^{\nu} \cdot c_1}{\Gamma\left(\frac{\nu+3}{2}\right) \Gamma\left(\frac{\nu+1}{2}\right)} = \frac{2^{-\nu}}{\Gamma(\nu+1)} \cdot \int_0^{\infty} \frac{t^{\nu+1}}{\sqrt{t^2+1}} dt,$$

d'où en appliquant des formules très connues concernant la fonction gamma:

$$c_1 = -\frac{\pi i^{-\nu}}{2 \cos \frac{\nu\pi}{2}}.$$

Pour déterminer le coefficient c_3 mettons dans (1) $y = 0$; l'intégrale ainsi obtenue a un sens, pourvu que $\Re(\nu) > -1$; nous aurons, en vertu de l'intégrale fondamentale de M. WEBER § 7, (9):

$$c_3 = \frac{\pi i}{2 \cos \frac{\nu\pi}{2}}.$$

Quant au coefficient c_2 , il est facile de voir qu'il doit disparaître; en effet, supposons $\Re(\nu) > 0$, puis mettons dans (1) $x = 0$, le premier membre de cette formule s'évanouira, ce qui n'est possible pour le second membre que si $c_2 = 0$.

Cela posé, nous aurons finalement la formule:

$$\int_0^{\infty} \frac{J^{\nu}(tx) t}{\sqrt{t^2 + y^2}} dt = -\frac{\pi y}{2} \cdot J^{\frac{\nu-1}{2}}\left(\frac{xyi}{2}\right) H_2^{\frac{\nu+1}{2}}\left(\frac{xyi}{2}\right) - \frac{1}{x} \quad (2)$$

qui est certainement nouvelle; dans (2) $H_2^a(x)$ désigne la fonction de HANKEL, savoir

$$H_2^a(x) = J^a(x) - iY^a(x). \quad (3)$$

Changeons ensuite dans (2) le signe de ν , nous pouvons déterminer sans peine la valeur de l'intégrale correspondante qui contient une fonction cylindrique quelconque. Nous ne nous arrêtons pas à une recherche plus approfondie d'une telle généralisation de (2); au contraire nous préférons soumettre notre formule (2) à une légère transformation.

A cet effet, mettons dans (2) $-iy$ au lieu de y , puis supposons pour un instant réels la nouvelle variable y et le paramètre ν ; il résulte, en égalant les parties réelles et imaginaires de la formule ainsi obtenues, ces deux autres formules:

$$\int_y^\infty \frac{J^\nu(tx)t}{\sqrt{t^2-y^2}} dt = \frac{\pi y}{2} \cdot J^{\frac{\nu-1}{2}}\left(\frac{xy}{2}\right) Y^{\frac{\nu+1}{2}}\left(\frac{xy}{2}\right) - \frac{1}{x} \quad (4)$$

$$\int_0^y \frac{J^\nu(tx)t}{\sqrt{y^2-t^2}} dt = \frac{\pi y}{2} \cdot J^{\frac{\nu-1}{2}}\left(\frac{xy}{2}\right) J^{\frac{\nu+1}{2}}\left(\frac{xy}{2}\right), \quad (5)$$

dont la première est certainement nouvelle, tandis que la seconde coïncide avec un cas particulier de notre formule générale § 9, (2).

§ 15. Étude de l'intégrale $\int_0^\infty J^{\nu+1}(tx)t^{\nu+1} \cdot (t^2+y^2)^{\nu-\frac{1}{2}} dt$.

Dans le second cas du § 13 nous obtenons tout d'abord une formule de la forme

$$\int_0^\infty \frac{J^{\nu+1}(tx)t^{\nu+1}}{(t^2+y^2)^{\frac{1}{2}-\nu}} dt = \frac{y^{2\nu+1}}{x^\nu} \cdot \left[c_1 J^\nu\left(\frac{xyi}{2}\right) J^{\nu+1}\left(\frac{xyi}{2}\right) + c_2 J^{-\nu}\left(\frac{xyi}{2}\right) J^{-\nu+1}\left(\frac{xyi}{2}\right) + c_3 \left(J^\nu\left(\frac{xyi}{2}\right) J^{-\nu-1}\left(\frac{xyi}{2}\right) + \frac{2 \sin \nu \pi}{i \pi xy} \right) \right], \quad (1)$$

d'où, en suivant la méthode ordinaire, cette détermination des coefficients c_s :

$$\begin{aligned} c_3 &= 0 \\ c_1 &= \frac{2^{\nu-2} \sqrt{\pi} \Gamma\left(\nu + \frac{1}{2}\right) i^{-2\nu-1}}{\sin \nu \pi} \\ c_2 &= -\frac{2^{\nu-2} \sqrt{\pi} \Gamma\left(\nu + \frac{1}{2}\right) i^{2\nu+1}}{\sin \nu \pi}, \end{aligned}$$

ce qui donnera la formule cherchée

$$\int_0^\infty \frac{J^{\nu+1}(tx)t^{\nu+1}}{(t^2+y^2)^{\frac{1}{2}-\nu}} dt = -\frac{2^{\nu-2} \sqrt{\pi} \Gamma\left(\nu + \frac{1}{2}\right) (iy)^{2\nu+1}}{x^\nu \sin \nu \pi} \cdot \left(J^\nu\left(\frac{xyi}{2}\right) J^{\nu+1}\left(\frac{xyi}{2}\right) e^{-2\nu\pi i} + J^{-\nu}\left(\frac{xyi}{2}\right) J^{-\nu-1}\left(\frac{xyi}{2}\right) \right) \quad (2)$$

qui est valable, pourvu que x soit positif et $\frac{1}{6} > \Re(\nu) > -\frac{3}{2}$; quant à y , cette variable ne doit être purement imaginaire que si nous supposons encore $\Re(\nu) > -\frac{1}{2}$.

Cela posé, mettons dans (2) $2x$ au lieu de x et $-iy$ au lieu de y , nous aurons une identité de la forme:

$$\begin{aligned} & \int_y^\infty \frac{J^{\nu+1}(2tx)t^{\nu+1}}{(t^2-y^2)^{\frac{1}{2}-\nu}} dt + (-1)^{\nu-\frac{1}{2}} \cdot \int_0^y \frac{J^{\nu+1}(2tx)t^{\nu+1}}{(y^2-t^2)^{\frac{1}{2}-\nu}} dt = \\ & = -\frac{2^{\nu-2}\sqrt{\pi}\Gamma\left(\nu+\frac{1}{2}\right)y^{2\nu+1}}{x^\nu \sin \nu\pi} \left(J^\nu(xy)J^{\nu+1}(xy) \cos \nu\pi - \right. \\ & \quad \left. - iJ^\nu(xy)J^{\nu+1}(xy) \sin \nu\pi + J^{-\nu}(xy)J^{-\nu-1}(xy) \right), \end{aligned}$$

ce qui nous permet de déterminer la valeur du facteur $(-1)^{\nu-\frac{1}{2}}$ qui figure au premier membre; nous aurons par là, après une légère modification des significations:

$$\int_0^{\frac{\pi}{2}} J^{\nu+1}(2x \cos \varphi) (\cos \varphi)^{\nu+1} (\sin \varphi)^{2\nu} d\varphi = \frac{2^{\nu-1} \Gamma\left(\nu+\frac{1}{2}\right)\sqrt{\pi}}{x^\nu} \cdot J^\nu(x)J^{\nu+1}(x), \quad (3)$$

où il faut admettre $\Re(\nu) > -\frac{1}{2}$; la formule (3), qui est certainement nouvelle, peut aussi se démontrer sans peine par un calcul direct.

De plus, nous aurons cette autre formule:

$$\left. \begin{aligned} & \int_y^\infty \frac{J^{\nu+1}(2tx)t^{\nu+1}}{(t^2-y^2)^{\frac{1}{2}-\nu}} dt = -\frac{2^{\nu-2}\sqrt{\pi}\Gamma\left(\nu+\frac{1}{2}\right)y^{2\nu+1}}{x^\nu \sin \nu\pi} \cdot \\ & \cdot \left(J^\nu(xy)J^{\nu+1}(xy) \cos \nu\pi + J^{-\nu}(xy)J^{-\nu-1}(xy) \right), \end{aligned} \right\} (4)$$

où il faut admettre $\frac{1}{6} > \Re(\nu) > -\frac{1}{2}$; posons dans (4) $\nu = 0$, nous aurons, après un simple calcul, un cas particulier de la formule § 14, (4).

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DANSKE ARTER
AF
SLÆGTEN CERAMIUM (ROTH) LYNGBYE

AF
HENNING EILER PETERSEN

AVEC UN RÉSUMÉ EN FRANÇAIS

MED 9 FIG. I TEXTEN OG 7 TAVLER

D. KGL. DANSKE VIDENSK. SELSK. SKRIFTER, 7. RÆKKE, NATURVIDENSK. OG MATHEM. AFD. V. 2

KØBENHAVN

HOVEDKOMMISSIONÆR: ANDR. FRED. HØST & SØN, KGL. HOF-BOGHANDEL

BIANCO LUNOS BOGTRYKKERI

1908

Det Kgl. Danske Videnskabernes Selskabs Skrifter, 6^{te} Række.

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DANSKE ARTER

AF

SLÆGTEN CERAMIUM (ROTH) LYNGBYE

AF

HENNING EILER PETERSEN

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KØBENHAVN

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1908

A. Indledning.

Quamquam Species Ceramiorum ante alias Algas fere omnes ad oras Europæ frequentes obveniant, tamen confiteri fas est vix existere Floridearum genus cujus Species revera minus intelliguntur. (J. G. AGARDH: De typis Ceram, pag. 3.)

The Ceramia are almost as unsatisfactory to the Botanist as the Rubi, and their varieties quite are numerous.

(HARVEY: Phycol. brit.)

Den første af de to Udtalelser, som jeg har stillet foran denne Bearbejdelse af de danske Ceramium-Arter, siger os, at Ceramium-Slægten i Modsætning til, hvad man kunde vente, naar man tog Hensyn til, at dens Arter forekomme overmaade hyppigt, ikke i nogen særlig Grad har nydt Botanikernes Gunst. Den anden Udtalelse giver os Forklaringen paa dette Fænomen: Ceramium-Slægten er indenfor Algernes Omraade, hvad Rubus o. a. Slægter er blandt Blomsterplanterne, et Omraade, hvor den menneskelige Aand vanskeligt finder sig til Rette i sin Trang til at forme bestemte Kategorier, Arter, kortsagt et Omraade, som endnu befinder sig i Udvikling. Nøjere bestemt kunne vi karakterisere Ceramium-Slægten som et Omraade, i hvilket der kun findes faa skarpt adskilte Arter, derimod en stor Mængde Former, som gruppere sig om bestemte Typer og som i højere eller mindre Grad flyde over i hverandre. Denne sidste Egenskab gør enhver systematisk Behandling overmaade vanskelig og paa de fleste Punkter lidet tilfredsstillende. I flere Tilfælde maa Systematikeren egentlig give tabt og kun Trangen til de bestemte Kategorier faar ham til at træffe sine Afgørelser, hvad dog nærmest kun vil sige med Navne at bringe Orden i Virvaret. Man føler bedst her, hvor lidet den systematiske Methode strækker til, naar man staar overfor Omraader, der er i stærk Udvikling; her burde man, som det er bleven gjort gældende, kun tale om Udviklingsrækker eller lignende. Den eneste sikre Løsning af de Problemer, som Ceramium-Slægten Arter og Former stiller os, vil kun naaes ad Experimentets Vej. Men i saa Henseende er der vistnok endnu langt tilbage.

Den foregaaende Karakteristik af Ceramium-Slægten og de dertil knyttede Betragtninger vil tydeliggøre, hvormegen objectiv Værdi man bør tilkjende de her

i dette Arbejde beskrevne Arter og Former, som ikke er skarpt begrænsede fra Naturens Haand.

Jeg betoner dette saameget desto mere, som jeg paa flere Punkter divergerer fra en Forsker, der for ganske nylig har givet Bidrag til Kundskaben om denne Slægt, H. KYLIN.

Til Grund for nærværende Bearbejdelse af de danske Arter af Slægten *Ceramium* ligger i Hovedsagen Materiale (væsentligst Herbarexemplarer) samlet af Hr. Docent Dr. L. KOLDERUP ROSENVINGE gennem en lang Aarrække. I Forhold til dette Materiale, der omfatter over 300 Numre fra c. 150 Lokalteter og som giver et meget fuldstændigt Billede af *Ceramium*-Slægtens Forekomst i vore Farvande, træder de Oplysninger, som Forfatteren selv har kunnet skaffe tilveje og som det botaniske Museum har kunnet yde gennem sit Herbarium, fuldstændig i Skygge. Fra først af, da Dr. KOLDERUP ROSENVINGE overdrog mig at bearbejde denne Slægt, var det Meningen, at min Behandling skulde fremtræde som et Led af det Arbejde over de danske Havalger, som denne Forsker for Tiden har under Udarbejdelse. Af forskellige Hensyn fremtræder mit Arbejde allerede nu og som noget selvstændigt. For den Tillid, Dr. Kolderup Rosenvinge viste mig ved at overdrage mig Behandlingen af denne Slægt, der frembyder saa store Vanskeligheder, ligesaa for den Elskværdighed, hvormed han altid har støttet mig i dette Arbejde, bringer jeg ham her min hjærteligste Tak.

Slægten er behandlet næsten udelukkende fra et morphologisk-systematisk Synspunkt. Hvad der ved første Gennemgang viste sig som det, der skulde udføres: nemlig en grundig Redegørelse for de mange Former, der fandtes i Dr. Kolderup Rosenvinges Materiale, har beskæftiget mig i den Grad, at andre Spørgsmaal af mere almindelig Interesse f. Eks. Befrugtningsforholdene ikke er blevne paaagtede.

Af de 9¹ Arter, som omtales i dette Arbejde, er de 7 beskrevne tidligere og i det Hele taget Arter, der er almindelige og som derfor atter og atter er bleven omtalte af Systematikerne. Ikke destomindre hersker der den største Uklarhed over disse Arters Begrænsning, en Uklarhed, som jeg efter bedste Evne har søgt at raade Bod paa. Jeg har dog i mindre Grad søgt at udfinde, hvad Autorerne have ment; meget mere er jeg traadt i Skranken for personlige Opfattelser og helt uden Betydning er vel saadanne ikke, naar de iøvrigt støttes ved nøjagtige Undersøgelser af de paagældende Objekter. Det, som det foreløbig kommer an paa ved *Ceramium*-Slægten er, at man skarpt præciserer de enkelte Former og Arter — har man erkendt Realiteten, er Navnet uvæsentligt.

To nye Navne har jeg dannet 1. *Cer. vertebrale* for en ny Art(?) i Østersøen og tilgrænsende Farvande og 2. *Cer. Rosenvingii* for visse Former indenfor et Omraade, der tidligere henlaa i stor Uklarhed (*C. rubrum* a *decurrens* J. G. Agardh). En Mængde Former har jeg opstillet; maaske for mange. Ved „Form“ forstaar

¹ 10 med den i Efterskriften nævnte *Cer. Deslongchampii*.

jeg iøvrigt kun det, der indenfor Arten fremtræder som noget selvstændigt uden Hensyn til Aarsagerne.

Af yderligere systematisk Nyt kan jeg fremhæve, at det er lykkedes mig at finde Midler til at erkende *C. tenuissimum* i vegetativ Tilstand. Af mere almindelig Interesse er Paavisningen af Parasporernes Udviklingshistorie og deres Uafhængighed af Tetrasporerne¹.

Ved hver enkelt Art ere dens biologiske Forhold som f. Eks. Fruktifikationsorganernes Art og Hyppighed, Livsperioden, Lokaliteten, saavidt det lod sig gøre, bleven nævnt og dens geografiske Omraade indenfor vore Farvande, saalangt vi foreløbig kan bestemme det, blevet antydet. Men dette er ogsaa alt. Man vil saaledes ikke i dette Arbejde finde noget om vore Algesamfunds S sammensætning og Ceramium-Arternes Stilling deri; ej heller er jeg i nogen nævneværdig Grad kommen ind paa en Fremstilling af vore enkelte Farvandes Saltholdighed og Ceramium-Arternes Forhold hertil — her holder jeg mig kun til de grovere Træk. Disse to Problemer ville senere blive Genstand for en Undersøgelse fra Dr. Kolderup Rosenvinges Side. Mit Arbejde danner i saa Henseende kun et Led af Grundlaget til denne Forskers Fremstilling.

Indenfor den systematiske Litteratur danner J. G. AGARDHS forskellige Arbejder, hvoriblandt i Særdeleshed hans senere Afhandling: de typis Ceramiorum diversis og HARVEYS Phycologia britannica Grundlaget; mindre Betydning har KÜTZINGS Arbejder. Blandt nyere Forskere have bl. a. FOSLIE, KJELLMAN og KYLIN leveret Bidrag til Slægtens Systematik. Foslies Arbejde over de norske Ceramier er egentlig kun paa Grund af sin Kortfattedhed uden særlig Betydning; af de to andre har Kylin ydet det værdifuldeste og det er iøvrigt kun hans Arbejde, som vedrører min Behandling her. Helt enig med ham er jeg ikke; jeg tror imidlertid at Forskellen mellem hans og mine Opfattelser ikke vil vise sig at være særlig stor. Iøvrigt henviser jeg til den specielle Del.

Arbejder, som vedrøre andre Forhold ved Ceramium-Slægten, ville, forsaavidt de overhovedet har Betydning for nærværende Afhandling, blive nævnt i den Oversigt over denne Slægts almindelige Forhold, som indleder den specielle Omtale af de enkelte Arter.

For at undgaa unødvendig Vidtløftighed henviser jeg kun, hvor jeg mener, at der er særlig Grund til det, til de enkelte Lokalteter og Indsamlingsnumrene. Det, der har Betydning, er ikke saa meget de enkelte Lokalteter som de enkelte Omraader. Efter Overenskomst med Dr. KOLDERUP ROSENVINGE benytter jeg følgende Inddelinger og Betegnelser for vore Farvande.

Ns. Nordsøen: fra den slesvigske Grænse indtil Hanstholm.

Sk. Skagerak: fra Hanstholm til Skagens Gren.

Lf. Limfjorden.

¹ Smlgn. her Kylin (1907); han har en Bemærkning om, at Parasporer og Tetrasporangier kunne forekomme i samme Bælte.

- Kn. nordlige Kattegat. Begrænses mod Syd ved en Linie fra Sæby til Læsø Norvest-Rev og ved en Linie fra Læsø Østpynt mod Øst.
- Ke. østlige Kattegat. Begrænses mod Vest af Kobbergrunden og en Linie fra dennes Sydspids til Østpynten af Anholt og derfra til Gilbjerg Hoved; begrænses mod Sundet ved en Linie fra Nakkehoved til Spidsen af Kullen.
- Km. Mellemste Kattegat: Begrænses mod Syd ved en Linie fra Anholts Nordvest-pynt til Fornæs.
- Ks. Sydlige Kattegat: Begrænses mod Sydvest ved en Linie fra Spidsen af Sjællands Odde til Hjelm.



De danske Farvande med de i denne Afhandling benyttede Inddelinger.

- Sa. Samsøpartiet: Begrænses mod Lillebælt ved en Linie fra Æbelø til Bjørnsknude og mod Storebælt ved en Linie fra Fynshoved til Refsnæs Pynt.
- Lb. Lillebælt. Begrænses mod Syd af en Linie fra Pølshuk paa Als til Vejsnæs paa Ærø og mod sydfynske Øgaard ved en Linie fra Hornenæs til Skjoldnæs.
- Sf. Sydfynske Øgaard. Begrænses mod Storebælt ved en Linie fra Turø Rev til Næs Hoved paa Langeland.
- Sb. Storebælt. Begrænses mod Østersøen af en Linie mellem Gulstav paa Langeland og Kappel Kirke paa Lolland, mod Smaalandsøhavet ved en Linie, der fra Korsør Kirke gaar over Vest-Pynten af Egholm, langs Vestsiden af

denne Ø, Agersø og Omø, og fra dennes Syd-Pynt over den Syd-vestlige Omø Staalgrund til den østlige Pynt af Onsevig paa Lolland.

- Sm. Smaalands havet: Begrænses mod Østersøen udfør Bøgestrømmen af en Linie udenom Sandene til Bøgestrøm-Tønden.
- Su. Sundet: Begrænses mod Syd af en Linie fra Sydspidsen af Amager mod Øst.
- Bv. Vestlige Østersø: indtil en Linie fra Gjedser til Darsserort.
- Bm. Mellemste Østersø (Møen-Partiet) indtil en Linie fra Nordenden af Rügen nordefter.
- Bb. Bornholmske Østersø: Farvandet omkring Bornholm.

Jeg har haft Lejlighed til at undersøge *Ceramium*-Arterne i Herbariet tilhørende Museet i Berlin og Riksmuseet i Stockholm¹; endvidere har jeg i Lund haft Adgang til J. G. Agardhs Herbarium. For den Velvilje, der af de paagældende Institutioner er vist overfor mine Undersøgelser, bringer jeg herved min Tak.

Oversigt over den af mig benyttede Litteratur og Exsiccaværker.

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¹ udlaaente til Københavns botaniske Museum.

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B. Bemærkninger om *Ceramium*-Slægtens morphologisk-vegetative og Frukifikations-Forhold af særlig Interesse for den specielle Beskrivelse af de enkelte Arter samt en kort Oversigt over *Ceramium*-Slægtens Udbredelse i de danske Farvande. (Almindelig Del.)

Jeg har forsøgt, om man ikke kunde anvende Antallet af Axeceller i hvert Grenstykke som Kendemærke for de enkelte Arter.

Noget konstant Antal gives naturligvis ikke for hver enkelt Art, men derimod et Middeltal, som vel i og for sig karakteriserer Arten, men som dog i de allerfærreste Tilfælde lader sig praktisk anvende, eftersom det viser sig, at de fleste Arter paa det nærmeste har samme Middeltal. Naar den ene Art f. Eks. har Middeltallet 7 og den anden 9, ligger der praktisk set en altfor stor Fare ved at anvende disse Tal. Jeg har derfor i min Fremstilling ikke i nogen særlig Grad lagt Vægt paa denne Side af Sagen.

Axecellerne optræde under 2 Former, en med parallelle Sider og en med Sider, der opefter nærme sig hinanden. Disse to Slags kunne findes hos samme Art og fremkomme rimeligvis som Følge af forskellige ydre Kaar [og da saaledes, at de koniske Celler rimeligvis er almindelige paa Lokalteter, hvor Arten er udsat for stærkt Træk]. Den koniske Form er forøvrigt ikke tilstede fra Begyndelsen af.

Da Barken spiller saa stor en Rolle for Karakteristiken af de enkelte Arter, er det nødvendigt her at dvæle lidt mere udførligt ved den. Jeg lader dog her alle ikke danske Arter ude af Betragtning. [Om Barkens almindeligere Forhold se Arbejder af Cramer (1857), Agardh (1894), Oltmanns (1904—05) samt Kylin (1907), i hvilke Hovedpunkterne af det, som her skildres, er omtalte.]

J. G. Agardh er den første, som skarpt har gjort opmærksom paa det, som her meddeles om Barkens Væxt, og anvendt Barken i Systematikens Tjeneste.

I nogle Tilfælde er Evnen til at vokse hos Barkcellerne i Bælternes Rand omtrent lige stærk og vi faa da, eftersom Væksten tidligt standser eller fortsættes i længere Tid, henholdsvis skarpt begrænsede Bælter med lige Rand og mindre skarpt begrænsede med Randceller, der vokser op og ned. Hel Symmetri i Forhold til Skillevæggene mellem Axecellerne forekommer dog sjældent, da den ene Del

(enten den nedre eller den øvre) af Bæltet regnet fra disse Vægge altid vil være en Del fremfor den anden.

I andre Tilfælde er den øvre og nedre Rand ulige begavede med Evne til at vokse, og vi faa da efter Omstændighederne Bælter, der enten vokse op- eller ned- eller dog stærkere i den ene Retning end i den anden. Bælter, som have Randvækst, ville i de allerfleste Tilfælde, hurtigere eller langsommere, naa hinanden og derved give Anledning til en sammenhængende Bark. Mellem denne og de skarpt begrænsede Bælter gives der en Mængde Overgangsstadier, alt efter som Bælterne ere naaede langt eller kort mod hinanden, og efter den Maade, hvorpaa Bælterne vokse. Den Maade, hvorpaa dette nu sker hos de delvis barkklædte Arter, er karakteristisk for Arten: det vil vise sig, at der gør sig en bestemt Type gældende for Væksten. Saaledes er f. Ex. *Cer. fruticosum* i Særdeleshed karakteriseret ved den stærke opadløbende Tendens, som dens Bælter udvise, medens paa den anden Side en Art som *Cer. Rosenvingii* udmærker sig ved Bælter, der næsten ligeligt vokser i begge Retninger. En Art *Cer. circinnatum*, som vi forøvrigt ikke have i vore Farvande, har atter Bælter, som fortrinsvis vokser nedad. I de Tilfælde, hvor vi have ulige Vækst, for de danske Arters Vedkommende i Særdeleshed opadgaaende, finde vi aldrig en eller anden Grad udelukkende tilstede. Den ulige Vækst gør sig efter Alderen højst forskelligt gældende; den kulminerer sædvanligt et Stykke fra Spidsen og taber sig efterhaanden nedefter. Saaledes finde vi aldrig udelukkende Bælter med skarpt begrænset nedre Rand; kun en Zone paa Individet udviser saadanne; længere nede vokser Bælterne ogsaa fra den nedre Rand, omend stadig i mindre Grad end den øvre o. s. fr. Barkens Mægtighed, dens Tykkelse, er tiltagende med Alderen — og dette gælder alle Tilfælde, baade dem, hvor der kun er frie Bælter og dem, hvor der er delvis eller helt sammenhængende Bark fra Basis mod Spidsen. Hos de meget stærkt barkklædte Former er dog denne her fremhævede Forskel mellem øvre og nedre Dele ikke saa fremtrædende, som hvor Barken er svag. Førend jeg dvæler nærmere ved den helt sammenhængende Bark, skal jeg kort omtale en særlig Form for Bæltedannelse, som af og til viser sig hos de ellers helt barkklædte Former. Vi finde i saadanne Tilfælde Barken afbrudt af klare Partier, sædvanlig smalle, uden at Barkrandene ud for disse i nogen særlig Grad vokse mod hinanden. Jeg tyder dette ikke som et Stadium mellem helt fri Bæltedannelse og sammenhængende Bark, men som snarere fremkaldt ved en sen Længdestrækning af Axecellerne.

Den sammenhængende Bark, som er fremgaaet af Bælter, der paa en eller anden Maade ere voksede mod hverandre, udviser sædvanlig en ret stor Modsætning mellem den Del af Barken, der findes ud for eller i Nærheden af Axecellernes Skillevægge: Diaphragmedelen og den, der findes ud for selve Axecellen, et lille Stykke fra Skillevæggen at regne, Axecelledelen. Her er Barken altid tyndere, mere storcellet end i Diaphragmedelen. Tangentiale Delinger, hvorved Barken vinder i Tykkelse, forekomme her først paa et sent Tidspunkt, medens saadanne tidligt begynde i den egentlige Bæltedel, Diaphragmedelen. Paa Grund

af Væksten er Cellerne i Axecelledelen sædvanlig strakte paa langs — medens de i Diaphragmedelen mere har en tilfældig Længderetning eller ere isodiametriske. Den fra først af helt sammenhængende Bark, som f. Ex. hos *Cer. rubrum*, viser i Reglen ikke store Modsætninger mellem de nævnte Dele; de yderste Celler, der jo bestemme Barkens Karakter, er ensartede overalt. Naturligvis vil man dog ogsaa her paa Tværsnit konstatere en Forskel i Tykkelse. Ydre Kaar, vistnok navnlig Vandets Saltholdighed, bestemme i høj Grad, hvor mægtig Barken bliver udviklet, hvor mange Lag¹, der dannes. I Særdeleshed træder denne Forskel tydelig frem hos de fra først af helt barkklædte Former, navnlig hos *Cer. rubrum*, hvor vi have alle Grader mellem en tyklaget Bark med smaatcellet Yderlag og et tyndlaget og derfor storcellet Yderlag (idet nemlig Cellestørrelsen er aftagende udefter). Med Hensyn til Barkens Sammenhæng baade i de Tilfælde, hvor vi kun have Bælter, og hvor vi have sammenflydende eller sammenhængende Bark, maa her indskydes den Bemærkning, at de yderste Lag Barkceller altid danner aabne Pletter udfor de Steder, hvor Tetrasporangierne findes, et Forhold, der staar i Forbindelse med Tetrasporernes Udtræden.

Naar Barken er flerlaget (herved ser jeg dog bort fra Tetrasporangiecellerne), fungerer sædvanligt de indre og større Celler som Magasineringsceller, for den ved Assimilationen dannede Floridéstivelse. Naar Barken kun bestaar af 1 til 2 Lag, er der ingen saadan Arbejdsdeling, idet alle Barkens Celler undtagen Tetrasporangiecellerne kunne danne denne Stivelse. Ved dette Indhold faar Barken hos de ovennævnte svagt barkede *Cer. rubrum* Former (og andre tyndlagede Arter) et ganske ejendommeligt Udseende. Med tiltagende Alder fortykkes sædvanlig Celledembranerne, og det Udseende, Axeceller, Bark og Bælter derved faar, er ofte meget forskelligt fra det, der er karakteristisk i de unge Stadier. Nogen særlig systematisk Betydning har dog disse Forandringer ikke.

Foruden de Grene, der ere opstaaede ved Topcellens Vækst og Deling og som danner det for *Ceramium* Slægten karakteristiske gaffelgrenede Løv, optræder der sekundære Grene, som i de fleste Tilfælde udgaa fra de indre større Celler, som findes omkring Axecellernes Skillelægge, og som ogsaa kunne danne Tetrasporangier. Der er da, som det vil forstaaes heraf, et vist Forhold mellem Udviklingen af sekundære Grene og Tetrasporangiedannelsen. Nogen bestemt Regel gives dog ikke. Samme Individ vil hyppigt bære saavel sekundære Grene som Tetrasporangier — men samme Bælte vil dog sjældnere bære bægge disse Organer. I enkelte Tilfælde har jeg bemærket, at den øvre Bælterand hos *Cer. strictum* i Stedet for at danne Parasporehobe har dannet sekundære Grene.

Udviklingen af sekundære Grene er meget forskellig hos de forskellige Arter, og den danner, naar der da ses bort fra de Tilfælde, hvor en stærk Tetrasporangiedannelse hæmmer Grenudviklingen, et meget godt Karaktermærke for visse Arter.

¹ Om regelmæssige Lag, det ene uden for det andet, er der ikke Tale; naar jeg taler f. Eks. om tre Lag, vil det sige, at Barkcellerne omtrentlig forekommer i 3 forskellige Afstande fra Axecellernes Midtlinie paa langs.

Saaledes er f. Eks. *Cer. arborescens* karakteriseret ved et meget stort Antal sekundære Grene, *Cer. strictum* derimod ved en meget ringe Udvikling af disse.

Haar findes meget udbredt. Disse Organer dannes af Barkens yderste Celler derved, at en større Barkcelle afgrænser en mindre, som skyder en Forlængelse ud. Haarene ere farveløse, lange og smalle, faa Mikromillimeter brede, med tydeligt protoplasmatiske Indhold.

Haardannelsen er stærkest om Foraaret og om Sommeren, men ingenlunde, hvad man kunde vente, særlig almindelig hos Individier paa lavt Vand. Tværtimod, i en Dybde paa over 10 Meter kunne vi endnu finde rigelig Haardannelse, ja endog paa 20 Meters Dybde er Haar endnu ikke ganske sjældne. Hvilke ydre Faktorer, der er de egentlig bestemmende for Haarenes Fremkomst, skal jeg ikke indlade mig paa at gruble over. Lyset spiller formodentlig en vis Rolle, men andre Faktorer ere vistnok lige saa vigtige.

Haardannelsen giver ikke gode Arsmærker.

Hos visse Arter: *Cer. tenuissimum*, delvis *Cer. rubrum* og *Cer. arborescens*, har jeg fundet særegne, nyre- eller hjærteformede, indholdsrige, lysbrydende, farveløse Barkceller (Fig. III) i de yderste eller næstyderste Lag af Barken. Indholdet af disse Celler farves svagt gult ved Chlorzinkjod; Osmiumsyre giver ingen Reaktion; derimod faar man en rød Farve frem ved MILLON'S Reagens. Da de almindelige Barkceller ikke farves nær saa meget, indeholder disse Celler altsaa særligt store Mængder af Æggehvide-stoffer. Betydningen af disse Celler er mig ukendt.

I Litteraturen er vistnok lignende Dannelser kun beskrevne for *Turnerella* og *Cruoria arctica*'s¹ Vedkommende. *Antithamnion*'s „Blasenzellen“ er vistnok noget andet².

Farven er ret forskellig hos de forskellige Arter. Nogen sikker Vejledning til Artsbestemmelse giver Farverne dog ikke, i Særdeleshed da de kunne paavirkes af Sollyset, bleges. Lyse Farver, stærk Afblegning, finde vi sædvanlig hos Overflade-individer; mørkere Farver er karakteristisk for Bundformer, Skyggeindivider. Alle de Individier, der forekomme i Aarets mørkeste Tid, er dog, hvad enten de findes paa lavt eller dybt Vand, meget mørkt farvede, i tørret Tilstand sorte eller næsten sorte.

Hvor enkelt end *Ceramium*-Arterne ere byggede, saa frembyder de dog fra Art til Art saa mange morphologiske Forskelligheder, at disse, hvor vi have med typiske Individier at gøre, ofte alene er tilstrækkelige for det øvede Øje ved Bestemmelsen. Disse Forskelligheder kommer frem i Grenvinklernes større eller mindre Udspærrethed, i Internodiernes Længde, i den mere eller mindre tydelige Dikotomi o. s. fr. Særlig karakteristisk er ofte Udviklingen af Hovedstammer, Grenendernes Forhold, om de ere indkrummede eller rette.

Udviklingen af *Cystokarpier* har jeg ikke forfulgt (smlgn. her Janczewski, 1876). De anlægges vel altid lateralt, men blive ofte med Væksten mere eller mindre

¹ L. Kolderup Rosenvinge: Grønlands Havalger, Medd. om Grønland. Bd. III, pag. 784 og 815.

² Nestler: Die Blasenzellen von *Antithamnion plumula*. Wiss. Meeresunters. 1898. N. F., 3. Abt.: Helgoland.

endestillede. De systematiske Karakterer, man i saa Henseende har villet danne, synes mig dog ganske ubrugelige. Jeg finder ikke, at Cystokarpierne i mindste Maade frembyder noget, hvorpaa man kan støtte Artskarakterer. Ej heller finder jeg, at de Svøbgrene, som altid støtter Cystokarpierne, kan anvendes i samme Retning. Cystokarpierne ere hyppigere forekommende hos visse Arter end hos andre og sjældnere end Tetrasporangier og Parasporehobe, hvor saadanne forekomme.

Antheridier eller bedre *Spermatimoderceller* (Spermogonier) (Fig. I,) da disse Celler ikke findes i formede Dannelser, forekomme paa andre Individuer end paa de cystokarpiebærende; *Ceramium* Arterne er saaledes tvebo.

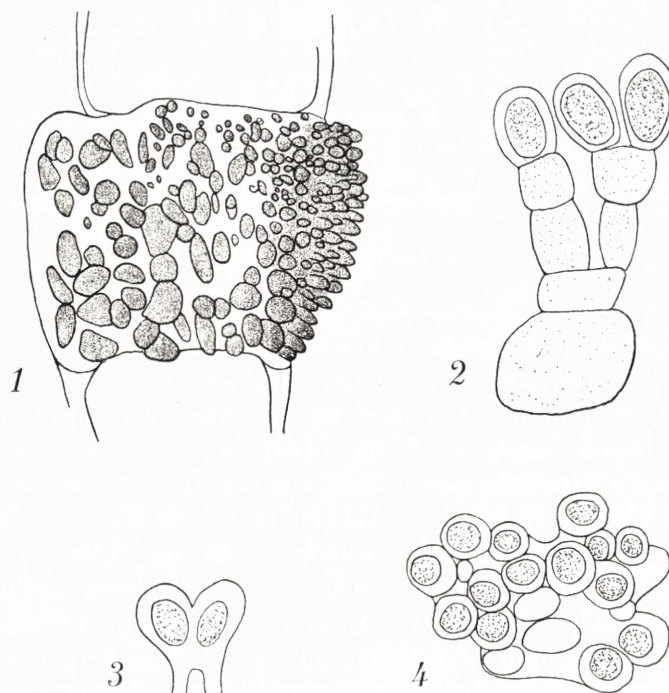


Fig. I. 1. Bælte med Spermatimoderceller (*Cer. diaphanum*). 2. Spermatimodercellernes Forbindelse med Barkcellerne. 3. Sammenvoxede Spermatimoderceller. 4. Spermatimoderceller sete fra oven (2, 3 & 4. *Cer. Rosenvingii*).

Naar Spermatimodercellerne skulle dannes, deler Barkens yderste Lag sig stærkt og sædvanligt da ved Delinger vinkelret paa Overfladen. Hver af de herved fremkomne yderste Celler, der altsaa staa vinkelret ud paa Overfladen, danner paa sin Yderside een eller flere Spermatimoderceller. Disse vokse ud fra de nævnte Celler og afgrænses fra dem ved Væg (Fig. I. 2). Sædvanlig findes disse Celler sammen i smaa Grupper eller større afgrænsede Partier; kun i ganske enkelte Tilfælde har jeg set hele Individuer dækkede fra nederst til øverst med dem. Spermatimodercellerne frembyde vistnok hverken med Hensyn til deres Form eller Udbredelse paa Individuerne Artskarakterer. At Antheridierne saa sjældent blive

fundne, skyldes vistnok mest den Omstændighed, at man først kan iagttage dem med Mikroskop. De antheridiebærende Individider bliver derfor ikke i samme Grad samlede som de cystokarpiiebærende.

Den kønsløse Formering ved Sporer finder Sted paa 2 Maader 1) ved Tetrasporer og 2) ved Parasporer.¹



Fig. II. Parasporohobe (*Cer. diaphanum*). I 1 ser man den første Begyndelse; de to svagt punkterede Celler ved den øvre Rand viser den ganske unge Parasporohob.

Medens Tetrasporer forekomme hos alle Arter, optræder Parasporerne kun hos enkelte.

Tetrasporerne opstaa som bekendt i visse indre Barkceller nær Diaphragmerne og kunne efter Individets Art og Kraft optræde i flere eller færre Rækker.

¹ Navnet Parasporer skyldes SCHMITZ.

Hos Arter med smaa Bælter findes dog aldrig mere end een Række. Efter min Mening bør man ikke lægge altfor stor systematisk Værdi ind i Antallet af Rækker.

Hos enkelte Arter, af danske dog kun *Cer. tenuissimum*, komme Tetrasporangierne ved særlig Vækst af Bæltet til at rage stærkt frem. Hos de andre kan man blot tale om mere eller mindre indsænkede Tetrasporangier. Tetrasporerne træde i sidstnævnte Tilfælde ud gennem de tidligere omtalte Aabninger i Barken. I enkelte Tilfælde har jeg bemærket en Art Monosporedannelse (*Cer. diaphanum*)¹.

I Modsætning til Tetrasporerne dannes Parasporene, der blandt danske Arter kun findes hos *Cer. diaphanum* og *Cer. strictum*, kun fra de yderste Celler i Barken, hyppigst fra de Celler, der ligger nær Bælternes øvre Rand, eller de øverste Randceller selv. Den Celle, som er den første Begyndelse til Parasporehoben, strækker sig lidt frem foran de andre Barkceller og fortykker sin Membran noget (Fig. II. 1 & 2). Den deler sig derpaa, uden at Spor af Tetradedannelse kan paavises, ved uregelmæssigt stillede Vægge i et ofte meget stort Antal Sporer (Fig. II. 3). Vi faa da tilsidst en Cystokarpie-lignende Dannelse af mere eller mindre uregelmæssig, afrundet lappet Form, en Samling Sporer liggende uordnet indenfor en fortykket hyalin Fællesmembran. Parasporehobe kunne ved flygtigere Undersøgelse forvexles med Cystokarpier, men adskiller sig fra disse 1) ved Stillingen, 2) ved Mangelen af Støttegrene (som dog Cystokarpierne af og til kunne mangle), endelig 3) ved deres gruppevise Optræden. Paraspore- og Tetrasporedannelse kan foregaa samtidigt paa samme Individ og i samme Bælte².

Ceramium Arterne forekomme saavel paa lavt som paa dybt Vand. En enkelt Form tilhører den egentlige Litoralregion eller forekommer paa lavt Vand: *C. diaphanum*; andre er bundne til noget dybere Vand, f. Eks. *Cer. strictum*; de fleste er dog vistnok, naar den øverste litorale Region (Fjæren) undtages, ligegyldige for større eller mindre Dybde, omend Forskelligheder i denne Retning kan have Betydning for deres morphologiske Udvikling. Arterne forekomme dels som Epiphyter, dels paa dødt Substrat, og det er da saaledes, at visse Arter fortrinsvis ere epiphytiske, medens de fleste ere ligegyldige med Hensyn til Substratet. Iøvrigt vil jeg, som allerede tidligere nævnt med Hensyn til Algesamfundene og Ceramium Arternes Stilling i dem, henvise til Dr. Kolderup Rosenvinges fremtidige Skildringer heraf.

De fleste Ceramium Arter forekomme kun i Aarets lyse Tid og have da i Særdeleshed deres Maximum i Sommermaanederne. Her i vore Farvande er det vistnok egentlig kun *Cer. rubrum* og *Cer. fruticosum*, som træffes om Vinteren og tidlig paa Foraaret.

De danske Farvandes ulige Natur betinger en ulige Fordeling af de enkelte Arter indenfor det hele Omraade, og det er da rimeligvis den forskellige Saltholdighed, som findes i de forskellige Dele af vore Farvande, — som jeg forøvrigt ikke skal dvæle ved her, idet jeg henviser til Dr. Kolderup Rosenvinges Arbejde, — som spiller den væsentligste Rolle.

¹ Sngl. Gobi 1877 Tab. fig. 8.

² Sngl. Kylin, der har bemærket det samme pag. 175.

En Ting er forunderlig, naar vi betragter Udbredelsesforholdene, og det er den, at flere Arter, som *Cer. diaphanum*¹, *Rosenvingii*, ikke er fundne i nordlige Kattegat (eller Limfjorden), da de jo dog forekommer andetsteds, hvor Vandet har samme Saltholdighed som disse Farvande. Aarsagen hertil er mig ubekendt; om Indsamlingsmangler kan der vel ikke være Tale, da de paagældende Dele er særdeles vel undersøgte. — Udbredte over alle danske Farvande er *Cer. rubrum* og *Cer. tenuissimum*. *Cer. fruticulosum* forekommer kun i Skagerak, nordlige Kattegat og Limfjorden — den er i det Hele vistnok en Form, der tilhører nordligere Farvande. Den med denne Art beslægtede *Cer. Areschougii* gaar derimod ret sydligt gennem Kattegat ned i Bælterne. *Cer. strictum*'s nordligste Lokalitet er i Limfjorden, *Cer. diaphanum*'s ved Anholt; bægge gaa de ind i Østersøen. *Cer. Rosenvingii* har omtrent samme Udbredelse som *Cer. diaphanum*, kun forekommer den ikke i den midterste og vestlige Østersø. Den med *Cer. Rosenvingii* beslægtede *Cer. arborescens* gaar nordligere end denne, helt op i nordlige Kattegat, men naar ikke langt ind i Østersøen²). *Cer. vertebrale* er paa en enkelt Lokalitet nær kun bemærket i Østersøen. *Cer. rubrum* forandres morphologisk meget efter som den kommer sydpaa; noget lignende gælder tildels *Cer. diaphanum*; de øvrige Arter synes ikke at forandres videre indenfor deres danske Omraade.

Nøgle til Bestemmelse af de danske Ceramium Arter.

1. Barken overalt adskilt i skarpt begrænsede Bælter..... 2
— Sammenhængende Bark eller Overgangstilfælde mellem Bæltedannelse og sammenhængende Bark 3
2. Barken uden nyre-hjerteformede, lysbrydende Celler..... 4
— Barken med saadanne *Cer. tenuissimum*
3. Som Regel ensartet Bark over det Hele; af og til klare Linier paa tværs nær Spidsen *Cer. rubrum*
— Bark mere eller mindre ensartet, 1) snart med Bælter, der kun allerøverst ere skarpt begrænsede, men længere nede ere mere eller mindre sammenflydende, 2) snart uden egentlig Bæltedannelse, med tydelig uensartet Bark fremgaaet ved Sammensmeltning af Bælter, eller 3) med de fleste Bælter skarpt begrænsede, kun de nedre opadløbende... 5
4. Smaatcellet Yderbark; Parasporer til Stede, Bælteafstand 3—4 Gange Bæltehøjden *Cer. diaphanum*
— Storcellet Yderbark; Parasporer til Stede eller ikke til Stede.. 6
5. Ikke noget Steds helt sammenhængende Bark 7
— Sammenhængende Bark forneden eller højt op 8
6. Axeceller meget lange, ofte indtil 10 Gange Bælternes Højde; Parasporer til Stede *Cer. strictum*

¹ Med Hensyn til *Cer. diaphanum*'s Udbredelse er det muligt, at den ogsaa har hjemme i Limfjorden, idet to Individuer, som ere fundne ved Nykjøbing (F. Børgesen), muligt hører til denne Art.

² Angaaende *Cer. Deslongchampii* se Efterskriften.

6. Axeceller næppe mere end 5—6 Gange Bælternes Højde;
Parasporer ikke til Stede..... 9
7. Bælterne kun svagt opadløbende forneden
Cer. diaphanum forma corticatula eller *Cer. diaphanum* (Hovedformen)
— Bælterne opadløbende næsten overalt
Cer. fruticosum forma? Cer. Arèschougii pro parte?
8. Bælterne mest opadløbende 10
— Bælterne baade opadløbende og nedadløbende 11
9. Bælter indtil omtrent lige saa høje som brede; rette Grenender *Cer. Deslongchampii*
— Bælter sædvanlig bredere end høje, Grenender mere eller mindre rette — ofte indtil 30—40 Axeceller i hvert Grenestykke *Cer. vertebrale*
10. Grenenderne haarfine, ofte rette; lyse Farver; altid med tydelig Bæltedannelse mod Spidsen; Habitus som *Cer. strictum* o. l. *Cer. Arèschougii*
— Grenender ikke haarfine; mørke Farver; Habitus som *Cer. rubrum* *Cer. fruticosum*
11. Ingen særlig Udvikling af sekundære Skud *Cer. Rosenvingii*
— Stærk Udvikling af sekundære Skud *Cer. arborescens*

C. Beskrivelse af de enkelte Arter.

(Speciel Del.)

a. Barken med skarpt begrænsede Bælter eller med svagt opadløbende Bælter forneden.

I. Antallet af Axeceller i hvert Grenestykke gennemsnitligt 7—15.

1. Ingen Parasporedannelse.

Ceramium tenuissimum (Lyngbye) Agardh. Fig. III. Tab. I, Fig 1.

Syn.: *Cer. diaphanum* var. *tenuissima* Lyngbye, Tent. Hydr. Dan. pag. 120,

Tab. 37, B. 4. J. G. Agardh, Spec. gen. et ord. Alg. Vol. II, 1 pag. 120.

Lyngbyes Herbarium: Hofmansgave, Novbr. 1812 og Gilleleje ²/₈ 1833.

Crouan: Algues mar. de Finistère Nr. 168 (Exemplaret i Bibl. bot. i Lund).

Areschoug: Algæ Scandinavicæ exsic. Ser. nov. Nr. 13.

Individerne meget regelmæssigt gaffelformet forgrenede, dannende store kraftige Vegetationer paa indtil 15 Ctm. i Diam. Grenenderne altid indkrummede, sete under Mikroskopet med udadtil ejendommelig takket Rand (Fig. III. 1), en Karakter, som blandt de danske Arter kun findes hos denne Art, og hvorved den straks skelnes fra *Cer. strictum* og lignende Former, der habituelt minde i høj Grad om den. Sekundære Grene ere ikke særlig almindelige. Bælterne ere altid vel afgrænsede uden

Spor af Væxt opad eller nedefter, med store yderste Barkceller, sædvanlig noget mindre høje end brede. Axcellernes Længde eller bedre Afstanden mellem Bælterne meget stor i Forhold til Bælternes Højde. Nogle Maal ville oplyse om dette.

	Bæltehøjde	Bæltebredde	Afstand
6. Grenstykke fra Spidsen	72 μ	88 μ	990 μ

En Række Maal for samme Plantes Vedkommende ser saaledes ud:

(5205 Lökken)	Bæltehøjde	Bæltebredde	Afstand
1. Grenstykke efter forceps	27 μ	44 μ	22 μ
2. — — — —	33 -	49 -	44 -
3. — — — —	38 -	55 -	72 -
4. — — — —	33 -	55 -	220 -
5. -- -- -- --	33 -	72 -	275 -
ubestemt nær Basis	82 -	61 -	800 -

Axcellernes Ydervægge ofte meget tydeligt parallelle. Antallet af Axceller i hvert Internodium (Grenstykke) er sædvanlig 9—11.

Som allerede omtalt i den almindelige Oversigt udmærker *Cer. tenuissimum* sig ved Tilstedeværelsen af ejendommelige, lysbrydende, farveløse, nyre- eller hjerte-

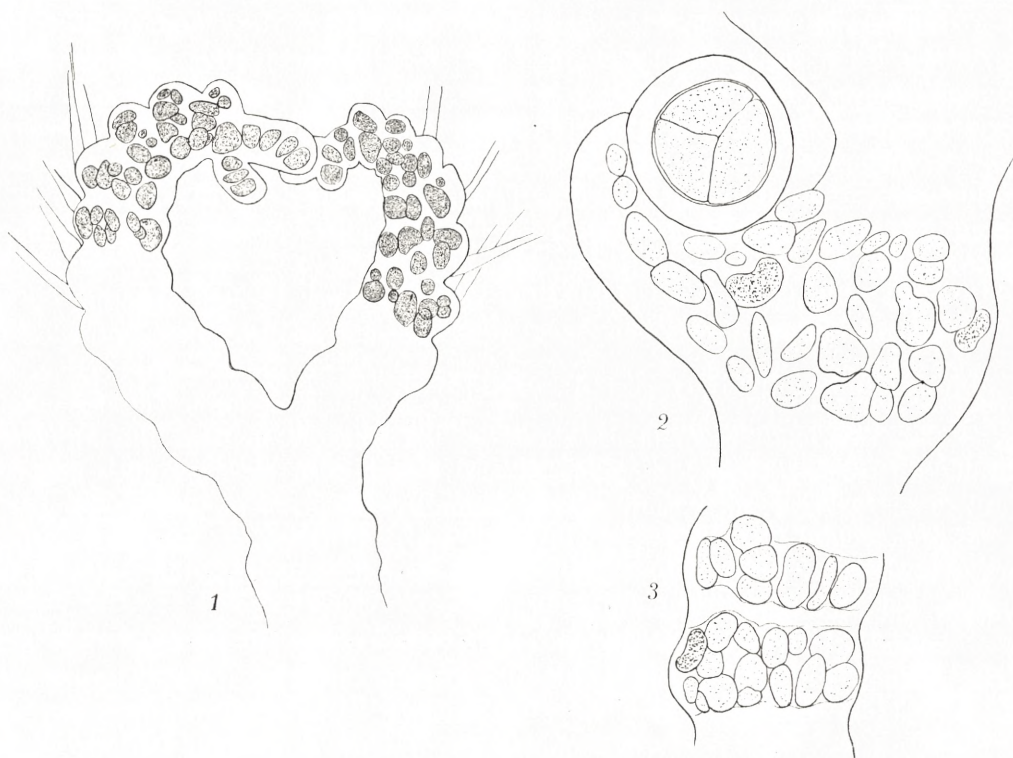


Fig. III. *Cer. tenuissimum*. 1. Grenspidser. 2. Tetrasporangium og Bælte med 2 af de ejendommeligt lysbrydende Barkceller. 3. Unge Bælter, hvoraf det nedre viser en af de lysbrydende Celler.

formede Barkceller (Fig. III. 2, 3). Disse omdannede Barkceller reagere ret stærkt for Æggehvide-stoffer, men indeholder ikke Floridéstivelse og findes i Særdeleshed i de yngre Bælter i et Antal af 2—3 i det yderste Barklag. Med Alderen synes de at forsvinde eller forandres. Disse Celler danne, naar Hensyn tages til de danske Arter, et godt Kendetegn paa *Cer. tenuissimum*. I andre geografiske Omraader er denne Karakter mindre brugelig, da vi genfinde disse Celler hos *Cer. gracillimum*.

Haar er overmaade hyppige. Farven er paa unge, ikke blegede Individider skiden blaarød.

Tetrasporangier forekomme ret hyppigt, sædvanlig 1 (sjældnere 2) i hvert Bælte, enradet ordnede paa den ydre Side af Grenene, normalt stærkt fremragende, støttede af særlige Barkdannelser (Fig. III. 2).

Cystokarpier har jeg kun bemærket 1 Gang; Antheridier slet ikke.

Naar Kylin (l. c. pag. 175) angiver at have set Parasporer, maa dette vistnok bero paa en Fejltagelse.

Ceramium tenuissimum er væsentlig en Sommerform (Expl. tagne i Juni—Sept.); et enkelt Individ er dog taget i Januar. Den forekommer saavel paa lavere som dybere Vand (dybest ca. 23 Meter), vistnok udelukkende epiphytisk. Arten er tagen paa 32 Lokaliteter¹ (med 36 Numre) i alle danske Farvande undtagen Nord-søen, Smaalands-havet, den vestlige og bornholmske Østersø, men maa antages ogsaa at kunne findes i disse Farvande. Naar Gobi (1877) angiver at have fundet *Cer. gracillimum* i Østersøen, maa det antages, at han har haft at gøre med *Cer. tenuissimum* eller *Cer. strictum*. De nordligst forekommende Individider (Hirshals, Fladen) ere gennemgaaende kraftigere og mørkere farvede end de sydlige, men om morphologiske Forandringer er der dog ikke Tale.

2. Parasporer til Stede.

a. Afstanden mellem Bælterne højst indtil 4—6 Gange længere end Bælternes Højde.

Ceramium diaphanum Harvey et Agardh (Tab. I, Fig. 2, 4 og 5; Tab. II, Fig. 4).

Ceramium diaphanum Roth i Harvey: Phycologia brit. Tab. 193; *Ceramium diaphanum* (Lightfoot) J. G. Agardh: Sp. gen. et ord., Vol. II, pars 1, pag. 125; Epicris: pag. 28.

Cer. diaphanum (Lightfoot) Roth hos Hauck, Foslie, de-Toni o. a.

Exsic: Crouan: Algues mar. de Finistère Nr. 171 (Exempl. tilhørende det bot. Bibliothek i Lund).

Areschoug: Algæ scand. exs. Ser. nov. Nr. 208 nederst.

Wyatt: Algæ Danmonienses Nr. 87.

Phycotheca boreali-amer. Nr. 846 a & b (3 Exempl.).

Naar jeg har sat Harveys og Agardhs Navne efter Artsnavnet *Cer. diaphanum*, saa er det, fordi jeg refererer de Former, jeg her henfører til denne Art, til disse

¹ Lokaliteter, der ligge nær ved hinanden, ere regnede under et.

to Forskeres Beskrivelser og Afbildning. Det er muligt, at Lightfoots og Roths Navne bør tilføjes, men jeg maa tilstaa, at jeg, naar jeg undersøger Beskrivelserne hos disse to sidste Forskere, ikke kan se andet, end at det er ganske uklart, hvad de have ment. Deres Beskrivelser passer ligesaagodt til *Cer. tenuissimum*, *Cer. strictum*, *Cer. Areschougii* og *fruticosum* o. m. a. som til *Cer. diaphanum*. Prioriteten af deres Navne kan muligvis dog bevises ved Originalemplarer fra deres Haand og jeg lægger derfor ikke stor Vægt paa denne Side af Sagen.

Ceramium diaphanum hører efter min Opfattelse til de meget vanskelige Arter, idet den kan variere saaledes, at den kommer til snart at ligne *Cer. Deslongchampii* snart *Cer. strictum*; endelig har den Berøringspunkter med *Cer. Areschougii* og *fruticosum*. Her i denne Forbindelse, med Hensyn til de her behandlede Arter, vedrører Slægtskabet med *Cer. strictum* os mest og jeg skal da her kortelig gøre

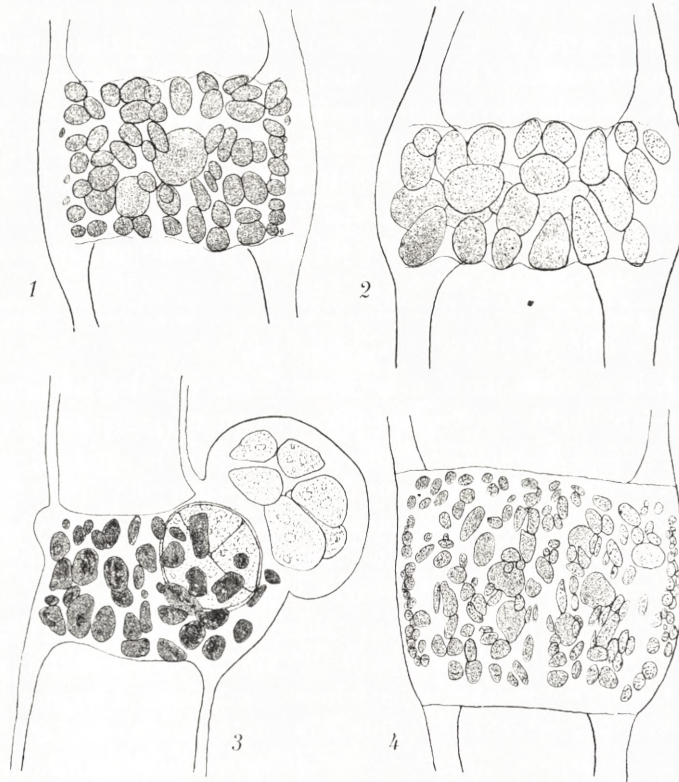


Fig. IV. 1. Bælte af *Cer. diaphanum*. 2. Bælte af *Cer. strictum* (1 og 2 samme Forstørrelse). 3. *Cer. strictum* med Tetrasporangium og Parasporangium i samme Bælte. 4. Bælte af *Cer. diaphanum*.

Rede for, hvorfor jeg ikke som FOSLIE har forenet bægge disse Arter til een¹. Ved nøjagtig Undersøgelse af en stor Mængde Individuer ikke blot fra vore Farvande, men ogsaa fra andre, mener jeg at have fundet, at der er visse Karakterer, som

¹ *Cer. diaphanum* forma typica og forma stricta.

ikke i nogen særlig Grad er underkastede Variation og som ikke flyde over i hinanden, hvormeget end det morphologiske Habitus, der udmærker disse to Former, kan forsvinde, hvormeget de end ligne hinanden. Hos *Cer. diaphanum* vil sædvanlig Højden af Bælterne i de nedre og mellemste Dele være større end ca. 120 μ ; hos *Cer. strictum* vil denne Højde i de samme Partier sædvanlig være lige omkring dette Tal eller hyppigt lavere (Fig. IV. 1 & 4). Barken hos *Cer. diaphanum* er flerlaget med smaa yderste Barkceller; hos *Cer. strictum* er Barken i hvert Fald i de øvre og midterste Dele faalaget (1 højst to Lag) dannet ofte af noget større Celler end hos *Cer. diaphanum* (Fig. IV. 2). Kun hos en bestemt Form af *Cer. diaphanum* vil Afstanden mellem Bælterne være 5—6 Gange Bæltehøjden — hos *Cer. strictum* vil dette Forhold være det normale og større Afstande ikke sjældne; derimod vil mindre ikke forekomme. Iøvrigt indrømmer jeg, at der er Tilfælde, hvor Afgørelsen kan være vanskelig, men der er jo dog ikke noget i Vejen for, at to Arter kan variere ind i hinandens Karakterer, og to Arter er efter min Opfattelse *Cer. diaphanum* og *Cer. strictum*.

Individerne af denne Art ere af forskellig Størrelse, ofte meget store, indtil 15—20 Ctm. i Diameter — hos danske Former dog næppe mere end 10 Ctm. — Endeforgreningerne mere eller mindre indkrummede. De fleste Individer, jeg har set fra andre Lokalteter end danske, ere sædvanlig udstyrede med en stor Mængde sekundære Grene; af de danske Individer have kun faa været forsynede meget rigt med saadanne. Middeltallet af Antallet af Axeceller i hvert Grenestykke er omtrent 8,5. Følgende Oversigt oplyser om Leddenes Længde.

	Bæltehøjde	Bæltebredde	Afstand
1. Grenestykke efter forceps ¹	61 μ	110 μ	33 μ
2. — — — — —	83 -	138 -	55 -
5. — — — — —	138 -	275 -	249 -
Nedre Dele	165 -	300 -	440 -
—	121 -	176 -	204 -
—	275 -	375 -	660 -
—	165 -	220 -	600 -

Hos *forma corticatula* kan Afstanden mellem Bælterne stige til ca. 700 μ , saaledes at Forholdet mellem Bæltehøjde og Afstand ($\frac{B}{A}$) bliver noget mindre end i sidste anførte Tilfælde.

Naar Barken er bleven nogenlunde udviklet, hvilket vil sige et Stykke nedenfor Spidsen, er den altid flerlaget² med smaatcellet yderste Lag. Den er heri forskellig fra den, vi finde hos *Cer. strictum*, som kun sjældent, naar undtages de allernederste Dele, er flerlaget paa samme Maade som hos *Cer. diaphanum*. — De sidst dannede Barkceller vil sjældent overskride 12 μ i længste Diameter. De nederste Bælter har undertiden udpræget Tendens til at voxte opefter, saaledes at vi faa Bælter, der

¹ Forceps betegner den yngste Gaffelgrening.

² De indre tetrasporangiedannende Celler er ikke regnede med.

høre til samme Kategori som de, der er karakteristiske for *Cer. Areschougii* og *Cer. fruticulosum*. Axecellernes Form med Alderen ofte konisk. Haar meget almindeligt til Stede. Farven i ren Tilstand i Retning af det rustrøde.

Tetrasporer og Parasporer ere de hyppigste Forplantningsorganer og optræde omtrent med lige stor Hyppighed. Tetrasporangierne forekomme oftest kun i een Række.

Cystokarpier ere sjældne, altid (?) omgivne af Svøbgrene, side- eller endestillede; Antheridier har jeg kun bemærket faa Gange.

Cer. diaphanum er en udpræget Littoral- og lavt Vands Form voxende dels paa Alger, dels paa Stene og Bolvæker o. l. Den træder herved i Modsætning til *Cer. strictum*, der altid vil findes paa noget dybere og dybt Vand, noget der taler for, at det er to adskilte Arter, men som dog ikke er noget Bevis derfor, idet jo *Cer. strictum* kan være en Form af *Cer. diaphanum* tilpasset til dybere Vand. Den forekommer kun sjældent i Vintermaanederne, men har sin Hovedudvikling i Maa- nederne April—Oktober.

Jeg har fundet det hensigtsmæssigst at skelne mellem 4 vel karakteriserede Former, hvortil kommer en foreløbig mindre bekendt Form (5).

1. *Cer. diaphanum forma typica* α : *forma typicissima in maribus danicis*. (Tab. I, Fig. 2 og 4.)

Det karakteristiske ved denne Form er dels den rigelige Udvikling af sekundære Grene, dels en tydelig Tendens til at danne Hovedstammer i Forgreningen, saaledes at der ofte kommer en Slags fjerformet Grendannelse frem; endelig er Grenspidserne sædvanlig stærkt indkrummede. De nedre Bælter vise undertiden Tegn til at ville voxe opefter. HARVEYS Fig. 193 i Phyc. brit. giver et ret godt Billede af denne Form; kun skulde Bælterne maaske gøres noget højere og Axecellerne noget kortere.

Helt typiske er strængt taget kun Exemplarer fra Bm: Rødvig (6005); Faxe Ladeplads (5709); Su: Ellekilde Strand (Forf.) og Lb: Rosenvold Havn (1735). De øvrige, hvoraf den nordligste er taget i Anholt Havn og den sydligste i Gjedser Havn, (øvrige Lokalteter er i sydlige Kattegat, Samsøpartiet, Storebælt og Sundet) danne mere eller mindre tydelig Overgang til *forma modificata*.

2. *Cer. diaphanum forma strictoides*. (Tab. II, Fig. 3, subf. β .)

Denne Form slutter sig tæt op til *typica*, men adskiller sig dels ved sit mere regelmæssigt dikotome *strictum*agtige Habitus, dels ved ofte at have meget store Bælteafstande (indtil 5—6 Gange Bæltehøjden) (indtil 700 μ). Hos subforma *corticatula* er Bælterne forneden meget tydeligt opadvoxende.

subforma α .

Enkelte Steder: Ks: Holbæk (913); Lynæs Havn (2604); Kjerteminde (1461); Sb: Rudkjøbing (1157); Sm: Venegrund (5980) (2—3 Fvn.!!!); Bm: Østersø ved Møen (Carol. Rosenberg). Formen fra Venegrund er ikke ganske littoral.

Her stiller jeg endvidere nogle tvivlsomme Former tagne paa meget lavt og stille Vand paa 3 Steder Ks: Mellem Bognæs og Boserup (4678), Holbæk (828) og Sb: Nakskov Fjord (Th. Mortensen).

Subforma β [corticatula (Kylin)? (Kylin Tab. 7, 3)].

Denne Form identificerer jeg omend med Tvivl med den af KYLIN (1907) opstillede Art *Cer. corticatum*¹. At jeg ikke opstiller den som Art, ligger deri, at den Karakter, hvorpaa den særlig opstilles, de svagt opadløbende Bælter, genfindes om end i ringe Grad hos *Cer. diaphanum*, fra hvilken Art den iøvrigt ikke er til at skelne.

Den er funden i Sundet i Helsingørs Havn (1862 og C. Rasch 313), paa Københavns Inderrhed (298) og ved Dragør (4699) samt nord for Ærø i sydfynske Øgaard (5932).

3. *Cer. diaphanum forma modificata* (Tab. I, Fig. 3).

Det, der karakteriserer denne Form overfor *typica*, er overvejende Mangelen af sekundære Grene eller den ringe Udvikling af disse og den sjældnere Forekomst af Hovedstammer. Fra „*strictoides*“ skelnes den dels ved ovenanførte, dels ved den mindre regelmæssige dikotome Forgrening og de typiske Bælteafstande. Kan blive meget kraftigt udviklet. Denne Form er funden paa 30 Lokaliteter i sydlige Kattegat, Samsøpartiet, Sundet, Storebælt, sydfynske Øgaard, mellemste og bornholmske Østersø.

Enkelte Exemplarer stamme fra November Maaned. Flere Individuer vise Overgang til *forma radiculosa* (Tab. I, Fig. 5). Nogen Afsvækkelse af Formen i Østersøen kan ikke paavises; tværtimod.

4. *Cer. diaphanum forma radiculosa* (Grunow) (Tab. II, Fig. 4).

Syn.: *Cer. radiculosum* Grunow; Hauck: Meeresalgen; pag. 106.

Det mest karakteristiske ved denne Form er den tætte sammenfildrede Væxt. Vegetationerne bestaa ofte af en tættere nedre Del og enkelte fra denne fremragende Skud. Sekundære Grene almindelige. Væxten er i det Hele svag og Stammerne tyndere end hos de andre Former. Kun funden paa enkelte Lokaliteter ved Bornholm og Christiansø i Østersøen. (Mon Kjelmans Form fra Gotland (Kjelman 1897) er lig denne Form?).

Den nordligste Lokalitet, som *Cer. diaphanum* i Følge det foregaaende er funden paa, er Anholt Havn. Der findes imidlertid i Materialet nogle Individuer fundne ved Nykjøbing, Morsø (F. Børgesen 35), som muligvis er at henhøre til *Cer. diaphanum*. De ligner noget *Cer. elegans*, men Sandsynligheden taler dog for, at vi her virkelig ogsaa have med *Cer. diaphanum* at gøre, og denne Arts Udbredelse bliver da mere forstaaelig.

Fuldt saa vel udviklede som andetsteds forekommende *diaphanum* Former er

¹) Mine Erfaringer i Sommeren 1908 have bragt mig paa den Tanke, om ikke *Cer. corticatum* Kylin er identisk med en svagt barket Form af *Cer. Areschougii*.

de danske ikke; men nogle af dem (*forma typica*) har dog Artens typiske Præg over sig. Majoriteten af de i de midterste og sydlige Farvande forekommende Former tilhører Formen „*modificata*“, der vel nok hyppigst betegner en Form fremkommen som Følge af ringe Saltholdighed, men ikke nogen særlig svækket Form, tværtimod. Snarere synes *Cer. diaphanum* i Østersøen at give Anledning til nye og kraftige Former: Arten naar vistnok langt ind i Østersøen; den er jo endnu hyppig ved Bornholms Kyst.

[5. *Cer. diaphanum forma zostericola*.

Under dette Navn har jeg noteret nogle meget daarlig udviklede, meget dikotomt grenede Exemplarer, som minder om Le Jolis's *Cer. strictum* forma *zostericola* (Algues marines de Cherbourg Nr. 123). De ere fundne ved Stubbekjøbing (3283), ved Bogø (3309), i Guldborgsund (1081—1093), samt ved Livø (3821) og Sprogø (3234) paa Chorda Filum. Jeg kan ikke ganske anerkende dem som Former af *Cer. strictum*; men jeg anser endnu Spørgsmaalet for at være aabent].

β. Afstanden mellem Bælterne indtil 10 Gange længere end Bælternes Højde.

Ceramium strictum Grev. et Harvey (Tab. I, Fig. 6 og 7; Tab. II, Fig. 1).

Harvey: Phyc. brit. Tab. 334.

J. G. Agardh: Spec. gen. et ord. alg. Vol. II. 1 pag. 123; Epicrisis pag. 27.

Individerne af forskellig Størrelse (højest ca. 15 Ctm. i Diam.), i de fleste Tilfælde lidet kraftige med meget tynde Celletraade, lyst eller mørkt blaarøde af Farve, sædvanlig udpræget dikotomt forgrenede, uden særlig fremtrædende sekundær Grendannelse. Grenspidserne mere eller mindre indkrummede uden nogen yderliggaaende Tendens i den ene eller anden Retning. Barken svag, uden det for *Cer. diaphanum* karakteristiske, smaatcellede Yderlag (Fig. IV. 2), ret storcellet. Medens vi hos *Cer. diaphanum* kan tale om 3—4 Lag, naar vi regner de inderste store Celler med, faar vi her næppe at gøre med mere end 2. Bælteranden er altid skarpt begrænset. Bælternes Højde naar næppe mere end 110 μ . Afstanden mellem Bælterne er, som tidligere nævnt, ofte meget stor. I de mellemste og nederste Dele af Individerne vil den ofte naa en Størrelse, der er en 8—10 Gange Bælternes Højde. Følgende Tal oplyser om Forholdet mellem Bælternes Højde, Bredde og indbyrdes Afstand i de nedre Partier.

Exemplarer fra	B. H.	B. Br.	B. A.
Nissum Bredning.....	83 μ	110 μ	440 μ
Lillebælt	65 -	140 -	270 -
Sjællands Rev	110 -	165 -	720 -
Flinterenden.....	110 -	140 -	600 -
Davids Grund	87 -	138 -	800 -
Salthammer Rev.....	55 -	110 -	550 -

Denne tilfældige Sammenstilling tør dog ikke antages at give Gennemsnitsmaalene i de respektive Farvande.

Axcellerne ere dels cylindriske — dels koniske. Haar er ikke særlig rigeligt tilstede.

Tetrasporangier og Parasporehobe forholde sig ganske som hos *Cer. diaphanum*, kun forekomme de første paa Grund af Bælternes mindre Højde i kun een Række. Parasporehobe ere hyppigere end Tetrasporangier.

Cystokarpierne frembyde intet særligt bemærkelsesværdigt; de ere side- eller endestillede, omgivne af flere eller færre Svøbgrene. De ere kun iagttagne 1 Gang; Antheridier slet ikke.

Cer. strictum er som *Cer. diaphanum* og de fleste andre Ceramium Arter udelukkende knyttet til Aarets lyseste Tid — de ere fundne i Maanederne April—September. Forplantningsorganer ere fundne i Maanederne Maj—September. I Modsætning til *Cer. diaphanum* forekommer *Cer. strictum* ikke i den strængt littorale Zone. Den er vistnok altid bundet til noget dybere og dybt Vand (3—16 Meter) — formodentlig udelukkende som Epiphyt.

Jeg mener, at *Cer. strictum* i de danske Farvande optræder under to Former, hvoraf den ene, *forma vera*, danner Hovedmængden; den anden, *forma stricto-tenuissima*, har kun underordnet Betydning.

Cer. strictum forma vera (Tab. I, Fig. 7; Tab. II, Fig. 1).

Grenenderne ikke udspærrede. Funden paa c 50 Lokalteter i Limfjorden, sydlige Kattegat — Samsøpartiet — Sundet og Bælterne, sydfynske Øgaard, Smaalands havet, vestlige og midterste og bornholmske Østersø.

Mangelen paa Lokalteter i Skagerak, nordlige, midterste (og østlige) Kattegat er paafaldende, da Arten jo angives ellers at forekomme paa Steder, hvor Vandet er stærkt salt. I Limfjorden er den funden 3 Steder: 1. ved Mullerne i Nissum Bredning, 2. udfor Eierslev og 3. ved Nørre-Sundby, altsaa baade i den vestlige, midterste, og østlige Del. Derpaa faa vi en Lokaltet ved Østspidsen af Anholt, medens Farvandet nord for Limfjordslinien ingen kan opvise¹. De nordligste Lokalteter efter Anholt er ved Sjællands Odde og Lynæs og nu tager Lokalteternes Hyppighed stærkt til — Østgrænsen i Østersøen ligger aabenbart langt imod Øst. Mulig er det denne Form, som GÖBI omtaler under Navn af *Cer. gracillimum*.

Ceram. strictum forma stricto-tenuissima (Tab. I, Fig. 6).

Denne Form udmærker sig i særlig Grad ved mere udspærrede Grenspidser og en meget elegant Væxt. Den er meget nær forbunden med Hovedformen, samt minder meget om de Side 22 omtalte Indvandsformer af *Cer. diaphanum*. Ligeledes har den en stor habituel Lighed med *Cer. tenuissimum*.

Lok. Sb: Kjerteminde Havnemole (1454, 1484); Strandby Stenrev ved Langeland (5906); Lb: ved Bøjgden (2154); Bm: ved Stevns Klint (M. B. H.).

¹ *Cer. strictum* forekommer sikkert ikke i Farvandet omkring Frederikshavn.

II. Antallet af Axeceller i hvert Grenstykke ofte meget stort; indtil c. 40.

Ceramium vertebrale mihi (Fig. V) (Tab. II, Fig. 2).

Denne Art er sikkert nær beslægtet dels med *Cer. diaphanum* og *strictum* dels med *Cer. Deslongchampii*, men har dog selv noget saa ejendommeligt ved sig, at jeg har foretaget mig det vovelige Skridt at opstille en ny *Ceramium* Art.

Individerne ligne i ung Tilstand habituel dem, vi finde hos *Cer. diaphanum forma modificata*. Senere bliver Væksten ganske karakterløs og Grenenderne aldeles rette. Tidlig anlægges der mange, ca. 15—20, Axeceller i hvert Grenstykke; men med stigende Alder bliver dette Antal forøget — jeg har flere Gange fundet c. 40. Bæltehøjden er i de øvre Dele udpræget *strictum*-agtig, i de nedre mere *diaphanum*-agtig. I Grenstykker nær Spidsen¹ var Bæltehøjde, Bæltbredde og Bælteafstand henholdsvis

B. H.	B. Br.	B. A.
28 μ	66 μ	44 μ
27 -	55 -	55 -

mod Basis:

B. H.	B. Br.	B. A.
82 μ	121 μ	250 μ
100 -	193 -	275 -

Barkcellerne i de øvre Bælter i faa Lag som hos *Cer. strictum*, temmelig store og udelte; i de nedre Bælter derimod vil vi sædvanlig finde en mere *diaphanum*-agtig smaatcellet Bark.

I de nedre og mellemste Dele sker tidligt en stærk Udvikling af Membranerne i Tykkelse. Ikke blot Axecellerne, men ogsaa Barkcellerne, saavel de indre som de ydre, fortykke deres Vægge meget stærkt og frembringe derved et ganske ejendommeligt Udseende af Cellaadene under Mikroskopet, som jeg kun har set Antydninger af hos *Cer. Deslongchampii*. Idet Bælterne blive fortykkede, komme de til at rage frem udenfor Axecellerne; hele Traaden med disse Udvidelser og Indsnævninger faar da i Forening med de tykke Membraner en vis Lighed med en Art Hvirvelsøjle. Hele dette Billede forstærkes i høj Grad ved de Linier, som dannes af Axecellernes indre Membraner. De fortykkede Vægge ere sædvanlig noget gulligt farvede, hvilket i Forening med Barkcellernes Indholds blaa-røde Farve forlener Traadene under Mikroskopet med noget yderligere karakteristisk. Haar ikke bemærkede, men kunne formodentlig være til Stede. Farven er blaa-sort-rød.

Tetrasporangier ensidige eller kranstillede i enkelt Række, svagt fremragende. Cystocarpier, Antheridier, Parasporehobe er ikke iagttagne.

Diagnose. Frondes 2—3 pollicares, adultiores densæ. Ramificatio in junioribus plus minus dichotoma, in adultioribus irregulariter ramulosa, ramis lateralibus

¹ dog ikke i umiddelbar Nærhed af forceps, men et Stykke nede.



Fig. V. *Cer. vertebrale*.

non copiose evolutis. Ramuli terminales erecti, longi. Numerus articulorum in internodiis usque ad 40 (plerumque 15—20).

Zonæ superiores ut in *Cer. stricto* breves, basales plus minus altæ ut in *Cer. diaphano*, leviter corticatæ. Membrana, præcipue cellularum axialium adultiorum, crassa, refringens, habitu characteristicæ, luride colorata. Tetrasporangia secundata vel verticillata, leviter prominentia. Parasporæ, cystocarpia, antheridia et pili non observata. Color sordide atropurpureus vel rubiginosus. Habitat in mari baltico et ad Nyborg (Storebælt) et ad Saltholm (Sundet) in profund. 2—20 met.

Nogle Exemplarer er tagne ved Saltholm (425 a) og i Nyborg Havn (1069 pr. parte.); ellers er den kun funden i midterste og bornholmske Østersø paa indtil 16 Meter Vand paa følgende Lok.: udfør Kramnisse (3656), Davids Grund (5118), Broens Rev (5148), Højbratterne (5069), udfør Allinge (5110), Arnager Rev (7005). Arten er kun tagen i Aug.—Sept. Maaned.

At denne Art ikke er nogen særlig Østersø Varietet af *Cer. strictum* og *diaphanum*, synes godtgjort ved disse Arters Forekomst de samme Steder. Mulig vil det vise sig, at Arten ogsaa har en nordlig Udbredelse og der gaar over i *Cer. Deslongchampii*.

Den næste Gruppe Arter, som jeg nu gaar over til at omtale, omfatter alle de Former, som er intermediære mellem den Gruppe, som er behandlet, og *Ceramium rubrum* og de med den beslægtede. Det er Former med større eller mindre Udvikling af den sammenhængende Bark. Indenfor denne Gruppe mener jeg at kunne skelne mellem Arter, hvor Bælterne dels kunne voxe op og ned, dels i særlig Grad voxe opefter. Til den første Afdeling hører *Cer. Rosenvingii* og *Cer. arborescens*; indenfor den anden stiller jeg *Cer. Areschougii* og *Cer. fruticosum*. Navnlig med Hensyn til denne sidste Art træder jeg i Modsætning til KYLIN. Denne Forsker opstiller 5 Arter intermediære mellem Arterne med skarpt begrænsede Bælter og *Cer. rubrum*-Gruppen. Af disse har jeg henført *Cer. corticatulum* til *Cer. diaphanum* som Varietet under denne. *Cer. Areschougii* mener jeg er tilstrækkelig begrundet som Art og har derfor her optaget dette Navn uden Forbehold. *Cer. rescissum* og *penicillatum* opfatter jeg som Varieteter (Former) under en Art, jeg efter Kützing-Agardh benævner *Cer. fruticosum*. Om *Cer. rubriforme* se pag. 70 (32).

b. Barken ikke i skarpt begrænsede Bælter eller sammenhængende over hele Individet.

I. Nedre og mellemste Dele sædvanlig helt barkklædte. Bælterne, dog ikke de allerøverste, med Evne til at voxe baade op og ned.

a. Ingen særlig Udvikling af sekundære Skud.

***Ceramium Rosenvingii* mihi** (Fig. VI, 2; Fig. VII, 1) (Tab. II, Fig. 5, 6 og 7).

Syn.: *Ceram. rubrum* (Huds.) Ag. *a. decurrens* excl. *Cer. Areschougii* Kylin?

Denne Art er ligesom den af KYLIN opstillede *Cer. Areschougii* indbefattet i J. G. Agardhs *Cer. rubrum a. decurrens*. Navnet *decurrens* kan ikke komme til

Anvendelse her, eftersom min Art ikke kan betragtes som identisk med Kützings *Hormoceras decurrens*. Ligesom Kylin maatte jeg søge et andet Navn end *decurrens* og har da som tilsvarende til denne Forskers „*Cer. Areschougii*“ valgt Navnet *Cer. Rosenvingii*.

Individerne af forskellig Størrelse og Udseende. Jo mindre Barken er udviklet, desto mere nærmer Arten sig *Cer. tenuissimum* og *strictum*; jo mere den er udviklet, desto mere faar vi noget *rubrum*-agtigt frem. I første Tilfælde vil kun de nedre Partier være helt barkklædte; i sidste naar Barken næsten helt op til Spidsen. Af de frie Bælter vil kun de alleryngste være skarpt begrænsede. Hos *forma tenuis*, hvor den barkklædte Del kun findes nær Plantens Basis, gaar de skarpt begrænsede Bælter temmelig langt ned. Overgangszonen mellem den helt barkklædte Del og Partiet med de skarpt begrænsede Bælter dannes af et længere eller kortere Stykke, hvor Bælterandene voxer mod hverandre (Fig. VII. 1). Der forekommer ikke her den skarpe Afgrænsning af den nedre Bælterand, som i hvert Fald for nogle af Bælternes Vedkommende er karakteristisk for *Cer. fruticosum* og *Areschougii*; heller ikke den øvre Bælterand er nogensinde skarpt begrænset. Evnen til at voxer er noget forskellig udviklet hos de to Rande — den ene vil dog aldrig staa i saa høj Grad tilbage for den anden, som det er ejendommeligt for de to nævnte Arter. Sædvanlig vil Barken i de helt barkklædte Partier vise en tydelig Modsætning mellem Diaphragmedelen og Axecelledelen; sidstnævnte Del vil i Reglen være dannet af færre Lag end den første og af ret store Celler, der tydeligt ere strakte paa langs.

Sekundære Grene ere kun lidet udviklede og Forgreningen i det Hele taget ikke særlig ejendommelig (dikotom). Grenspidserne er i forskellig Grad indkrummede, ofte særdeles lidt. Som nævnt ovenfor nærmer denne Art sig paa den ene Side *Cer. tenuissimum*, *Cer. strictum* o. l., paa den anden Side *Cer. rubrum*. Medens det altid vil være let at holde den ude fra de to førstnævnte og andre lignende Former, frembyder de Former, som nærme sig *Cer. rubrum*, betydelige Vanskeligheder, Vanskeligheder, som i høj Grad forstærkes ved den Omstændighed, at *Cer. rubrum*, og for den Sags Skyld ogsaa *Cer. arborescens*, kan variere mod *Cer. Rosenvingii*, idet den øverste Del kan slaa over i Bæltedannelse. Jeg mener nu at have iagttaget, at de Bælter, der dannes hos utvivlsomme *Cer. rubrum* Former, ikke viser nogen Tendens til Op- eller Nedadløben, men ere skarpt begrænsede. Jeg bruger derfor denne Karakter til Adskillelse af de *Cer. Rosenvingii-arborescens* lignende *Cer. rubrum* Former og disse to Arter. (Paa lignende Maade foretages Adskillelsen mellem tvivlsomme *Cer. fruticosum* Former og *Cer. rubrum* med Bæltedannelse).

Haar overordentlig hyppigt til Stede. Farven lyst rød.

Om Tetrasporangierne er der intet særligt at bemærke: de findes i 1—flere Rækker og ere indsænkede. Parasporehobe ikke til Stede. Cystokarpier side- eller endestillede, omgivne af 1—flere Svøbgrene, sjældent forekommende ligesom Anthedierne.

Denne Art er i vore Farvande en Foraars- og Sommerform. Den er funden i 3—13 Meters Dybde og er vistnok altid epiphytisk.

Jeg opfatter den under følgende Former.

1. *Cer. Rosenvingii forma tenuis* (Tab. II, Fig. 5).

Af Habitus som *Cer. strictum*, mere eller mindre regelmæssigt dikotomt forgrenet uden stærkt indkrummede Grenender. Barken kun sammenhængende helt nede ved Basis; Barkcellerne (i Bælterne og i den sammenhængende Del) i 1—2 Lag, ofte med tydelige Floridéstivelsekorn.

Funden paa 3 Lokal. Sa: ved Æbelø Fyr (2966); Lb: ved Skjoldnæs Fyr (5949) og ved Remmen ved Bogø (2406).

2. *Cer. Rosenvingii forma intermedia* (Tab. II, Fig. 6).

Individerne mere kraftige og *Cer. rubrum*-lignende end hos foregaaende. Barken er omtrent sammenhængende til over Midten (regnet fra Spids til Basis); de øvre Partier af Habitus som de tilsvarende hos *Cer. strictum*.

Lok. Kn: Krageskovs Rev (3502); Sa: Nexelø (Th. Mortensen); Lb: Thorø Rev (2376); Lillegrund (2358); Aakrog ved Brunshus (2366); Vodrups Flak (2316); Sb: Vresens Puller (5717); Sf: Flæskholms Flak (2316); Billes Grunde (2322, 2320); Bw: Dimesodde (2528). [Exemplarer fra Billes Grunde og Dimesodde har Antheridier.]

3. *Cer. Rosenvingii forma transgrediens* (Tab. II, Fig. 7).

Den sammenhængende Bark naar meget højt op; Individerne habituelt som *Cer. rubrum*. De frie Bælter sædvanlig ikke skarpt begrænsede, men vise Tendens til at voxer op og ned (Fig. VI. 2). Den nedre Bark ofte med ret tydelige Modsætninger mellem Axecelle- og Diaphragmedel. Som allerede flere Gange berørt vil jeg skelne mellem bæltedannende Former af *Cer. rubrum* og de rubroide Former af *Cer. Rosenvingii* ved Hjælp af de frie Bælters Forhold; skarpt begrænsede frie Bælter tyde paa *Cer. rubrum*; mindre skarpt begrænsede, op- og nedadvoxende paa *Cer. Rosenvingii*. Selv om der virkelig i disse Forskelligheder ligger noget reelt, hvad jeg personlig mener, turde det dog mange Gange være svært at komme til noget Resultat, eftersom Begreberne „skarpt begrænset“ „ikke skarpt begrænset“ jo i høj Grad er tilgængelige for subjektiv Fortolkning. De Tilfælde, hvor *Cer. Rosenvingii* Formerne kun vise ringe Op- og Nedadvoxen, vil være meget vanskelige at have med at gøre. At gøre *Cer. Rosenvingii* til en Varietet af *Cer. rubrum* er mig paa mit nuværende Stadium af Ceramium-Kundskab fuldstændig forkasteligt, men jeg kan paa den anden Side ikke andet end indrømme, at de to Arter flyder over i hinanden. Mulig vil det vise sig, at ogsaa visse helt barkklædte Former bør henregnes under *Cer. Rosenvingii*; de Tilfælde vil da være overordentlig vanskelige at klare. Det forekommer mig nødvendigt her at trække en Grænse; om jeg har været heldig her, vil Tiden vise; jeg troer, at jeg i Hovedsagen har Ret. At anvende den nedre

sammenhængende Bark som Kriterium for de to Arter lader sig vistnok kun gøre i de skarpt udtalte Tilfælde.

De herhen hørende Exemplarer ere tagne paa $3\frac{1}{2}$ —17 Meters Dybde paa følgende Lokalteter:

Ks: Lysegrund (2628); Hatterrev (4601); Hastens Grund (4538); Gilleleje (171); Su: Hellebæk (J. Lange); Lb: Dyreborg (2337); Sf: Egholms Flak (2558); Flæskholms Flak (2316); Bm: Gjedser Rev (3606); Schönheyders Pulle (5807).

Flere af disse Exemplarer have samme Numre som de, der er opførte under *forma intermedia*. De er altsaa tagne paa samme Lokaltet, ja maaske Side om Side med disse. Dette taler, synes mig, til Gunst for den Opfattelse, at disse to forskellige Former virkelig hører til samme Art som Lokalvarianter.

Cer. Rosenvingii gaar i vore Farvande, som det vil fremgaa af det ovenanførte, ikke langt mod Nord, men har sin Hovedudbredelse i de midterste og sydlige Farvande.

Diagnose. Frondes 5—6 pollicares, ramificatio plus minus dichotoma, non divaricata; ramis apice plerumque teretibus plus minus curvatis. Cellulæ zonarum ab utroque margine excurrentes. Pars algæ semper cortice continua munita. Hæc pars corticata modo basalis, modo basalis et intermedia, numquam apicalis. Forma parte basali corticata habitu *Cer. tenuissimi* et (forma tenuis) stricti; forma parte intermedia et (forma intermedia et transgrediens) basali corticata habitu *Cer. rubri*. Tetrasporangia non prominentia. Cystocarpia et antheridia rara. Pili frequentes. Alga vario modo rubescit. April—Maj. $3\frac{1}{2}$ —17 met. epiphytice.

Syn. *Cer. rubrum* (Huds.) Ag. *a* decurrens pro parte cum dubio. Nomen specialis decurrens usurpari non potest, quia *Hormoceras decurrens* Kützing non ad formam meam referendum est.

β. Stærk Udvikling af sekundære Skud; tydelig Udvikling af Hovedstammer.

Ceramium arborescens J. G. Agardh (Tab. III, Fig. 1—2). *Analecta algologica* Cont. II, pars 1. De typis *Ceramiorum* pag. 33.

Denne Art indtager en Mellemstilling mellem *Cer. Rosenvingii* forma tenuis og forma intermedia og *Cer. rubrum*. Den ligner *Cer. rubrum* i den kraftlige Væxt, i Udviklingen af Hovedstammer og talrige sekundære Skud, *Cer. Rosenvingii* i Barkens For-

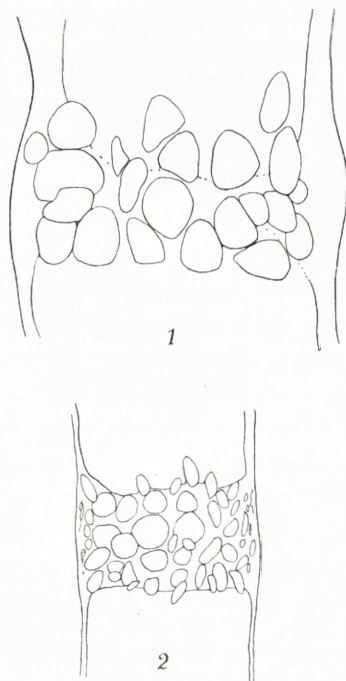


Fig. VI. 1. *Cer. Areschougii*: ungt Bælte.
2. *Cer. Rosenvingii*: ungt Bælte.

hold. I Virkeligheden er det vanskeligt for ikke at sige umuligt at skelne denne Arts Yderformer fra de to nævnte paa Grund af Karakterernes Mangel paa Skarphed. Overfor *Cer. rubrum* vil Bælternes Forhold kunne lede os, men helt sikre tør vi ligesaa lidt her som ved *Cer. Rosenvingii* være; overfor denne Art bliver Forholdet vanskeligere. Ikke destomindre mener jeg, at *Cer. arborescens* er en god Art, men som de fleste Ceramium Arter yderst variabel. Identifikationen af denne Art med Agardhs i hans senere Dage opstillede *Cer. arborescens*, har jeg fundet rigtig ved Undersøgelse af hans Originalherbarium i Lund; iøvrigt ligger der vistnok flere Former under dette Navn i hans Herbarium.

Vegetationerne sædvanlig kraftige, *Cer. rubrum*-agtige med tydelig Udvikling af Hovedstammer og Mængder af sekundære Skud, der i Forening med disse Hovedstammer forlener Arten med noget karakteristisk træformet, hvoraf Navnet. Grenspidserne ofte meget langt tangformede, af et vist ejendommeligt Habitus, mere eller mindre tynde. Grenene mod Spidsen ofte halvskærmformet ordnede. Antallet af Axeceller i hvert Grenstykke gennemsnitligt 15—20. Barken gennemgaaende som hos de kraftige *Cer. Rosenvingii* Former. Den sammenhængende Bark naar oftest højt op over Midten; i Regelen vil kun et lille Stykke nær Spidsen have frie Bælter. Disse ere med Undtagelse af de allerøverste tilbøjelige til at voxe baade op og ned. Modsætningen mellem Axecelle- og Diaphragmedel er næppe saa udpræget som hos *Cer. Rosenvingii*. Haar meget almindeligt forekommende.

Tetrasporangier i 1—2 Rækker, indsænkede. Cystokarpier side- eller endestillede, sjældne ligesom Antheridierne.

Denne Art forekommer som Epiphyt og paa fast Substrat paa lavere og dybere Vand (indtil 13 Meters Dybde) og er væsentlig en Foraars- og Sommerform (April—Juli—?).

Funden paa 20 Lokalteter i Skagerak, Limfjorden, nordlige og sydlige Kattegat, Samsøpartiet, Sundet og Bælterne, sydfynske Øgaard og Østersøen (den vestlige og midterste Del).

II. Bæltedannelse eller mere eller mindre tydelig sammenhængende Bark eller bægge Dele. Bælterne med særlig Evne til at voxe opefter.

Skarpt begrænsede Bælter forekomme kun nær Spidsen af Grenene. I den øvrige Del, hvor der er frie Bælter, voxe Bælterandene mod hverandre, men saaledes, at den nedre Rand eller den nedre Del af Bælterne for en Tid synes at være ude af Stand til at udvikle sig videre, end det fra først af er anlagt, medens den øvre Del fra først af er i Stand til at voxe op efter. Denne Forskel i Evne til at voxe foranlediger, at Bælterne paa et vist Stadium (i en vis Zone) har en skarpt begrænset nedre Rand. Denne Zone kan være kortere eller længere, men den er altid til Stede, hvor der er frie Bælter, og er denne Gruppes vigtigste Karakter. Det er ikke altid, at den nedre Del af Bælterne (regnet fra Diaphragmet mellem

Axecellerne) er kortere end den øvre; i denne Henseende er der ret betydelige Forskelligheder, selv indenfor Arterne¹.

Indenfor denne Gruppe skelner jeg foreløbigt kun mellem 2 Arter, nemlig *Cer. Areschougii* Kylin og *Cer. fruticosum* Kützing.

Ceramium Areschougii Kylin; Fig. VI. 1 og VII. 2.

H. Kylin: Studien über die Algenflora der schwedischen Westküste (1907), pag. 179, Tab. 7, Fig. 6.

Syn. *Ceram. rubrum* α *decurrens* J. G. Agardh pr. p. *Ceram. fruticosum* (Kütz.) J. G. Agardh pr. p.

Arten er nøje beskrevet af Kylin². Af praktiske Hensyn hidsætter jeg her følgende:

Individerne ret kraftige, ikke udspærret dikotomt forgrenede, med haarfine Grenspidser, som kunne være rette. Arten har ganske Habitus som den ovenfor skildrede *Cer. Rosenvingii forma tenuis* og *intermedia*, men kendes let fra disse ved

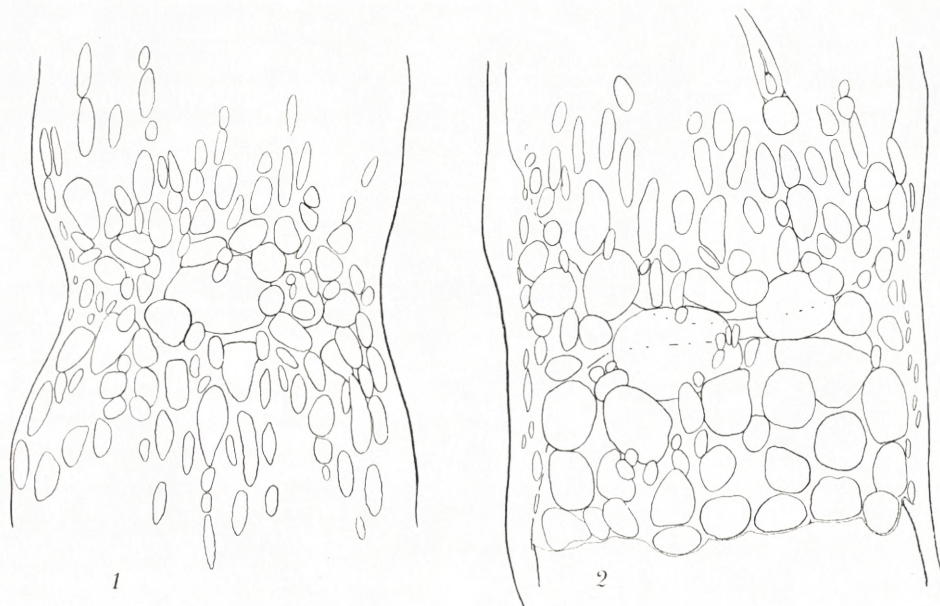


Fig. VII. 1. Bælte af *Cer. Rosenvingii*; 2. Bælte af *Cer. Areschougii*; begge Bælter stamme fra den midterste Region af Exemplarerne.

Bælternes Art. I nogle Tilfælde har jeg set meget høje Bælter, i andre synes Bæltehøjden ikke særlig stor (knapt saa høje som brede, eller lige saa høje som brede; dette gælder dog kun de fuldtud udviklede Bælter). I en vis Zone er den nedre

¹ En Beskrivelse af de forskellige Bæltearter finder man forøvrigt hos Agardh i hans: De typis Ceramiorum (Analecta alg. Cont. II).

² Originalemplarer af Kylin's Arter har været mig tilgængelige.

Bælterand altid skarpt afskaaren. Paa den nedre Del af Planten vil altid et større eller mindre Parti være helt barkklædt. Overgangszonen mellem den helt barkklædte og den ikke helt barkklædte Del dannes af Bælter, som baade kan voxe op og ned, mest dog opad og undertiden kun i ringe Grad nedad. I den helt barkklædte Del naar Barken sædvanlig ikke nogen stærk Udvikling; den er ret storcellet, bestaar af ca. 2 Lag og minder ved sin Modsætning mellem Axcelledel og Diaphragmedel om den tilsvarende hos *Cer. Rosenvingii*. Haar er almindelige; Farven lyst rødlig med blaalig Tone. Tetrasporangierne sidde i 1—2 Kredse, indsænkede. Cystocarpierne ere omgivne af 3—4 Svøbgrene og er insererede paa Siden af de øvre Gaffelgrene; sjældne ligesom Antheridierne, som jeg kun har bemærket en Gang.

Epiphytisk paa lavere og dybere Vand (indtil c. 20 Meter?), efter KYLIN i Littoralregionens nederste Del og i Sublittoralregionen, i Farvandet ved Frederikshavn fra 1½ til 11 Meters Dybde. Væsentlig en Sommerform. Sandsynligvis vil unge eller svagt barkedede Individuer af denne Art kunne forvexles med *Cer. corticulatum* Kylin.

Funden i nordlige Kattegat, Samsøpartiet, Storebælt og Lillebælt paa følgende Lokaliteter, nemlig

Kn: Nordre Rønner (6153) (6168); Frederikshavn (C. M. Poulsen) og Farvandet der omkring Juni—Juli 1908; Trindelen (2795) (2767); Sa: Lillegrund ved Fynshoved (1566); Klepperne ved Samsø (2895); Lb: Fænø Sund (400); Bw: Gulstav ved Langeland (3687).

Anmærkning.

Cer. rubriforme Kylin (op. c. pag. 183).

I Farvandet omkring Frederikshavn (Kn) forekommer *Cer. Areschougii* meget hyppigt og synes der at variere en hel Del, hvad Barkens Udvikling angaar. Jeg fandt (Juni—Juli 1908), at enkelte Individuer kunde være ganske rubrumagtige med en Bark som den, Kylin har beskrevet for *Cer. rubriforme*. Disse Individuers Forbindelse med *Cer. Areschougii* var utvivlsom; paa den anden Side kom der ogsaa i det habituelle noget frem, der kunde minde om *Cer. rubriforme*. Uden at benægte Existensen af *Cer. rubriforme* som Art, skal jeg kun pege paa Muligheden af Opfattelsen af denne Art som en Variant af *Cer. Areschougii*.

***Ceramium fruticulosum* Kütz. J. G. Agardh emend. Tab. IV, Fig. 1—4.**

Syn.: *Hormoceras fruticulosum* Kütz. Sp. alg. pag. 676.

Kützing: Tab. phyc. Vol. XII, Tab. 73.

Agardh: *Analecta algologica* Cont. II: De typis *Ceramiorum*, pag. 31.

I sin Afhandling: De typis *Ceramiorum* anvender AGARDH dette Artsnavn for de europæiske Former af *Ceramium* Slægten, som havde i særlig Grad opadvoxende Bælter: *cellulas igitur excurrentes, quibus adproximari videntur genicula proxima, a margine superiore geniculorum præcipue provenire mihi adparuit*. Med hvilken Ret han henfører disse Former under Kützings Navn, skal jeg ikke her komme nærmere ind paa; Bælterne i Kützings to Figurer (*f* & *g*) er ikke særlig opadvoxende, den tredje Figur (*e*), der viser Artens Habitus, stemmer derimod ganske godt med det

Udseende, som flere Former af denne Gruppe have. Mulig vil det vise sig, at Navnet *fruticosum* bør ændres; hvilket Navn man nu end vil tage, ændrer det dog ikke for mig Sagens Realitet: kun een Art for de af mig her omtalte Former, ikke flere Arter, som Kylin har gjort sig til Talsmand for.

Individerne af forskellig Størrelse, ofte meget store, indtil c. 20 Ctm. i Diameter. Paa den ene Side nærmer de sig *Cer. Areschougii*, paa den anden Side *Cer. rubrum*. Ligesom i foregaaende Tilfælde med Hensyn til *Cer. Rosenvingii* og *arborescens* er Overgangstilfældene til *Cer. rubrum* vanskelige at behandle. Forgreningen er hos *forma penicillata* yderst karakteristisk med tydelige Hovedstammer og toradede Grene; iøvrigt er den ikke særlig ejendommelig.

Sekundære Skud er tilstede i højere eller ringere Grad. Grenspidserne indkrummede eller rette.

Barken er meget forskelligt udviklet. Snart finde vi lutter frie Bælter, snart en næsten sammenhængende Bark, snart en Forening af bægge Dele med stadig jævn Overgang fra den ene Type til den anden, saaledes at al Begrænsning vilde være yderst vilkaarlig. De frie Bælter er ofte meget høje, over dobbelt saa høje som brede — med alle Gruppens Karakterer i Retning af Væxt. Barken er meget kraftigere udviklet end hos *Cer. Areschougii*, ofte med mange Lag af *rubrum*-agtig Karakter σ : ofte stærkt smaatcellet i det yderste Lag. Haar almindelige. Farven er mere eller mindre mørkt brun eller rustrød.

Tetrasporangier i een—flere Rækker, indsænkede, ofte paa særlige, sekundære Grene og mod Spidsen. Cystokarpier side- eller endestillede uden særligt bemærkelsesværdigt, undertiden paa smaa sekundære Skud, sjældent forekommende ligesom Antheridierne.

Forekommer vistnok hele Aaret igennem paa lavere og dybere Vand, hyppigst paa lavere Vand i den littorale Zone dels som Epiphyt dels paa fast Substrat (Bolværker etc.).

1. *Cer. fruticosum forma rescissa* (Kylin). Tab. IV, Fig. 2.

Syn. *Ceramium rescissum* Kylin l. c. pag. 182, Tab. 7, Fig. 4.

Forgreningen er enten almindelig dikotom eller der finder, som det er typisk for de ægte *Cer. rubrum* Former, en Udvikling af Hovedstammer Sted. Barken enten alene ordnet i Bælter eller der forekommer paa en større eller mindre Strækning sammenhængende Bark, og det er da ikke alene mod Basis, at denne kan findes; undertiden er de øvre Dele helt *rubrum*-agtige. De helt frie Bælter sædvanlig høje (indtil c. 500 μ) med tydelig, skarpt afskaaren nedre Rand. Barken mere eller mindre tæt af et *rubrum*-agtigt Udseende. Undertiden kan de mindre barkklædte Individer have et vist Habitus af *Cer. diaphanum*, med hvilken Art Former af *Cer. fruticosum* vistnok mange Gange ere blevne forvexlede. Hertil hører Individer tagne i Kn: Udfor Frederikshavn; i Frederikshavn Havn, i Sæby Havn, samt i Sk: ved Bragerne og paa Hirshals Mole; i Frederikshavns Havn og Farvandet deromkring kan Formen betegnes som almindelig. [Overgang til „*forma penicillata* danner

5553, Frederikshavn, og 4080, Sæby Havn]. Individierne af denne Form er tagne i Maanederne Juli, August September og December (7322: Frederikshavn, bar Antheridier).

2. *Ceram. fruticulosum forma penicillata* (Kützing). Tab. IV, Fig. 3 og 4.

Syn. *Gongroceras penicillatum* Kützing, Spec. Alg. pag. 678.

Ceramium penicillatum Areschoug (nomen); Kylin, l. c. pag. 177?.

Naar jeg benytter Navnet „*penicillata*“ om denne Form, saa støtter jeg mig naturligvis først og fremmest paa Kützings Diagnose og Figur (Tab. phyc. Bd. XII Tab. 80). Næppe vilde jeg dog af denne Grund have identificeret denne min Form med denne Art, der i lang Tid ikke er bleven paaagtet, hvis ikke nogle Exemplarer i Herbariet fra Riksmuseet i Stockholm overensstemmende med min Form, med Paaskriften: *Ceramium penicillatum Areschoug olim*, havde ledt min Vej til Kützings Diagnose. Den Art, som KYLIN (l. c. pag. 177) beskriver og afbilder som *Ceram. penicillatum*, er sandsynligvis den samme som min; helt sikker er jeg dog ikke i saa Henseende. Formens Habitus demonstreres bedst ved Henvisning til mine Figurer (Tab. IV). Den ene Figur (Tab. IV, Fig. 4) (7038)) viser en Melleform mellem *rescissa* og *penicellata*. Der er tydelige Hovedstammer, stadig kortere Grenstykker, jo længere vi komme opefter, og regelmæssig Forgrening i Spidsen; endelig er der en Mængde sekundære Grene. Den anden Figur (Tab. IV, Fig. 3) (7041) viser den typiske Form. Grendannelsen er udpræget toradet og Dikotomien forstyrret helt ved ulige Vækst. Op ad Hovedstammerne sidde smaa Buske, smaa Grensystemer af mærkelig ensartet Udseende. Skønt disse to Individier, der her ere afbildede, ved første Øjekast synes vidt forskellige, genfindes navnlig mod Spidsen fælles morphologiske Træk. I Virkeligheden viser det sig, at de ere forbundne med ganske umærkelige Overgange. Jeg kan i saa Henseende henlede Opmærksomheden paa den nedre Gren tilhøjre i Fig. 3; mod Basis viser den udpræget toradet Grenstilling, mod Spidsen ligner den mere Formen, der er afbildet i Fig. 4. Muligvis hænger den toradede Stilling af Grenene sammen med en Forekomst paa meget lavt Vand og Dannelsen af Tetrasporangier. I Exemplaret fremstillet paa Tab. IV, Fig. 3 er de smaa Grensystemer rigelig forsynede med Tetrasporangier, Grenspidserne blive, naar der findes Tetrasporangiedannelse i dem, ofte rette, et Fænomen, vi ogsaa finder udviklet hos *Cer. rubrum*; ellers er de normalt indkrummede. Barken er dels dannet af frie Bælter, dels mere eller mindre sammenhængende. Den sammenhængende Bark meget *rubrum*-agtig, smaatcellet i sin yderste Del. De frie Bælter høje. Denne Form er vistnok særligt en littoral Form (Møler).

I vore Farvande er den funden i Sk: paa Hirshals Mole, paa Stenrev ved Hirschals, ved Lønstrup paa Stene ved Land og ved Roshage (Hanstholm); i Kn: i Frederikshavns Havn. Exemplarerne ere tagne i Maanederne Maj—August; men Formen vil rimeligvis ogsaa være at finde til Aarets andre Tider.

3. *Ceram. fruticosum forma rubroides* (Tab. IV, Fig. 1).

Under denne Form sammenstiller jeg de Former, som utvivlsomt høre sammen med *Cer. fruticosum*, men som i Henseende til Barkens Udvikling nærme sig *Cer. rubrum*. Ligesom de to først nævnte Former forbinde sig indbyrdes ved Overgangsformer, forbinde de sig med denne Form. Ligesom ved *Cer. Rosenvingii* gør jeg Artens Omfang ret stort; det gaar imidlertid her som ved denne: mod *Cer. rubrum* kunne de til denne Art hørende Former til Nød afgrænses; indbyrdes gaa de jævnt over i hinanden. Jeg foretrækker her ubetinget at anvende Begrebet „Form“ som Ramme.

Barken er enten sammenhængende eller dannet af stærkt, sammenflydende Bælter, flerlaget. Selv hvor den er mest sammenhængende, vil den hist og her, men navnlig mod Spidsen forraade sin Oprindelse fra Bælter, der ere voxede mod hverandre, i Særdeleshed fra den øvre Rand. Habitus er iøvrigt ganske rubrumagtigt, og noget specifikt ved Forgreningen har jeg ikke bemærket. Tetrasporangier i ofte rette Grenspidser. Om nogen Overensstemmelse mellem denne Form og Kylins *Cer. rubriforme* mener jeg efter saavel hans Figur som det mig tilgængelige Original Exemplar at dømme ikke der kan være Tale.

Funden i Li: ved Thisted, Nykjøbing og Hals, i Kn: i Frederikshavns og Skagens Havn allevegne paa Moler og Bolværk samt ved nordre Rønner paa lavt Vand (0—2 Meter). Den er iagttaget i April, Juni og September Maaneder, men forekommer vistnok ogsaa til andre Tider.

Cer. fruticosum's Forekomst i vore Farvande er udpræget nordlig. En Linie fra Limfjorden mod Øst begrænser, saavidt Iagttagelser hidtil foreligge, Artens Omraade mod Syd.

c. I de allerfleste Tilfælde sammenhængende Bark uden større Modsætninger mellem Axecelle- og Diaphragmedel. Af og til mod Spidsen og konstant i Cystokarpiernes Svøbgrene er Barken afbrudt ved mere eller mindre smalle Mellemlum, saaledes at vi faa en Art Bæltedannelse frem.

Hertil henfører jeg for de danske Farvandes Vedkommende kun en Art:

Ceramium rubrum (Huds.) Agardh. Fig. VIII og IX; Tab. IV, Fig. 5 og 6; Tab. V, VI og VII.

Hudson: Flora anglica Ed. I, 1762, pag. 600.

C. A. Agardh: Disp. Alg. pag. 16.

J. G. Agardh: Sp. gen. et ord. alg. Vol. II, pars 1, pag. 127.

id.: Epierisis, pag. 101.

En af *Cer. rubrum's* væsentlige Karakterer er den sammenhængende Bark. Som allerede flere Gange bemærket, er Barken dog ikke absolut sammenhængende; konstant i Cystokarpiernes Svøbgrene og af og til, navnlig henimod Spidsen, finde vi en tydelig udtalt Bæltedannelse. Medens Bælterne i Svøbgrenene ikke volde videre

Besvær ved *Cer. rubrum*'s Begrænsning, stiller Sagen sig anderledes, naar Bælterne optræde andetsteds. Jeg mener imidlertid at have fundet, at de Bælter, der dannes af virkelige *Cer. rubrum* Former, ikke vise Evne til Opad- eller Nedadløben, endvidere, at Bælteafstandene ikke blive meget store; de vil sædvanlig indskrænke sig til en smal Linie. Medens Axecellerne hos *Cer. Rosenvingii*, *arborescens* og tildels *Cer. fruticulosum* tidlig synes at strække sig og Barkcellerne fra hvert Bælte derefter stræbe mod hverandre, sker Axecellernes Længdevæxt hos *Cer. rubrum* sædvanlig samtidig med Barkens Længdevæxt, saaledes at det ikke kommer til Bæltedannelse. Af og til hænder det imidlertid, at Axecellerne kommer i stærkere Væxt end Barken, hvilket bevirker, at denne bliver adskilt efter lige Linier. Bælterandene består i disse Tilfælde mest af isodiametriske Celler.

Den primære Grendannelse hos *Cer. rubrum* er snart rent gaffelformet, snart saaledes, at der finder en Udvikling af Hovedstammer Sted. Sekundære Grene er snart tilstede i overvældende Mængde, snart vil man kun opdage Spor af dem. Grenspidserne kunne enten være rette eller indkrummede, Væksten kraftig eller svag. I faa Ord at samle den Mangfoldighed, som her kommer frem i det morfologiske, og derigennem give noget karakteristisk for Arten er vistnok umuligt, og jeg henviser da ogsaa her til Omtalen af de enkelte Former.

De morfologiske Forskelligheder glide over i hinanden, uden at man tør tale om særlige Arter, og det eneste fælles, der kan opvises, er den sammenhængende Bark. Bortset fra Bæltedannelsen, som er omtalt ovenfor, er Barken højst forskelligt udviklet (smlgn. Fig. VIII). Vi finde alle Grader mellem tykklaget Bark med smaat-cellet Yderlag til en tyndlaget, storcellet Bark. Naar Barken er svag eller kun mellemstærkt udviklet, vil Barkcellerne ikke udvise nogen særlig Længderetning; er Barken derimod flerlaget, vil det ofte vise sig, at de yderste Barkceller, der da ere smaa, ere strakte paa langs. Modsætningen mellem Axecelle- og Diaphragmedelen er mere eller mindre udpræget, sædvanlig er den ikke særlig stor; størst er den muligvis hos de stærkt barkedede Former. Af og til kan man i Yderbarken særlig i de ældre Dele finde de i Indledningen omtalte, særlige, lysbrydende, stærkt æggehvideholdige Celler, men om nogen regelmæssig Forekomst synes der ikke at være Tale; mange Overgangsformer mellem disse Celler og almindelige Barkceller ses dog jævnlige.

Haar er meget almindeligt til Stede. Farven er højst forskellig lige fra det lyst røde til mørkebrunt-sort.

Tetrasporangier i 1—flere Rækker i Diaphragmedelen og tilgrænsende Partier uden noget særligt bemærkelsesværdigt. Ofte er de samlede i særlige Grene, terminale eller sekundære; disse er da jevnlig ganske rette. Cystokarpierne, som er almindeligt forekommende, er side- eller endestillede, omgivne af flere eller færre Svøbgrene, ofte paa sekundære Grene. Antheridier sjældne.

Cer. rubrum hører til de Arter¹, som forandre sig morfologisk paa Strækningen fra Nordsøen ind i Østersøen. Den Faktor, som er den mest bestemmende

¹) Smlgn. Svedelius: Studier öfver Östersjöns hafsalgflora, Ups. 1901.

her, er utvivlsomt Vandets Saltholdighed. De mest typisk udviklede *Cer. rubrum* Former ere bundne til stor Saltholdighed; i brakt Vand eller Vand med ringe Saltholdighed som i Østersøen træffe vi kun kummerligt udviklede Exemplarer. Vore Farvandes Saltholdighed er ikke jævnt aftagende mod Syd og Øst; forskellige Strømforskelde bevirker, at det ferske Vand fra Østersøen og det salte fra Nordsøen bliver

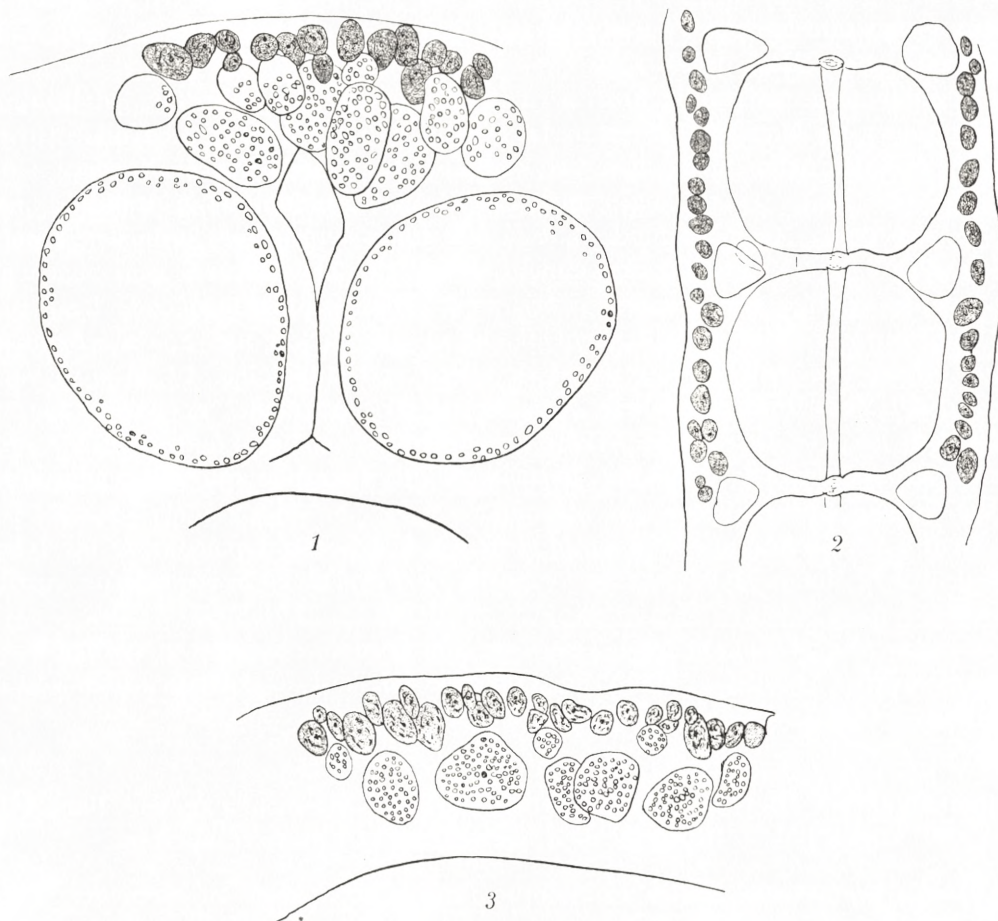


Fig. VIII. *Ceram. rubrum* (Mikrotomsnit). 1 og 3. Tværsnit af en flerlaget *Ceram. rubrum*; udfør Diaphragmedelen (1) og udfør Axcelledelen (3). 2. Længdesnit af en svagt barked *Ceram. rubrum*.

blandet paa en ret uregelmæssig Maade. Dette bevirker atter, at vi ikke kunne trække bestemte Grænser for de enkelte Overgangsformers Omraader; dog ville vi omtrentlig kunne angive deres Hovedudbredelse.

Ved Siden af Saltholdigheden spiller utvivlsomt andre Faktorer en Rolle, saaledes f.Ex. Vandets Temperatur og Bevægelse. De sydligere Former, som tages om

Vinteren, har meget mere af Nordsøpræget end de tilsvarende tagne om Sommeren paa samme Sted. Paa stille og lavt Vand udvikles smukke og regelmæssige Former.

Af de sædvanlig omtalte Former af *Cer. rubrum* (Agardh opfører 7 foruden *a decurrens*, som KYLIN og jeg har skilt ud; Foslie 9 foruden denne Form) har jeg kun kunnet notere de 3, nemlig *forma prolifera*, *secundata* og *pedicellata (virgata?)*, den sidste maaske med nogen Tvivl, som forekommende i de danske Farvande.

Disse tre Former findes kun i Nordsøen, Skagerak og den nordlige Del af de øvrige Farvande; i de andre finde vi Overgangsformer mellem disse tre og Østersø-Formen. Blandt de Stadier, vi her finder, vil jeg i særlig Grad henlede Opmærksomheden paa min *forma irregularis*, der synes at være Hovedformen i den midterste Del af vore Farvande, i hvert Fald ved Sommertid. Med Hensyn til den eventuelle Artsberettigelse, som flere af disse Former f. Ex. *prolifera* kunde gøre Fordring paa og som ogsaa er indrømmet dem af nyere Forfattere f. Ex. KYLIN, vil jeg bemærke, at jeg ikke kan se andet end, at alt, hvad der er opstillet som Varieteter af *Cer. rubrum* undtagen *a decurrens*, i Virkeligheden flyder ganske sammen, uden at der kan findes gode Karakterer til artsligt at skille dem. *Cer. rubrum* er en meget bøjelig Art, en Art som i høj Grad paavirkes af lokale Forhold, hvis enkelte Lokalvarianter ikke have opnaaet saa megen Fasthed, at de bør op højes til Arter. *Cer. rubrum* forekommer til alle Aarets Tider, men har dog sin Hovedudviklingsperiode, sin Forplantningsperiode om Foraaret og Sommeren. Den findes i størst Mængde i den litorale og sublitorale Region og naar ogsaa sin kraftigste Udvikling her; den er imidlertid ingenlunde sjælden paa dybere Vand. Den forekommer saavel paa fast Substrat som epiphytisk paa andre Alger.

De i de danske Farvande forekommende Former af *Cer. rubrum* lade sig bedst ordne paa nedenfor angivne Maade.

- A. Former i Nordsøen og Skagerak (Sommer og Vinter) *Cer. rubrum forma prolifera, secundata et pedicellata (virgata?)* Agardh.
- B. Former i Limfjorden og nordlige Kattegat (Sommer og Vinter) *forma prolifera, secundata et pedicellata (virgata)* i en ændret, ofte karakterløs Form: *forma modificata* [sjældnere *forma prolifera irregularis*].
- C. Former syd for Limfjordslinien med tydeligt Nordsø-Præg (Sommer) *subtypica æstiva*.
- D. Former syd for Limfjordslinien med et svagt Nordsø-Præg (Efteraar og Vinter) *forma subtypica hiemalis*.
- E. Sommerformer i sydlige Kattegat og sydlige Farvande. Nordsø-Præget forsvundet: *forma irregularis*.
- F. Sommerformer i sydlige Kattegat og sydlige Farvande særlig svagt barkede, ofte med svag Antydning af Bælter i Spidsen: *forma irregularis subcorticata*.
- G. Østersø Former: *forma ballica*.
- H. Stille Vands Former: *forma radians*.

I. Divaricate Former: *forma divaricata*.

J. Dybere Vands Former med svag bælteformet Adskillelse af Barken: *forma decurrentoides*.

Af de her opregnede Former skyldes de 7 første (A—G) rimeligvis Forskelligheder i Vandets Saltholdighed; de betegne de Stadier, som *Cer. rubrum* gennemgaar paa Strækningen fra Nordsøen til Østersøen. Alle disse Stadier ere jævnt forbundne og glide ganske over i hverandre.

Naar jeg har opløst denne Gruppe af *Cer. rubrum* i Former, udsondret Stadier i denne retrograde Bevægelse, da er det mig klart, at jeg paa visse Punkter er ganske vilkaarlig. Min *forma modificata* og *subtypica* skyldes udelukkende praktiske Hensyn; jeg har ønsket at faa nogle Holdepunkter. Disse to Formers Karakterer ere nærmest negative — de udmærke sig ved ikke at være i Besiddelse af *forma prolifera*'s og *secundata*'s — de typiske Nordsøformers — Karakterer — ved en Tendens mod det karakterløse, der er ejendommeligt for Østersøens Former. Anderledes stiller Sagen sig for *forma irregularis* og *subcorticata*'s Vedkommende. Jeg kan ikke se rettere, end at vi her have en Art Nydannelse, en Opblussen i Retning af noget artsligt, inden Arten indtræder i Østersøstadiet; ikke heller foreligger der her en vilkaarlig Afgrænsning, idet disse to Former jo som fremhævet netop er ejendommelige i og for sig.

Hele denne Gruppering af *Cer. rubrum* er et første Forsøg paa i Enkeltheder at paavise Trinene, Faserne i den retrograde Proces, som denne Art undergaar paa Vejen fra Nordsøen og ind i Østersøen, hvor de Betingelser, som den kræver for at existere, efterhaanden forsvinder.

De Former, som er særlig karakteristiske for de danske midterste og sydlige Farvande, er ikke endemiske her, men kunne genfindes andre Steder, hvor Vandets Saltholdighed er formindsket. Saaledes findes i Færøernes Fjorde mange Former lig de danske, navnlig Former lig med f. *modificata* og *subtypica*.

Det er rimeligvis en stærk Iblanding af fersk Vand fra Fjældene, der faar Betydning her.

A. Former i Nordsøen og Skagerak (excl. *forma decurrentoides*).

Cer. rubrum forma prolifera, secundata et pedicellata (virgata?) (Cer. pedicellatum Agardh) (Tab. IV, Fig. 5 og 6, Tab. V, Fig. 1, Tab. VII, Fig. 2).

Blandt de i dette Omraade af vore Farvande fundne Former svarer *Cer. rubrum forma secundata* (Lgb.) Agardh nøje til den af mig som *secundata* betegnede Form. Her er ingen Fejltagelse mulig, eftersom denne Form er saa overordentlig karakteristisk. De andre to (tre) Former volder derimod større Vanskelighed, da der aldrig har foreligget nogen egentlig udtømmende Skildring og Afbildning af dem. Hvorledes jeg opfatter *forma prolifera*, vil bedst fremgaa af min Figur og nedenfor følgende Beskrivelse. *Forma pedicellata* opfatter jeg paa samme Maade som KYLIN

(smgl. hans Tab. 6, Fig. 1 & 2), omend jeg heller ikke her er ganske paa det rene med, om Bestemmelsen er rigtig; Navnet „virgata“ havde mulig været bedre. Jeg kan ikke se nogen Berettigelse til at udskille nogen af disse Former som Arter; det er aabenbart Lokalitetsforskelligheder o. desl., som fremkalder det forskellige morphologiske Habitus. Selv den meget karakteristiske Form *secundata* er saa jævnt forbunden med de andre, at det ikke vil være muligt at afgøre, hvor det secundate Habitus begynder og hvor det holder op. Efter min Opfattelse er det saaledes, at en ung *Cer. rubrum forma prolifera* efter Omstændighederne kan udvikle sig til en *forma secundata*, *pedicellata* eller anden Form. Ved Siden af disse Former har jeg en enkelt Gang i Materialet fundet en særlig uregelmæssig Form, som leder

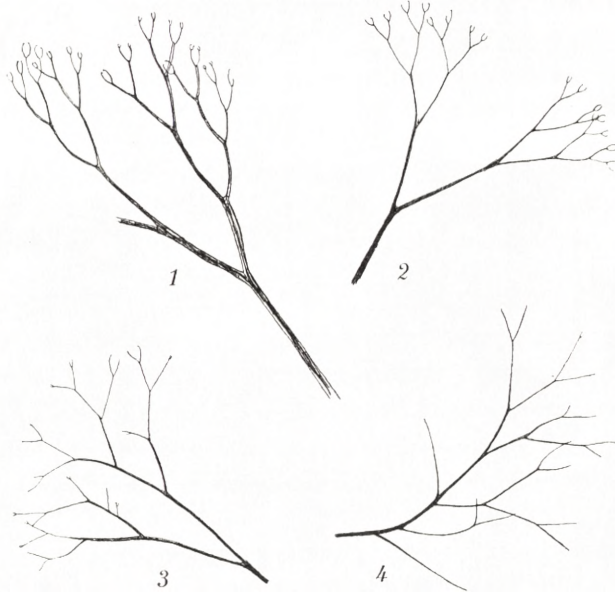


Fig. IX. Grenspidser af *Ceram rubrum*. 1. Form fra Nordsøen, *forma prolifera*. 2. Stille Vands Form, *forma radians*. 3. *forma subtypica*. 4. *forma irregularis*.

Tanken hen paa den, som senere vil blive omtalt under Navn af *forma irregularis*. Enhver af de ovennævnte Former kan vistnok give Anledning til saadanne uregelmæssige Former, naar de ydre Omstændigheder er for det eller Alderen gør sin Virkning gældende, og jeg burde da vistnok ogsaa have opført denne Form ved Siden af de andre. Den spiller dog næppe den Rolle, som *forma irregularis* i de sydligere Farvande, hvorfor jeg ikke særlig lægger Vægt paa den her. Det uregelmæssige Præg, som kendetegner denne sydlige Form, kan komme frem hos de nordligere Former men sporadisk — jo mere sydpaa vi kommer, des større bliver Procenten af saadanne uregelmæssige Former.

Enhver Form har vistnok sin tilsvarende „irregularis“ Form; om den er dominerende, er et andet Spørgsmaal. Fælles for de to ovennævnte Former (*prolifera* og *secundata*), som under eet kunde betegnes som *Cer. rubrum forma typica* og som ere udbredte ved de større Haves Kyster, er en kraftig Vækst (med jævn, men ringe Aftagen af Grenenes Tykkelse mod Spidsen), Udviklingen af Hovedstammer, de mange sekundære Skud, en særlig ejendommelig rhomboid Ordning af Grenspidserne, som i Særdeleshed er tydelig hos unge Individuer, endelig ofte yderst kraftig udviklet, flerlaget Bark med i de mest udprægede Tilfælde smaatcellet Yderlag. Fig. 2, Tab. VII, der viser en Form fra Færøerne, giver en god Forestilling om, hvad der morphologisk er karakteristisk for de typiske Nordsø-Former. Hos *forma pedicellata* er

Hovedgrenene i særlig Grad strakte. *Forma secundata* udmærker sig i sin mest ejendommelige Form ved langt fra hinanden siddende stærkt indadkrummede Grene, der ensidigt er besatte med sekundære Grene. LYNGBYE's Figur i „Tentamen Hydrophytologiæ Danicæ“ (Tab. 37, A) giver et meget godt Billede af denne Forms aparte Udseende. Hvad der betinger det mest karakteristiske „*secundata*“ Habitus, ved jeg ikke; i mindre udpræget Form findes det hos enhver *forma prolifera* og nogle *pedicellata* Former. Fig. 1, Tab. V viser en noget uregelmæssig Melleform (*forma secundata irregularis*) beslægtet med *forma secundata*.

Former, som nærmest ere at betragte som Repræsentanter for *forma prolifera*, ere fundne i Skagerak, ved Skiveren paa Hirshals Mole, paa Stenrev udfor Hirshals, paa Møllegrund udfor Hirshals (6—8 Favne, 11—15 Meter), ved Lønstrup og Roshage (Hanstholm) inde under Land, samt i Nordsøen paa et Vrag ved Harboøre.

Forma secundata er funden i Skagerak ved Skagen (nær Land), paa Hirshals Mole og ved Roshage (nær Land). *Forma pedicellata* er funden de ovennævnte 3 Steder samt i Nordsøen ved Ørhage og Esbjerg.

[Under Nr. 8020 og 8027 ligger Individuer tagne ved Hirshals i April Maaned; de er ret karakterløse og nærme sig *forma modificata*. Om vi have at gøre med Foraarsformer eller tilfældige Modifikationer fremkaldte af en eller anden Aarsag, ved jeg ikke.]

De ovennævnte Former ere tagne i Juni, August og September Maaneder og bære Tetrasporangier og Cystokarpier.

B. Former i Limfjorden og nordlige Kattegat (indtil Limfjordslinien mod Syd) excl. *forma radians*. *Forma pedicellata* (*virgata*) et *forma modificata* (Tab. III, Fig. 3; Tab. V, Fig. 3). (Efter Dr. Kolderup Rosenvinges Inddelinger bliver dette Omraade at betegne som 1. Limfjorden, 2. nordlige Kattegat og 3. nordlige Del af midterste og østlige Kattegat).

Forma pedicellata (*virgata*?) er funden ved Thyborøn (Høfder) og i den vestlige Del af Limfjorden indtil Agersund. Hovedmængden af *Ceram. rubrum* i de paa-gældende Farvande dannes imidlertid af en Form eller Rækker af Former, som fjerne sig i højere og mindre Grad fra *forma prolifera*, *secundata* og *pedicellata*, men mest fra de to første. Under eet har jeg forenet dem under Navnet *forma modificata*, der i sig selv indeholder noget karakterløst, som ganske svarer til de Former, der føres ind herunder. At give en nøjere Karakteristik af denne Form er egentligt umuligt. Man kunde sige, at den kunde betegnes netop ved i ringere Grad at have de Karakterer, som udmærke de tre Nordsø-Former. Dette bliver dog ikke meget tydeligt; men positive Karakterer er det saa vanskeligt at give. Jeg kan kun sige, at vi her hos *forma modificata* finder mindre udpræget rhombeformet Ordning af de unge Grensystemer, mindre Tendens til *secundat* Stilling af de sekundære Skud og at disse sidste ikke naar nogen rig Udvikling; endelig turde Grendannelsen blive mere uregelmæssig. Fig. 3 paa Tab. III viser meget tydeligt Slægtskabet med *forma secundata*; Fig. 3 paa Tab. V er mere modificeret og nærmer sig *forma subtypica*.

Denne Form og Overgangsformer til Nordsøtyperne er fundne paa en Række Lokaliteter i det angivne Omraade — gennem hele Limfjorden fra Thyborøn til Hals (mest paa Moler o. l.), i Kattegat (Kn) ved Nordre Rønner (c. 10 Meters Dybde), Tønneberg Banke (c. 12 Meters Dybde), i Vesterø Havn (Læsø), i Farvandet omkring Frederikshavn og i denne Bys Havn, i Sæby Havn, ved Asaa o. a. Steder.

En Del af de paagældende Exemplarer ere tagne i Vintermaanederne (November—Januar). Tetrasporangier og Cystokarpier ere hyppige (dog forekomme de ikke paa Vinterexemplarerne); et enkelt Individ: 5512 Asaa, Oktober, bar Antheridier.

C og D. Former syd for Limfjordslinien med mere eller mindre tydeligt Præg af at være i Slægt med *forma prolifera, secundata et pedicellata*: *forma subtypica* (Tab. III, Fig. 4; Tab. VI, Fig. 2).

Disse Former, som jeg betegner med Navnet „*subtypica*“ ere yderligere modificerede Nordsøformer, hvis Karakterer eller rettere karakterløse Habitus bedst oplyses ved Henviisning til de ovennævnte Figurer. Det er navnlig de unge Grensystemer, som endnu viser Nordsøtypens Præg. Disse Former vise Overgang til *forma irregularis* især ved deres Tendens til at danne rette Grenender, til at blive uregelmæssige i Forgreningen, navnlig henimod Spidsen. Hovedstammer undertiden meget tydeligt fremtrædende, sædvanlig dog noget udviskede; sekundære Grene sjældnere forekommende (cystocarpiebærende Individier). Barken er næppe saa kraftigt udviklet som hos de mest typiske Nordsøformer.

C. Sommerformer: *forma subtypica aestiva* (Tab. VI, Fig. 2).

Fundne paa 11 Lokaliteter nemlig: Km: Mariagerfjord; Ks: Holbæk Fjord; Sa: Hofmangsgave; Su: Helsingørs Havn, Nordre Røse, Kjøbenhavns Inderrhed; Lb: udfør Snoghøj (Forf.); Sb: Nyborg, Lohals; Sf: Taasinge Færgebro, og Bm: Orehoved Havn (Moler og dybere Vand). Disse Former er ikke nær saa talrige som de, jeg har betegnet som *forma irregularis*, som forekommer i omtrent samme Omraade (2 Ex. bar Cystokarpier, 1 Tetrasporangier).

D. Vinterformer *forma subtypica hiemalis* (Tab. III, Fig. 4).

Det er i særlig Grad her de unge Grensystemer, som forraade Slægtskabet med Vesterhavstypen. Rimeligvis svare en Del af disse Vinterformer, der alle udmærke sig ved meget mørk Farve, til *forma irregularis*, der er en udpræget Sommerform. Det koldere Vand om Vinteren skulde her hos denne kalde til Live Mindelser om dens Frænder i Nordsøen.

Individer af denne Gruppe, hvis Habitus bedst oplyses ved Henviisning til Fig. 4, Tab. III, ere fundne paa 12 Lokaliteter, nemlig:

Sundet og Bælterne: Slettens Havn, Kjerteminde Havn, Nyborg Havn, Overnakhage ved Nyborg, udfør Korsør, ved Stenderup (Lillebælt), i Fyrrenden (11 Meter) i Fænø Sund, i Middelfart Havn, ved Sydenden af Bogø samt i Smaalandsøhavet ved Stubbekøbing.

Individerne ere tagne i Januar—April samt November Maaneder. To Individier

fra November har henholdsvis Tetrasporangier og Cystokarpier. Vinterformerne ere altid gamle Individder, mere eller mindre slidte; om Foraaret fornyer de sig ved nye Grensystemer.

E & F. Sommerformer fra sydlige Kattegat, Samsøpartiet og sydligere Farvande: *forma irregularis* og *subcorticata* (Tab. V, Fig. 2 og 4; Tab. VI, Fig. 1 og 4; Tab. VII, Fig. 3).

De to sidste endnu kraftigt udviklede Stadier af *Cer. rubrum* inden *forma baltica* dannes af de to ovennævnte Former; de ere forbundne indbyrdes ved Melleformer og knytte sig i den ene Retning til *forma subtypica*, i den anden til *forma baltica*. Den betegner det sidste Stadium i Rækken af *Cer. rubrum*'s Former fra Nord til Syd og Øst, et Stadium, hvis fleste Repræsentanter vistnok findes i den midterste Del af Østersøen.

Det, der karakteriserer disse to Former, er dels en ganske usymmetrisk Forgrening med rette Grenspidser dels en mindre udpræget Udvikling af Hovedstammer og stor Mangel paa sekundære Grene. Barken er forskelligt udviklet; i nogle Tilfælde ret kraftig, i andre svag, hos *forma subcorticata* meget svagt udviklet, i Almindelighed fyldt med store Mængder af Floridéstivelsekorn, idet der ikke er særlige indre Magasineringceller; det Lag, som hos de andre Former anvendes til Ophobning af Stivelsen, fattes her. *Forma subcorticata* viser undertiden tydelig Bæltedannelse i Spidsen. Rimeligvis er denne Bæltedannelse ligesom den svage Bark at henføre til denne Forms Forekomst nær Vandoverfladen.

Fig. 2 paa Tab. V og Fig. 1 og 4 paa Tab. VI give et Billede af de hyppigst forekommende Former. Vi se, hvorledes en tidlig, ulige fordelt Vækst (smlgn. Fig. IX) har forandret den oprindelige delvis symmetriske, dikotome Voxemaade i Spidsen til noget usymmetrisk.

De rette Grenspidser optræde under to Former: den stift rette og spidse og den kraftesløse, lange, for Strømmen og Bølgerne svajende. Den sidste Grenform er navnlig karakteristisk for Individder, der forekomme paa Tangbuske højt oppe mod Vandoverfladen, hvor de maa staa og bølge frem og tilbage. Disse lange, slatne Grene giver disse Former et eget Habitus, noget karakterløst, mere eller mindre langstrakt. I Modsætning til disse Former træde de Exemplarer, der findes paa dybere Vand, eller overhovedet de Former, der findes paa mere beskyttede Steder, idet de optræde i mere tæt buskede og kortere Vegetationer uden særlig lange Grene. Fig. 1 og Fig. 4 paa Tab. VI vise en Bundform og en Overfladeform tagne paa 3–4 Meters Dybde og i Overfladen paa samme Lokalitet ved Ellekilde (Su) (Forfatteren). Som disse to er sikkert de fleste litorale *Cer. rubrum* Former langs Kysterne i sydlige Kattegat, Samsøpartiet, Sundet og Bælterne. De sublitorale og dybere Vands *irregularis* Former ere maaske repræsenterede ved (Tab. V, Fig. 4) en mere aaben Form. *Forma subcorticata* er ikke vegetativt nogen ejendommelig Form; den betegner kun en „*irregularis*“ med svag Bark. (Om Adskillelsen mellem denne og *Cer. Rosenvingii* og *arborescens* se Side 27 (65)). Overfladeformerne af denne Type er i særlig Grad

udsatte for at blive slidte; man finder derfor hyppigt, at unge Grensystemer bryde frem paa ældre Dele. Disse Grensystemer have da ofte en „*subcorticata*“ Bark¹.

Forma irregularis og *subcorticata* er tagne paa 40 Lokaliteter i midterste Kattegat, sydlige Kattegat, Samsøpartiet, Sundet og Bælterne, sydfynske Øgaard samt i vestlige og midterste Østersø. Den kan betegnes som yderst almindelig indenfor det paa-gældende Omraade, men kun om Sommeren. Tetrasporangier og Cystocarpier ere almindelige.

G. Formen i Østersøen (*forma baltica*) (Tab. VII, Fig. 1 og 5).

Med dette Navn betegnes det sidste Stadium inden *Cer. rubrum* forsvinder helt. Det er ganske en Smagssag, hvorledes man vil afgrænse det mod de foregaaende; de to Figurer Tab. VII giver dog en Antydning. Det karakteristiske Ceramium-Præg er ved helt at forsvinde — Forgreningen bliver usymmetrisk — Væksten svag, Grenenderne tidligt rette. I Farvandet omkring Bornholm vil denne Form vistnok mødes med daarligt udviklede Exemplarer af de to foregaaende Former. Den er fundet paa lavere og dybere Vand indtil c. 10 Meter. Kun Tetrasporangier ere bemærkede.

Efter GÖBI gaar *Cer. rubrum* ikke øst for Reval; i den svenske Del af Østersøen forekommer den ved Kysterne af Smaaland og Gotland (Svedelius); om den naar op i den botniske Bugt, er vistnok tvivlsomt.

Jeg gaar derefter over til at omtale nogle Former, som ikke vedrører Spørgsmaalet om *Cer. rubrum*'s gradvise Forandring fra Nord til Syd og Øst, men som skyldes andre Aarsager.

H. Stille Vands Former: *forma radians* (Tab. VI, Fig. 3).

Naar visse Former af *Cer. rubrum* faar Lov til at voxe under gunstige Vilkaar paa meget stille, ikke dybe Lokaliteter, udvikler de sig meget regelmæssigt dikotomt med afrundet Periferi (Fig. IX, 2). Grenspidserne blive da sædvanlig noget udspærrede. De nordlige Former skulle rimeligvis afledes fra *Cer. rubrum forma prolifera* eller *modificata* — de sydligere fra andre Former. Barken er gennemgaaende middelstærkt udviklet. Fundet flere Steder i Limfjorden, ved Horsens og ved Svendborg.

I. *Forma divaricata* (Tab. VII, Fig. 4).

Denne Form udmærker sig ved en meget stærk Udspærring af Grenene, navnlig i Spidsen af Individerne. Om Aarsagen til dette Fænomen ved jeg intet; angaaende Formens Stilling overfor andre Former formoder jeg, at den nærmest bør henføres til *forma subtypica*. Mørk Farve og kraftig Bark. Kun funden 3 Gange, i Fænø Sund (2 Gange) og i Fyrrenden (Lillebælt) paa dybt Vand (c. 12 Meter) og henholdsvis i Februar, April og Marts Maaned.

J. *Forma decurrentoides*.

Denne Form er enten at betragte som en svagt udviklet *forma prolifera* med Tendens til Adskillelse af Barken i Bælter, eller som en særlig Art. Jeg foretrækker

¹) Subcorticate Individuer kunne muligvis ogsaa findes indenfor de andre Former.

imidlertid foreløbig det første Alternativ. Bælterne ere ingensinde udviklede som hos *Cer. tenuissimum* o. l., ej heller som hos *Cer. Rosenvingii*, det Hele indskrænker sig i de fleste Tilfælde til, at der dannes meget smalle Mellemrum i Barken, eller rettere, at Barken er afbrudt mere eller mindre regelmæssigt efter rette Linier paa tværs. I de Partier, der grænse op til disse Mellemrum, vil der ikke være Tegn paa nogen Ned- og Opadløben af Barken. Funden i Skagerak udfor Hirshals og i nordlige Kattegat paa mest ret stor Dybde indtil ca. 25 Meter i Juli og August Maa- neder. Cystokarpier og Tetrasporangier ere bemærkede. Farven er mere blegrød end hos de *forma prolifera* Individuer o. l., som forekomme i de samme Farvande.

Med Hensyn til Forstaaelsen af Figurerne paa de 7 Tavler, som ledsage denne Afhandling, da henvises dels til Texten, dels til Oplysningerne paa selve Tavlerne.

Tavlerne ere bekostede af Carlsbergfondet. For den Velvilje, som denne Institution herved har vist Forfatteren, bringer denne sin bedste Tak.

EFTERSKRIFT.

Cer. Deslongchampii Chauv.

J. G. Agard: Sp. gen. et ord. alg. Vol. II, p. 1, pag. 122.

I Dr. Kolderup Rosenvinges Samling findes under Nr. 7975 et Par Individuer tagne paa nordre Tværmole i Frederikshavn (Kn) i April 1906, om hvilke jeg formodede, at de tilhørte *Cer. Deslongchampii* — noget sikkert kunde dog ikke afgøres. At disse Individuer sikkert tilhøre *Cer. Deslongchampii* og at denne Art forekommer blandt de danske *Ceramium*-Arter, fik jeg i Sommeren 1908 Bevis for, idet jeg paa det nævnte Sted fandt denne Art. Arten findes optagen i Nøglen (Side 15), til hvilken der henvises, da der her ikke kan være Tale om en nærmere Beskrivelse.

Med Hensyn til *Cer. vertebrale*, da er denne Art maaske at opfatte som en særlig „Østersø“-Form af *Cer. Deslongchampii*; men i saa Fald maa det forundre, at denne sidste Art ikke er funden i vore andre Farvande.

Rettelser og Tilføjelser.

Pag. 50 (12) Linie 8 fr. n.: og sædvanligt da ved Delinger, læs: og sædvanligt forekommer da paa et vist Udviklingstrin Delinger

Pag. 50 (12) Linie 7 fr. n.: der altsaa staa, læs: der staa

Sur les espèces danoises du genre *Ceramium*.

Par

HENNING-EILER PETERSEN.

(Résumé par l'auteur.)

Après des récoltes faites dans toutes les régions du Danemark, M. KOLDERUP ROSENINGE s'occupe depuis plusieurs années de l'étude critique des Algues danoises. Il a bien voulu m'assigner une partie de cette tâche en me chargeant, en 1905, de l'étude détaillée du genre *Ceramium*. Je tiens à lui dire ici combien je suis reconnaissant de la confiance qu'il m'a témoignée.

Les matériaux récoltés par M. Kolderup Roseninge se composent essentiellement d'échantillons desséchés provenant des diverses régions; souvent les récoltes ont été répétées aux diverses saisons dans les différentes localités, de sorte que la collection en question comprend actuellement environ 300 échantillons recueillis en 150 endroits environ. Autant que je peux en juger, elle donne une idée assez complète et exacte de la distribution du genre *Ceramium* dans nos parages.

En outre de la collection KOLDERUP ROSENINGE je me suis servi pour la présente étude de récoltes faites par moi-même et de la collection d'espèces de *Ceramium* que possède le Musée Botanique de Copenhague. Cette dernière collection comprend des récoltes faites à des époques différentes par LYNGBYE, C. ROSENBERG, C.-M. POULSEN, JOH. LANGE et par d'autres encore; ni cette collection ni la mienne propre n'égalent en importance celle de M. Kolderup Roseninge.

Par l'intermédiaire du Musée Botanique de Copenhague, le Musée Botanique de Berlin et le Musée National (Riksmuseum) de Stockholm m'ont prêté leurs collections de *Ceramium*. Je prie les Directions de ces deux musées d'en agréer mes remerciements sincères.

De concert avec M. Kolderup Roseninge j'ai adopté pour cette étude la répartition et la notation abrégée des parages qu'il avait employées le premier. Voir la carte de la page 44 (6).

En fait de travaux algologiques de plus ancienne date j'ai surtout consulté le chapitre intitulé *De Typis Ceramiorum* qui se trouve contenu dans les *Analecta Algologica* de J.-G. Agardh ainsi que les ouvrages systématiques publiés par le même auteur et par Harvey. Parmi les publications plus récentes ce sont les «*Studien über die Algenflora der schwedischen Westküste*», par H. Kylin, qui m'ont été les plus utiles, quoique je ne partage pas toujours les vues de l'auteur. Pour les autres ouvrages consultés, je me permettrai de renvoyer le lecteur à la bibliographie, p. 45 (7).

Considéré au point de vue général, le genre *Ceramium* a ceci de particulier que les diverses espèces se relient les unes aux autres par des intermédiaires tellement nombreux

qu'il est souvent difficile d'établir entre elles des limites distinctes. Les organes de reproduction: cystocarpes, anthéridies, tétrasporanges et amas de paraspores, qui présentent ailleurs des différences assez marquées pour servir de base à une classification systématique, ne constituent pas toujours ici des caractères suffisamment distinctifs. Il faut donc le plus souvent avoir recours à des caractères morphologiques-végétatifs dont les limites ne sont pas non plus très faciles à établir, ce qui entraîne, dans les déterminations spécifiques, une incertitude continue. Or il est clair que dans une étude comme celle que nous allons résumer il s'agit en première ligne d'indiquer d'une manière assez exacte pour ne laisser aucun doute la signification des noms employés, quelle que soit d'ailleurs l'extension des espèces et l'attribution des différentes formes. L'essentiel c'est la description des unités choisies, qu'elles cadrent ou non avec celles employées par les auteurs précédents. Aussi ne me suis-je pas borné, en traitant des espèces connues, à renvoyer aux descriptions déjà données; j'ai tâché de fournir, après un examen renouvelé, des descriptions assez exactes pour ne pouvoir être attribuées qu'à la forme en question.

Il m'a semblé qu'il ne fallait pas attacher trop d'importance à la disposition des cystocarpes ni à leurs ramules latéraux, etc., puisqu'il n'y a pas moyen d'en tirer les principes d'une classification systématique des formes danoises. Aussi n'en ai-je pas étudié le développement progressif. Quant aux spermogonies ou anthéridies, on sait qu'elles n'ont été observées qu'un petit nombre de fois. Dans les matériaux que j'ai pu examiner, ces organes étaient très rares, et je crois en pouvoir conclure qu'ils sont peu fréquents dans la nature, moins fréquents, par exemple, que les tétraspores et les cystocarpes, même en admettant que les proportions constatées dans les matériaux examinés ne correspondent pas exactement à la réalité: en effet on a soin, ordinairement, en récoltant les matériaux, de choisir de préférence des individus à tétrasporanges et à cystocarpes, les tétrasporanges et les cystocarpes étant le plus souvent visibles à l'œil nu. Les relations entre les spermogonies et les cellules corticales sont mises en évidence par la fig. I.

La formation des cellules mères des pollinides est précédée par des cloisonnements répétés des couches extérieures de l'écorce (fig. I). Ces cloisonnements s'opérant parallèlement et perpendiculairement à la surface corticale, les nouvelles cellules y forment de petites proéminences qui font naître à leur sommet une ou plusieurs cellules mères de pollinides, séparées des premières cellules par une cloison. Les cellules mères de pollinides sont quelquefois disséminées par groupes; dans d'autres cas elles recouvrent la plante tout entière.

Les tétrasporanges ne demandent pas une mention particulière. Il est clair que lorsqu'on trouve, dans un groupe d'espèces où les tétrasporanges sont généralement enfoncés et disposés en rosettes, des formes qui les ont saillants et unisériés, on peut faire de ces particularités des caractères spécifiques. Pour ce qui est de prendre le nombre des séries de tétrasporanges enfoncés pour caractère distinctif, le plus prudent est certainement de s'en abstenir, ce nombre variant suivant l'état de développement atteint par les zones. Les formes à zones étroites n'ont d'ordinaire qu'une seule série de tétrasporanges enfoncés; c'est le cas, par exemple, pour le *Cer. strictum*.

A l'encontre de ce qui a lieu pour les tétraspores, les paraspores, qu'on ne rencontre, en Danemark, que chez les *Cer. diaphanum* et les *Cer. strictum*, naissent uniquement des

cellules corticales externes (fig. II); le plus souvent elles sont produites par les cellules voisines du bord supérieur des zones où par les cellules qui constituent ce bord. La cellule d'où vont naître les amas de paraspores s'avance un peu en relief sur les autres cellules corticales, en même temps que sa membrane s'épaissit légèrement (fig. II, 1). Elle finit par prendre une forme semblable à celle d'un cystocarpe plus ou moins irrégulier, arrondi, lobé: une membrane commune, hyaline, épaissie, renferme des spores entassées sans ordre. Une même zone peut offrir à la fois des formations de paraspores aussi bien que de tétraspores¹⁾ (fig. IV, 3).

Les poils sont très communs; on en a constaté la présence sur des individus dragués à toutes les profondeurs; cependant ils sont plus fréquents dans les eaux éclairées, pas trop profondes. Dans les échantillons recueillis en hiver, les poils sont tout à fait exceptionnels.

Chez le *Cer. tenuissimum* j'ai rencontré des cellules corticales particulières à l'aide desquelles les individus stériles de cette espèce se distinguent aisément de ceux du groupe des *Cer. strictum*, etc. Les cellules en question sont plus ou moins réniformes, de contenu incolore et réfringent; elles réagissent plus fortement que les autres cellules corticales aux traitements destinés à constater la présence d'albuminoïdes (fig. III, 2 et 3). On trouve des cellules corticales semblables aux précédentes chez le *Cer. gracillimum* (espèce qui n'habite pas les parages danois) et, assez rarement, chez le *Cer. rubrum* et le *Cer. arborescens*.

Abstraction faite des cas où les tétrasporanges peuvent fournir des caractères spécifiques, le groupement des espèces de *Ceramium* doit se baser exclusivement sur des différences d'ordre morphologico-végétatif, et notamment sur les différences constatées dans les tissus corticaux. Le mode de ramification et les autres particularités végétatives ne nous serviront que de caractères secondaires. En adoptant ce système de classification nous nous trouverons d'accord avec J.-G. Agardh qui attribue également une importance prépondérante aux caractères tirés de l'écorce. Non que l'écorce soit d'ailleurs bien faite de sa nature pour servir de base à la classification: c'est faute de mieux qu'on a dû se contenter des démarcations un peu vagues qu'on en pouvait tirer.

J.-G. Agardh distingue: les formes à zones distinctement séparées, les formes entièrement recouvertes d'écorce, les formes à zones plutôt ascendantes, les formes à zones plutôt descendantes et, enfin, les formes à zones se rapprochant par suite d'un développement à peu près égal de leurs bords supérieurs et inférieurs. La première catégorie de formes se trouve représentée dans nos parages par le *Cer. tenuissimum*, le *Cer. strictum* et le *Cer. vertebrale*. Cette dernière forme n'avait pas été établie jusqu'à présent; elle se rencontre surtout dans les parages du sud et de l'est du Danemark. J'ai conscience qu'en faisant du *Cer. strictum* une espèce à part je suis en désaccord avec M. FOSLIE qui y voit une variété du *Cer. diaphanum*; j'espère avoir rencontré juste. Le *Cer. diaphanum*, dont les parties inférieures présentent souvent des zones ascendantes, appartient à une catégorie intermédiaire entre les espèces à zones nettement distinctes et les formes à zones conrescentes et plutôt ascendantes. Cette catégorie intermédiaire est représentée dans nos parages par le *Cer. Areschougii*, récemment créé par M. Kylin, et par le *Cer. fruticulosum*, qui comprend les espèces Kyliniennes *Cer. rescissum* et *Cer. penicillatum*. Un autre groupe, intermédiaire celui-là entre les formes

¹⁾ Cf. Kylin (1907) p. 175.

entièrement recouvertes d'écorce — représentées dans les parages danois par le *Cer. rubrum* — et les espèces à zones distinctement séparées, est constitué par le *Cer. Rosenvingii* et le *Cer. arborescens* dont les zones se rapprochent les unes des autres. Le *Cer. arborescens* a été décrit par Agardh dans son livre intitulé: De Typis Ceramiorum. Le *Cer. Rosenvingii* de son côté rentre dans le groupe d'Algues désigné par J.-G. Agardh sous le nom de *Cer. rubrum a decurrens*. Cette espèce correspond du tout au tout à celle du *Cer. Areschougii* dans le groupe des *Cer. fruticulosum*. Les formes à zones exclusivement descendantes ne sont pas représentées dans nos parages. Quelques-unes des espèces que je viens d'énumérer comprennent des formes variées qu'on trouvera mentionnées chacune sous son espèce. Il y en a dont on devrait peut-être faire des espèces à part.

Dans une espèce particulière, le *Cer. rubrum*, la variation des formes est certainement due à des différences de conditions extérieures. La salure, par exemple, qui varie beaucoup d'une région à l'autre, joue ici un rôle important. Pour les autres particularités à noter, voir les descriptions des diverses espèces.

a. L'écorce se compose en règle générale de zones distinctement séparées.

1. Le nombre des cellules axiles de chaque segment de ramification est de 7 à 15.

1. Pas de paraspores.

Ceramium tenuissimum (Lgb.) Agardh p. 54 (16) fig. III, pl. I fig. 1.

Individus très régulièrement dichotomes. Les extrémités des rameaux sont toujours infléchies; sous le microscope le bord extérieur se montre denticulé d'une façon particulière (fig. III, 1), caractère qui ne se retrouve dans aucune autre espèce danoise et qui peut servir à distinguer notre espèce, déjà à l'état végétatif, du *Cer. strictum* par exemple. Ramifications secondaires assez rares. Zones nettement délimitées à grandes cellules corticales externes. La distance entre les zones est jusqu'à 10 fois leur hauteur. Comme nous l'avons déjà fait remarquer, cette espèce est caractérisée par la présence de cellules corticales réfringentes, incolores, réniformes ou cordiformes (fig. III, 2, 3). Ces cellules qui semblent riches en albuminoïdes et dépourvues d'amidon, se rencontrent surtout, au nombre de 2 ou 3, dans la couche corticale externe des zones peu âgées. Elles disparaissent ou se modifient à mesure que vieillit l'individu. Les cystocarpes ne sont pas fréquents, pas plus que les tétrasporanges. Je n'ai pas observé d'anthéridies.

Cette espèce est essentiellement une forme estivale habitant les profondeurs moyennes. On en a constaté la présence dans 32 localités disséminées sur tous les parages danois excepté Ns, Sm, Bw et Bb. Dans le domaine considéré on n'en a pas trouvé de variétés.

2. Formes à paraspores.

a. Les intervalles des zones ont au plus 4 ou 5 fois la hauteur des zones elles-mêmes.

Ceramium diaphanum Harvey et Agardh p. 56 (18) (fig. IV, 1, 4) (Pl. I, fig. 2, 3, 4, 5; pl. II, fig. 3, 4).

Par l'imposition des noms d'Harvey et d'Agardh j'ai voulu indiquer que je ne comprends pas très bien ce qu'il faut entendre par l'espèce *Cer. diaphanum* (Lightfoot) Roth. La question me paraît d'ailleurs peu importante.

Cette espèce est de dimensions très variées, souvent assez considérables, jusqu'à 15—20

cm de diamètre; les formes danoises n'atteignent guère plus de 10 cm. Les extrémités des rameaux sont plus ou moins infléchies. D'après mes observations, les individus récoltés en dehors du Danemark sont ordinairement très riches en ramifications secondaires tandis qu'il est rare de trouver des individus danois qui en présentent beaucoup.

La hauteur des zones dépasse parfois 120 μ . Leur distance est, au plus, 4-6 (*strictoides*) fois leur hauteur.

Dans les régions où l'écorce a obtenu un développement quelque peu considérable — c'est-à-dire à quelque distance du sommet — elle se compose de plusieurs couches dont l'externe a des cellules de petites dimensions¹⁾. Cette consistance de l'écorce distingue le *Cer. diaphanum* du *Cer. strictum* dont l'écorce se divise rarement en couches, si ce n'est dans la région tout à fait basilaire. Les zones inférieures ont quelquefois une tendance prononcée à se développer vers le haut; tel est surtout le cas pour la *forma corticatula*.

Les tétraspoires et les paraspoires sont les organes de reproduction les plus communs, de fréquence à peu près égale. Les cystocarpes et les anthéridies sont rares.

Le *Cer. diaphanum* habite les eaux littorales et peu profondes où il adhère aux algues, aux pierres, aux pilotis des jetées, etc. Il se fait rare pendant les mois sombres de l'année; comme toutes les autres espèces considérées il est surtout fréquent en été.

Je distingue quatre formes bien caractérisées auxquelles vient s'ajouter une cinquième moins bien connue.

1. *Cer. diaphanum forma typica*. Pl. I, 2, 4.

La caractéristique de cette forme est le développement abondant de ramifications secondaires et la tendance assez marquée des nouveaux rameaux à former de nouvelles branches principales. Les extrémités des rameaux sont le plus souvent infléchies. Les échantillons danois examinés par moi ont été recueillis dans un petit nombre de régions du Ks, du Bm et du Lb et n'atteignent ni la vigueur ni les dimensions des individus habitant l'Atlantique.

2. *Cer. diaphanum forma strictoides*. Pl. II, fig. 3.

Cette forme est très voisine de la forme *typica*; cependant elle s'en distingue par son faciès plus régulièrement dichotomique, qui rappelle beaucoup celui du *Cer. strictum*, et par les grandes distances entre les zones (jusqu'à 6 fois la hauteur des zones).

Subforma α . La tendance ascendante est peu prononcée dans les zones basilaires.

Recueillie dans Ks, Sb, Sm et Bm. (Pl. II, fig. 3).

Subforma β [*corticatula* (Kylin)?]

[Syn: *Ceramium corticatulum* (Kylin) (Voir: Kylin, 1907, p. 176, Pl. 7, 3)].

Zones basilaires ascendantes.

Recueillie par ci par là dans le Su (port d'Elseneur, petite rade de Copenhague, Dragør) et dans le Lb (au nord de l'île d'Ærø).

3. *Cer. diaphanum forma modificata*. Pl. I, fig. 3, 5.

Cette forme se rattache par de nombreux intermédiaires aux deux formes précédentes. Elle en diffère par sa ramification moins régulière et moins riche en branches secondaires. Il faut probablement y voir une forme née des deux autres en des endroits où l'eau était trop peu salée pour en permettre le plein développement.

Recueillie en 30 endroits différents dans Ks, Sa, Sb, Su, Sf, Bm et Bb.

¹⁾ Nous faisons abstraction des cellules intérieures qui donneront naissance aux tétrasporanges.

4. *Cer. diaphanum forma radiculosa* (Grun.); Pl. II, fig. 4.

Syn: *Cer. radiculosum* Grunow. Hauck, Meeresalgen, p. 106.

Caractéristique: Ramifications courtes enchevêtrées. — Les individus se composent souvent d'une partie basilaire assez ramassée d'où partent un petit nombre de pousses plus élancées. Pas mal de ramifications secondaires. Port peu vigoureux. Recueilli en des endroits épars sur les côtes des îles de Bornholm et de Christiansö (Bb).

A ces formes il faut peut-être en ajouter une cinquième, habitant le *Zostera* et le *Chorda*; mais cette attribution n'a rien de définitif. La forme en question a une certaine ressemblance avec le n° 123 (*Cer. strictum*) des Algues marines de Cherbourg (Le Jolis).

D'après les matériaux examinés, l'habitat le plus septentrional des *Cer. diaphanum* danois non douteux serait le port de l'île d'Anholt; mais on finira peut-être par lui trouver des habitats situés plus loin vers le nord; pour ma part je trouverais naturel qu'il y en eût.

β . La distance entre les zones est jusqu'à dix fois leur hauteur.

Ceramium strictum Grev. et Harv. p. 61 (23); Pl. I, 6 et 7; II, 1.

A l'encontre de M. Foslie, je classe ici le *Cer. strictum* comme une espèce à part.

Individus de dimensions variables (diamètre maximum d'environ 15 cm), ordinairement de taille faible à filaments cellulaires très minces; ramification de caractère décidément dichotome, à rameaux secondaires peu développés. Extrémités des rameaux plus ou moins infléchies. Écorce à cellules assez grandes, à couches peu nombreuses (Fig. IV, 2). Par ces caractères le *Cer. strictum* se distingue du *Cer. diaphanum*. Zones toujours nettement distinctes; hauteur des zones jusqu'à 110 μ ; la distance d'une zone à l'autre est jusqu'à 8 ou 10 fois leur hauteur. Tétraspores et paraspores comme chez le *Cer. diaphanum*; notons seulement que ces dernières sont un peu plus nombreuses que les tétraspores.

Les cystocarpes ont été observés, mais rarement; les anthéridies, pas du tout. Espèce essentiellement estivale, trouvée jusqu'à présent à des profondeurs de 2 à 16 mètres; toujours épiphyte(?).

Dans les parages danois cette espèce est représentée par deux formes:

1. *Cer. strictum forma vera*. Pl. I, fig. 7, II, fig. 1.

Rencontré en 50 endroits dans Lf, Ks, Sa, Lb, Sb, Su, Sf, Sm, Bw, Bm, Bb.

Il est assez curieux que cette forme n'ait pas été notée dans les régions septentrionale et orientale du Cattégat; remarquons toutefois que M. Kylin l'a rencontrée en Suède sur les côtes du Bohuslän et du Halland.

2. *Cer. strictum forma stricto-lenuissima*. Pl. I, fig. 6.

Cette forme se distingue par ses extrémités de rameaux plus divariquées et par son port particulièrement élégant. Elle n'a été rencontrée qu'en des points rares des parages méridionaux.

II. Le nombre des cellules axiles de chaque segment de ramification est souvent très grand, jusqu'à 40 environ.

Ceramium Deslongchampsii Chauv.

La présence de cette espèce dans les parages danois n'a été constatée qu'au mois de juillet dernier lorsque l'auteur du présent mémoire la trouva dans le port de Frederikshavn (Kn); nous n'en ferons donc pas ici l'objet d'une mention spéciale.

Ceramium vertebrale mihi; p. 63 (25). Fig. V, Pl. II, fig. 2.

Cf. la diagnose donnée à la page 63 (21).

Cette espèce est caractérisée par la direction de ses extrémités de rameaux, qui se dressent à mesure que l'individu atteint un âge plus avancé, par le grand nombre de cellules axiales que contiennent souvent les divers segments des ramifications et par les épaissements curieux de ses membranes. Elle présente à la fois certains des caractères du *Cer. Deslongchampi* et d'autres qui sont propres au *Cer. strictum*. Des recherches ultérieures nous apprendront s'il faut maintenir à cette forme son rang d'espèce à part. On pourrait peut-être y voir un représentant du *Cer. Deslongchampi* dans les parages méridionaux; mais comment alors s'expliquer que le *Cer. Deslongchampi* n'ait pas été récolté au sud de Frederikshavn?

b. L'écorce se divise seulement par endroits en zones nettement distinctes; elle forme même quelquefois un revêtement continu.

I. Les portions basilaires et moyennes sont d'ordinaire entièrement recouvertes d'écorce.

Les parties supérieures présentent des zones se développant vers le haut aussi bien que vers le bas excepté dans les régions tout à fait apicales.

a. Peu de pousses secondaires.

Ceramium Rosenvingii mihi. Page 64 (26), fig. VI, 2, VII, 1. Pl. II, fig. 5, 6, 7.

Cette espèce se trouve comprise, avec le *Cer. Areschougii* créé par M. Kylin, dans le *Cer. rubrum a decurrens* de J.-G. Agardh. Le qualificatif de *decurrens* n'est pas à sa place ici puisque l'espèce considérée n'est pas identique à l'*Hormoceras decurrens* de M. Kützing¹⁾. J'ai donc été amené, comme M. Kylin, à lui donner un autre nom spécifique, et j'ai choisi celui de «*Rosenvingii*».

Pour la diagnose, voir la page 67 (29). Il résulte des descriptions données à cet endroit que l'espèce en question est très variable. Je propose de lui attribuer pour représentants les formes suivantes:

1. *Cer. Rosenvingii forma tenuis*. Pl. II, fig. 5.

Les zones nettement distinctes prédominent; ce n'est que vers la base qu'on trouve des revêtements corticaux plus ou moins continus et des zones se rapprochant les unes des autres. Le faciès est à peu près celui du *Cer. strictum*, à ramification dichotomique plus ou moins accusée. Recueilli en trois endroits divers dans Sa, non loin du phare de l'île d'Æbelø; et dans Lb: aux environs du phare de Skjoldnæs et sur les côtes de l'île de Bogø.

2. *Cer. Rosenvingii forma intermedia*. Pl. II, fig. 6.

Les individus sont plus vigoureux et plus semblables au *Cer. rubrum* que ne l'étaient ceux de la forme précédente. L'écorce recouvre d'un revêtement presque continu la partie inférieure de l'individu, jusqu'à mi-hauteur et un peu au-delà; dans la partie supérieure le faciès est à peu près celui du *Cer. strictum*. Les zones libres se rapprochent les unes des autres en croissant; des deux bords de la zone c'est le bord inférieur qui s'avance le plus vite. Les parties d'écorce continue qui entourent les tronçons médians des interstices entre les diaphragmes, se composent de cellules particulièrement grandes où se rencontrent souvent

¹⁾ Pas plus qu'avec le *Cer. decurrens* de la Phycologia Britannica.

des grains d'amidon bien distincts. Il n'est pas facile d'établir la limite qui sépare cette forme de la forme suivante.

Recueilli en 10 endroits divers dans Kn, Sa, Sb, Lb, Sf, Bw.

3. *Cer. Rosenvingii forma transgrediens*. Pl. II, fig. 7.

Le revêtement cortical monte assez haut. Par son facies cette forme rappelle le *Cer. rubrum* à tel point qu'on a quelquefois de la difficulté à l'en distinguer. Les zones libres dont il présente toujours un certain nombre ont des tendances ascendantes aussi bien que descendantes. Pour établir une limite, si arbitraire soit-elle, entre le *Cer. rubrum* et le *Cer. Rosenvingii*, je proposerais de ne pas attribuer à la dernière espèce les formes entièrement recouvertes par un revêtement cortical. Pour ce qui est des formes à zones libres, je ne vois pas d'inconvénient à en rapporter au *Cer. rubrum* en entendant par zones libres des zones nettement limitées qui ne montrent aucune tendance ascendante ni descendante. Au contraire les formes dont les zones peu distinctes tendent à se confondre, ne devraient pas, d'après moi, être classées dans cette espèce. Je vois très bien tout ce qu'il y a d'arbitraire dans ces distinctions, mais il est indispensable d'en établir du moment qu'on veut entreprendre des recherches dans ce domaine. Chez les formes *intermedia* et *transgrediens* des *Cer. Rosenvingii*, l'écorce qui entoure les diaphragmes est souvent assez différente de celle qui recouvre les régions intermédiaires. Recueilli en 10 localités dans Ks, Su, Lb, Sf et Bw.

Le *Cer. Rosenvingii* ne se trouve représenté en Danemark que dans les parages du Sud et du Centre.

β. Développement abondant de pousses secondaires; axes primaires généralement distincts.

Ceramium arborescens J.-G. Agardh. P. 67 (29), Pl. III, fig. 1—2.

Les végétations sont ordinairement vigoureuses, rappelant celles du *Cer. rubrum*, avec des axes primaires fortement développés et une grande abondance de pousses secondaires. Les extrémités des rameaux ont généralement la forme de pinces allongées; les rameaux les plus rapprochés du sommet sont souvent disposés en corymbe. En règle générale, l'écorce continue dépasse de beaucoup la mi-hauteur de l'individu: on ne trouve guère de zones libres qu'à peu de distance du sommet. Dans les cas où les caractères qui constituent le facies de cette espèce sont peu prononcés on la distingue difficilement du *Cer. Rosenvingii*. Il existe peut-être des formes entièrement recouvertes d'écorce et qu'il faudrait néanmoins rapporter à cette espèce. Jusqu'ici je n'en ai pas trouvées. Pour distinguer cette espèce des formes zonées du *Cer. rubrum* il faut remarquer l'aspect et le développement des zones libres. Les tétrasporanges n'offrent pas de caractères intéressants. Les cystocarpes et les anthéridies sont rares. Espèce printanière ou estivale; épiphyte ou fixée à un substratum inanimé. Trouvée en 20 endroits, à des profondeurs plus ou moins considérables, dans Sk, Lf, Kn, Ks, Sa, Su, Sb, Lb, Sf, Bw et Bm.

II. Ecorce divisée en zones; ou plus ou moins continue; ou bien les deux formations représentées à la fois. Les zones ont une tendance ascendante marquée.

Les zones nettement délimitées ne s'observent que dans le voisinage des extrémités des rameaux. Ailleurs les zones libres se rapprochent peu à peu les unes des autres, mais leur

développement a ceci de particulier que la partie inférieure des zones semble dépourvue pendant quelque temps de tout pouvoir de croissance, tandis que la partie supérieure croît dès le début vers le haut. Il en résulte que les zones présentent à un certain stade de leur développement (dans une certaine région du thalle) un bord inférieur nettement marqué. Cette région plus ou moins étendue, se retrouve partout où nous avons des zones libres. Le développement des zones ascendantes a été décrit par J.-G. Agardh et par M. H. Kylin.

Ceramium Areschougii Kylin, p. 69 (31).

M. Kylin a donné une description détaillée de cette espèce (l. c., p. 179). Épiphyte, habitant des eaux plus ou moins profondes (jusqu'à 20 m). Forme estivale; recueillie en 9 points divers dans Kn, Sa, Lb, Bw. L'espèce est très variable. [L'examen d'individus récoltés aux environs de Frederikshavn, où on en trouve beaucoup, m'a donné l'idée que le *Cer. rubriforme* Kyl. d'un côté et, de l'autre, le *Cer. corticatulum* Kyl. sont peut-être deux formes du *Cer. Areschougii* représentant l'un un stade voisin du *Cer. rubrum*, l'autre un stade parent du *Cer. diaphanum*]

Ceramium fruticosum Kütz, p. 70 (32). Pl. IV, fig. 1—4.

Espèce très compréhensive, trop compréhensive peut-être: j'y réunis sous le nom de *fruticosum* des formes peu différenciées telles que le *Cer. rescissum* et le *Cer. penicillatum*, que je ne crois pas identique à la forme *penicillata* ci-dessous mentionnée. D'après moi le facies de cette espèce se distingue assez nettement de celui du *Cer. Areschougii*. La justesse du nom de *fruticosum* est peut-être contestable; je l'ai choisi parce qu'Agardh s'en est servi pour désigner des formes comme celles dont il s'agit ici.

Individus de dimensions différentes, souvent très grands, mesurant jusqu'à 20 cm de diamètre. D'un côté ils ressemblent aux *Cer. Areschougii*, de l'autre ils se rapprochent des *Cer. rubrum*. Mode de ramification très variable, quelquefois presque penné (*forma penicillata*).

Le revêtement cortical présente des degrés de développement assez variés; il est constitué: tantôt uniquement par des zones libres (ressemblance avec le *Cer. Areschougii*), tantôt par une couche continue (ressemblance avec le *Cer. rubrum*), tantôt par des formations intermédiaires représentant ces deux types mêlés à des degrés divers. La hauteur des zones est souvent très considérable. Tétraspores, cystocarpes et anthéridies peu intéressants; les deux dernières sortes d'organes sont rares. Espèce essentiellement estivale mais qui se rencontre aussi aux autres époques de l'année. La couleur des individus vivants est toujours d'un rouge ferrugineux avec des teintes bleu foncé. Habitat: eaux profondes ou peu profondes, (jetées et quais).

1. *Cer. fruticosum forma rescissa* (Kylin). Kylin l. c., pl. 7. Pl. IV, fig. 2.

Voir la description donnée par M. Kylin l. c. p. 182. Recueilli par ci par là dans Kn, Sk et Lf.

2. *Cer. fruticosum forma penicillata* (Kützing). Pl. IV, fig. 3.

Je n'ose pas affirmer que cette forme soit identique au *Cer. penicillatum* de M. Kylin. Si je me sers de cette dénomination c'est que je l'ai vue employée dans l'herbier de Stockholm. On y trouve en effet rapportés au *Cer. penicillatum Areschoug olim* un certain nombre d'exemplaires, les mêmes probablement auxquels M. Kützing fait allusion dans la diagnose qu'il donne à la page 676 de la «Species Algarum». Pour le facies de cette espèce, voir les fig. 1, 2, 4 de la planche IV.

La figure 4 de la planche IV nous montre un individu de la forme *penicillata* dont le faciès rappelle le *Cer. penicillatum* de M. Kylin: axes principaux bien marqués; segments de thalle diminuant de longueur à mesure qu'ils sont plus rapprochés du sommet; mode de ramification régulièrement dichotomique.

L'autre figure (pl. IV, fig. 3) est beaucoup plus curieuse. La disposition des rameaux est nettement distique, la dichotomie se trouvant altérée par suite d'un développement inégal. Le long des branches principales naissent de petits systèmes de rameaux d'aspect toujours pareil.

Les tétrasporanges sont assez fréquents dans les portions terminales des ramules droits.

Recueilli dans Sk et Kn (port de Frederikshavn); les individus distiques habitent les eaux peu profondes.

3. *Cer. fruticosum forma rubroides* (Pl. IV, fig. 1).

Sous ce nom je comprends les formes qui tout en se rattachant de très près au *Cer. fruticosum* se rapprochent néanmoins, par leurs formations corticales, du *Cer. rubrum* dont elles rappellent surtout les formes irrégulières. Même dans les régions les plus continues la couche corticale dénote par endroits sa provenance de zones fusionnées. Pour la détermination, on fera bien d'examiner de préférence des individus peu âgés.

Recueilli en des points espacés dans Kn et Lf.

c. Couche corticale continue qui est cependant quelquefois interrompue par des interstices étroits dans le voisinage du sommet et toujours dans les ramules involucreaux des cystocarpes.

Ceramium rubrum (Huds.) Agardh. P. 35 (73). Pl. III, fig. 3 et 4, pl. IV, fig. 5 et 6, pl. V, VI et VII.

Parmi les espèces traitées dans le présent mémoire le *Cer. rubrum* offre les plus grands disparates dans l'ensemble des régions considérées. Mais contrairement à ce qui était le cas pour les autres espèces (le *Cer. diaphanum* excepté), il est évident ou du moins probable que la grande majorité de ces disparates est due à un agent déterminé, à savoir: la plus ou moins grande proportion de chlorure de sodium contenue dans l'eau marine. Le *Cer. rubrum* supporte mal les eaux de faible salure, aussi le voyons-nous s'éteindre dans nos parages du sud-est après avoir d'ailleurs pris des caractères assez accusés dans les parages du centre. J'ai tâché de distinguer les divers degrés de cette extinction en délimitant les régions habitées par les différentes formes de transition; mais j'accorde volontiers qu'une telle délimitation est nécessairement arbitraire, l'eau douce se mêlant insensiblement à l'eau salée du Skagerak et de la mer du Nord sauf dans certains endroits où, par suite des conditions extérieures (courants, etc.), les transitions sont plus brusques qu'ailleurs. J'ai pris pour point de départ le *Cer. rubrum* forma prolifera J.-G. Agardh qui est particulièrement caractéristique de la mer du Nord, des côtes septentrionales de l'Atlantique et, d'une manière générale, de toutes les mers tempérées. A cette forme viennent se rattacher toutes les autres qui s'en distinguent par des caractères plus ou moins modifiés. Il convient de faire remarquer expressément que ces formes ne sont pas du tout endémiques dans les parages danois. Comme elles doivent leur existence à la salure mitigée de l'eau on doit s'attendre à les rencontrer partout où se présentent les mêmes conditions de milieu. Et en effet j'ai retrouvé

dans les fjords des îles Feroe, qui reçoivent beaucoup d'eau douce sous forme de torrents, un certain nombre des *Ceramium* danois.

Quant à la formation de zones corticales, j'ai constaté la présence d'interstices non revêtus d'écorce chez des individus appartenant sans aucun doute aux *Cer. rubrum*. Ces interstices étaient le plus souvent situés dans les sommités des branches. Il ne m'a pas été possible de constater s'il y avait développement ascendant ou descendant des zones. La division par zones se retrouve constamment dans les ramuscules qui servent d'involucre aux cystocarpes. L'épaisseur de l'écorce est assez variable; elle dépend probablement, jusqu'à un certain point, de la salure de l'eau. J'ai récolté quelques individus estivaux à écorce particulièrement mince dans les régions centrales des parages danois.

En fait de tétrasporanges, de cystocarpes et d'anthéridies je n'ai rien noté d'extraordinaire; les cystocarpes sont assez communs, tandis que je n'ai rencontré qu'un petit nombre d'anthéridies; les tétrasporanges sont excessivement abondants. Le *Cer. rubrum* peut végéter pendant l'hiver; les individus vieux se renouvellent probablement au printemps par l'émission de pousses nouvelles.

I. Formes dont l'existence dépend probablement de la proportion de chlorure de sodium contenue dans l'eau.

A. Formes habitant la mer du Nord et le Skagerak.

Cer. rubrum forma prolifera, secundata et pedicellata J.-G. Agardh. (Cette forme ne prend pas souvent un aspect irrégulier). (Pl. IV, fig. 5 et 6, pl. V, fig. 1, pl. VII, fig. 2). Les formes *secundata* et *pedicellata* ne me semblent pas assez distinctement caractérisées pour qu'on en fasse des espèces à part.

Les formes *prolifera* et *secundata* sont caractérisées, plus que les autres, par la disposition particulière, rhomboïdale, des ramifications terminales, par leurs extrémités de rameaux fortement infléchies et par l'abondance de leurs branches secondaires. Le mode de ramification varie: tantôt on observe des troncs principaux ébauchés, tantôt il n'y en a pas le moindre vestige.

L'individu jeune de la forme *prolifera* qui est représenté à la pl. IV, fig. 5, et la forme feroéenne figurée à la pl. VII, fig. 2 ont tous les deux leurs rameaux terminaux disposés d'une manière bien caractéristique. La fig. 6 de la planche IV montre une forme intermédiaire entre la précédente et la forme *secundata*. M. Kylin¹⁾ a donné une représentation très ressemblante de la forme *pedicellata*. Cette dernière forme doit probablement sa naissance à l'influence d'agents extérieurs particuliers tels que les courants d'eau. Parmi les échantillons rapportés par moi à cette forme il y en a qu'on ferait peut-être mieux de réunir en une forme à part: *forma virgata*, très voisine de la *forma pedicellata*.

B. Formes habitant le Limfjord et la région septentrionale du Cattégat. (Lf, Kn, *passim* dans Km et Ke); p. 41 (79); pl. III, fig. 3; pl. V, fig. 3.

La forme *pedicellata (virgata?)* a été récoltée aux environs de Tyborön et dans la partie occidentale du Limfjord, jusqu'au détroit d'Aggersund. Cependant le *Cer. rubrum* est surtout représenté dans les parages en question par une forme ou plutôt une série de formes qui

¹⁾ l. c. pl. 6, fig. 1 et 2.

diffère plus ou moins des formes *prolifera* et *secundata* et aussi, mais d'une manière moins prononcée, de la forme *pedicellata*.

Je les réunis ici sous le nom de *forma modificata*; mais il m'a bien fallu renoncer à en donner une caractéristique, tant la chose est difficile et pour ainsi dire impossible. Le lecteur en trouvera aux planches III et V (fig. 3 et 3) des représentations plus ou moins dépourvues de caractères marquants, surtout de ceux qui distinguent les trois formes précédentes. Quelques-uns des échantillons ont été récoltés pendant les mois d'hiver.

C et D. Formes estivale et hivernale recueillies dans Km, Ks, Sa, Su, Lb, Sb et, moins souvent, dans Bm: *forma subtypica*.

Dans ces formes on ne distingue qu'imparfaitement les traits qui caractérisent les formes habitant la mer du Nord. Notons d'ailleurs que chez les individus récoltés en hiver ces traits se présentent avec une netteté relativement considérable. Cf. pl. III, fig. 4 et pl. VI, fig. 2. Ces deux formes n'ont été recueillies que dans un nombre restreint de localités.

E et F. Formes estivales recueillies dans le Cattégat méridional, aux environs de l'île de Samsö, et dans des parages situés plus loin encore vers le sud: *forma irregularis* et *forma subcorticata*; p. 43 (81). Pl. V, fig. 2 et 4; pl. VI, fig. 1 et 4; pl. VII, fig. 3.

Ces deux formes représentent deux stades d'évolution extrêmes, mais encore vigoureux, du *Cer. rubrum*. On dirait que l'espèce tend à se renouveler par la formation de deux espèces, avant de s'éteindre dans la Baltique. Etroitement reliées entre elles, les deux formes en question se rattachent d'un côté à la *forma subtypica*, de l'autre à la *forma baltica*.

Les formes *irregularis* et *subcorticata* se distinguent par leur ramification non symétrique, aux extrémités de rameaux plus ou moins droites, par un développement moins prononcé de troncs principaux, et par leur manque de pousses secondaires. Chez la forme *subcorticata* l'écorce n'atteint qu'un développement très faible; elle contient souvent des grains d'amidon.

Les figures 2 de la planche V, 1 et 4 de la planche VI, représentent les formes les plus fréquentes (cf. la fig. IX, p. 40 (78)); on y observe que la *forma prolifera* primitive a pris une croissance moins symétrique. Les extrémités droites se présentent sous deux formes: l'une raide, l'autre flexible, allongée, agitée çà et là au gré des courants et des ondes. Cette dernière forme est surtout celle des individus qui vivent fixés à des touffes d'algues croissant non loin de la surface des eaux dont les ondulations communiquent aux rameaux un mouvement continu.

Les figures 1 et 4 de la planche VI montrent une forme du fond et une forme de la surface (*subcorticata*), récoltées par l'auteur, respectivement à une profondeur de 2 à 3 mètres et à la surface des eaux de la même localité (Ellekilde). Ce sont là probablement les deux types littoraux des *Cer. rubrum* habitant Ks, Sa, Su, Sb et Lb.

La *forma subcorticata* ne présente pas de caractères végétatifs particuliers; c'est une *forma irregularis* à écorce faiblement développée.

Les formes *irregularis* et *subcorticata* sont représentées dans l'herbier de M. Kolderup Rosenvinge par des échantillons récoltés en 40 endroits différents dans Km, Ks, Sa, Su, Sb, Lb, Sf, Bw et Bm.

G. La forme de la Baltique: *forma baltica*; Pl. VII, fig. 1 et 5.

Sous ce nom nous désignons la dernière phase atteinte dans la Baltique par le *Cer. rubrum*. Les caractères propres aux *Ceramium* ont presque entièrement disparu; la ramification devient tout à fait asymétrique. Thalle frêle à extrémités droites. Surtout commune dans les parages voisins de l'île de Bornholm.

II. Formes qui doivent probablement leur existence à des agents autres que la salure.

H. Formes d'eaux tranquilles: *forma radians*. Pl. VI, fig. 3.

Certaines formes du *Cer. rubrum* prennent dans les eaux tranquilles et peu profondes un développement dichotomique régulier à périphérie arrondie. Cette catégorie de *Ceramium* est représentée, dans les régions septentrionales des parages danois, par des formes dérivant probablement de la *forma prolifera* ou bien de la *forma modificata*, tandis que les formes plus méridionales descendent sans doute de la *forma subtypica*. En dehors de ces trois formes je n'en trouve pas qui aient pu donner naissance à la forme H.

I. *Forma divaricata*. Pl. VII, fig. 4.

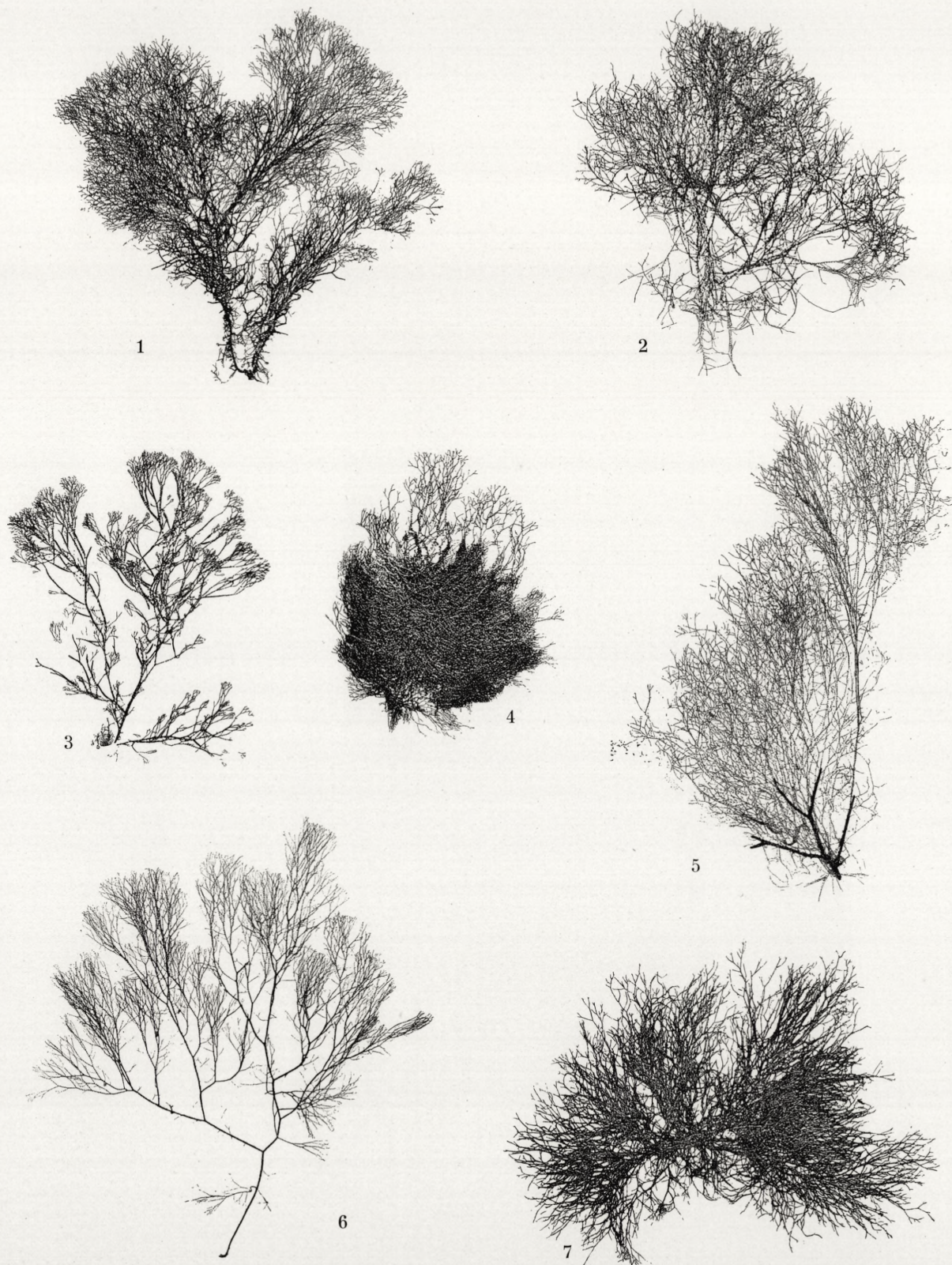
Cette forme se reconnaît à ses rameaux très écartés surtout aux sommités des branches. Les causes qui déterminent ce caractère ne me sont pas connues. Quant à la place qu'il faut assigner à la forme I parmi les autres *Ceramium*, je la suppose assez voisine de la *forma subtypica*. Jusqu'à présent on n'a trouvé de la forme I que des échantillons végétatifs. Localités dans Lb: détroit de Fænö; passe de «Fyrrenden» (Fænö). Saison: mois de février, mars, avril.

J. *Forma decurrentoides*.

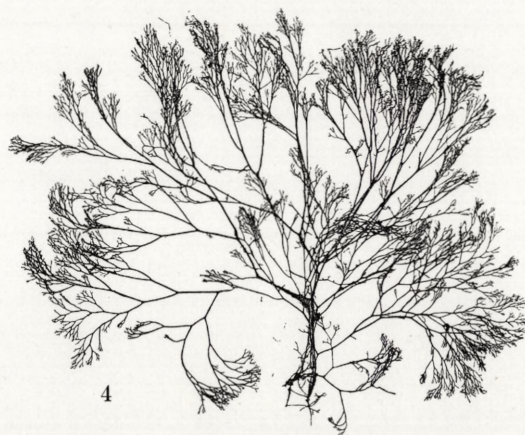
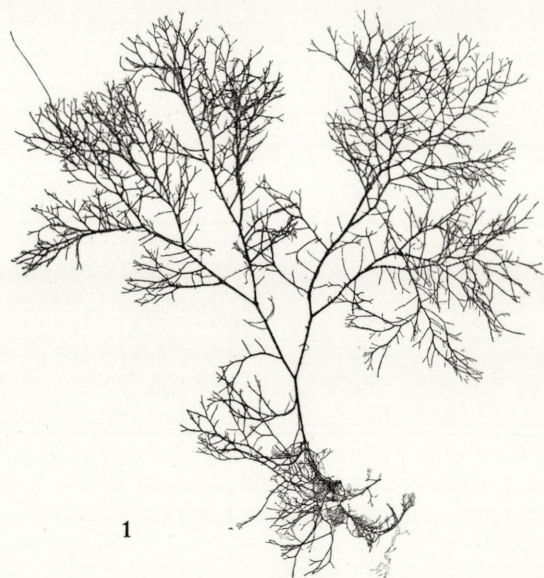
Pour ma part j'incline à voir dans cette forme une *forma prolifera* avec des traces d'interstices entre les zones corticales. Dans les formes à écorce faible telles que la *forma irregularis* et la *forma subcorticata* j'attache peu d'importance au caractère zoné de l'écorce, mais ici, où le facies est celui de la *forma prolifera*, je trouve utile d'attirer l'attention sur ce point. Le développement des zones est celui des *Cer. rubrum*. Probablement cette forme habite de préférence les eaux très profondes. Récoltée, aux mois de juillet et d'août, à des profondeurs considérables (jusqu'à 25 m) dans certaines localités du Sk et du Kn.



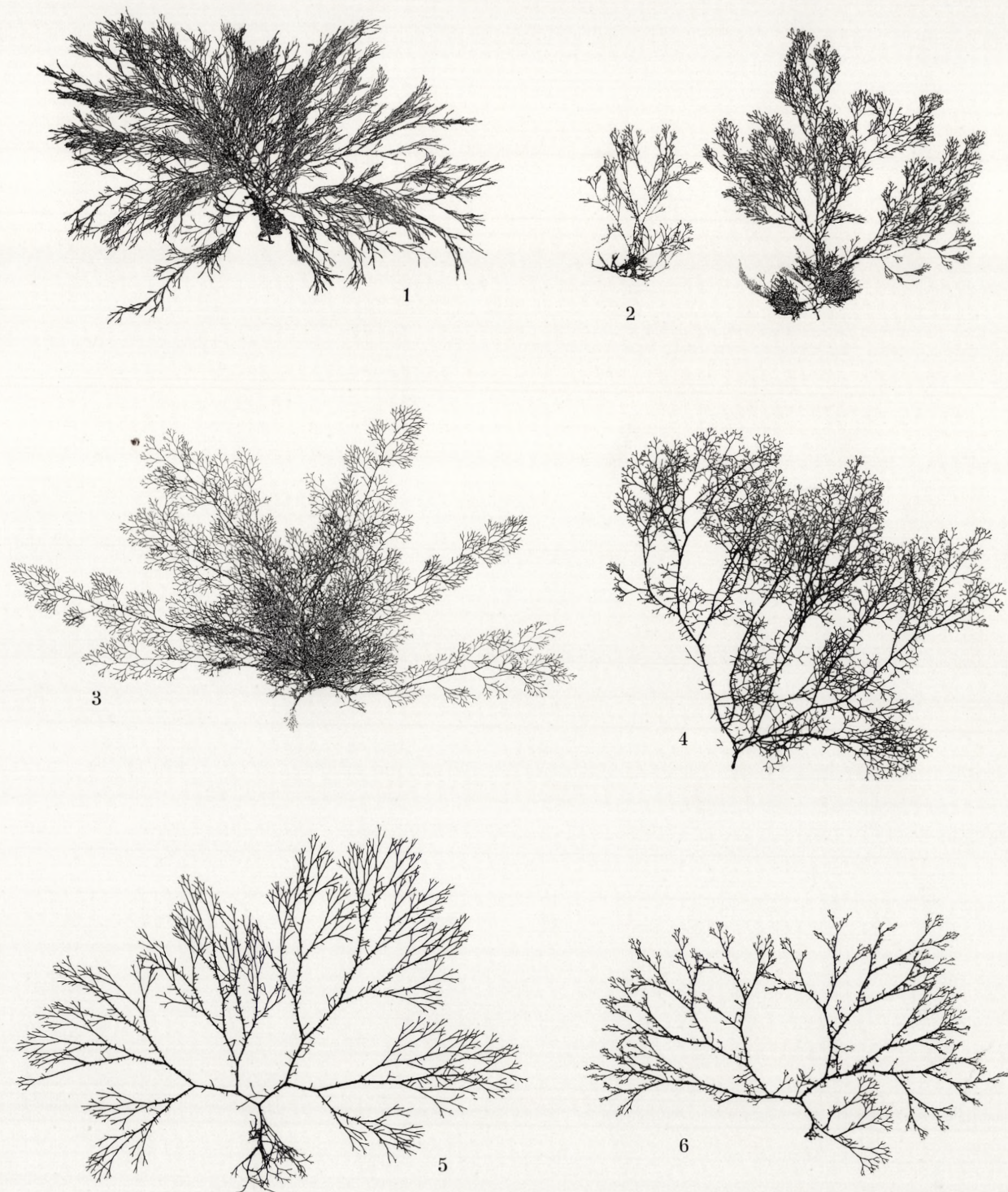
1. *Cer. tenuissimum*, (Sk); 2, 4. *Cer. diaphanum* forma typica, (Bm, Sa); 3. *Cer. diaphanum* forma modificata, (Sm); 5. *Cer. diaphanum* forma modificata (voisine de forma radiculosa), (Su); 6. *Cer. strictum* forma stricto-tenuissima, (Sb); 7. *Cer. strictum* forma vera, (Bb). (1, 2, 3, 4 et 5: échelle $\frac{5}{16}$; 6 et 7: éch. $\frac{2}{16}$).



1. *Cer. strictum* forma vera (épiphyte sur *Cer. rubrum*), (Sb); 2. *Cer. vertebrale*, (Bb); 3. *Cer. diaphanum* forma strictoides (α), (Su); 4. *Cer. diaphanum* forma radiculosa, (Bb); 5. *Cer. Rosenvingii* forma tenuis, (Li); 6. *Cer. Rosenvingii* forma intermedia, (Kn); 7. *Cer. Rosenvingii* forma transgrediens, (Sb). (2, 3 et 4: éch. $\frac{5}{6}$; 1 et 5: éch. $\frac{2}{6}$; 6 et 7: éch. $\frac{1}{2}$).



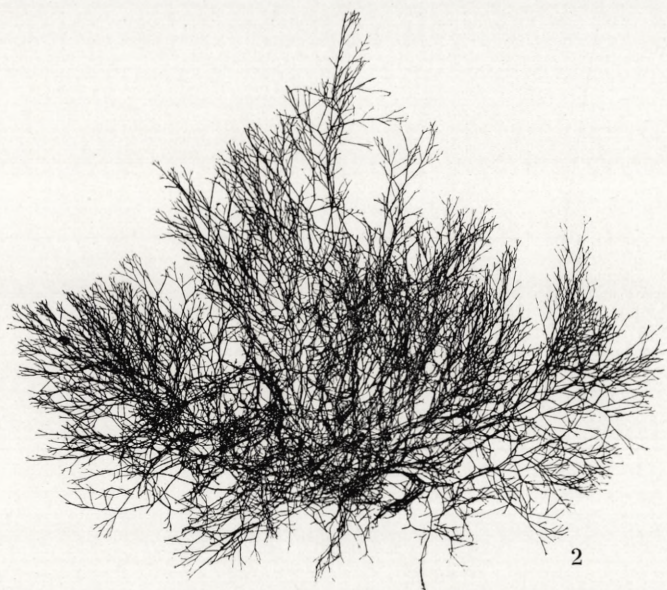
1. *Cer. arborescens*, (Kn); 2. *Cer. arborescens*, (Sb); 3. *Cer. rubrum* forma *modificata* (voisine de forma *secundata*), (LF); 4. *Cer. rubrum* forma *subtypica hiemalis*, (Ke, Gillejeje Février). (4: éch. $\frac{2}{6}$; 1 et 3: éch. $\frac{2}{8}$; 2: éch. $\frac{1}{2}$).



1. *Cer. fruticosum* forma *rubroides*, (Lf); 2. *Cer. fruticosum* forma *rescissa*, (Kn) (deux individus); 3 et 4. *Cer. fruticosum* forma *penicillata*, (Sk); 5. *Cer. rubrum* forma *prolifera* (voisine de forma *secundata*; jeune individu), (Sk) (7067); 6. *Cer. rubrum* forma *prolifera* (voisine de forma *secundata*, (Sk) (7062). (2, 4, 5 et 6: éch. $\frac{5}{6}$; 3: éch. $\frac{2}{3}$; 1: éch. $\frac{1}{3}$).



1



2

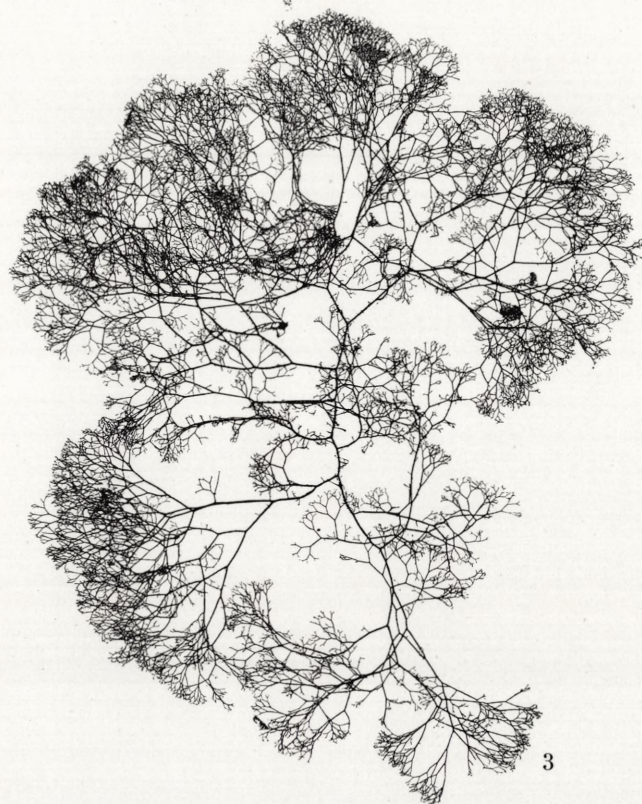


3

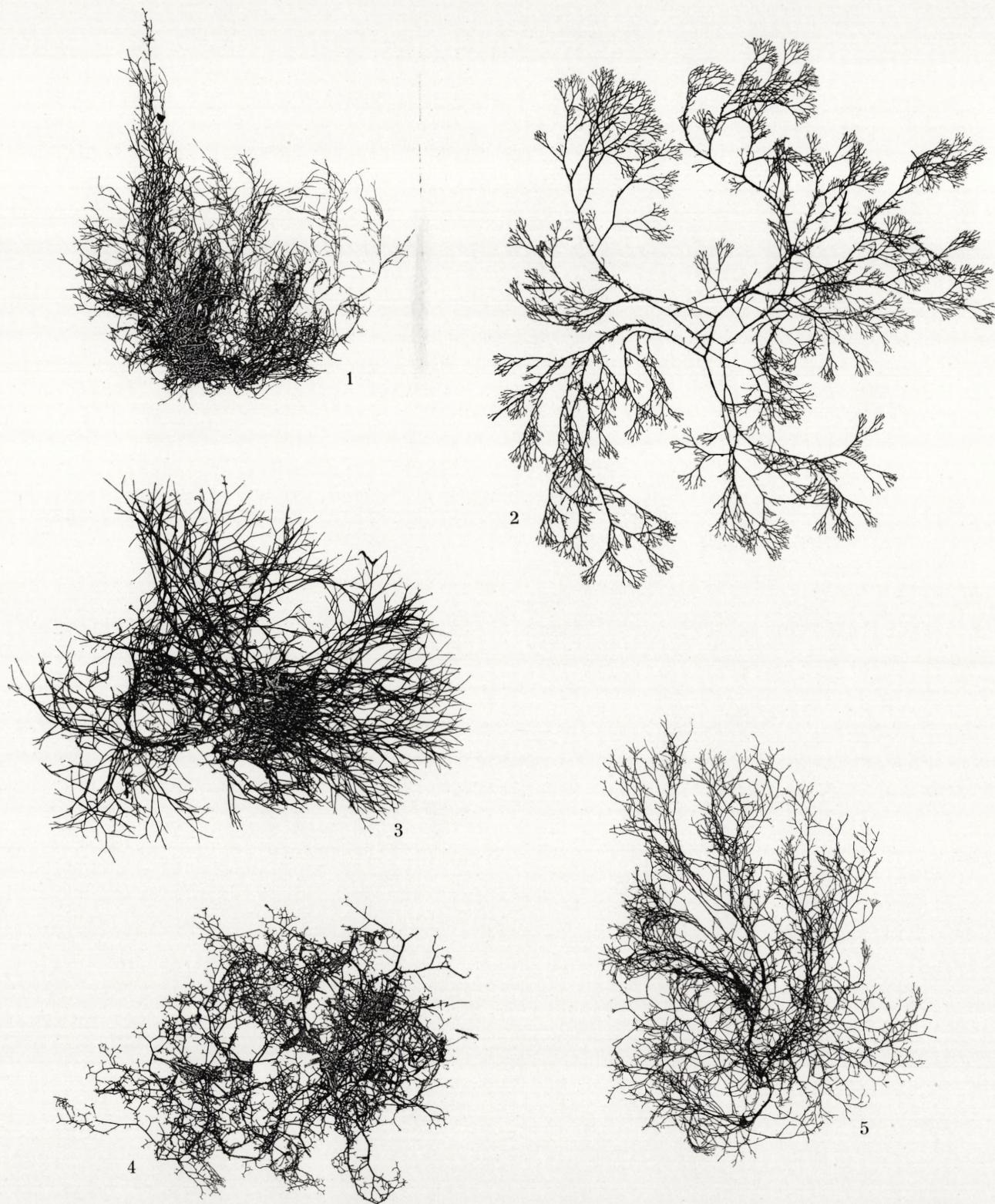


4

1. *Cer. rubrum* forma prolifera (une forme irrégulière voisine de forma secundata), (Sk); 2. *Cer. rubrum* forma irregularis, (Sa); 3. *Cer. rubrum* forma modificata (voisine de forma subtypica æstiva), (Kn); 4. *Cer. rubrum* forma irregularis (voisine de forma subtypica æstiva), (Li). (1 et 3: éch. $\frac{2}{3}$; 2 et 4: éch. $\frac{1}{2}$).



1. *Cer. rubrum* forma *irregularis* (individu croissant sur le fond), (Su); 2. *Cer. rubrum* forma *subtypica aestiva* (voisine de forma *irregularis*), (Su); 3. *Cer. rubrum* forma *radians*, (Sf); 4. *Cer. rubrum* forma *irregularis* (individu épiphyte sur *Fucus*), (Su). 1 et 2: éch. $\frac{2}{3}$; 3 et 4: éch. $\frac{1}{2}$.



1. *Cer. rubrum* forma baltica, (Bb); 2. *Cer. rubrum* forma prolifera (voisine de forma secundata), (Bordö, îles Féroë, F. Bør-
gesen); 3. *Cer. rubrum* forma irregularis, (Ke); 4. *Cer. rubrum* forma divaricata, (Li); 5. *Cer. rubrum* forma baltica, (Bb).
(1: éch. $\frac{5}{8}$; 2, 3 et 4: éch. $\frac{2}{8}$; 5: éch. $\frac{1}{8}$.)

(Forts. fra Omslaget S. 2.)

	Kr.	Øre
VI , med 4 Tavler. 1890—92	13.	75.
1. Lorenz, L. Lysbevægelsen i og uden for en af plane Lysbølger belyst Kugle. 1890	2.	"
2. Sørensen, Willam. Om Forbeninger i Svømmeblæren, Pleura og Aortas Væg og Sammensmeltningen deraf med Hvirvelsøjlen særlig hos Siluroiderne, samt de saakaldte Weberske Knoglers Morfologi. Med 3 Tavler. Résumé en français. 1890	3.	80.
3. Warming, Eug. Lagoa Santa. Et Bidrag til den biologiske Plantegeografi. Med en Fortegnelse over Lagoa Santas Hvirveldyr. Med 43 Illustrationer i Texten og 1 Tavle. Résumé en français. 1892	10.	85.
VII , med 4 Tavler. 1890—94	13.	75.
1. Gram, J. P. Studier over nogle numeriske Funktioner. Résumé en français. 1890	1.	10.
2. Prytz, K. Metoder til korte Tiders, særlig Rotationstiders, Udmaalning. En experimental Undersøgelse. Med 16 Figurer i Texten. 1890	1.	50.
3. Petersen, Emil. Om nogle Grundstoffers allotrope Tilstandsformer. 1891	1.	60.
4. Warming, Eug. Familien Podostemaceae. 4 ^{de} Afhandling. Med c. 185 mest af Forfatteren tegnede Figurer i 34 Grupper. Résumé et explication des figures en français. 1891	1.	50.
5. Christensen, Odin T. Rhodanchromammoniakforbindelser. (Bidrag til Chromammoniakforbindelsernes Kemi. III.) 1891	1.	25.
6. Lütken, Chr. Spolia Atlantica. Scopelini Musei Zoologici Universitatis Hauniensis. Bidrag til Kundskab om det aabne Havs Laxesild eller Scopeliner. Med 3 Tavler. Résumé en français. 1892	3.	50.
7. Petersen, Emil. Om den elektrolytiske Dissociationsvarme af nogle Syrer. 1892	1.	25.
8. Petersen, O. G. Bidrag til Scitamineernes Anatomi. Résumé en français. 1893	2.	75.
9. Lütken, Chr. Andet Tillæg til «Bidrag til Kundskab om Arterne af Slægten <i>Cyamus</i> Latr. eller Hvalusene». Med 1 Tavle. Résumé en français. 1893	"	85.
10. Petersen, Emil. Reaktionshastigheden ved Methylætherdannelsen. 1894	1.	50.
VIII , med 3 Tavler. 1895—98	12.	25.
1. Melnert, F. Sideorganerne hos Scarabæ-Larverne. Les organes latéraux des larves des Scarabés. Med 3 Tavler. Résumé et explication des planches en français. 1895	3.	30.
2. Petersen, Emil. Damptryksformindskelsen af Methylalkohol. 1896	1.	"
3. Buchwaldt, F. En mathematisk Undersøgelse af, hvorvidt Vædsker og deres Dampe kunne have en fælles Tilstandsligning, baseret paa en kortfattet Fremstilling af Varmetheoriens Hovedsætninger. Résumé en français. 1896	2.	25.
4. Warming, Eug. Halofyt-Studier. 1897	3.	"
5. Johansen, W. Studier over Planternes periodiske Livsyttringer. I. Om antagonistiske Virksomheder i Stofskiftet, særlig under Modning og Hvile. 1897	3.	75.
6. Nielsen, N. Undersøgelser over reciproke Potenssummer og deres Anvendelse paa Rækker og Integraler. 1898	1.	60.
IX , med 17 Tavler. 1898—1901	17.	"
1. Steenstrup, Japetus, og Lütken, Chr. Spolia Atlantica. Bidrag til Kundskab om Klump- eller Maanefiskene (<i>Molidae</i>). Med 4 Tavler og en Del Xylografer og Fotogravurer. 1898	4.	75.
2. Warming, Eug. Familien Podostemaceae. 5 ^{te} Afhandling. Med 42 Figurgrupper. Résumé en français. 1899	1.	60.
3. Meyer, Kirstine. Om overensstemmende Tilstande hos Stofferne. En med Videnskabernes Selskabs Guldmedaille belønnet Prisaafhandling. Med en Tavle. 1899	2.	60.
4. Jørgensen, S. M. Om Zeise's Platosemiæthylen- og Cossa's Platosemiamminsalte. Med 1 Tavle. 1900	"	75.
5. Christensen, A. Om Overbromider af Chinaalkaloider. 1900	1.	"
6. Steenstrup, Japetus. Heteroteuthis <i>Gray</i> , med Bemærkninger om Rossia- <i>Sepiola</i> -Familien i Almindelighed. Med en Tavle. 1900	"	90.
7. Gram, Bille. Om Proteinkornene hos oliegivende Frø. Med 4 Tavler. Résumé en français. 1901	2.	50.
8. Melnert, Fr. Vandkalvelarverne (<i>Larvæ Dytiscidarum</i>). Med 6 Tavler. Résumé en français. 1901	5.	35.
X , med 4 Tavler. 1899—1902	10.	50.
1. Juel, C. Indledning i Læren om de grafske Kurver. Résumé en français. 1899	2.	80.
2. Billmann, Euar. Bidrag til de organiske Kvægsølvforbindelsers Kemi. 1901	1.	80.
3. Samsøe Lund og Rostrop, E. Marktidsele (<i>Cirsium arvense</i>). En Monografi. Med 4 Tavler. Résumé en français. 1901	6.	"
4. Christensen, A. Om Bromderivater af Chinaalkaloiderne og om de gennem disse dannede brintfattigere Forbindelser. 1902	1.	40.
XI , med 10 Tavler og 1 Kort. 1901—03	15.	05.
1. Warming, Eug. Familien Podostemaceae. 6 ^{te} Afhandling. Med 47 Figurgrupper. Résumé en français. 1901	2.	15.
2. Ravn, J. P. J. Molluskerne i Danmarks Kridtaflejringer. I. Lamellibranchiater. Med 1 Kort og 4 Tavler. 1902	4.	"
3. Winther, Chr. Rotationsdispersionen hos de spontant aktive Stoffer. 1902	2.	"
4. Ravn, J. P. J. Molluskerne i Danmarks Kridtaflejringer. II. Scaphopoder, Gastropoder og Cephalopoder. Med 5 Tavler. 1902	3.	40.
5. Winther, Chr. Polarimetriske Undersøgelser II: Rotationsdispersionen i Opløsninger	1.	60.
6. Ravn, J. P. J. Molluskerne i Danmarks Kridtaflejringer. III. Stratigrafiske Undersøgelser. Med 1 Tavle. Résumé en français. 1903	3.	85.
XII , med 3 Tavler og 1 Kort. 1902—04	10.	50.
1. Forch, Carl, Knudsen, Martin, und Sørensen, S. P. L. Berichte über die Konstantenbestimmungen zur Aufstellung der hydrographischen Tabellen. Gesammelt von <i>Martin Knudsen</i> . 1902	4.	75.
2. Bergh, R. Gasteropoda opisthobranchiata. With three plates and a map. (The Danish expedition to Siam 1899—1900, I.) 1902	3.	45.
3. Petersen, C. G. Joh., Jensen, Søren, Johansen, A. C., og Levinsen, J. Chr. L. De danske Farvandes Plankton i Aarene 1898—1901. 1903	3.	25.
4. Christensen, A. Om Chinaalkaloidernes Dibromadditionsprodukter og om Forbindelser af Alkaloidernes Chlorhydrater med højere Metalechlorider. 1904	1.	35.

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	Kr. Øre
Borgesen, F. An ecological and systematic account of the Caulerpas of the Danish West Indies. 1907.	1. 75.
Christensen, Carl. Revision of the American species of Dryopteris of the group of <i>D. opposita</i> . 1907.	2. 85.
Drejer, S. Symbolæ caricologicæ, med 17 Tavler 44. fol.	6. "
Gottsche, C. M. De mexikanske Levermossier, efter Prof. Liebmanns Samling, m. 20 Tavler. 67	9. 25.
Liebmann, F. Mexicos Bregner. 49	4. "
— Mexicos Halvgræs og Philetæria, m. 1 Tavle. 50	2. 30.
— Mexicos og Central-Americas neldeagtige Planter. 51	1. 15.
Petersen, O. G. Undersøgelser over Træernes Aarringe. 1904.	1. 60.
Schouw, J. Fr. De italienske Naaetræers geographiske og historiske Forhold, m. 1 Kort. 44	1. 25.
— Ege- og Birkefamiliens geographiske og historiske Forhold i Italien, m. 1 Kort. 47	1. "
— Om en Samling Blomstertegninger i den kgl. Kobberstiksamling. 49	" 65.
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— Bidrag til Vadernes, Sandenes og Marskens Naturhistorie 1904.	1. 75.
Ørsted, A. S. Centralamericas Gesneraceer, m. 12 Tavler. 58	4. "
— Om en særegen Udvikling hos visse Snyltesvampe, navnlig om den genetiske Forbindelse mellem Sevenbommens Bævrerust og Pæretræets Gitterrust, m. 3 Tavler. 68	1. 25.
— Bidrag til Kundskab om Egefamilien i Fortid og Nutid, m. 8 Tavler og 1 Kort. Résumé en français. 71.	6. "

THE DANISH EXPEDITION TO SIAM 1899-1900

IV. Marine
Lamellibranchiata

by

Herman Lyngé

With 5 plates and a map

D. KGL. DANSKE VIDENSK. SELSK. SKRIFTER, 7. RÆKKE, NATURVIDENSK. OG MATHEM AFD. V. 3

—♦♦♦♦♦—
KØBENHAVN

HOVEDKOMMISSIONÆR: ANDR. FRED. HØST & SØN, KGL. HOF-BOGHANDEL

BIANCO LUNOS BOGTRYKKERI

1909

Det Kgl. Danske Videnskabernes Selskabs Skrifter, 6^{te} Række.

Naturvidenskabelig og matematisk Afdeling.

	Kr.	Øre
I , med 42 Tavler, 1880—85		
1. Prytz, K. Undersøgelser over Lysets Brydning i Dampe og tilsvarende Vædsker. 1880	29.	50.
2. Boas, J. E. V. Studier over Decapodernes Slægtskabsforhold. Med 7 Tavler. Résumé en français. 1880	8.	50.
3. Steenstrup, Jap. Sepiadarium og Idiosepius, to nye Slægter af Sepiernes Familie. Med Bemærkninger om to beslægtede Former Sepioloidea D'Orb. og Spirula Lmk. Med 1 Tavle. Résumé en français. 1881	1.	35.
4. Colding, A. Nogle Undersøgelser over Stormen over Nord- og Mellem-Europa af 12 ^{te} —14 ^{de} Novb. 1872 og over den derved fremkaldte Vandflod i Østersøen. Med 23 Planer og Kort. Résumé en français. 1881	10.	"
5. Boas, J. E. V. Om en fossil Zebra-Form fra Brasiliens Campos. Med et Tillæg om to Arter af Slægten Hippidion. Med 2 Tavler. 1881	2.	"
6. Steen, A. Integration af en lineær Differentialligning af anden Orden. 1882	"	50.
7. Krabbe, H. Nye Bidrag til Kundskab om Fuglenes Bændelorme. Med 2 Tavler. 1882	1.	35.
8. Hannover, A. Den menneskelige Hjerneskals Bygning ved Anencephalia og Misdannelsens Forhold til Hjerneskallens Primordialbrusk. Med 2 Tavler. Extrait et explication des planches en français. 1882	1.	60.
9. — Den menneskelige Hjerneskals Bygning ved Cyclopa og Misdannelsens Forhold til Hjerneskallens Primordialbrusk. Med 3 Tavler. Extrait et explic. des planches en français. 1884	4.	35.
10. — Den menneskelige Hjerneskals Bygning ved Synotia og Misdannelsens Forhold til Hjerneskallens Primordialbrusk. Med 1 Tavle. Extrait et explic. des planches en français. 1884	1.	30.
11. Lehmann, A. Forsøg paa en Forklaring af Synsvinklens Indflydelse paa Opfattelsen af Lys og Farve ved direkte Syn. Med 1 Tavle. Résumé en français. 1885	1.	85.
II , med 20 Tavler, 1881—86		
1. Warming, Eug. Familien Podostemaceae. 1 ^{ste} Afhandling. Med 6 Tavler. Résumé et explic. des planches en français. 1881	3.	15.
2. Lorenz, L. Om Metallernes Ledningsevne for Varme og Elektricitet. 1881	1.	30.
3. Warming, Eug. Familien Podostemaceae. 2 ^{den} Afhandling. Med 9 Tavler. Résumé et explic. des planches en français. 1882	5.	30.
4. Christensen, Odin. Bidrag til Kundskab om Manganets Iiter. 1883	1.	10.
5. Lorenz, L. Farvespredningens Theori. 1883	"	60.
6. Gram, J. P. Undersøgelser ang. Mængden af Primitiv under en given Grænse. Résumé en français. 1884	4.	"
7. Lorenz, L. Bestemmelse af Kviksølvsojler's elektriske Ledningsmodstande i absolut elektromagnetisk Maal. 1885	"	80.
8. Traustedt, M. P. A. Spolia Atlantica. Bidrag til Kundskab om Salperne. Med 2 Tavler. Explic. des planches en français. 1885	3.	"
9. Bohr, Chr. Om Htens Afvigelse fra den Boyle-Mariotteske Lov ved lave Tryk. Med 1 Tavle. 1885	1.	"
10. — Undersøgelser over den af Blodfarvestoffet optagne Iltmængde udførte ved Hjælp af et nyt Absorptionsmeter. Med 2 Tavler. 1886	1.	70.
11. Thiele, T. N. Om Definitionerne for Tallet, Talarterne og de tallignende Bestemmelser. 1886	2.	"
III , med 6 Tavler, 1885—86		
1. Zeuthen, H. G. Keglesnitlæren i Oldtiden. 1885	10.	"
2. Levinsen, G. M. R. Spolia Atlantica. Om nogle pelagiske Annulata. Med 1 Tavle. 1885	1.	10.
3. Rung, G. Selvregistrerende meteorologiske Instrumenter. Med 1 Tavle. 1885	1.	10.
4. Meinert, Fr. De eucephale Myggelarver. Med 4 dobb. Tavler. Résumé et explic. des planches en français. 1886	6.	75.
IV , med 25 Tavler. 1886—88		
1. Boas, J. E. V. Spolia Atlantica. Bidrag til Pteropodernes Morfologi og Systematik samt til Kundskaben om deres geografiske Udbredelse. Med 8 Tavler. Résumé en français. 1886	10.	50.
2. Lehmann, A. Om Anvendelsen af Middelgradationernes Metode paa Lyssansen. Med 1 Tavle. 1886	1.	50.
3. Hannover, A. Primordialbrusken og dens Forbening i Truncus og Extremiteter hos Mennesket før Fødselen. Extrait en français. 1887	1.	60.
4. Lütken, Chr. Tillæg til «Bidrag til Kundskab om Arterne af Slægten <i>Cyamus</i> Latr. eller <i>Hvallusene</i> ». Med 1 Tavle. Résumé en français. 1887	"	60.
5. — Fortsatte Bidrag til Kundskab om de arktiske Dybhavs-Tudsefiske, særligt Slægten <i>Himantolophus</i> . Med 1 Tavle. Résumé en français. 1887	"	75.
6. — Kritiske Studier over nogle Tandhvaler af Slægterne <i>Tursiops</i> , <i>Orca</i> og <i>Lagenorhynchus</i> . Med 2 Tavler. Résumé en français. 1887	4.	75.
7. Koefoed, E. Studier i Platosoforbindelser. 1888	1.	30.
8. Warming, Eug. Familien Podostemaceae. 3 ^{die} Afhandling. Med 12 Tavler. Résumé et explic. des planches en français. 1888	6.	45.
V , med 11 Tavler og 1 Kort. 1889—91		
1. Lütken, Chr. Spolia Atlantica. Bidrag til Kundskab om de tre pelagiske Tandhval-Slægter <i>Steno</i> , <i>Delphinus</i> og <i>Prodelphinus</i> . Med 1 Tavle og 1 Kort. Résumé en français. 1889	2.	75.
2. Valentiner, H. De endelige Transformations-Grupper Theori. Résumé en français. 1889	5.	50.
3. Hansen, H. J. Cirolanidæ et familiæ nonnullæ propinquæ Musei Hauniensis. Et Bidrag til Kundskaben om nogle Familier af isopode Krebsdyr. Med 10 Kobbertavler. Résumé en français. 1890	9.	50.
4. Lorenz, L. Analytiske Undersøgelser over Primitivmængderne. 1891	"	75.

THE DANISH EXPEDITION TO SIAM 1899-1900

D. Kgl. Danske Vidensk. Selsk. Skrifter. 7. Række, naturvidensk. og mathem. Afd. V. 3

IV. Marine
Lamellibranchiata

by

Herman Lynge

With 5 plates and a map



København

Bianco Lunos Bogtrykkeri

1909

The present work upon the *Lamellibranchiata* collected by the Danish Expedition to Siam forms the first part of a description of all the testaceous Mollusca of the Gulf of Siam, which I hope to publish gradually, the description being based upon the excellent collections made by Dr. TH. MORTENSEN during the Danish Expedition 1899–1900.

I have thought it right to include in the present work all the species which have hitherto been recorded from the Gulf of Siam, even although not collected by the Danish Expedition to Siam.

I wish heartily to thank Mr. G. M. R. LEVINSEN of the Zoological Museum of the University of Copenhagen for freely placing the collections of the Museum at my disposal; also I am much indebted to my friend at the Zoological Museum, Mr. AD. S. JENSEN, for his unfailing help in searching out material for comparison. Unfortunately, our museum in Copenhagen, although excellent in other respects, is not rich in Asiatic Mollusca which could have been of use to me for the sake of comparison. I was therefore very much pleased, when, during my sojourn in London (which I visited before finishing my work), I was able to avail myself of the much richer collections in the British Museum of Natural History, owing to the ready courtesy and kindness of Mr. EDGAR SMITH, to whom I tender my heartiest thanks. I am also indebted to MESSRS. PH. DAUTZENBERG, Paris, to the late Professor ED. v. MARTENS of Berlin, and to J. COSMO MELVILL Esq. of Shrewsbury for information and intelligence.

To Dr. TH. MORTENSEN, who from the beginning has taken a great interest in my work, and has always been ready with advice and information, I wish to offer my hearty thanks, and also to express my appreciation of the way in which, during the Expedition and often under very difficult circumstances, he has got together such excellent collections, which have in so many ways enriched zoological science with valuable material.

Copenhagen, December 1908.

HERM. LYNGE.

Introduction.

Our knowledge of the marine *Lamellibranchiata* of the Gulf of Siam was for a long time very limited. Thus, when Professor ED. v. MARTENS, in 1860, published his paper "On the Mollusca of Siam" in the "Proceedings of the Zool. Society of London," he mentioned in it only 7 species of marine *Lamellibranchiata*. Nor was our knowledge of the fauna enlarged until L. MORLET described Mr. PAVIE's collections in the "Journal de Conchyliologie," 1889; but in 1891, when PAUL FISCHER published his "Catalogue et distribution géograph. d. Mollusques terrestres, fluviatiles et marins d'une partie de l'Indo Chine"¹ he was able to record 72 species of marine *Lamellibranchiata* from the Gulf of Siam, and this number has been increased to 85 species by PAVIE's new collections, which CROSSE & FISCHER, in 1892, described in the "Journal de Conchyliologie." By Dr. TH. MORTENSEN's thorough and excellent dredgings and collections from the eastern part of the Gulf of Siam during the years 1899—1900, the number of known species of *Lamellibranchiata* from that place has now been increased to 379 species. But the fauna is without doubt still far from exhausted by this last addition, because the Danish Expedition dredged only in the northern and eastern parts of the gulf, and only down to a depth of about 35 fathoms. The Mollusc fauna in the western part and also in the deeper parts in the middle of the gulf is still unknown. It is true that the "Skeat-Expedition" has made collections on the Malacca side of the gulf, but the Mollusca of these collections have not yet been worked out. Thus, as it is only the littoral fauna of a part of the gulf which is known, it must be understood that the present list is only the beginning of a complete list of the species occurring in the gulf. Though it may be supposed that the littoral fauna of the northern and eastern parts of the gulf is now almost completely known, yet it is probable that the fauna of the western side of the Gulf of Siam is richer, and contains many species which have not hitherto been taken on the eastern side. This is owing to the fact that the water on the Malacca side is much purer and fresher than in the eastern part, where the outlets of the numerous rivers make the sea-water foul and muddy and also less saline.²

¹ Bulletin Soc. Hist. Nat. d'Autun. IV, 1891, pp. 87--276.

² Cf. TH. MORTENSEN, "The Danish Expedition to Siam, 1899—1900. Results of the zoological Collections." Kgl. Danske Vidensk. Selsk. Skrifter, 6. R. Naturv. og mathem. Afd. XII, 2, 1902, pp. 155—57.

On comparing the *Lamellibranchiata* hitherto described from the Gulf of Siam with those of other more thoroughly investigated parts of the Asiatic waters, we find, according to MELVILL & STANDEN, that 426 species (among which are many deep water forms) are recorded from the Persian Gulf, the Gulf of Oman, and the Arabian Sea. Besides the fact that this fauna has many species in common with that of the Gulf of Siam, the two faunas correspond in many points with each other in regard to character. Unfortunately, J. G. HIDALGO's work on the *Lamellibranchiata* of the Philippines is not yet finished, so no definite number of species can be recorded from that place. In CASTO DE ELERA's uncritical "Catálogo sistemát. de toda la Fauna de Filipinas," III, 1896, more than 800 *Lamellibranchiata* are recorded from the Philippines. From Japan, PILSBRY gives in 1895 over 500 species in his "Catalogue of the Marine Mollusks of Japan," and he has afterwards added several to these.

The new species and varieties which will be described in the following pages are: —

- Arca* (*Barbatia*) *Siamensis*.
- (*Anadara*) *Mortenseni*.
- (*Scapharca*) *dichotoma* Desh. var. *gratiosa*.
- Carditella pusilla*.
- *pulchella*.
- Lucina* (*Phacoides*) *Dalli*.
- (*Phacoides*) *pulchella*.
- Kellya lineata*.
- *rosea*.
- *vitrina*.
- *elongata*.
- *lilium*.
- Montacuta costata*.
- *venusta*.
- (*Tellimya*) *variabilis*.
- (*Tellimya*) *rudis*.
- Tellina* (*Arcopagia*?) *Smithi*.
- (*Merisca*) *Martensi*.
- (*Moerella*) *Berghi*.
- (*Macoma*) *tenuisculpta*.
- Circe Melvilli*.
- Chione* (*Timoclea*) *Siamensis*.
- Hemicardium* (*Fragum*) *fragum* L. var. *carinata*.
- Corbula lineata*.
- *arcaeformis*.
- (?) *mirabilis*.
- Sphenia quadrangularis*.

If we draw any conclusions concerning the character of the whole fauna, we may confidently say, even if convinced that it is but imperfectly known, that it belongs entirely to the Indo-Pacific Fauna. I do not think forms occur which are peculiar to the Gulf of Siam; if so, they may possibly be some of the species of the Mangrove fauna (e. g. *Lucina Dalli* m.), but I do not believe even these to be peculiar to the Gulf of Siam, they can without doubt be found also in other similar localities in Indian waters.

The classification is partly that proposed by Professor P. PELSENEER in 1894 in his "Introduction à l'étude d. mollusques"¹, which is based on the study of the comparative anatomy of the more minute details of the gills; not that I consider it to be quite satisfactory, but, unfortunately, that is true of all other older systems of the *Lamellibranchiata*. I have ventured upon some alterations in his system; for instance, I have not reckoned *Psammobia* to *Myacea*, as he does, but placed it under *Tellinacea*, to which it belongs more closely, judging from other systematic characters. I have retained *Pinna* under *Pteriidae*, to which it most naturally belongs, and not in the neighbourhood of *Ostrea* and *Lima* where PELSENEER would have it. To employ the structure of the gills exclusively as the basis of a classificatory system², without taking other features into consideration, especially the structure of the hinge, is in my opinion absolutely wrong in the case of the *Lamellibranchiata*.

¹ And afterwards revised in his "A Treatise on Zoology, ed. by E. RAY LANKESTER, V. Mollusca by P. PELSENEER, London, 1906."

² Cf. E. L. RICE, "Die systemat. Verwertbarkeit d. Kiemen bei d. Lamellibranchiaten." *Jenaische Zeitschrift f. Naturwissenschaft*, 31. Bd., 1898, p. 29.

Order Protobranchiata.

Fam. Nuculidae.

Nucula Cumingi, Hinds.

Nucula Cumingii, HINDS, Proc. Zool. Soc. London, XI, 1843, p. 97.

- — — Zoology of the Voyage of "Sulphur." Mollusca by HINDS, 1845, p. 62, pl. 18, fig. 1.
— — — HANLEY, Monograph of the fam. Nuculidæ. (SOWERBY, Thesaurus Conchyliorum III.) p. 157, pl. IV, fig. 117.
— — — REEVE, Conchol. icon., XVIII, *Nucula*, Sp. 5.

The Gulf of Rayong and Cape Liant. Common around Koh Kut and Koh Kahdat, 4—30 fathoms, sand, mud and shells.¹

Long. 4—12 mm.

Distribution:— Singapore, Strait of Malacca, Philippines, New Guinea, Strait of Macassar.

Nucula Layardi, A. Ad.

Nucula Layardii, A. ADAMS, Proc. Zool. Soc. London, XXIV, 1856, p. 51.

- *Layardi*, — HANLEY, Monogr. of the fam. Nuculidæ (SOWERBY, Thesaurus Conchyl., III.) p. 160, pl. V, fig. 153.
— — — REEVE, Conchol. icon. XVIII. *Nucula*. Sp. 36.
— — — EDG. SMITH, Ann. and Magaz. Nat. Hist., 7. Ser., XVIII, 1906, p. 252.

West of Koh Chuen, soft clay and mud. (³/₂).² The Sound of Koh Chang, 3—5 fathoms, soft clay (many specimens). The coast of Lem Ngob, low tide (¹/₂).

Long. 4—10 mm.

Distribution:— Ceylon, Bombay, Karachi, Mekran Coast, Gulf of Oman, Persian Gulf.

REEVE (loc. cit.) is correct in saying that the present species is much more nearly allied to *N. Cumingi* than to *N. convexa* (as stated by A. ADAMS). The outline of *N. Layardi* corresponds almost completely with that of *N. Cumingi*. The number of the hinge-teeth ("six in front and nineteen behind") stated by EDG. SMITH (loc. cit.) to occur in his "single shell", which measured 15 mm. in length, is not always constant, more or fewer teeth frequently occurring. Undoubtedly the age, size and development of the individual also have a share in regard to this feature.

¹ In the list of localities "sand," "mud," "stones," etc. stand for "sandy bottom," "muddy bottom," "stony bottom," etc.

² The number in parenthesis indicate throughout the number of specimens collected.

Yoldia tenella, Hinds.

- Nucula tenella*, HINDS, Proc. Zool. London, XI, 1843, p. 99.
 — — — HANLEY, Rec. bivalve shells, p. 376, pl. 19, fig. 47.
Leda — — — Monogr. of the fam. *Nuculidae* (SOWERBY, Thesaurus Conchyl., III) p. 137,
 No. 56, pl. 1, fig. 15.
Yoldia — — — REEVE, Conchol. icon., XVIII, *Yoldia*, Sp. 4.

Koh Chuen, 10—15 fathoms ($1\frac{1}{2}$). West of Koh Chuen, soft clay and mud ($1 + \frac{4}{2}$). East of Koh Mak, 20 fathoms, mud ($1\frac{1}{2}$). W. of Koh Kut, 30 fathoms, sand and mud ($\frac{5}{2}$). N. of Koh Kut, 10 fathoms, mud ($1\frac{1}{2}$).

Long. 4—11 mm.

Distribution:— Singapore, Gulf of Oman (MELVILL & STANDEN).

Yoldia serotina, Hinds.

- Nucula serotina*, HINDS, Proc. Zool. Soc. London, XI, 1843, p. 99.
Leda — — — SOWERBY, Thesaurus Conchyliorum, III, 1866, Monogr. of the fam. *Nuculidae* by
 HANLEY, p. 136, No. 54, pl. 1, figs. 19—21.
Yoldia — — — A. ADAMS, REEVE, Conchol. icon., XVIII, *Yoldia*, Sp. 5.
Leda lepida, — — — Proc. Zool. Soc. London, XXIV, 1856, p. 49.

South of Koh Kut, 17—20 fathoms, mud ($1\frac{1}{2}$).

Long. 4 mm.

Distribution:— Singapore, Gulf of Oman (MELVILL & STANDEN). — Philip-
 pines, Borneo.

Nuculana Belcheri, Hinds.

(Pl. 1, Figs. 18—19).

- Nucula Belcheri*, HINDS, Proc. Zool. Soc. London, XI, 1843, p. 98.
 — — — Zoology of the voyage of "Sulphur." Mollusca by HINDS. 1845, p. 63, pl. 18,
 fig. 11.
Leda — — — HANLEY, Monogr. of the fam. *Nuculidae* (SOWERBY, Thesaurus Conchyl., III), p. 116,
 pl. 2, fig. 53.
Læda — — — REEVE, Conchol. icon., XVIII, *Læda*, Sp. 23.
Nuculana — — — SMITH, Proceed. Malacolog. Soc. London, V, 1903, p. 395, No. 346.

The Sound of Koh Chang, 5 fathoms, soft clay. ($1\frac{1}{2}$).

Long. 10 mm.

Distribution:— Agulha Bank, Cape of Good Hope (BELCHER), off Cape
 Colony and Natal, 34—440 fathoms (EDG. SMITH).¹

The single valve obtained from the Gulf of Siam is not full-grown, therefore,
 as may be seen in Pl. 1, Fig. 19, the characteristic central keel, which extends from
 the ventral side towards the umbo, is absent at the posterior end; this agrees
 entirely with the opinion expressed by HANLEY (loc. cit., p. 117) "As the central
 keel does not extend to the umboes, it is probably wholly absent in the fry."

¹ On South African Marine Mollusca. (Annals of the Natal Government Museum. Vol. I, p. 1, 1906).

Nuculana puellata, Hinds.

- Nucula puellata*, HINDS, Proc. Zool. Soc. London, XI, 1843, p. 100.
 — — — Zoology of the voyage of "Sulphur." Mollusca by HINDS, 1845, p. 64, pl. 18, fig. 18.
Leda — — HANLEY, Monogr. of the fam. *Nuculidae* (SOWERBY, Thesaurus Conchyl., III), p. 127, pl. 3, fig. 94.
Læda — — REEVE, Conchol. icon., XVIII, *Læda*, Sp. 34.

Koh Chuen, 10—15 fathoms (common). W. of Koh Chuen, soft clay and mud (very common). S. of Koh Samit, 20 fathoms, mud ($1\frac{1}{2}$). Sound of Koh Chang, 3—5 fathoms, soft clay (common). West coast of Koh Chang, 10 fathoms, mud ($1\frac{1}{2}$). S. of Koh Bidang, 9 fathoms, mud (common). S. of Koh Kahdat, 8—10 fathoms, mud ($1\frac{1}{2}$). Between Koh Kahdat and Koh Kut, 6 fathoms, clay mixed with sand ($1\frac{1}{2}$). W. of Koh Kut, 15 fathoms, mud ($4\frac{1}{2}$). N. of Koh Kong, 8 fathoms, mud (2). W. of Koh Kong, 10—15 fathoms ($2\frac{1}{2}$).

Long. 3—8 mm.

Distribution:— Malacca, NE. coast of New Guinea (BRAZIER).

There is great variability in the length of the rostrum, and in some specimens it may be much longer than is shown in the figures given by HINDS and HANLEY.

REEVE'S figure is very misleading, for the sculpture — which in reality consists of an exceedingly pretty, fine, regularly concentric striation — in his figure is highly irregular and undulating.

Nuculana mauritiana, Sow.

- Nucula Mauriliana*, G. B. SOWERBY jun., Conchological Illustrations, 1833, *Nucula*, p. 4, No. 22, fig. 17.
 — — — HANLEY, Catal. of rec. biv. shells, p. 170, pl. 19, fig. 46.
Læda — — REEVE, Conchol. icon., XVIII, *Læda*, Sp. 33.
Leda — — SOWERBY, Thesaur. Conchyl., III (HANLEY, Monogr. of the fam. *Nuculidae*), p. 126, No. 38, fig. 99.

Between Koh Lan and Koh Kong, common, taken in great number in 6—30 fathoms, mud, clay mixed with sand, shells.

Long. 2—12 mm.

Distribution:— Mergui Archipel., Ceylon, Bombay, Mekran Coast, Mauritius. — China.

Many of the specimens from the Gulf of Siam bear a close resemblance to *Nuculana nasuta*, Sow.

Nuculana retusa, Hinds.

- Nucula retusa*, HINDS, Proc. Zool. Soc. London, XI, 1843, p. 99.
 — — — Zoology of the voyage of "Sulphur." Mollusca by HINDS, 1845, p. 63, pl. 18, fig. 9.
Leda (Portlandia) retusa, HINDS, HANLEY, Monograph of the fam. *Nuculidae* (SOWERBY, Thesaurus Conchyl. III), p. 146, No. 71, pl. 2, figs. 28—29.
Yoldia retusa, HINDS, H. & A. ADAMS, Genera of rec. Moll., II, 1858, p. 548.
 — — — REEVE, Conchol. icon., XVIII, *Yoldia*, Sp. 21.

East of Koh Chuen, 9 fathoms (1).
 Long. 1.75 mm.
 Distribution: — Strait of Malacca. — Philippines.

Order Filibranchiata.

Fam. Anomiidae.

Anomia sol, Reeve.

(Pl. 1, Figs. 1—2).

Anomia sol, REEVE, Conchol. icon., vol. XI, *Anomia*, 1859, Sp. 4.
 — — CROSSE et FISCHER, Journ. de Conchyl., vol. 37, 1889, p. 290.

Coast of Lem Ngob (3). Gulf of Klong Salakpet (3). W. of Koh Kut, 30 fathoms, sand and mud.

On stones and shells (for instance on *Perna Cumingi*, Reeve).

Long. 57 mm., alt. 51 mm. (sp. max.).

Long. 8 mm., alt. 8 mm. (sp. min.).

Distribution: — Kurachee (Indus). — Annam.

The upper valve, in the specimens from the Gulf of Siam, has a peculiar wrinkled (in the younger specimens nodose) appearance; the interior has a nacreous lustre. *A. plenilunium*, Reeve (from Borneo, Mergui Isls. and several other places) is, no doubt, only *A. sol*, Reeve, although REEVE states that "The under valve is tumidly raised about the orifice, with flexuous lines diverging around;" this is undoubtedly only an individual character.

Anomia amabæus, Gray.

(Pl. 1, Figs. 3—4).

Anomia amabæus, GRAY, Proc. Zool. Soc. London, XVII, 1849, p. 115.
 — — — REEVE, Conchol. icon., XI, *Anomia*, Sp. 7.
 — *dryas*, — Proc. Zool. Soc. London, XVII, 1849, p. 115.
 — — — REEVE, Conchol. icon., XI, *Anomia*, Sp. 24.

Koh Lan, 30 fathoms, mud (1). Between Koh Rin and Cliff Rock, 15 fathoms (1). The northern side of Koh Mesan, 10—15 fathoms, stones (3). S. of Koh Chuen, 30 fathoms, shells (2). Between Koh Kut and Koh Kahdat, 10 fathoms, shells (3).

Long. 18 mm., alt. 21 mm. (sp. max.).

Long. 8 mm., alt. 8 mm. (sp. min.).

Distribution: — Singapore (*A. dryas*), Philippines (*A. amabæus*).

Judging from the material at hand, and after having examined the original specimens in the British Museum, I cannot see that there is any difference between GRAY'S two species *A. amabaeus* and *A. dryas* (some specimens from Koh Mesan agree almost completely with REEVE'S *A. dryas*). The hinge in the species we are here considering presents a peculiar feature, which may be seen in Pl. 1, Fig. 4; there is, in the upper valve a keel which extends internally from the point of attachment of the ligament to the dorsal margin of the valve, a similar case I have neither met with, nor seen described, in any other species of *Anomia*. The umbones are situated at some distance from the margin of the valves.

Anomia (Aenigma) aenigmatica, Ch.

- Tellina aenigmatica*, CHEMNITZ, Conchyl. Cabin., XI, 1795, p. 211, pl. 199, figs. 1949—50.
Anomia — — ANTON, Archiv f. Naturgesch., III Jahrg. 1 Bd., 1837, p. 285, No. 13.
 — *aenigmatica*, — REEVE, Conchol. icon., XI, 1859, *Anomia*, Sp. 37.
 — — — GRAY, Proc. Zool. Soc. London, XVII, 1849, p. 118.
 — — — — Catal. Biv. Moll. Brit. Mus., I, 1850, p. 20.
 — — — MORLET, Journ. de Conchyl., vol. 37, 1889, p. 160.
Aenigma — — G. C. BOURNE, Quart. Journ. of Microscop. Science, No. 202, 1907, pp. 253—95, pl. 15—17.
 — *roseum*, GRAY, MARTINI u. CHEMNITZ, Conchyl. Cabin., VII, 1. Abth., p. 62, pl. 7, figs. 1—7.
 — *reticulatum*, KOCH, MARTINI u. CHEMNITZ, Conchyl. Cabin., VII, 1. Abth., p. 62, pl. 7, fig. 8.
 — *convexum*, — — — — — — — p. 63, pl. 7, figs. 9—12.
 — *corrugatum*, — — — — — — — p. 63, pl. 7, figs. 13—15.

“Palmiers d'eau à Kanipot (ᶜ: Kampt) Golfe de Siam” (L. MORLET).

Distribution:— Singapore, Delta of Irawady (Pegu, Burma), Bombay, Karachi, Persian Gulf. — Philippines, Borneo.

The Danish Expedition to Siam collected no specimens of this species.

Placuna placenta, L.

- Anomia placenta*, LINNÉ, Systema Naturae, ed. X, 1758, p. 703, No. 205, ed. XII, p. 1154, No. 241. Mus. Ludov. Ulricæ, 1764, p. 536, No. 126.
Placuna — — LAMARCK, Hist. nat. d. anim. s. vert., VI, 1 p. 1819, p. 224, No. 3, éd. 2, VII, p. 270, No. 3.
 — — — — Encyclop. méthod., pl. 173.
 — — — MARTINI u. CHEMNITZ, Conchyl. Cabin., VII, 1. Abth., p. 66, pl. 5, fig. 3.
 — — — REEVE, Conchol. icon., XVIII, *Placuna*, Sp. 3.
 — — — P. FISCHER, Catalogue d. Moll. de l'Indo-Chine, p. 208.
 — — — HORNELL, Rep. Ceylon Mar. Biolog. Laboratory, I, p. 2. 1906, p. 41.
Placenta orbicularis, RETZIUS, Diss. sist. nova testaceorum genera. Lund, 1788, p. 15.
 — — — MELVILL and STANDEN, Proc. Zool. Soc. London, 1906, p. 793.

Off Koh Kam, 10 fathoms, gravel ($1/2$). S. of Koh Samit, 20 fathoms, mud ($2/2$). W. of Koh Chang, 20 fathoms, mud (1). Sound of Koh Chang, 3—5 fathoms, soft clay (many specimens). Coast of Lem Ngob (3). S. of Koh Kut, 17—20 fathoms, mud (2). N. of Koh Kong, 8 fathoms, mud (4).

“Les grèves du golfe de Siam” (MORLET).

Long. 5—85 mm.

Distribution: — Singapore, Mergui Archip., Andamans, Tranquebar, Ceylon, Panjim and Goa, Bombay, Karachi, Persian Gulf, Aden. — Annam, Poulo-Condor, Philippines, China, Japan, North, East and West Australia.

Pl. auriculata, Yoldi¹ from the Red Sea is only a form of *Pl. placenta* L. which anteriorly and posteriorly is flattened in an ear-like manner above the dorsal margin. Such forms also occur among the specimens from the Gulf of Siam. A. WILLEY² (loc. cit. p. 37, Fig. 1) mentions and figures specimens of *Pl. placenta* from Ceylon with such ear-like lobes occurring on either side of the hinge-line, especially in young individuals.

Placuna papyracea, Lam.

Ehippium parvum papyraceum Anglicanum seu Polonicum, CHEMNITZ, Conchyl. Cabin., VIII, 1785, p. 114, pl. 79, fig. 715.

Placuna papyracea, LAMARCK, Hist. nat. d. anim. s. vert., VI, p. 1, 1819, p. 224. — éd. 2, 1836, VII, p. 270.
— — — Encyclop. méthod., pl. 174, fig. 2.

— — — MARTINI u. CHEMNITZ, Conchyl. Cabin., VII, 1. Abth., p. 65, pl. 5, fig. 2.

Placenta quadrangula, RETZIUS, Diss. sist. nova testaceor. genera, 1788, p. 16.

Koh Lan, 30 fathoms, mud (1). Between Koh Rin and Cliff Rock, 15 fathoms (7). N. of Koh Kam, 5 fathoms, gravel (12). East of Cape Liant, 9 fathoms, shells (1). Koh Chuen, 30 fathoms (2). Koh Kahdat, 1—5 fathoms, sand with stones (1).

Long. 19—84 mm.

Distribution: — Mergui Archip. — Philippines, Amboina (?), Aru Isl., Sorong, Australia.

REEVE, and J. E. GRAY³ attribute much importance to the reciprocal length of the two hinge-teeth, to their position with reference to each other, and to the angle formed by them; in the case of young individuals these can by no means be used as specific characters (in older specimens they may be employed as such); in specimens, for example, of *P. papyracea*, Lam. and *P. placenta* L. (of about 20 mm. in breadth) from the Gulf of Siam, there is no difference whatever with regard to these points: on the other hand, the sculpture and consistency of the shell, which in most cases is characteristic in each species of *Placuna*, is a far better specific character, being also constant.

Placuna (Placunema) sella, Gmel.

Ehippium anglicanum maximum, CHEMNITZ, Conchyl. Cabin., VIII, 1785, p. 111, pl. 79, fig. 714.

Anomia Sella, GMELIN, Systema Naturae, ed. XIII, 1790, p. 3345, No. 27.

Placuna sella, — LAMARCK, Hist. nat. d. anim. s. vert., VI, p. 1, p. 224. — éd. 2, VII, p. 270.

¹ MÖRCH, Catalog. conchyl. quæ reliq. com. de Yoldi, II, p. 63. The original specimen is in my collection.

² Spolia Zeylanica, vol. V, part XVII, Colombo, 1907, pp. 33—57.

³ Proc. of the Zool. Soc. London, XVI, 1848, p. 114.

- Placuna sella*, GMELIN, Encyclop. méthod., pl. 174, figs. 1 et 3—4.
 — — — MARTINI u. CHEMNITZ, Conchyl. Cabin., VII, 1. Abth., p. 64, pl. 5, fig. 1.
 — — — REEVE, Conchol. icon., XVIII, *Placuna*, Sp. 1.
 — — — P. FISCHER, Catal. d. Moll. de l'Indo-Chine, p. 208.
Placenta Ehippium, RETZIUS, Diss. sist. nova testaceor. genera, 1788, p. 16.

“Les grèves du golfe de Siam” (MORLET).¹

The Danish Expedition to Siam collected no specimens of this species.

Distribution: — Singapore, Mergui Archip. — Philippines, China, Java, Blitong (post-tertiary), Celebes, Amboina, Obi Isls., Pelew Isls.

Fam. Arcidae.

Arca navicularis, Brug.

- Arca navicularis*, BRUGUIÈRE, Encyclop. méthod. Hist. natur. d. vers., I, 1792, p. 99, No. 4.
 — — — REEVE, Conchol. icon., II, *Arca*, Sp. 70.
 — — — EDG. SMITH, Rep. Challenger. Lamellibranchiata, p. 259.
 — — — KOBELT in MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 2 Abth., p. 51, pl. 4, fig. 7, pl. 14, figs. 6—7.
 — — — MORLET, Journ. de Conchyl., vol. 37, 1889, p. 162.
 — — — E. LAMY, Bulletin du Mus. d'Hist. Nat., Paris, 1904, p. 270.
 — — — PRITCHARD and GATLIF, Proceed. Roy. Soc. Victoria, vol. 17, 1, 1904, p. 240.
 — — — E. LAMY, Journ. de Conchyl., vol. 55, 1907, p. 20.
subquadrangula, DUNKER, Philippi, Abbild. u. Beschreib. neuer od. wenig gekannt. Conchyl., 1847, II, p. 210. (*Arca* 10), No. 3, *Arca*, pl. III, fig. 3.
 — — — KOBELT in MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 2 Abth., p. 67, pl. 19, figs. 5—6.
fusco marginata, — Novitat. Conchol., 1858—70, p. 136, No. 157, pl. 45, figs. 12—14.
 — — — KOBELT in MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 2 Abth., p. 69, pl. 20, figs. 1—2.

var. *linter*, Jonas.

- Arca linter*, JONAS, Zeitschr. f. Malakozool., 1845, p. 172.
 — — — PHILIPPI, Abbild. u. Beschreib. etc., II, p. 209, No. 1, pl. 3, fig. 1.
 — — — KOBELT in MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 2 Abth., p. 19, pl. 6, figs. 1—2.
 — — — E. LAMY, Journ. de Conchyl., vol. 55, 1907, p. 20.
navicularis, BRUG., PHILIPPI, Abbild. u. Beschreib. etc., II, p. 210, No. 2, pl. 3, fig. 2.
 — — — var., DUNKER, Index moll. mar. Japon., p. 232, pl. 14, figs. 16—17.

Very common, many specimens taken between Koh Rin and Koh Kut, 4—38 fathoms, shells, stones, mud and sand.

Islands in the Gulf of Siam (L. MORLET).

Long. 2—59 mm.

Distribution: — Gulf of Manaar, Aden, Suez, Madagascar (VOELTZKOW, LAMY), Durban (EDG. SMITH). — Poulo Condor, Cochin China, China, Japan, Amboina, Blitong (post-tertiary), Torres Strait, North, East and South Australia, Tahiti, Salomon Isls., New Caledonia.

¹ Journal de Conchyliologie, 1889, vol. 37, p. 161.

For var. *linter*, E. LAMY gives the following distribution:— Nossi Bé, Isle of Bourbon, China, Macao.

In the matter of synonymy I have followed LAMY with regard to *navicularis* as compared with *linter*, although I am of opinion that the latter is merely a variation of the former. In all the specimens from the Gulf of Siam the ligament upon the area had the form figured by PHILIPPI (loc. cit.) in Pl. III, Fig. 1.

Arca Kraussi, Phil.

Arca Kraussii, PHILIPPI, KRAUSS, Die südafrikan. Mollusken, 1848, p. 14, pl. 1, fig. 13.

— — — Abbild. u. Beschreib. neuer od. wen. gekannt. Conchyl., III, 1851, p. 88 (20), pl. 5, figs. 8—10.

Koh Kram, 30 fathoms (1). Between Koh Mesan and Koh Chuen, 15—38 fathoms, stones (2). Koh Chang, stones, very low tide (1). Koh Lom (1). Koh Mak, sand coast ($1\frac{1}{2}$).

Long. 9—27 mm. (For comparison with the measurements quoted by LISCHKE: Jap. Meeres Conchyl., II, p. 142, I give the measurements of a specimen from between Koh Mesan and Koh Chuen. The length of the shell 27 mm., the height 15 mm., the length of the area 22 mm., the breadth of same 9 mm.).

Distribution:— Mergui Archipel., Gulf of Manaar, Djibouti, Red Sea, Seychelles, Mascarenes, Querimba Isls., Natal. — Poulo Condor, Japan.

The distinctness of this species has been much disputed. P. FISCHER¹ and A. H. COOKE² mention it as synonymous with *A. Arabica*, Forsk. (Phil.); KOBELT³ believes it to be synonymous with *A. maculata*, Sow.; EDG. A. SMITH⁴ and E. LAMY⁵ consider it to be identical with *A. imbricata*, Brug. (= *umbonata*, Lam., *cuneata* (*cunealis*), Reeve and *Americana d'Orb.*). G. B. SOWERBY⁶ identifies it with *A. mutabilis*, Sow. LAMY in his latest revision of the species of *Arca* (Journ. de Conchyl., vol. 55, 1907, p. 28) identifies, and without doubt correctly, *A. Kraussi*, Phil. with *A. imbricata*, Brug. var. *arabica* Phil.

The specimens from the Gulf of Siam agree closely with the description and figures of KRAUSS and PHILIPPI. *Arca bicarinata*, G. B. Sowerby⁷ from Cebu (Philippines) is, no doubt, simply the present species.

Arca signata, Dunk.

(Pl. 1, Figs. 14—15).

Arca signata, DUNKER, *Novitates conchologicae*. 1858—70, p. 112, pl. 38, figs. 3—5.

— — — MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 2 Abth., pl. 44, figs. 7—8.

— (*Barbatia*) *signata*, DUNKER, LAMY, Journ. de Conchyl., vol. 55, 1907, p. 78, pl. 1, figs. 1—2.

¹ Journ. de Conchyl., vol. XIX, 1871, p. 213.

² Annals and Magaz. of Nat. Hist., 5. ser., vol. 18, 1886, p. 92.

³ MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 2 Abth., pp. 76—78.

⁴ Challenger Expedition. Report on the Lamellibranchiata, p. 259. — Report on the zool. collect. made during the voyage of "Alert." p. 110. — Proc. Zool. Soc. London, 1891, p. 431.

⁵ Bulletin du Muséum d'Histoire Naturelle, 1904, p. 271.

⁶ Marine shells of South Africa, 1892, p. 65.

⁷ Proceed. of the Malacolog. Soc. London, vol. VI, 1901, p. 211, pl. 22, fig. 14.

The northern side of Koh Mesan, 10—15 fathoms, stones (1). S. of Koh Chuen, 30 fathoms, shells (2). Between Koh Kut and Koh Kahdat, 10 fathoms, shells ($2\frac{1}{2}$). Long. 8—23 mm.

Distribution:— King Island, Mergui Archipel (E. v. MARTENS), Poulo Penang (Mus. Calcutta), Bombay (Mus. Calcutta). — Amoy (Jousseau).

E. v. MARTENS¹ and LAMY refer this species to the subgenus *Barbatia*. But it appears to me that it should be placed with *Arca* (s. str.). DUNKER has already stated, that the species varies considerably in regard to form, and the specimens from the Gulf of Siam, as well as LAMY's figure, entirely confirm this statement. As the specimen figured by DUNKER is rather monstrous I have thought it right to give a new figure of a typical specimen.

Arca (Barbatia) fusca, Brug.

- Arca fusca*, BRUGUIÈRE, Dictionn. encycl. méthod., I, 1792, p. 102, No. 10.
 — — — — — Encycl. méthod., pl. 308, fig. 5.
 — — — — — LAMARCK, Anim. s. vertèbres, ed. 2, VI, p. 466, No. 14.
 — — — — — REEVE, Conchol. icon, II, *Arca*, Sp. 82.
 — (*Barbatia fusca*, BRUG., MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 2 Abth., p. 18, pl. 4, fig. 2; pl. 6, figs. 5—6.
 — — — — — P. FISCHER, Catal. d. Moll. de l'Indo-Chine, p. 214.
 — — — — — LAMY, Journ. de Conchyl., vol. 55, 1907, p. 53.
 — *bicolorata*, CHEMNITZ, Conchyl. Cabin., XI, 1795, p. 243, pl. 204, fig. 2007.

The northern side of Koh Chang, 1 fathom, coral blocks ($2\frac{1}{2}$). Koh Mak, sand coast ($1\frac{1}{2}$). Koh Kahdat, 1 fathom, sand (1).

Long. 12—33 mm.

Distribution:— Singapore (The Danish Expedit. to Siam, 2 specimens, 2—3 fathoms, coral-reef), Mergui Isls., Nicobar Isls., Madras, Gulf of Manaar, Red Sea, Seychelles, Madagascar, Mascarenes, Querimba Isls. — Poulo-Condor, Cochin China, Philippines, Mentawai Isls., Celebes, Sulu Isls., Java, Small Sunda Isls., Moluccas, Aru Isl., Sorong, Torres Strait, North, East and West Australia, Salomo Isls., Viti Isls., Tonga Isls., Lifu Isl., New Caledonia, New Zealand.

LAMY (loc. cit. p. 53) considers *A. cruciata*, Philippi and *A. Rodatzi*, Dunker (from Zanzibar) to be synonymous with *A. fusca*, Brug.

Arca (Barbatia) complanata, Ch.

(Pl. 1, Figs. 5—10).

- Arca complanata*, CHEMNITZ, Conchyl. Cabin., VII, 1784, p. 198, pl. 55, figs. 544—45.
 — — — — — L. MORLET, Journ. de Conchyl., vol. 37, 1889, p. 162.
 — (*Barbatia complanata*, CHEMNITZ, P. FISCHER, Catal. d. Moll. de l'Indo-Chine, p. 215.
Byssoarca decussata, SOWERBY, Proc. Zool. Soc. London, vol. I, 1833, p. 18.
Arca — — — — — REEVE, Conchol. icon., II, *Arca*, Sp. 81.

¹ The Journal of the Linnean Soc., vol. XXI, 1887, p. 207.

- Arca (Barbatia) decussata*, SOWERBY, MARTINI u. CHEMNITZ, Conchyl. Cabin, VIII, 2 Abth., p. 144, pl. 37, figs. 2—5.
 — — — — — E. LAMY, Bull. du Mus. d'Hist. Nat. Paris, 1904, p. 273. — Loc. cit. 1906, p. 317. No. 78.
- Byssarca velata*, SOWERBY, Proc. Zool. Soc. London, vol. I, 1833, p. 18.
Arca — — — REEVE, Conchol. icon., II, *Arca*, Sp. 79.
Barbatia — — — var., DUNKER, Novitates conchologicae, p. 124, pl. 41.
Arca (Barbatia) velata, SOWERBY, MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 2 Abth., p. 207, pl. 49, figs. 2—3.

The north side of Koh Mesan, 10—15 fathoms, stones (1). Koh Chick, rocky coast (3). North end of Koh Chang, 1 fathom, old coral blocks (38). The same locality, 12 fathoms, old coral blocks (4). West coast of Koh Chang, 10 fathoms, mud (5). Koh Sarlak (2). Lem Ngob, on piles of bridge, very low tide (2). Koh Lom (3). Strand of Koh Kahdat (1). Koh Mak, sand coast (1 + $\frac{3}{2}$).

“Sinum Siamensem habitare dicitur” (*Barbatia velata*, Sow. var., Dunker). Islands in the Gulf of Siam (*A. complanata* Ch., L. Morlet, loc. cit.).

Long. 8—55 mm.

Distribution: — Singapore,¹ Salanga, Mergui Archipel, Nicobar Isls., Madras, Ceylon, Persian Gulf, Gulf of Aden, Red Sea, Gulf of Suez and Akaba, Seychelles, Madagascar, Mascarenes. — Poulo Condor, China, Japan, Philippines, Celebes, Torres Strait, New Caledonia, Viti Isls., Funafuti (Ellice Isl.), Paumotu Isl., Society Isls., New Zealand, Galapagos Isls. (San Thomé in the Gulf of Guinea, Hoyle?).

On the basis of the material at hand, I have united *Arca decussata*, Sow. with *A. velata*, Sow. into one species, as it is not possible to keep these forms distinct, *A. decussata* merging by easy stages into *A. velata*, while the specific characters which have been pointed out, are not constant. In Pl. 1, Figs. 5—10 I have figured several forms which show this transition better than it could be shown by any description. It was undoubtedly owing only to the lack of a larger quantity of material that SOWERBY established two species upon specimens taken in the same localities (“Lord Hood’s and Chain Islands, Pacific Ocean, attached to shells. Cuming”).² The literature gives indications of the great uncertainty which authors show in the determination of the highly variable *Barbatia*-forms; while a great number of species: — *A. foliata*, Forskål,³ *revelata*, Dsh., *Petersi*, Dkr., *sculptilis*, Reeve and many others need to be known in more complete development- and variation-series before their distinctness can be guaranteed. The reported occurrences of the West-Indian species *Arca Heblingi*, Ch. (*candida*, Gmel.) in Asiatic waters are without doubt due to erroneous determinations, and all the specimens in question should evidently be referred to *A. complanata*; nor is *A. nivea*, Ch. sufficiently defined as a species, and it needs revision.⁴ PAGENSTECHEER however, goes too far,⁵ when

¹ Taken by the Danish Expedition to Siam, four specimens, in 2--3 fathoms, coral-reef.

² In spite of CHEMNITZ’S naming Guinea as the home of his species *A. complanata*, an undoubtedly incorrect statement, I have not hesitated in referring the forms we are here considering to that species.

³ v. MARTENS, Vorderasiat. Conchyl. 1874, p. 103, pl. 9, fig. 58.

⁴ ED. LAMY, Journ. de Conchyl., vol. 52, 1904, p. 140. — Bullet. du Mus. d’Hist. Natur., 1904, p. 272.

⁵ Ueber die von R. KOSSMANN am Rothen Meere gesamm. Mollusken. Lpzg. 1877, p. 35.

he refers *Arca lactea* var. *erythraea*, Issel, from the Red Sea to *A. decussata*, Reeve (Sow.), as stated by A. H. COOKE,¹ it is in reality only a form of *A. lactea* L. — LAMY in his latest revision of the gen. *Arca*² regards *A. complanata*, Ch., somewhat differently from the way in which I regard it here. He gives *A. velata*, Sow., as a variety of *A. complanata*, Ch. (which he names *A. nivea*, Ch.), and places *A. decussata* as a distinct species; but as LAMY'S work was not published until I had finished my work upon the *Arca*-group, I have not been able to consider it here.

Arca (Barbatia) lima, Reeve.

Arca lima, REEVE, Proc. Zool. Soc. Lond., XII, 1844, p. 125.

— — — Conchol. icon., II, Sp. 101.

— (*Barbatia*) *lima*, REEVE, MARTINI u. CHEMN., Conchyl. Cabin., VIII, 2 Abth., p. 115, pl. 30, figs. 5—6.

— — — — EDG. A. SMITH, Lamellibranchiata of the Challenger Exped., p. 260.

— — — — — Report on the zoolog. collect. made during the voyage of H. M. S. "Alert," p. 110.

— — — — E. LAMY, Bull. du Mus. d'Hist. Nat. Paris, 1904, p. 273.

— *decussata*, SOWERBY var. *lima*, REEVE, LAMY, Journ. de Conchyl., vol. 55, 1907, p. 65.

Koh Kram, 6—10 and 30 fathoms (3). E. of Koh Chuen, 9—10 fathoms, shells (2). Koh Chuen, 10—15 fathoms (2). S. of Koh Chuen, 30 fathoms, shells (³/₂). Off Koh Kam, 10 fathoms, gravel (1). Gulf of Rayong, sand, mud and shells (1). North and west coast of Koh Chang, 1 fathom, old coral blocks (12). Koh Kahdat, 1 fathom, sand (2). W. of Koh Kut, 30 fathoms, sand and mud (¹/₂). Between Koh Kut and Koh Kahdat, 10 fathoms, shells (5). S. of Koh Kahdat, 8—10 fathoms, mud (²/₂).

Long. 3—45 mm.

Distribution:— Singapore (low water, Sv. GAD), Madras, Gulf of Manaar, Laccadive and Maldivé Archipel., Gulf of Aden, Red Sea (pleistocene). — Philippines, Torres Str., Port Molle, St. Vincent's Gulf, South Australia, South. Paumotu Isls.

The following species may safely be reckoned as synonymous with *Arca lima*, Reeve: — *Barbatia oblonga*, Dkr.³ (*non Anomalocardia oblonga*, Phil. et Dkr.), *Arca granulata*, Phil.,⁴ from the Sandwich Islands, *Barbatia (Acar) aceræa*, Melv. & Stand.⁵ EDG. A. SMITH⁶ states that *A. trapezina*, Lam. ("as determined by REEVE"), is probably a form of *A. lima*, Reeve; how far *trapezina*, Lam., is on the whole a form of *A. lima* I am not at present prepared to say; that the whole *Barbatia*-group — when, later, a larger quantity of material is at hand and further comparative investigations have been carried out — will unquestionably be reduced in many respects, is practically certain. In many cases it is very difficult to determine young specimens of *A. lima* and to keep them distinct, as for example from *A. complanata*,

¹ Annals and Magazine of Nat. Hist., 5. ser., vol. 18, 1886, p. 93.

² Journ. de Conchyliologie, vol. 55, 1907, p. 59.

³ Novitates Conchologicae, p. 107 and p. 85.

⁴ Abbild. und Beschreib. neuer od. wenig gekannt. Conchyl., III, p. 114 (22), pl. VI, fig. 3.

⁵ Journ. Linn. Soc. Zoology, vol. XXVII, p. 186, pl. 10, fig. 15.

⁶ Proc. Zool. Soc. London, 1891, p. 431.

Ch. I cannot agree with EDG. SMITH when he says¹ that "The few ribs towards the middle being duplicate, as stated by REEVE, is an individual rather than a specific character;" in all the specimens from the Gulf of Siam the majority of the ribs in the middle towards the hinder extremity are duplicate. As mentioned in connection with *A. complanata*, Ch., I have unfortunately not been able to take into full consideration LAMY's work on the genus *Arca*, as my investigations upon this genus were ended when the work in question was published.

Arca (Barbatia) parva, Sow.

Byssoarca parva, SOWERBY, Proc. Zool. Soc. London, 1833, p. 19.

Arca — — REEVE, Conchol. icon., II, *Arca*, Sp. 119.

— (*Barbatia*) *parva*, REEVE, MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 2 Abth., p. 197, pl. 47, fig. 7.

— — — SOWERBY, LAMY, Journ. de Conchyl., vol. 55, 1907, p. 51.

Barbatia attenuata, DUNKER i. l. Museum Godeffroy. Catalog IV, 1869, p. 114 — Catalog V, 1874, p. 173.

West coast of Koh Chang, 10 fathoms, mud (1). Koh Mak, sand coast ($\frac{1}{2}$).
Long. 15—21 mm.

Distribution: — Persian Gulf, Djibouti, Gulf of Suez, Madagascar. — Tahiti, Paumotu Isl., Ducie's Isl.

Arca (Barbatia) Siamensis, n. sp.

(Pl. 1, Figs. 16—17).

This shell is rather thin and ventricose, oblong rectangular in outline, and the posterior half is swollen from the umbones obliquely downwards towards the posterior part of the ventral side. The valves are somewhat obliquely twisted, and the left valve projects, having its lower edge below that of the right valve. The anterior end is rounded and passes evenly into the ventral side; the posterior end, which is much higher, is rather straightly truncate and slopes obliquely downwards towards the ventral side, with which it makes a rounded angle; the ventral side is somewhat compressed in the middle. The surface of the valves is closely set with about 48 flattened, smooth, radiating ribs, which are provided with a longitudinal furrow towards the anterior end. The interstices between the ribs are narrower than the ribs. From the umbones and down to the middle of the ventral side there is a depression of the valves. The upper margin is straight and rises sharply towards the posterior end. The umbones are situated in the anterior third of the shell. The area is very narrow and long. The colour is white and the hinder margin of each valve is dark-coloured. The surface is covered by a thin, brown epidermis which in the interstices between the ribs is set with small scales or bristles. There are about 47 hinge-teeth. The interior of the valves is white, and the outer ribs project beyond the margin so that the latter becomes dentate.

¹ Report on the zoolog. collections made during the voyage of H. M. S. "Alert," p. 110.

Long. 24 mm., alt. 14 mm., crass. 10 mm.

Between Koh Rin and Cliff Rock, 15 fathoms ($1\frac{1}{2}$). Koh Kram, 30 fathoms ($1\frac{1}{2}$). Gulf of Koh Chang, 3—5 fathoms, soft clay ($2\frac{1}{2}$). Between Koh Kut and Koh Kahdat, 10 fathoms, shells ($5\frac{1}{2}$).

This characteristic species is nearest related to *A. obliquata*, Gray, and *A. decussata*, Lischke, but may easily be distinguished from these forms.

Arca (*Fossularca*) *pectunculiformis*, Dunk.

Barbatia pectunculiformis, DUNKER, Novitates conchologicae, 1866, p. 88, pl. 28, figs. 4—6.

Arca (*Barbatia*) *pectunculiformis*, DUNKER, MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 2 Abth., p. 125, pl. 32, figs. 5—6.

— (*Noetia*) — — LAMY, Journ. de Conchyl., vol. 55, 1907, p. 300.

W. of Koh Chuen, soft clay and mud ($13\frac{1}{2}$). S. of Koh Samit, 20 fathoms, mud ($4\frac{1}{2}$). Gulf of Koh Chang, 5 fathoms, soft clay ($4\frac{1}{2}$). Strand of Koh Kahdat ($15\frac{1}{2}$). S. of Koh Kahdat, 8—10 fathoms, mud ($2\frac{1}{2}$). Between Koh Kahdat and Koh Kut, 6 fathoms, clay mixed with sand ($18\frac{1}{2}$). S. of Koh Kut, 17—20 fathoms, mud ($1\frac{1}{2}$). W. of Koh Kut, 15 fathoms, mud ($1\frac{1}{2}$). W. of Koh Kong (1).

Long. 3—10 mm.

Distribution: — Karikal (Coromandel Coast, subfossil, DAUTZENBERG), Borneo (DUNKER), Surahaja (Java, ED. v. MARTENS).¹

Arca olivacea, Reeve, is very closely related to this species. Can some of the recorded occurrences of *A. lactea* L. in Asiatic and Australian waters, be due to erroneous determination of *A. pectunculiformis*, Dunk.?

Arca (*Fossularca*) *sculptilis*, Reeve.

Arca sculptilis, REEVE, Proc. Zool. Soc. London, 1844, p. 128. — Conchol. icon., II, 1844, *Arca*, Sp. 118.

— (*Barbatia*) *sculptilis*, REEVE, EDG. SMITH. Rep. Lamellibranchiata of the Challenger Exped., p. 262.

— (*Acar*) — — KOBELT in MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 2 Abth., p. 193, No. 175, pl. 46, fig. 14.

Common between Koh Lan and Koh Mak, many specimens in 1—38 fathoms, sand, mud, gravel and shells.

Long. 2—13 mm.

Distribution: — Bombay (MELVILL & ABERCROMBIE, *A. Zebuensis*, REEVE), Karachi (MELVILL & STANDEN). — Amboina (Challenger), Philippines (REEVE), Torres Strait. (MELVILL & STANDEN).

LAMY (Journ. de Conchyl., vol. 55, 1907, p. 100) identifies *A. sculptilis*, REEVE, with *A. afra*, Gmel. var. *solida*, Sow. I do not think that he is correct in so doing. Apart from other considerations the differing geographical distributions of *A. afra*, Gmel. (= *A. pisolina*, Lam.), *A. solida*, Sow., and *A. sculptilis*, Reeve, are at once conspicuous; besides, it seems to me that *A. sculptilis* may very well be

¹ As communicated by letter.

separated from the two other forms mentioned above, at any rate as far as the specimens from the Gulf of Siam are concerned. These agree entirely with the diagnosis and figure by REEVE, and also with the excellent description by EDGAR SMITH of *A. sculptilis*. They do not at all resemble the figure of LAMARCK's original specimen of *A. pisolina* (in *Journal de Conchyl.*, vol. 52, 1904, pl. 5, figs. 6—7); neither do they agree with REEVE's diagnosis and figure of his species *A. solida*. The great number of specimens which I have before me all show a white colour under the thin epidermis. *A. Zebuensis*, Reeve, is undoubtedly synonymous with *A. sculptilis*.

Arca (Fossularca) tenebrica, Reeve.

- Arca tenebrica*, REEVE, Proc. Zool. Soc. London, XII, 1844, p. 126.
 — — — — Conchol. icon., II, *Arca*, Sp. 105.
 — (*Barbatia*) *tenebrica*, REEVE, MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 2 Abth., p. 156, pl. 39, figs. 7—8.
 — — — — — EDG. A. SMITH, Report on the zoolog. collect. made during the voyage of H. M. S. "Alert," 1884, p. 110.
 — (*Fossularca*) — — — — LAMY, Journ. de Conchyl., vol. 55, 1907, p. 105.

Coast of Lem Ngob (1). North end of Koh Chang, 1 fathom, old coral blocks (4). Koh Chang, between stones at very low tide (46). Gulf at the south end of Koh Chang (1). Strand of Koh Kahdat ($1\frac{1}{2}$).

Long. 7—16 mm.

Distribution: — Bombay, Karachi (MELVILL & STANDEN). — Philippines, Japan (Nagasaki), Port Essington, Port Curtis.

The epidermis is extremely velvet-like in several of the specimens from the Gulf of Siam, and the outline in this species varies rather considerably.

Arca (Acar) plicata, Ch.

- Arca plicata*, CHEMNITZ, Conchyl. Cabin., XI, 1795, p. 244, pl. 204, fig. 2008.
 — (*Acar*) *plicata*, CHEMNITZ, MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 2 Abth., p. 195, pl. 47, fig. 5.
 — — — — — E. LAMY, Bull. du Mus. d'Hist. Nat. Paris, 1904, pp. 274—75.
 — — — — — — — Journ. de Conchyl., vol. 55, 1907, p. 80. — Bull. du Mus. d'Hist. Nat. Paris, 1906, p. 317.
 — *squamosa*, LAMARCK, Anim. sans vert., VI, part. 1, 1819, p. 45, No. 35. — éd. 2, VI, p. 474, No. 35.
 — — — — — SAVIGNY, Descr. de l'Égypte. Mollusques, pl. 10, fig. 6.
 — — — — — LAMY, Journ. de Conchyl., vol. 52, 1904, p. 142.
Barbatia squamosa, LAMARCK, PRITCHARD and GATLIFE, Proceed. Roy. Soc. Victoria, vol. 17, part. 1, 1904, p. 241.
Arca Domingensis, — — — — — Anim. sans vert., VI, part. 1, 1819, p. 40, No. 16. — éd. 2, VI, p. 467, No. 16.
 — — — — — LISCHKE, Japan. Meeres-Conchyl., II, p. 142 u. III, p. 107.
 — (*Acar*) *domingensis*, LAMARCK, ED. A. SMITH, Lamellibranchiata of the Challenger Exped., p. 265.
 — *gradata*, BRODERIP and SOWERBY, Zoolog. Journal, IV, 1829, p. 365.
 — — — — — — — GRAY, Zool. of Beechey's Voyage, p. 152, pl. 43, fig. 1.
 — — — — — — — HANLEY, Rec. div. shells, p. 155, pl. 18, fig. 39.
 — — — — — — — REEVE, Conchol. icon., II, *Arca*, Sp. 92.
Byssoarca divaricata, SOWERBY, Proc. Zool. Soc. London, I, 1833, p. 18.
Arca — — — — — REEVE, Conchol. icon. II, *Arca*, Sp. 108.

Byssosarca pusilla, SOWERBY, Proc. Zool. Soc., I, 1833, p. 18.

Arca — — REEVE, Conchol. icon., II, *Arca*, Sp. 112.

— *donaciformis*, REEVE, Conchol. icon., II, *Arca*, Sp. 104.

— (*Byssosarca*) *pholadiformis*, C. B. ADAMS, Shells coll. at Panama, 1852, p. 260.

Barbatia (Acar) laminata, ANGAS, Proc. Zool. Soc., 1865, pp. 697 and 655.

Arca (Byssosarca) dubia, BAIRD, BRENCHELY, Jottings during the cruise of H. M. S. Curaçoa among the South Sea Islands, 1873, p. 453, pl. 42, figs. 5—6.

— M' COYI, TENISON-WOODS, Transact. and Proc. Roy. Soc. Victoria, vol. XIV, 1878, p. 61.

Gulf of Siam ($1\frac{1}{2}$).

Long. 15 mm.

Distribution: — Gulf of Manaar, Mangalore (Malabar Coast), Maldive Archip., Arabian Sea, Gulf of Oman, Persian Gulf, Gulf of Aden, Red Sea, Gulf of Suez, Mozambique, Natal coast, Seychelles, Amirantes, Madagascar, Mauritius, Cape of Good Hope, St. Helena, Ascension, Annobon, St. Thomé, Cape Verd Isls., Madeira. — Tonkin, South Japan, Philippines, Moluccas, Torres Strait, North, East and South Australia, Tasmania, the South Sea Islands, New Caledonia. — West coast of America from St. Barbara to Peru; East coast of America: Bermudas, Florida, Gulf of Mexico, Bahamas, Greater and Lesser Antilles.

The wide distribution of this species, together with its great tendency to variation, has caused it to have numerous names given to it in the course of time. LISCHKE,¹ and more recently ED. LAMY,² have recorded a great many of these. A. H. COOKE³ doubts the correctness of LISCHKE's views upon the identity of these species; he is of opinion that they are three well-distinguished forms: *gradata* (the West American form), *Domingensis* + *squamosa* (the West Indian form), *divaricata*, Sow. = *plicata*, Ch. (the East Indian form); but the distinguishing characters recorded by him are not valid. I have at my disposal a fairly large quantity of material of *A. Domingensis* from the West Indies, and the extensive variation-series includes, as far as I can see, all the forms which have been established. I think, W. H. DALL is mistaken when he⁴ refers *A. Domingensis*, Lam., and *gradata*, Brod. & Sow., from the Gulf of Mexico and the Caribbean Sea to *A. reticulata*, Ch. He supposes that *A. congenita*, Edg. A. Smith, also, is possibly only a form of *A. plicata*, Ch.

Arca (Acar) tenella, Reeve.

(Pl. 1, Figs. 11—13).

Arca tenella, REEVE, Proc. Zool. Soc. London, XII, 1844, p. 124.

— — — Conchol. icon., II, 1844, *Arca*, Sp. 91.

— (*Barbatia*) *tenella*, REEVE, MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 2 Abth., p. 155, pl. 39, figs. 5—6.

Barbatia mollis, DUNKER, Novitates concholog., 1867, p. 92, pl. 31, figs. 2—4.

Arca (Barbatia) mollis, DUNKER, MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 2 Abth., p. 128, pl. 33, figs. 5—6.

— (*Acar*) *tenella*, REEVE, LAMY, Journ. de Conchyl., vol. 55, 1907, p. 93.

¹ Japanische Meeres-Conchylien, II, p. 142, III, p. 107.

² Journal de Conchyliologie, vol. 52, 1904, pp. 142—47, and vol. 55, 1907, pp. 80—87.

³ Annals and Magazine of Nat. Hist., 5. Ser., vol. 18, 1886, p. 94.

⁴ Report of the Mollusca of the "Blake" Expedition, I, 1886, p. 242.

Koh Lan, 30 fathoms, mud ($1/2$).

Long. 19 mm.

Distribution: — Laccadive and Maldive Archip., Djibouti (LAMY), Isle of Bourbon (Deshayes), Madagascar. — Philippines, Torres Strait, Viti Isls., Funafuti (Ellice Isls.), Samoa Isls.

In the specimen from the Gulf of Siam the ribs are not markedly granulated. Prof. ED. v. MARTENS, whom I asked to compare the specimen with DUNKER's original specimen, informed me that it "stimmt ganz gut zu den Original Exemplaren von *A. mollis*, Dunk."

Arca (Anadara) granosa, L.

- Arca granosa*, LINNÉ, Syst. Nat., ed. X, 1758, p. 694, No. 146. — ed. XII, p. 1142, No. 176. — ed. XIII, p. 3310, No. 18. — Mus. Ludov. Ulr., p. 519, No. 93.
- — — CHEMNITZ, Conchyl. Cabin., VII, p. 219, pl. 56, fig. 557.
- — — REEVE, Conchol. icon., II, *Arca*, Sp. 15.
- (*Anomalocardia*) *granosa*, LINNÉ, MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 2 Abth., p. 38, pl. 3, fig. 7.
- (*Anadara*) — LAMARCK, MORLET, Journ. de Conchyl., vol. 37, 1889, p. 162.
- *granosa*, LINNÉ, ED. LAMY, Journ. de Conchyl., vol. 52, 1904, p. 158. — loc. cit., vol. 55, 1907, p. 210.
- (*Anomalocardia*) *granosa*, L., DAUTZENBERG & FISCHER, Journ. de Conchyl., vol. 53, 1905, p. 193.

Coast of Lem Ngob (1). Coast of Koh Chang ($8/2$). Isles of the Gulf of Siam (L. MORLET).

Long. 27—47 mm.

Distribution: — Malacca, Mergui Archip., Bassein river (Burma), Nicobars, Madras, Tranquebar, Gulf of Manaar, Bombay. — Cochin China, Tonkin, China, Japan (Nagasaki, Kozuka), Philippines, Sumatra, Java, Borneo, Celebes, Moluccas (Lucipara, Ceram, etc.), Timor, Macassar, Aru Isl., Sorong.

According to E. v. MARTENS¹ this species occurs frequently in brackish water at Singapore, on Borneo, Celebes, Sunda Islands and other places. M. v. NEUMAYER states² that an "*Arca granulosa* L. var. *minuta*" was found among fresh-water shells ("und zwar mit Arten der Gattungen *Vivipara*, *Bythinia*, *Melania* und *Corbicula*") in the deposits of the Yang-tse-kiang delta. This is nearly certainly a form of *A. granosa* which lives here in brackish water under conditions similar to those prevailing in the localities³ stated by v. MARTENS.

Arca (Anadara) oblonga, Phil.

- Arca oblonga*, PHILIPPI, Abbild. u. Beschreib. neuer od. wenig gekannt. Conchyl., III, 1851, p. 85 (17), pl. 5, fig. 6.
- (*Anomalocardia*) *oblonga*, PHILIPPI, MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 2 Abth., p. 103, pl. 27, figs. 7—8.
- (*Anadara*) — — — P. FISCHER, Catal. d. Moll. de l'Indo Chine, p. 215.

¹ Zoolog. Ergebnisse einer Reise in Niederländ. Ost-Indien hrsg. v. M. Weber, IV, 1897, p. 228.

² Wissenschaftl. Ergebnisse d. Reise d. Grafen Béla Széchenyi in Ostasien, 1877—80, II, 1898, p. 641, pl. 1, fig. 4.

³ compare also about its occurrence in the Bassein river, in Journ. of the Asiatic Society of Bengal, vol. 36, 1867, p. 70.

Coast of Koh Chick (¹/₂). Sound of Koh Chang, 3—5 fathoms, soft clay, very common, taken in great numbers. Coast of Lem Ngob (¹/₂). Between Koh Kut and Koh Kahdat, 10 fathoms, shells (²/₂).

Bangkok (Siam) Coll. Dautzenberg (P. FISCHER loc. cit.).

Long. 2—27 mm.

Distribution:— Salanga, on the west coast of Malacca (v. MARTENS). Mergui Archip. (PHILIPPI).

It seems to me that there is a very close conformity and even transition, between the forms representing the series:— *oblonga*, Phil. — *oblonga*, Dunker¹ — *nodifera*, Martens² — *paucigranosa*, Dunker.³ I feel practically certain that all these forms should be referred to one species. *Anomalocardia pulchella*, Dunker,⁴ is, no doubt, simply the present species. PHILIPPI'S statement⁵ that "Die Area ist ganz vom schwarzen Ligament eingenommen" has, in KOBELT'S diagnosis (MARTINI u. CHEMNITZ, loc. cit.), been altered to "das schwarze glatte rautenförmige Band lässt vornen und hinten ziemlich viel Raum frei;" this agrees also with the specimens from the Gulf of Siam. ED. LAMY⁶ considers *A. oblonga*, Phil., to be a form of *A. granosa* L.

Arca (Anadara) subrubra, Dunk.

Anomalocardia subrubra, DUNKER, Novitates conchologicæ, 1866, p. 83, No. 92, pl. 28, figs. 1—3.

Arca (Anomalocardia) subrubra, DUNKER, KOBELT in MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 2 Abth., p. 111, No. 83, pl. 29, figs. 4—5.

— (*Anadara antiquata* L. var. *subrubra*, DUNKER, LAMY, Journ. de Conchyl., vol. 55, 1907, p. 200.

Koh Chuen, 30 fathoms (²/₂).

Long. 13—15 mm.

Distribution:— Philippines.

¹ Novitates conchologicæ, p. 85, pl. 29, figs. 7—9. recorded to have been taken at the Mergui Islands.

² Proc. Zool. Soc. London, part 28, 1860, p. 17. MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 2 Abth., p. 46, pl. 13, figs. 3—4. Recorded from Bangkok and Java by E. v. MARTENS who ("Zool. Ergebnisse ein. Reise in Niederländ. Ost-Indien hrsg. v. M. Weber," 1897, p. 228) states that it is sold as food in Bangkok, and that it lives in brackish water in these localities. It is a misprint when v. MARTENS (loc. cit.) states, that *A. nodifera* is "17 mal so lang als hoch."

³ Novitates conchologicæ, p. 85, pl. 29, figs. 10—12. MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 2 Abth., p. 100, pl. 27, figs. 1—2. KOBELT is also of opinion (in the last-mentioned work) that *A. paucigranosa*, Dunker is only a more feebly sculptured example of *A. nodifera*. DUNKER records it from "Siam."

⁴ Novitates conchologicæ, p. 113, pl. 38, figs. 6—9. DUNKER records it from "Japan," R. STEARNS from the east coast of Nippon. As REEVE had already in 1844 employed the same specific name for an *Arca (Acar)* from the Mediterranean, DUNKER'S name must certainly be altered. (For the reasons which justify the adoption of Reeve's name *A. pulchella*, for the Mediterranean species instead of *A. imbricata*, Poli, see "Bucquoy, Dautzenberg et Dollfuss, Les Mollusques mar. du Roussillon," II, p. 190).

⁵ Abbild. u. Beschreib. neuer od. wenig gekannt. Conchyl. (loc. cit.).

⁶ Journ. de Conchyl., vol. 52, 1904, p. 160, and vol. 55, 1907, p. 210.

Arca (*Anadara*) *uropygomelana*, Bory.

- Arca uropigimelana*, BORY DE ST VINCENT, Encyclopédie méthod., 1797, pl. 307, fig. 2.
 — (*Anomalocardia uropygmelana*, BORY, MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 2 Abth., p. 85, pl. 23, figs. 5—6.
 — (*Anadara uropygmelana*, BORY DE SAINT-VINCENT, LAMY, Bull. du Mus. d'Hist. Nat. Paris, 1904, p. 277. Journ. de Conchyl., vol. 55, 1907, p. 207.
 — *holoserica*, REEVE, Proc. Zool. Soc. London, XII, 1844, p. 39. Conchol. icon., II, *Arca*, Sp. 11.
 — — — MORLET, Journ. de Conchyl., vol. 37, 1889, p. 162.
 — (*Anadara holosericea*, REEVE, P. FISCHER, Catal. de Moll. de l'Indo-Chine, p. 216.
 — — *holoserica*, — EDG. SMITH, Proc. Zool. Soc. London, 1891, p. 431.

MORLET (loc. cit.) states that the present species (*A. holoserica*, Reeve) is taken at "Isles du golfe de Siam." LAMY, however, points out (Journ. de Conchyl., vol. 55, 1907, p. 242) that this statement is due to erroneous determination by MORLET, and that the specimens belong to *Arca cornea*, Reeve var. *Cecillei* (Phil.), Lamy (compare this species). Nor did the Danish Expedition to Siam collect any specimens of *A. uropygomelana*, Bory (= *A. holoserica*, Reeve).

Distribution:—Salanga (Malacca), Felidu Atoll and Hulule Isl. (Maldivé Archip.), Gulf of Aden, Red Sea, Mauritius, Madagascar, Seychelles, East Africa, Querimba Isls. — Philippines, Java, Togeian Isls., Moluccas, Gilbert Isls. (Kingsmill), New Caledonia.

STURANY¹ states that a specimen (of *A. scapha*, Chemn.) resembling *A. holoserica*, Reeve, has been taken at Ras Abu Somer (Red Sea). W. J. HALL and R. STANDEN state² that *A. uropygomelana*, Bory, has been taken on "a raised coral reef" at Port Sudan, near Suakim, on the west coast of the Red Sea. Lastly, LAMY states³ that specimens from the Red Sea are in the Paris Museum.

Arca (*Anadara*) *Mortenseni*, n. sp.

(Pl. II, Figs. 1—2).

This shell is oval, thin, and rather ventricose. The front passes evenly and with rounded outline into the ventral side, while the hinder part is more straightly truncate, and forms a rounded angle with the ventral part. It is white, and bears about 47 sharp radiating ribs which are closely covered with small, regularly-arranged nodules and scales, crossed by fine, concentric lines of growth which give the surface a beautiful, reticulated appearance. Not all the radiating ribs extend over the umbones, but many unite with an adjacent rib. The interstices between the ribs are generally narrower than the ribs, and are finely sculptured. A keel, upon which the radiating ribs are further apart and stouter than are the other ribs, extends from the umbones towards the posterior part of the ventral side. Owing to this keel, the well-raised, prominent umbones become oblique, and are higher towards the hinder part. The umbones are situated at about the middle of the shell, a trifle nearer its anterior end. The ligament-area is small and narrow. There are about 25—26 hinge-teeth, divergent on each side of the centre. The interior is white; the exterior ribs are there slightly noticeable, and

¹ Lamellibranchiaten d. Rothen Meeres, 1899, p. 36.

² Journal of Conchology, vol. 12, 1907, p. 68.

³ loc. cit., Journ. de Conchyl., 1907, p. 209.

they are deeper only at the place where the keel is situated exteriorly; the margin is crenulated.

Long. 12 mm., alt. 9 mm.

West of Koh Kut, 30 fathoms, sand and mud.

This pretty little, characteristic species, of which unfortunately only a single left valve is at hand, has certainly been provided with an epidermis, but no trace of it is visible. I have taken the pleasure of associating with this new species the name of Dr. TH. MORTENSEN, who, during the Danish Expedition to Siam, made such excellent collections of Molluscs, in a place of which the fauna had been, hitherto, but slightly known.

Arca (Anadara) cornea, Reeve var. Cecillei (Phil.), Lamy.

Arca (Scapharca) Cecillei (PHILIPPI), KOBELT in MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 2 Abth., p. 105, pl. 28, figs. 3-4 (non pl. 40, figs. 2-3).

— (*Anadara cornea*, REEVE var. *Cecillei*, PHILIPPI, LAMY, Journ. de Conchyl., vol. 55, 1907, p. 241.

The Gulf of Siam (PAVIE, 1885).

The Danish Expedition to Siam collected no specimens of this species.

Distribution:— Philippines.

MORLET (Journ. de Conchyl., vol. 37, 1889) had identified the specimens collected by PAVIE as *A. holoserica*, Reeve. LAMY (loc. cit.), however, points out that they were erroneously determined, and that they belong to the present form. For further details reference should be made to LAMY (loc. cit.), whose view of the synonymy I have adopted.

Arca (Anadara) auriculata, Lam.

Arca auriculata, LAMARCK, Hist. nat. d. anim. s. vert., 1819, VI, part. 1, p. 43. — éd. 2, VI, 1835, p. 472.

— — — DELESSERT, Recueil de coquilles décr. p. Lamarck, pl. XI, fig. 12.

— — — L. MORLET, Journ. de Conchyl., vol. 37, 1889, p. 162.

— — — LAMY, Journ. de Conchyl., vol. 52, 1904, p. 156. — loc. cit., vol. 55, 1907, p. 217.

“Iles du golfe de Siam.” MORLET (loc. cit.).

The Danish Expedition to Siam collected no specimens of this species.

Distribution:— How far the species from the “l’Océan indien,” described by LAMARCK, is the same as that which various authors record from the West Indies, I am not prepared to say. SAVIGNY’s figure¹ of *A. auriculata*, Lam. (recorded by ISSEL² from the Red Sea), can scarcely be LAMARCK’s species, which, also, has not since been recorded as found in the Red Sea. IHERING³ records it from S. Paulo (Brazil), but this seems very improbable, and I venture to suggest that it is due to erroneous determination.

¹ Description de l’Égypte. Coquilles, pl. 10, fig. 8.

² Malacologia del Mar Rosso, 1869, p. 88.

³ Journ. de Conchyl., vol. 43, 1895, p. 213.

Arca (Scapharca) globosa, Reeve.

- Arca globosa*, REEVE, Proc. Zool. Soc. London, XII, 1844, p. 45.
 — — — Conchol. icon., II, *Arca*, Sp. 52.
 — (*Anomalocardia globosa*), REEVE, MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 2 Abth., p. 203, pl. 48, fig. 4.
 — *globosa*, REEVE, CROSSE et FISCHER, Journ. de Conchyl., vol. 37, 1889, p. 292.
 ? — (*Scapharca globosa*), REEVE, an A. BRANDTII, PHILIPPI?, P. FISCHER, Catal. d. Moll. de l'Indo-Chine, p. 216.
 — *globosa*, REEVE, LAMY, Journ. de Conchyl., vol. 55, 1907, p. 260.

“Siam” (P. FISCHER, loc. cit.).

The Danish Expedition to Siam collected no specimens of this species.

Distribution: — Annam, Philippines.

P. FISCHER (loc. cit.) as stated above, doubts the correctness of the determination.

Arca (Scapharca) rhomboidalis, Ch.

- Arca rhomboidalis*, CHEMNITZ, Conchyl. Cabin., VII, 1784, p. 210, pl. 56, fig. 552.
 — — — Nyst, Mém. de l'Acad. roy. d. sc. de Belgique, XXII, p. 62.
 — *inaequivalvis*, BRUGUIÈRE, Encyclop. méthod., I, 1792, Hist. nat. d. vers., p. 106.
 — — — LAMARCK, Anim. sans vert., 2 éd., VI, p. 472, No. 30.
 — — — Encyclop. méthod., pl. 305, fig. 3a.
 — — — REEVE, Conchol. icon., II, *Arca*, Sp. 54.
 — — — KOBELT in MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 2 Abth., p. 40, pl. 3, fig. 1.
 — *hispidia*, PHILIPPI, Abbild. u. Beschreib. neuer od. wenig gekannt. Conchyl., III, p. 86 (18), pl. V, fig. 4.
 — *disparilis*, REEVE, Conchol. icon., II, 1844, *Arca*, Sp. 59.
 — — — LAMY, Journ. de Conchyl., vol. 55, 1907, p. 256.

Coast of Lem Ngob ($1\frac{1}{2}$). Sound of Koh Chang, 5 fathoms, soft clay ($1\frac{1}{2}$). West coast of Koh Chang, 1 fathom, old coral blocks ($1\frac{1}{2}$). W. of Koh Kut, 30 fathoms, sand and mud ($2\frac{1}{2}$). Between Koh Kut and Koh Kahdat, 6 fathoms, clay mixed with sand ($6\frac{1}{2}$). Same locality, 10 fathoms, shells ($3\frac{1}{2}$). S. of Koh Bidang, 9 fathoms, mud ($2\frac{1}{2}$).

Long. 4–50 mm.

Distribution: — Salanga, Mergui Isls., Madras, the Gulf of Manaar, Panjim and Goa, Bombay, Persian Gulf. — Philippines, Moluccas, Borneo, Java, Timor.

LAMY is of opinion that the *Arca inaequalvis* of BRUGUIÈRE and of REEVE is not identical with that species as defined by KOBELT; therefore he places KOBELT'S form as a synonym of *A. disparilis*, Reeve (= *A. rhomboidalis*, Chemnitz), while he separates *A. inaequalvis* (Bruguière), Reeve, as a distinct species.

Arca (Scapharca) vellicata, Reeve.

- Arca vellicata*, REEVE, Proc. Zool. Soc. London, 1844, p. 42. — Conchol. icon., 1844, II, *Arca*, Sp. 33.
 — (*Scapharca vellicata*), REEVE, KOBELT in MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 2 Abth., p. 177 pl. 44, fig. 1.
 — (*Anadara*) — — — LAMY, Journ. de Cochyl., vol. 55, 1907, p. 251.

Koh Chuen, 30 fathoms (1). Between Koh Kut and Koh Kahdat, 10 fathoms, shells ($19\frac{1}{2}$). S. of Koh Kahdat, 8—10 fathoms, mud ($9\frac{1}{2}$).

Long. 4—15 mm.

Distribution:— Ceylon (HANLEY), Mascat (Brit. Mus.), Red Sea (fossil, ISSEL). — China (Collect. de l'École d. Mines, Paris).

All the specimens from the Gulf of Siam are small, but correspond well with REEVE's diagnosis; the valves are thin; in the specimens without an epidermis there is a distinct intercostal-sculpture between the 46 radiating ribs; the angular transition, mentioned as occurring between the hinder and lower margins, is more rounded than is shown in REEVE's figure; the characteristic groove upon the umbones is very pronounced in quite small specimens.

Arca (Scapharca) crebricostata, Reeve.

Arca crebricostata, REEVE, Proc. Zool. Soc. London, XII, 1844, p. 46.

— — — Conchol. icon., II, *Arca*, Sp. 61.

— — — CROSSE et FISCHER, Journ. de Conchyl., vol. 37, 1889, p. 292.

— (*Scapharca*) *crebricostata*, REEVE, MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 2 Abth., p. 91, pl. 25, figs. 3—4.

— (*Anadara*) — — — P. FISCHER, Catal. d. Moll. de l'Indo-Chine, p. 216.

— — — — — LAMY, Journ. de Conchyl., vol. 55, 1907, p. 253.

Koh Mak, sand coast ($5\frac{1}{2}$). On the coast of Koh Kahdat ($2\frac{1}{2}$).

Long. 29—49 mm.

Distribution:— Cochin China, Annam.

I cannot make the great number of ribs (43—44), stated by REEVE and KOBELT, agree with the figures given by the same authors, which apparently show only about 35—37. Neither are so many ribs found in the specimens from the Gulf of Siam (in which there are only about 35), unless the most anterior, duplicate ribs are to be counted twice.

Arca (Scapharca) clathrata, Reeve.

Arca clathrata, REEVE, Proc. Zool. Soc. London, XII, 1844, p. 44.

— — — Conchol. icon., II, *Arca*, Sp. 48.

— (*Anomalocardia*) *clathrata*, REEVE, MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 2 Abth., p. 179, pl. 44, fig. 5.

— (*Scapharca*) — — — EDG. A. SMITH, Rep. Challenger Lamellibranchiata, p. 266.

— (*Anadara*) — — — LAMY, Bull. du Mus. d'Hist. Nat. Paris, 1904, p. 277.

— — — — — Journ. de Conchyl., vol. 55, 1907, p. 229.

Scapharca pygmaea, H. ADAMS, Proc. Zool. Soc. London, 1872, p. 11, pl. 3, fig. 15.

Arca — — — COOKE, Ann. and Mag. of Nat. Hist., 5 Ser., vol. 18, 1886, p. 94.

Common between Koh Lan and Koh Kut, many specimens in 1—30 fathoms, mud, sand, clay, and shells.

Long. 3—33 mm.

Distribution:— Madras, Felidu Atoll (Maldive Archip.), Gulf of Oman (MELVILL & STANDEN), Gulf of Aden, Red Sea, Suez. — Philippines, Amboina, Torres Strait, Mast Head Reef (Queensland).

In REEVE'S diagnosis, and in the descriptions of *A. clathrata* given by later authors, I do not find any mention of several distinctive characters, peculiar to this species. Thus, in the specimens from the Gulf of Siam, the sculpture is different on the two valves; on the right valve it is only the 8—10, most anterior ribs which are set with regularly-arranged, small nodules which gradually disappear almost completely from the rest of the ribs; also, on the right valve, all the ribs are somewhat flatter than are those on the left valve. The latter is more strongly sculptured, and on the 18—20 most anterior ribs the small nodules occur regularly and distinctly, like strings of beads; but they are frequently absent from the most posterior ribs. Upon both the umbones there is a distinct median groove, which occurs in all the specimens, from the smallest to the largest, and which affords a good distinguishing feature by means of which they may be separated from forms nearly related to them. A. H. COOKE¹ considers *A. rotundicostata*, Reeve, to be synonymous with the present species. I believe the same is the case with *A. Troscheli*, Dunker.² EDG. SMITH³ doubts REEVE'S statement that the epidermis is "very finely bristly between the ribs;" but among the specimens from the Gulf of Siam there are several in which this can be seen, and the bristles in such cases, are particularly strongly developed between the most posterior ribs. Specimens, however, also occur, with a perfectly well preserved epidermis, from which these bristles are entirely absent. As the present species is provided with a byssus, it cannot be referred to the sub-genus *Anadara*, but must belong to *Scapharca*.⁴ The Siam Expedition brought home several specimens in spirit which show a well-developed byssus.

Arca (Scapharca) consociata, E. Sm.

Arca (Scapharca?) consociata, EDG. A. SMITH, Challenger Exped. Report on the Lamellibranchiata, 1885, p. 266, pl. 17, fig. 7.

— — — — — MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 2 Abth., p. 221.

— *consociata*, EDG. A. SMITH, Ann. and Mag. Nat. Hist., 7 Ser., vol. 14, 1904, p. 12.

W. of Koh Chuen, soft clay (²⁸/₂ young specimens). S. of Koh Samit, 30 fathoms, mud (¹/₂). Off Tung Kaben, 6 fathoms, clay mixed with sand (¹/₂). Sound of Koh Chang, 4—5 fathoms, soft clay (3 + ⁸/₂). West coast of Koh Chang, 10 fathoms, mud (1). E. of Koh Mak, 20 fathoms, mud (2). Between Koh Kahdat and Koh Kut, 6 fathoms, clay mixed with sand (²/₂).

Long. 2—38 mm. (long. 38, alt. 27. — long. 26, alt. 18).

Distribution:— Off Chedubar (Araçan coast, 20—30 fathoms, SMITH). — Arafura Sea (SMITH).

As may be seen from the measurements given above, EDG. SMITH is right in believing that his specimen with a length of 12.5 mm., collected during the Challenger Expedition, is not full-grown.

¹ Annals and Magazine of Nat. Hist. 5 Ser., vol. 18, 1886, p. 95.

² Index Molluscor. mar. Japonici, p. 234, pl. 14, figs. 14—15.

³ Proc. Zool. Soc. London, 1891, p. 432.

⁴ EDG. A. SMITH, who, in the Challenger Report, 1885, refers *A. clathrata* to the sub-genus *Scapharca*, in 1891 (loc. cit. p. 432) had changed his opinion, and placed it under *Anadara*.

Arca (Scapharca) dichotoma, Desh.

(Pl. II, Fig. 3-4).

Arca dichotoma, DESHAYES, Conchyl. de l'île de la Réunion (Bourbon), 1863, p. 22, pl. 3, figs. 18-19.— (*Barbatia?*) *dichotoma*, DESHAYES, MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 2 Abth., p. 29, pl. 8, figs. 7-8.

W. of Koh Chuen, soft clay and mud ($1/2$). S. of Koh Tulu, 10 fathoms, clay mixed with sand ($1/4$). Between Koh Kahdat and Koh Kut, 6 fathoms, clay mixed with sand ($1/2$). W. of Koh Kut, 30 fathoms, sand and mud ($1/2$).

Long. 7-17 mm.

Distribution: — Bourbon (DESHAYES).

Professor ED. v. MARTENS, to whom I sent specimens from Koh Kut, has kindly determined these as *A. dichotoma*, Desh. This species differs, however, in several respects from the specimens from the Gulf of Siam, which have 25 ribs, all of which (except the last two at the anterior end) are divided by a narrow median groove into two ribs of about the same breadth, and covered with regularly-arranged small nodules. As the median groove does not begin quite at the umbo, specimens measuring, for example, about 5 mm. in height scarcely have the ribs at all divided. The interstices between the double ribs are about as broad as the ribs and bear close-set transverse lines. The keel, mentioned by DESHAYES, which divides the median part from the posterior end, and which, in his specimens bears four undivided ribs, does not occur in the Siam specimens; whether this is owing to individual or specific character, may be known later; at present I shall name the form from the Gulf of Siam, which we are here considering, *Arca dichotoma*, Desh. var. *gratiosa*.

Arca (Scapharca) Sabinae, Morl.*Arca (Anadara) Sabinae*, L. MORLET, Journ. de Conchyl., vol. 37, 1889, p. 189, pl. 8, fig. 6.— (*Scapharca*) — — — CROSSE et FISCHER, Journ. de Conchyl., vol. 37, 1889, p. 292.

— — — — — P. FISCHER, Catal. d. Moll. de l'Indo-Chine, p. 216.

— (*Anadara*) — — — Mission Pavie Indo Chine, Études diverses, III, 1904, p. 378, pl. 22, fig. 6.— (*Cunearca*) — — — LAMY, Journ. de Conchyl., vol. 55, 1907, p. 276.

Coast of Koh Chick ($10/2$). W. of Koh Kut, 15 fathoms, mud ($1/2$). Between Koh Kut and Koh Kahdat, 10 fathoms, shells ($1/2$). Strand of Koh Kahdat ($1/2$). Phu Quok in the Gulf of Siam (MORLET).

Long. 9-17 mm.

Distribution: — Ceylon. — Annam (Cochin China).

The shells from the Gulf of Siam are rather inequilateral, and not so regularly formed as that figured by MORLET; they agree most closely with the description which CROSSE & FISCHER give of the individuals from Annam.

Arca (Scapharca) gubernaculum, Reeve.*Arca gubernaculum*, REEVE, Proc. Zool. Soc. London, XII, 1844, p. 40.— — — — — Conchol. icon., II, *Arca*, Sp. 14.

— — — — — EDG. A. SMITH, Lamellibranchiata of the Challenger Exp., p. 266.

- Arca gubernaculum*, REEVE, MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 2 Abth., p. 107, pl. 28, figs. 5–6.
 — — — P. FISCHER, Catal. d. Moll. de l'Indo-Chine, p. 272.
 — (*Anadara*) *gubernaculum*, REEVE, LAMY, Journ. de Conchyl., vol. 55, 1907, p. 239.
 — *chalcanthum*, REEVE, Proc. Zool. Soc. London, XII, 1844, p. 44 (fide EDG. SMITH).
 — — — Conchol. icon., II, *Arca*, Sp. 43.
 — *Luzonica*, REEVE, Proc. Zool. Soc. London, XII, 1844, p. 44 (fide EDG. SMITH).
 — — — Conchol. icon., II, *Arca*, S. 44.

“Golfe de Siam,” L. MORLET (P. FISCHER loc. cit.).

The Danish Expedition collected no specimens of this species in the Gulf of Siam.

Distribution: — Philippines, China, Formosa, Port Jackson.

Arca (*Scapharca*) *indica*, Gm.

(Pl. II, Figs. 5–12).

- Arca indica*, GMELIN, Syst. Nat., ed. XIII, 1790, p. 3312, No. 27 (excl. var.).
 (— — — LAMARCK, Anim. sans vert., VI, p. 473, No. 31).
 (— — — REEVE, Conchol. icon., II, *Arca*, Sp. 56).
 — — — MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 2 Abth., p. 11, pl. 2, fig. 2.
 — (*Argina*) *indica*, GMELIN, LAMY, Journ. de Conchyl., vol. 55, 1907, p. 295.
 — *Indiæ Orientalis*, CHEMNITZ, Conchyl. Cabin., VII, 1784, p. 196, pl. 55, fig. 543.
Ostindische Bastartarche, MARTINI, Beschäftig. d. Berlin. Gesellsch. Naturf. Freunde, III, 1777, pp. 288–90, pl. 6, fig. 13.

Coast of Lem Ngob (⁹/₂).

Long. 21–44 mm., alt. 11–23 mm.

Distribution: — Coromandel Coast (Tranquebar; CHEMNITZ). HANLEY¹ records the species from Sumatra. In the Museum in Berlin are specimens from Sumatra; North-west Australia (MENKE). This species is probably more widely distributed.

By comparison with original specimens of *Arca indica*, Gm., from Tranquebar, from SPENGLER's collection in the Zoological Museum of the University of Copenhagen, I have been able to identify the specimens from the Gulf of Siam. The present species has hitherto been badly figured and described. LAMARCK, REEVE and KOBELT,² all say, that the area is absent in the species; this is not correct (GMELIN also does not mention it). Normally, there occurs an area which is rather narrow and striped³ as shown in the figures, Pl. II, Figs. 9 and 12; it is, however, frequently reduced to a minimum, and as the valves, thereby, have their umbones placed closely together, the latter become much worn; the hinge-teeth also suffering by this reduction of the area. The ribs, 30–36 in number, are flattened and broad. From the umbones downwards to the ventral margin the valves are frequently somewhat concave in the middle. REEVE's figure certainly

¹ Catalogue of recent bivalve shells, p. 158. As HANLEY in mentioning this species says: “with many ribs, which are grooved in the middle” it can hardly be the present species.

² MARTINI & CHEMNITZ, Conchyl. Cabin., loc. cit.

³ CHEMNITZ (loc. cit., VII, p. 197) says: “Der kleine zwischen den Wirbeln befindliche, etwas vertiefte Raum wird von einen schwärzlichen lederartigen Bande bedeckt.”

does not represent *Arca indica*, Gm., more probably it is *A. campechensis*, Gm. (= *A. americana*, Gray). LAMARCK has also, undoubtedly, been mistaken with regard to *A. indica*, Gm. when, in his diagnosis, he says "testa ovata" and later on "costiis mediis sulco divisis." ED. v. MARTENS also supposes (as he writes in a letter to me) that LAMARCK has fallen into the same error as REEVE, and has had, for examination, a specimen of *A. campechensis*, Gm.

Arca (Trisidos) tortuosa, L.

- Arca tortuosa*, LINNÉ, Systema Naturæ, ed. X, 1758, p. 693, No. 139. — ed. XII, p. 1140, No. 168. — ed. XIII, p. 3305, No. 1; — Mus. Ludov. Ulr., p. 517, No. 89.
 — — — LAMARCK, Anim. s. vert., éd. 2, VI, p. 460, No. 1.
 — — — REEVE, Conchol. icon., II, *Arca*, Sp. 86.
 — — — MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 2 Abth., p. 7, pl. 1, figs. 1—2.
 — — — CROSSE et FISCHER, Journ. de Conchyl., vol. 37, 1889, p. 291.
Parallelipedium tortuosum, LINNÉ, MORLET, Journ. de Conchyl., vol. 37, 1889, p. 163.
Arca (Parallelipedium) tortuosa, LINNÉ, LAMY, Journ. de Conchyl., vol. 55, 1907, p. 108.
 — *torta*, STEENSTRUP, MØRCH, Catal. conchyl. quæ reliq. C. P. Kierulf, 1850, p. 33. — Catal. conchyl. quæ reliq. Yoldi, II, 1853, p. 40.

NW. of Koh Chang, 10 fathoms, mud (1). Koh Lan, 30 fathoms, mud (1).
 W. of Koh Kut, 15 fathoms, mud ($1\frac{1}{2}$). Between Koh Kahdat and Koh Kut, 6—10 fathoms, clay mixed with sand, shells ($1 + \frac{2}{2}$).

Islands in the Gulf of Siam (MORLET).

Long. 10—28 mm.

Distribution:— Malacca, Singapore, Madras, Gulf of Manaar, Bombay, Karachi, Persian Gulf, Gulf of Aden, Zanzibar. — Poulo Condor, Annam, China, Philippines, Banka-Strait, Moluccas, North-west Australia, Port Curtis (East Australia).

ED. SMITH¹ is justified in rejecting KLEIN'S name for the subgenus *Parallelipedium*, as it dates from 1753; but he should use BOLTEN'S name *Trisidos*, dating from 1798, and should not employ, as he does, OKEN'S name *Trisis*, dating from 1815.

Arca (Trisidos) semitorta, Lam.

- Arca semi-torta*, LAMARCK, Anim. sans vert., éd. 2, VI, 1835, p. 460.
 — *semitorta*, — REEVE, Conchol. icon., II, *Arca*, Sp. 89.
 — (*Parallelipedium*) *semitorta*, LAMARCK, MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 2 Abth., p. 134, pl. 35, figs. 1—2.
 — (*Trisis*) *semitorta*, LAMARCK, EDG. A. SMITH, Report Challenger Lamellibr., p. 268.
 — (*Parallelipedium*) *semitorta*, LAMARCK, CROSSE et FISCHER, Journ. de Conchyl., vol. 40, 1892, p. 76.
 — — — — LAMY, Journ. de Conchyl., vol. 55, 1907, p. 109.

Common between Koh Rin and Koh Kut, 1—38 fathoms, mud, sand and shells.
 The Gulf of Siam on the west coast of Cambodge (CROSSE & FISCHER).

Long. 4—83 mm.

¹ Report on the Lamellibranchiata of the Challenger-Expedition, p. 268.

Distribution:— Persian Gulf, Gulf of Aden, Madagascar (VOELTZKOW). — Philippines, China (Hongkong, Shanghai), North Australia, Torres Strait, Tasmania (?).

Arca (*Cucullaea*) *concamerata*, Mart.

- Arca concamerata*, MARTINI, Beschäft. d. Berlin. Gesellsch. Naturf. Freunde, III, 1777, p. 292, pl. VII, figs. 15–16.
 — *cucullata*, — Conchyl. Cabin., VII, p. 174, pl. 53, figs. 526–28.
 — *Cucullus*, GMEL., Syst. Nat., ed. XIII, p. 3311, No. 23.
Cucullaea auriculifera, LAMARCK, Anim. s. vert., éd. 2, VI, p. 454.
 — *concamerata*, MARTINI, REEVE, Conch. icon., XVII, *Cucullæa*, Sp. 1.
Cucullaea — — MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 2 Abth., p. 5, pl. 1, figs. 3–4; pl. 5, figs. 1–2.
Cucullaea — — LAMY, Journ. de Conchyl., vol. 55, 1907, p. 306.
Cucullaea granulosa, JONAS, Proc. Zool. Soc. London, XIV, 1846, p. 34.
 — — REEVE, Conch. icon., XVII, *Cucullæa*, Sp. 2.
 — — LAMY, Bull. du Mus. d'Hist. Nat. Paris, 1904, p. 278. — Journ. de Conchyl., vol. 55, 1907, p. 306.

Koh Lan, 30 fathoms, mud (1). Koh Chuen, 10–30 fathoms ($2\frac{1}{2}$). Between Koh Chuen and Koh Chang, 15 fathoms, mud (4). S. of Koh Samit, 14–18 fathoms ($\frac{1}{2}$). Between Koh Kut and Koh Kahdat, 10 fathoms, shells (2). E. of Koh Mak, 20 fathoms, mud (1).

The Gulf of Siam, on the west coast of Cambodge (H. CROSSE & P. FISCHER, *C. granulosa*, Jon.).¹

Long. 4–92 mm.

Distribution:— Singapore, Mergui Archip., Nicobars, Madras, Tranquebar, Ceylon, Persian Gulf, Gulf of Aden, Red Sea (subfossil), Seychelles. — China, Formosa, Japan (Nagasaki), Torres Strait, New Caledonia.

I have specimens at hand from the Gulf of Siam which, with respect to the number of the outer lateral teeth agree entirely with the description of *Cucullaea granulosa*, Jonas (Reeve). The number of the teeth in the latter form is, however, quite unreliable as a distinguishing mark, as the lateral teeth in at least the younger individuals (e. g. in individuals measuring 65 mm. in length) pass into the rest of the row of teeth without any interval or other separation.

Pectunculus amboinensis, Gmel.

- Cardium amboinense*, GMELIN, Syst. Nat., ed. XIII, 1790, p. 3255, No. 43.
Arca pectunculus, LINNÉ, part. Syst. Nat., ed. X, p. 695, No. 150. — ed. XII, p. 1142, No. 180.
 — — MARTINI & CHEMNITZ, part., Conchyl. Cabin., VII, p. 235, pl. 58, figs. 568–69.
Pectunculus pectiniformis, LAMARCK, part. Hist. nat. d. anim. sans vert., VI, 1 part. 1819, p. 53, No. 16. — éd. 2, VI, 1835, p. 494, No. 16.
 — — — REEVE, Conchol. icon., I, *Pectunculus*, Sp. 11.
 — — — L. MORLET, Journ. de Conchyl., vol. 37, 1889, p. 163.
 — *pectunculus*, LINNÉ, EDG. A. SMITH, part., Proc. Zool. Soc. London, 1891, pp. 432–33.

¹ Journ. de Conchyl., vol. XL, 1892, p. 76.

Islands in the Gulf of Siam (L. MORLET, loc. cit.).

The Danish Expedition to Siam collected no specimens of this species.

Distribution: — Mergui Archip., Ceylon (?). — Cochin China, Poulo-Condor, Philippines, Amboina. All the other localities recorded in the literature should no doubt be referred to "*P. pectunculus* L. (EDG. SMITH.)"

EDG. SMITH (loc. cit.) is of opinion that LINNÉ (under the name of *Arca pectunculus*), LAMARCK, and others have confused two well-distinguished *Pectunculus* species; one species in which the interstices between the ribs are rather broad and well-marked as shown, for example, in SAVIGNY's figure (Descript. de l'Égypte, Coquilles, pl. X, fig. 2), and another species (the one we are here considering) in which the broad ribs stand close to each other, separated only by a groove, without any well-marked interstices. Also, in the first-named species, the interior of the valves has a strong reddish-brown colour on the hinge-plate below the teeth, a feature which is said not to occur so pronouncedly in the other species; but I am in doubt how far the latter is a constant character.

Limopsis cancellata, Reeve.

Pectunculus cancellatus, REEVE, Proc. Zool. Soc. London, XI, 1843, p. 188.

— — — Conchol. icon., I, *Pectunculus*, Sp. 39.

Limopsis cancellata, REEVE, EDG. A. SMITH, Report on the Lamellibranchiata of the Challenger Expedit., p. 256.

— *Woodwardi*, A. ADAMS, Proc. Zool. Soc. London, 1862, p. 231 (fide EDG. SMITH).

— — — DUNKER, Index molluscor. mar. Japon., p. 237, pl. XVI, figs. 5—6.

— *Philippii*, A. ADAMS, Proc. Zool. Soc. London, 1862, p. 230 (fide EDG. SMITH).

Arca multistriata, FORSKÅL, Descript. animal. quæ in itin. orient. observ., 1775, p. 123 (fide A. H. COOKE).

Pectunculus multistriatus, FORSKÅL, REEVE, Conchol. icon., I, *Pectunculus*, Sp. 42.

Limopsis multistriata, FORSKÅL, SAVIGNY, Descript. de l'Égypte. Coquilles, pl. X, fig. 3.

— — — juv., A. H. COOKE, Ann. and Mag. Nat. Hist., 5 Ser., vol. 18, 1886, p. 95.

W. of Koh Kut, 30 fathoms, sand and mud (²/₂).

Long. 2—6 mm., alt. 2—6 mm.

Distribution: — Singapore, Gulf of Manaar, Arabian Sea (lat. 18° 25' N., long. 71° 45' E.; in 191 fathoms), Red Sea, Suez. — Japan, Torres Strait, Mast Head Reef (Queensland), Port Jackson.

Limopsis Tenisoni, Ten. Woods (= *L. cancellata*, Ten. Woods non Reeve) from Tasmania and South Australia has been erroneously determined and referred to *L. multistriata*, Forsk.¹ by TATE and MAY.

Fam. Mytilidae.

Mytilus (Chloromya) viridis, L.

Mytilus viridis, LINNÉ, Syst. Nat., ed. X, 1758, p. 706, No. 220. — Mus. Lud. Ulr. 1764, p. 542, No. 138. —

Syst. Nat., ed. XII, 1767, p. 1158, No. 259.

— — — HANLEY, Catalogue of rec. biv. shells, p. 247.

¹ For further details cf. Proc. Roy. Soc. Tasman., 1876 (1877), p. 156; 1877 (1879), p. 56. — Proc. Linn. Soc. New South Wales, 1901, p. 437. — Scient. results of the trawling expedition of H. M. C. S. "Thetis" off the coast of New South Wales. Mollusca by C. Hedley, I, 1902, p. 297.

- Mytilus viridis*, LINNÉ, HANLEY, *Ipsa Linnæi Conchyliæ*, p. 145.
 — — — DAUTZENBERG & FISCHER, *Journ. de Conchyl.*, vol. 54, 1906, p. 211.
 — *Smaragdinus*, CHEMNITZ, *Conchyl. Cabin.*, VIII, 1785, p. 166, pl. 83, fig. 745; pl. 84, fig. 746.
 — *smaragdinus*, — REEVE, *Conchol. icon.*, X, *Mytilus*, Sp. 28.
 — — — MARTINI u. CHEMNITZ, *Conchyl. Cabin.*, VIII, 3 Abth., p. 31, pl. 3, fig. 5;
 pl. 13, figs. 1—2.
 — — — v. MARTENS, *Proc. Zool. Soc. London*, 1860, p. 17.
 — — — L. MORLET, *Journ. de Conchyl.*, vol. 37, 1889, p. 161.
 — *opalus*, LAMARCK, *Hist. nat. d. anim. s. vert.*, VI, part. I, 1819, p. 124, No. 18. — éd. 2, VII, 1836,
 p. 43, No. 18.

“Siam” (E. v. MARTENS, gathered by MOUHOT).

This species does not occur in the collections made by the Danish Expedition.

Distribution:— Singapore (ELERA), Mergui Isls. (v. MARTENS), Delta of the Irawady in Pegu (BLANFORD), Madras (MELVILL & STANDEN, and others), Gulf of Manaar (THURSTON), Bombay (MELVILL & ABERCROMBIE), Karachi (MELVILL & STANDEN), Persian Gulf (v. MARTENS), Red Sea? (P. FISCHER). — Cochin China (L. MORLET), Ben-Son, Annam (BOUTAN), Canton (JONES & PRESTON), Hongkong (Mus. Zool. Univers. Haun.), Shanghai (FRAUENFELD), Philippines (ELERA), Borneo (REEVE), Auckland? (FRAUENFELD).

CHEMNITZ records his species *M. Smaragdinus* from Tranquebar and Guinea.

Modiola Hanleyi, Dunk.

- Modiola Hanleyi*, DUNKER, *Index molluscor. mar. Japonici*, 1882, p. 223, pl. 16, figs. 3—4.
 — — — MARTINI u. CHEMNITZ, *Conchyl. Cabin.*, VIII Bd., 3 Abth., p. 95, pl. 26, figs. 4—5.

S. of Koh Chuen, 30 fathoms, shells (1). Koh Kahdat, 1—5 fathoms, sand with stones (3).

Long. 9—49 mm.

Distribution:— Singapore, shallow water (Sv. GAD). — Japan.

Several of the specimens from the Gulf of Siam were hidden in their nests of byssus-threads.

Modiola rhomboidea, Hanl.

- Modiola rhomboidea*, HANLEY, MARTINI u. CHEMNITZ, *Conchyl. Cabin.*, VIII, 3 Abth., p. 103, pl. 26, fig. 10.

Gulf of Rayong, 7—10 fathoms, sand and mud (1). S. of Koh Samit, 20 fathoms, mud (2). Koh Chang, 3—5 fathoms, clay ($1\frac{1}{2}$). W. of Koh Chang, 20 fathoms, mud (1). Off Koh Kut, 5 fathoms (1).

Long. 16—35 mm.

Distribution:— Charbar and Gulf of Oman (MELVILL & STANDEN). — China (Coll. Paetel), Japan (DUNKER).

Like many other *Modiola*-species, the present species spins a kind of protecting nest of byssus-threads, which almost covers the animal. The specimens from the Gulf of Siam agree exactly with the figure in MARTINI u. CHEMNITZ; but I find that REEVE's figure and description (*Conchol. icon.*, X, *Modiola*, Sp. 28) much more closely

resemble *M. elongata*, Sws., for instance; and his statement of "The Gambia, West Africa" as the locality, also makes it doubtful whether the species he describes and figures is the same as that recorded from the Asiatic waters. Both REEVE and CLESSIN give "Hanley, Species Recent Shells" as the place where the species was first described; it is, however, not to be found there at all, and I have not succeeded in discovering where HANLEY'S original description is to be found.

Modiola elongata, Sws.

- Modiola elongata*, SWAINSON, Exotic Conchology, 1821, Part I. Second edit., 1841, p. 31, fig. 8.
 — — — REEVE, Conchol. icon., X, *Modiola*, Sp. 4.
 — — — MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII Bd., 3 Abth., p. 97, pl. 27, figs. 1—2.

N. of Koh Kahdat, 4—5 fathoms, coarse sand (2). W. of Koh Chuen, soft clay and mud ($\frac{3}{2}$).

Long. 45 mm.

Distribution:— Moluccas, Aru Isl., Sorong (TAPPARONE CANEFRI), Jobi Isl. (Geelwinck Bay).

Modiola Metcalfei, Hanl.

- Modiola Metcalfei*, HANLEY, Proc. Zool. Soc. London, XII, 1844, p. 14.
 — — — Catalogue of recent bivalve shells, p. 235, pl. 24, fig. 25.
 — — — REEVE, Conchol. icon., X, *Modiola*, Sp. 16.
 — — — MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 3 Abth., p. 116, pl. 32, figs. 3—4.
 — — — L. MORLET, Journal de Conchyl., vol. 37, 1889, p. 161.

Islands in the Gulf of Siam (L. MORLET).

This species does not occur in the collections made by the Danish Expedition.

Distribution:— Madras, Gulf of Manaar. — Philippines, China (Hongkong), Japan (Nagasaki), Malay Archip., Ratack Isls. (Marshall Isls.).

Modiola plumescens, Dunk.

(Pl. II, Figs. 13—14).

- Perna (Modiola) plumescens*, DUNKER, Museum Godeffroy, Catalog IV, 1868, p. 115. — V, 1874, p. 175 (no description).
Modiola tumescens, DUNKER, (CLESSIN) MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII Bd., 3 Abth., p. 129, pl. 33, figs. 8—9.

Common between Koh Kram and Koh Kut, 1—30 fathoms, sand and shells.
 Long. 3—30 mm.

Distribution:— Viti and Samoa Isls. (DUNKER), Java, Amboina and Banda (ED. v. MARTENS in litt.).

I was at first of opinion, that the present species should most properly be referred to *Mod. barbata* L.,¹ which it greatly resembles in form and colour; for instance, the epidermal prolongations in my specimens agree exactly with those

¹ Taken at Japan by the Challenger Expedition.

of European specimens of *Mod. barbata* L.; but as the material at my disposal for comparison, was insufficient to decide this question, I sent some specimens to Professor ED. V. MARTENS. He informed me that he considered them to be: "*plumescens*, Dunker; CLESSIN beschreibt u. bildet sie ab, aber unter dem Namen *tumescens*, wahrscheinlich nur aus Irrthum (falsches Lesen)." The confusion introduced by CLESSIN into science by his "Monographs" in the new edition of MARTINI & CHEMNITZ: "Conchylien Cabinet" is much to be regretted. EDG. SMITH mentions, in his report on "Alert's" zoological results,¹ a *Modiola* sp. (taken at Port Molle) "remarkably like the European *M. barbata*;" it is probably the present species.

Modiola Philippinarum, Hanl.

- Modiola Philippinarum*, HANLEY, Proc. Zool. Soc. London, XII, 1844, p. 15.
 — — — Catalogue of rec. bivalve shells, p. 235, pl. 24, fig. 26.
 — — — REEVE, Conchol. icon., X, *Modiola*, Sp. 1.
 — — — ROCHEBRUNE, Bull. de la Soc. Philomath. de Paris, 29/10 1881 (Repr.), p. 6.
 — *philippinarum*, — EDG. SMITH, Ann. and Mag. Nat. Hist., 7 Ser., XVIII, 1906, p. 254.
Perna fulgida, H. ADAMS, Proc. Zool. Soc. London, 1870, p. 7, pl. 1, fig. 9.

E. of Cape Liant, 9 fathoms, shells (1). Between Koh Rin and Cliff Rock, 15 fathoms (2), Koh Kram, 30 fathoms (1^{1/2}).

Long. 2—41 mm.

Distribution:— Persian Gulf (EDG. SMITH), Red Sea (MAC ANDREW, COOKE). — Poulo Condor (ROCHEBRUNE), Philippines (ELERA), China (LISCHKE), Japan (STEARNS),² Amboina and Larentuka (v. MARTENS), Kei Bandan (Tapparone-Canefri), Jobi Isl. (Geelwinck Bay)?, Torres Strait (MELVILL & STANDEN), Mast Head Reef, Queensland (HEDLEY).

ED. V. MARTENS³ supposes that *Mod. Rumphii*, Phil. is synonymous with *M. Philippinarum*, Hanl. In the specimens from the Gulf of Siam the interior is whitely-iridescent.

Modiola Evansi, Smith.

Modiola evansi, EDG. SMITH, Journ. of Conchology, X, 1903. p. 368.

Tale Nawi in Lower Siam (RICH. EVANS).

This species does not occur in the collections made by the Danish Expedition.

EDG. SMITH says with regard to the locality from which this species has been taken: "This semi-lake is probably brackish water, being almost enclosed from the sea, and having several rivers and streams running into it."

¹ Report on the zool. collect. made in the Indo-Pacific Ocean during the voyage of H. M. S. "Alert", 1881—1882. Lond. 1884, p. 108.

² With reference to L. v. SCHRENCK's statement concerning the occurrence of the species at North Japan, and its synonymy with *M. modiolus* L. cf. L. v. SCHRENCK, Mollusken d. Amur-Landes, p. 498, and C. E. LISCHKE, Japanische Meeres Conchylien, I, p. 156.

³ Rumphius Gedenkboek, 1902, Mollusken, p. 128 (20).

Modiola lignea, Reeve.

Modiola lignea, REEVE, Conchol. icon., X, *Modiola*, Sp. 58, pl. X, fig. 71.

— — — MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 3 Abth., p. 102, pl. 27, fig. 3.

S. of Koh Chuen, 30 fathoms, shells (2). Koh Kahdat, 1—5 fathoms, sand (1).
Long. 15—20 mm.

Distribution: — Gulf of Aden (Shopland), Red Sea (Sturany). — Torres Strait (MELVILL & STANDEN), Australia (CLESSIN), Port Elizabeth (SOWERBY).

No locality was given for REEVE's original specimens in CUMING's collection; the species has since been found on the coasts of Australia and South Africa. It is also recorded from the West Indies, but this is undoubtedly due to erroneous determination. W. H. DALL states, in the report on the Mollusca of the Blake Expedition,¹ that he has specimens from the east and west coasts of Florida; and elsewhere² he states that it occurs along the east coast of America from S. Carolina to St. Thomas. I have in my collection, specimens from St. Thomas, collected by A. H. RUISE, and determined by MØRCH as *M. lignea*, Reeve; but the most important distinguishing characters of this species — the well-marked and conspicuous lines of growth on the front and hinder parts, while the middle is smooth — do not occur at all in these specimens, which are perfectly smooth all over the valve; nor, in DALL's description of the Mollusca of the Blake Expedition are these characters mentioned. The American specimens undoubtedly belong to another species.

Modiola arcuatula, Hanl.

Modiola arcuatula, HANLEY, Proc. Zool. Soc. London, XII, 1844, p. 16.

— — — REEVE, Conchol. icon., X, *Modiola*, Sp. 27, figs. 27 and 45.

— — — MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 3 Abth., p. 101, pl. 30, figs. 8—9.

— — — L. MORLET, Journ. de Conchyl., vol. 37, 1889, p. 161.

— — — P. FISCHER, Catalogue d. Mollusques de l'Indo-Chine, p. 212.

Siam (P. FISCHER). Cambodge, at the exit of the river Kampong-Son (L. MORLET).

This species does not occur in the collections made by the Danish Expedition.

Distribution: — Singapore, Mergui Isls. — Cochin China, Japan, Philippines, Java.

Modiola glaberrima, Dunk.

VolSELLA glaberrima, DUNKER, Proc. Zool. Soc. London, XXIV, 1856, p. 363, No. 16.

Modiola — — — REEVE, Conchol. icon., X, *Modiola*, Sp. 48.

— — — MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 3 Abth., p. 99, pl. 27, figs. 7—8.

— — — EDG. A. SMITH, Report on the Lamellibranchiata of the Challenger Exped., p. 275.

NW. of Koh Chang, 10 fathoms, mud ($\frac{2}{2}$). S. of Koh Chuen, 30 fathoms, shells (3). S. of Koh Samit, 20 fathoms, mud ($\frac{1}{2}$). Sound of Koh Chang, 3—5

¹ Report on the Mollusca. "Blake" Expedition, 1877—80, I, p. 236. Cambridge 1886.

² W. H. Dall, Catalogue of the shell-bearing marine Mollusks and Brachiopods of the south-eastern coast of the United States. Washington 1889, pp. 38—39.

fathoms, soft clay (1). W. of Koh Chang, 20 fathoms, clay (1). S. of Koh Kahdat, 8–10 fathoms, mud (2). W. of Koh Kut, 30 fathoms, sand and mud (1).

Long. 4–35 mm.

Distribution:— Mergui Archip., Suez. — Canton, East Australia (the districts around Sydney).¹

The specimens from the Gulf of Siam are all provided with a very shiny, greenish epidermis and several were either completely or partly hidden in their “nest” of byssus-threads, and fragments of shells, pebbles, etc. were partly attached to and partly entangled in these threads. *Modiola perfragilis*, Dunk.,² *M. Japonica*, Dunk., *M. angusta*, Cless.,³ and *M. cultellus*, Desh.,⁴ are closely allied species. Professor ED. v. MARTENS, to whom I sent some specimens of the present species from Koh Samit, writes as follows: “*Modiola perfragilis* “Reeve” von d. Molukken ist wohl Jugendzustand von *glaberrima*.”

Brachyodontes (Hormomya) subramosus, Hanl.

Modiola subramosa, HANLEY, Proc. Zool. Soc. London, XII, 1844, p. 14.

— — — Catalogue of rec. bivalve shells, 1842–56, p. 241, pl. 24, fig. 30.

— — — REEVE, Conchol. icon., X, *Modiola*, Sp. 43.

— — — MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 3 Abth., p. 121, pl. 31, fig. 11.

— — — v. MARTENS, Süss- u. Brackwasser Moll. d. Ind. Archip., 1897, p. 226.

— *ramosa*, CLESSIN, MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 3 Abth., p. 134, pl. 26, fig. 8.

West coast of Koh Chang, 1 fathom, old coral blocks (4). Koh Kahdat, 1 fathom, sand (1).

Long. 7 mm.

Distribution:— Mindanao and Samar, Philippines (CUMING and JAGOR), Ternate, Moluccas (DUNKER'S collect.), Celebes (PÄTEL'S collect.), the Gulf of Amboina (RUMPH and v. MARTENS), Sofong (TAPPARONE CANEFRI), New Caledonia (FRAUENFELD).

According to v. MARTENS,⁵ it is said to be able to live in brackish water and (in the Phillipines) perhaps even in freshwater. F. P. MARRATT⁶ records it (but this is surely an error) as obtained by the “Argo Expedition” at Abaco (Bahama Islands). SWAINSON'S name *Brachidontes*, as a sub-genus of *Modiola*, was altered to *Brachyodontes* by P. FISCHER, and afterwards by JUKES-BROWNE⁷ to the generic name *Brachyodontes*.

¹ E. v. MARTENS, Süss- u. Brackwasser Mollusken d. Indisch. Archipels, p. 87.

² It is strange that DUNKER (Proc. Zool. Soc. Lond., 1856, p. 362) in his diagnosis of this species from CUMING'S collection says: “testa . . . parum splendida.” REEVE, on the contrary, characterizes the same specimens as “shining” (nitente).

³ Probably identical with *M. perfragilis*, Dunk.

⁴ Magaz. de Zoologie éd. p. Guérin-Méneville, II, 1840, pl. 13, “from Kamtschatka” is undoubtedly synonymous with *M. glaberrima*, Dunk.

⁵ Loc. cit. p. 226.

⁶ HIGGINS and MARRATT, Mollusca of the Argo Expedition to the West Indies, 1876, Liverpool Museum Report, No. 1, 1878, p. 423.

⁷ Proceed. Malacolog. Soc. London, vol. VI, 1905, pp. 221–23.

Brachyodontes emarginatus, Bens. (Reeve).

- Modiola emarginatus*, BENSON, M. S. in Mus. Cuming.
 — — — REEVE, Conchol. icon., X, *Modiola*, Sp. 60, pl. X, fig. 73.
Perna emarginata, — ROCHEBRUNE, Faune malacol. de la Cochinchine et du Cambodge, Suppl.,
 Bullet. de la Soc. philomath. de Paris, ¹⁰/₁₂ 1881, (Repr.) p. 4, No. 17.
Modiola — — — P. FISCHER, Catal. d. Moll. de l'Indo-Chine, p. 212.
 — — — MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 3 Abth., p. 114, pl. 26, fig. 3
 (according to v. MARTENS not p. 120, pl. 25, figs. 7—8, these probably being
M. Fortunei, Reeve).
 — — — v. MARTENS, Süss- u. Brackwasser Moll. d. Ind. Archipels, 1897, p. 227.

Koh Kahdat, 1—5 fathoms, sand (3). Strand of Koh Kahdat (fragments).

Long. 25 mm.

Distribution:— The coast of Birma, in brackish water (BLANFORD), Bombay (MELVILL & ABERCROMBIE), Calcutta (v. MARTENS), Poulo Condor (ROCHEBRUNE), Philippines (ELERA).

Septifer bilocularis, L.

- Mytilus bilocularis*, LINNÉ, Systema Nat. ed. X, 1758, p. 705, No. 212. — ed. XII, p. 1156. — Mus. Ludov. Ulricæ, 1764, p. 540.
Tichogonia — — — MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII Bd., 3 Abth., p. 10, pl. 2, figs. 11—17.
Septifer — — — DUNKER, de Septiferis gen. Mytilaceorum et de Dreissenis, 1855, p. 6.
 — — — EDG. A. SMITH, Challenger Exp. Lamellibranchiata, 1885, p. 271.
 — — — P. FISCHER, Catal. d. Moll. de l'Indo Chine, p. 214.
 — — — DAUTZENBERG & FISCHER, Journ. de Conchyl., vol. 53, 1905, p. 450.
Mytilus Nicobaricus, CHEMNITZ, Conchyl. Cabin., VIII, 1785, p. 155, pl. 82, figs. 736—37.
 — — — REEVE, Conchol. icon., X, *Mytilus*, Sp. 42.

Very commonly distributed between Koh Kram and Koh Kut, 1—30 fathoms, sand, shells, mud and gravel; between old coral blocks.

Long. 3—48 mm.

Distribution:— Singapore, Strait of Malacca, Nicobars, Andamans, Aracan coast, Ceylon, Mahlos Atoll (Maldivé Archip.), Persian Gulf, Red Sea, Seychelles, Amirantes, Madagascar, Mascarene Isls., Querimba Isls., Zanzibar, Mozambique, Natal. — Poulo Condor, China, Tonkin, Hongkong, Japan (Nagasaki), Philippines, Sumatra, Christmas Isl., Celebes, Sulu Isls., Moluccas, Sunda Isls., Aru Isl., Sorong, New Guinea, Salomo Isls., Torres Str., East Australia, New Caledonia, Marianne Isls., Viti Isls., Paumotu Isl.

This species, which varies greatly, both in regard to colour and form, has presented to many authors the temptation of forming new species. EDG. SMITH, in his report of the *Lamellibranchiata* of the Challenger Expedition (p. 271), has enumerated various synonyms, and undoubtedly some more may be added. JUKES-BROWNE¹ gives the gen. *Septifer* as a sub-genus of *Brachyodontes*.

¹ Proc. Malacolog. Soc. London, vol. VI, 1905, p. 223.

Septifer excisus, Wieg.

- Tichogonia excisa*, WIEGMANN, Archiv f. Naturgeschichte, III, 1837, p. 49.
 — — — MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII Bd., 3 Abth., p. 24.
Septifer excisus, — RÉCLUZ, Revue et Magasin de Zoologie. 2 sér., I, 1849, p. 129.
Mytilus — — REEVE, Conchol. icon., X, *Mytilus*, Sp. 13.
Septifer — — CROSSE et FISCHER, Journ. de Conchyl., vol. 40, 1892, p. 75.
 — *fuscus*, RÉCLUZ, Revue (et Magasin) de Zoologie, 1848, p. 279. — 1849, p. 128.

Koh Lom, W. of Koh Chang (2).

West Coast of Cambodge in the Gulf of Siam (PAVIE).

Long. 21—26 mm.

Distribution: — Mergui Isl., Karachi, Gulf of Aden, Red Sea (pleistocene), Mauritius, Madagascar, Mozambique, Querimba Isls. — Funafuti (Ellice Isl.).

Tichogonia (*Septifer*) *siamensis*, Clessin¹ from "Siam," and also *Septifer Troscheli*, Dkr.,² undoubtedly belong to the present species. CLESSIN³ knows *Septifer excisus*, Wieg. only from DUNKER's description, and has hardly any clear conception of it; neither has he examined REEVE's figure, as he writes: "Reeve hat die Art nicht abgebildet, trotzdem sich dieselbe in der Cuming'schen Sammlung befinden muss."

Lithodomus gracilis, Phil.

- Modiola* (*Lithophagus*) *gracilis*, PHILIPPI, Zeitschr. f. Malakozool., 1847, IV, p. 117.
 — *gracilis*, PHILIPPI, Abbild. u. Beschreib. neuer od. wenig gek. Conchyl., 1851, III, p. 5 (19), pl. II, fig. 1.
Lithodomus gracilis, PHILIPPI, REEVE, Conchol. icon., X, *Lithodomus*, Sp. 4.
 — — — P. FISCHER, Catal. d. moll. de l'Indo-Chine, p. 213.
Lithophaga — — DUNKER in MARTINI u. CHEMNITZ, Conchyl. Cabin., 1882, VIII, 3 Abth., p. 12, pl. 4, figs. 7—8.

North end of Koh Chang, 1—12 fathoms, old coral blocks (many specimens).
 Koh Kahdat, 1 fathom, sand (9).

Long. 11—72 mm.

Distribution: — Malacca, Mergui Isls., Madras, Ceylon, Mahlos-Atoll (Maldive Archipel.), Red Sea, Seychelles,⁴ Amirantes, Tschago's Isls., Mauritius, Bourbon, Querimba Isls., Zanzibar. — Poulo Condor, China (Shanghai), Sunda Isls. (Java, Flores, and others), Amboina, Sorong, Torres Strait, north-west Australia, Tahiti.

With regard to the three closely allied forms — *L. teres*, Phil., *L. gracilis*, Phil., and *L. niger*, d'Orb. — I do not doubt, judging from the material at hand, that *L. teres*, Phil., is identical with *L. gracilis*, Phil. E. v. MARTENS has already stated in "Die Mollusken d. Maskarenen u. Seychellen," (p. 143) that *L. teres*, Phil., cannot be separated as a species from *L. gracilis*, Phil. (CHEMNITZ's figure⁵ of *Mytilus litho-*

¹ MARTINI u. CHEMNITZ, Conchyl. Cabinet, VIII, 3 Abth., pp. 19—20, pl. 15, figs. 8—9.

² W. DUNKER, Neue Mytilaceen, Zeitschr. f. Malakozool., X, 1853, p. 87.

³ loc. cit., pp. 24—25.

⁴ PH. DAUTZENBERG records it (Bull. de la Soc. Zool. de France, 1893) from here, and says: "Lithodomus gracilis Philippi, indiqué par von Martens sous le nom de *L. teres* Philippi."

⁵ CHEMNITZ, Conchyl. Cabinet, VIII, 1785, pl. 82, fig. 729.

phagus" from St. Maurice and Bourbon agrees exactly with *L. gracilis*, Phil., but yet PHILIPPI and DUNKER refer it to *L. teres*, Phil.). DUNKER¹ thinks that *L. teres* is closely analogous to *L. niger*, d'Orb. (= *L. Antillarum*, Phil.), and is perhaps only a variety of the same. The reason for this must be sought in the opinion expressed in his diagnosis of *L. teres*, Phil.: "epidermis nigro-castanea, in dorso et subter umbonibus laevis, in latere ventris simili modo striata ac in *Lithophaga nigra*." The most important mark of distinction between the West Indian *L. niger*, d'Orb., and the East Indian *L. gracilis*, Phil., is, as far as I can see from the material at my disposal, precisely this epidermal striation. In *L. gracilis*, Phil., these transverse lines extend almost to the anterior end (diminishing gradually in size) and only a small portion of the outermost part of that end is quite smooth; in the posterior part, the striation is usually continued somewhat farther than in *L. niger*. On comparing two specimens — one of each of these species — of equal size (e. g. 49 mm.), the result will be as follows: in *L. niger* (from St. Thomas) the striation is continued beyond 32 mm., as measured along the lower margin of the shell, while in *L. gracilis* (from the Gulf of Siam) it covers 40 mm.

Lithodomus straminea, Dunker.

Lithodomus stramineus, DUNKER, REEVE, Conchol. icon, X, *Lithodomus*, Sp. 11.

Lithophaga straminea, — DUNKER in MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 3 Abth. A, p. 6, pl. 2, figs. 1—2.

Koh Chang, very low tide (1).

Long. 22 mm.

Distribution: — Madras (MELVILL & STANDEN), the Gulf of Manaar (THURSTON). — Mast Head Reef, Queensland (HEDLEY).

The habitat "West Indies" given in CUMING's collection, is undoubtedly due to an error.

J. MABILLE and G. LE MESLE record² *Lithodomus lithophagus* L. from Poulo Condor; CROSSE³ is right in doubting the correctness of this determination. Is it not more probably *L. straminea*, Dkr., that has been found?

Lithodomus Malaccana, Reeve.

Lithodomus Malaccana, REEVE, Conchol. icon., 1858, X, *Lithodomus*, Sp. 20.

Lithophaga Malaccana, — MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 3 Abth. A, p. 20, pl. V, fig. 1.

Lithodomus subula, — Conchol. icon., X, *Lithodomus*, Sp. 26.

Lithophaga — — MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 3 Abth. A, p. 21, pl. V, fig. 13 (figs. 11—12?).

— *cavernosa*, DUNKER, MARTINI u. CHEMNITZ, loc. cit., p. 7, pl. II, figs. 5—6; pl. V, figs. 15—16.

— *reticulata*, — — — — — loc. cit., p. 19, pl. V, figs. 9—10.

¹ MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII Bd., 3. Abth., p. 13.

² Journal de Conchyl., XIV, 1866, p. 118.

³ loc. cit. p. 119.

Several specimens were taken between Cape Liant and Koh Kahdat in 1—15 fathoms, boring in old coral blocks, and from sandy bottom. Young specimens were taken from mud and stony bottom.

Long. 6—26 mm.

Distribution:— Malacca, Mergui Archip., the Gulf of Manaar (THURSTON), Karachi? (MELVILL & STANDEN), Persian Gulf (ANNANDALE), Hulule Isl. (EDG. SMITH), Zanzibar and Aldabra Isl. (VOELTZKOW). — Philippines, New Guinea, Cape York, North Australia ("CHALLENGER"), New Caledonia, Tahiti.

The present species, like all boring Molluscs, is subject to great variation in regard to form; I have put *L. subula*, Reeve, and DUNKER'S *L. cavernosa* and *reticulata* as synonymous forms, and several more could no doubt be added. CH. HEDLEY¹ supposes that *L. levigata*, Q. and G.² is the same species as *L. Malaccana*, Reeve; should this prove to be the case, REEVE'S name for it must yield to that of QUOY and GAIMARD, which has the priority. Besides boring holes in coral blocks, shells, and similar objects, this species often makes free "chalk houses," there is, for instance, a specimen of *Chama multisquamosa*, Reeve from Koh Kahdat, in one of the valves of which two individuals of *L. Malaccana* have made their two "houses" side by side; these are smooth interiorly, agreeing exactly in form with that of the *Lithodomus*-valve, and their only communication with the outer world is through an oblong hole bored in the valve of the *Chama*.

Lithodomus (Botula) cinnamomea, Chemn.

Mytilus cinnamominus, CHEMNITZ, Conchyl. Cabin., VIII, 1785, p. 152, pl. 82, fig. 731.

Modiola cinnamomea, LAMARCK, Encyclop. méthod., pl. 221, fig. 4.

Lithodomus cinnamominus, CHEMNITZ, REEVE, Conchol. icon., X, *Lithodomus*, Sp. 5.

— *cinnamomeus*, — FISCHER, Catal. d. Moll. de l'Indo-Chine, p. 213.

Mytilus fuscus, GMELIN, Syst. Nat., ed. XIII, p. 3359, No. 35.

Lithophaga fusca, GMELIN, MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII Bd. 3 Abth., p. 25, pl. 6, figs. 8—9.

Modiola silicula, LAMARCK, Anim. s. vert. VII, 1836, p. 25, No. 19.

Common from Cape Liant to Koh Chang, 1—30 fathoms, in old coral blocks, on stony and shelly bottom.

Long. 2—28 mm.

Distribution:— Mergui Archip., Nicobars, Ceylon, Suvadiva Atoll (Maldive Archip.), Karachi, Red Sea, the Gulf of Aden, east coast of Africa, Seychelles, Mauritius, Bourbon. — Poulo Condor, Annam, Philippines, Torres Strait, Mast Head Reef (Queensland), north-west Australia, New Caledonia, Paumotu Isl. — East coast of America from Cape Fear to Guadaloupe.

I agree entirely with CROSSE and FISCHER when they³ write concerning CHEMNITZ'S species from the Nicobars: "Est-il réellement identique à la forme analogue des Antilles?" The material at my disposal unfortunately is not con-

¹ Australian Museum, Sydney, Memoir III, 1896—1900, p. 492.

² Voyage de l'Astrolabe, III, p. 464, pl. 78, figs. 17—18.

³ Journal de Conchyliologie, XXXVII, 1889, p. 291.

siderable enough to decide the question. — The specimens from the Gulf of Siam, which agree most closely with the form figured by REEVE in Pl. I, Fig. 5b, have all a dark-brown epidermis and strongly marked, broad, step-like zones of growth. Also forms like LAMARCK'S *Mod. silicula* occur frequently.

Modiolaria Cumingiana, Dunker (Reeve).

Modiola Cumingiana, DUNKER, MS. Mus. Cuming.

— — — REEVE, Conchol. icon., X, 1857, *Modiola*, Sp. 50.

Modiolaria — — — MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 3 Abth., p. 146, pl. 34, figs. 2—3.

— *cumingiana*, — EDG. SMITH, Report Challenger Exped. Lamellibranchiata, 1885, p. 278.

Koh Kram, 20 fathoms ($1\frac{1}{2}$). Between Koh Riot and Koh Mesan, 3—5 fathoms, sand (1).

Long. 8—11 mm.

Distribution: — Karachi (MELVILL & STANDEN), Gulf of Aden (SHOPLAND), Red Sea (STURANY), Mauritius (LIÉNARD), Natal (EDG. SMITH). — Japan (DUNKER and STEARNS). Along the north (Torres Strait, and several other places), east (Moreton Bay, Sydney, and several other places), south (St. Vincent's Gulf, and several other places) and west coast (Swan River, and several other places) of Australia. Tasmania (TATE and MAY).

Modiolaria cuneata, Gould.

Modiolaria cuneata, GOULD, Proceed. of the Boston Soc. of Nat. Hist., VIII, 1861—62, p. 38.

— — — EDG. SMITH, Lamellibranchiata of the Challenger Exped., p. 278, pl. 16, fig. 7.

— — — PRITCHARD and GATLIFF, Proceed. Roy. Soc. Victoria, vol. 17, pt. 1, 1904, p. 254.

Koh Kahdat, 1—2 fathoms (1).

Long. 4 mm.

Distribution: — Port Jackson, Sydney ("Challenger"), False Bay, Cape of Good Hope (GOULD). "Common Port Phillip, associated with tunicates, Carrum to Frankston, Portsea" (PRITCHARD and GATLIFF).

Mod. coenobita, Vaillant, from Suez,¹ is closely allied to this species.

Modiolaria nana, Dunk.

(Pl. II, Fig. 15).

Lanistina nana, DUNKER, Proc. Zool. Soc. London, XXIV, 1856, p. 365.

Modiola — — — REEVE, Conchol. icon., X, *Modiola*, Sp. 56, pl. X, fig. 69.

Crenella — — — CLESSIN in MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 3 Abth., p. 152, pl. 34, fig. 10.

¹ Journ. de Conchyl., vol. 13, 1865, pp. 122—123, SAVIGNY, Descript. de l'Égypte. Coquilles, pl. XI, fig. 3. A. H. COOKE (Ann. and Mag. Nat. Hist., Ser. 5, vol. 17, p. 141) considers it to be identical with *Mod. marmorata*, Forb. EDG. SMITH (Proc. Zool. Soc. London, 1891, pp. 393—94) thinks, however, that COOKE is wrong in this. SOWERBY (Marine shells of South Africa, p. 65) has specimens from Port Elizabeth.

Gulf of Rayong, 7—10 fathoms, mud ($7/2$). Koh Kram, 30 fathoms ($1/2$). Between Koh Mesan and Cape Liant, 5—9 fathoms ($2/2$). Koh Kahdat, 1—5 fathoms, sand ($2/2$).
Long. 4—13 mm.

Distribution:— Port Lincoln, South Australia (CUMING), Sullivan Isl., Mergui Archip. (v. MARTENS).

DUNKER and REEVE give the size of the specimens in CUMING's collection as 4 mm.; from the Gulf of Siam there are specimens measuring as much as 13 mm. REEVE's figure (very badly reproduced in CLESSIN's Monograph in "Martini & Chemnitz") is not good in all points, hence I have given a new figure here. As all the specimens from the Gulf of Siam were taken dead, I have not been able to verify DUNKER's statement: "Pagina interna margaritacea."

Modiolaria miranda, Edg. Smith.

Modiolaria miranda, EDG. SMITH, Rep. Zoolog. Collect. made during the voyage of H. M. S. "Alert," 1884, p. 108, pl. 7, fig. N.

Common (from 16 different localities) between Koh Rin and Koh Kut, 1—30 fathoms, stones, shells, gravel and mud.

Long. 1—7 mm.

Distribution:— Dundas Straits.

Some of the specimens were taken from among the spines of *Stephanocidaris bispinosa*, Lam., from a depth of 30 fathoms.

Modiolaria (Gregariella) opifex, Philippi (non Say).

Modiola opifex (SAY?), PHILIPPI, Abbild. u. Beschreib. neuer od. wenig gekannt. Conchyl., III, 1851, *Modiola*, p. 21 (7), pl. II, fig. 7.

— — SAY, REEVE, Conchol. icon., X, *Modiola*, Sp. 39.

Lithophaga opifex, SAY, DUNKER in MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 3 Abth. A, p. 26, pl. 6, fig. 16.

Lithodomus splendidus, REEVE (non DUNKER), REEVE, Conchol. icon., X, *Lithodomus*, Sp. 31.

Between Koh Mesan and Koh Chuen, 25—38 fathoms, stones (7). Between Koh Mesan and Cape Liant, 5—9 fathoms ($1/2$).

Long. 9—15 mm.

Distribution:— Sydney (CUMING). — Brazil (HENR. KRØYER; Desterro, FR. MÜLLER; Rio Janeiro, CUMING).

In all the specimens from the Gulf of Siam the most posterior, flattened part of the valves, limited by ridges set with stiff epidermal bristles, was covered with adherent grains of sand; this gives the animals, which live buried in the sand, a great resemblance to their surroundings. *Modiola difficilis*, Deshayes,¹ appears to me to resemble more particularly a worn specimen of the present species.

¹ Mollusques de l'île de la Réunion (Bourbon), 1863, p. 23, pl. 3, figs. 22—24.

Modiolaria (Gregariella) coralliophaga, (Chemn.) Gmel.

- Mytilus coralliophagus*, CHEMNITZ, Conchyl. Cabin., VIII, 1785, p. 174, pl. 84, fig. 752.
 — — — GMELIN, Syst. Nat., ed. XIII, 1790, p. 3359, No. 31.
Modiola semen, LAMARCK, Anim. s. vert., éd. 2, VII, 1836, p. 26, No. 21.
 — *opifex*, SAY (non PHILIPPI), Journ. Acad. Nat. Sc., Philadelphia, IV, 1825, p. 368, pl. 19, fig. 2.
 — — — VERRILL & BUSCH, Trans. Connecticut Acad. X, 1900, p. 516, pl. 58, fig. 3.
 — *divaricata*, PHILIPPI, Zeitschr. f. Malakozool., 1847, p. 115.
 — — — Abbild. u. Beschreib. neuer od. wen. gek. Conchyl. *Modiola*, p. 21 (7), pl. II fig. 8.
Lithodomus divaricatus, PHILIPPI, REEVE, Conchol. icon., X, *Lithodomus*, pl. V, Sp. 34.
Lithophaga divaricata, PHILIPPI, MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII Bd. 3 Abth. A, p. 26.
Modiolaria — — LISCHKE, Japanische Meeres Conchyl., II, p. 148.

At the north end of Koh Chang, 1—12 fathoms, in old coral blocks (6).

Long. 7—13 mm.

Distribution: — Japan, Nagasaki (LISCHKE). — East coast of America from Cape Hatteras and the "Lesser Antilles" to Rio Grande do Sul.

The specimens from the Gulf of Siam agree in all points with the specimens from the West Indies.

Fam. Pteriidae.

***Pteria spectrum*, Reeve.**

- Avicula spectrum*, REEVE, Conchol. icon, X, 1857, *Avicula*, Sp. 59.
 — — — DUNKER in MARTINI u. CHEMNITZ, Conchyl. Cabin., VII, 3 Abth., 1872, p. 49, pl. 17, fig. 1.

Koh Chuen, 30 fathoms (1).

Long. 22 mm., alt. 11 mm.

Distribution: — Philippines.

I have compared the small specimen from Koh Chuen with REEVE'S original specimen in the British Museum, and although somewhat different I cannot see that it can be referred to any other species than to *P. spectrum*, Reeve.

***Pteria serrulata*, Dunk.**

- Avicula serrulata*, DUNKER, Zeitschr. f. Malakozoologie, V, 1848, p. 178.
 — — — MARTINI u. CHEMNITZ, Conchyl. Cabin., VII Bd. 3 Abth., p. 18, pl. 5, figs. 1—2.
 — *lata*, REEVE, Conchol. icon., X, *Avicula*, Sp. 5.

Between Koh Mesan and Cape Liant, 5—9 fathoms (1).

Long. 32 mm., alt. 24 mm.

Distribution: — Moluccas, Torres Strait.

Professor ED. v. MARTENS, to whom I sent the specimen for comparison, writes to me as follows: "wahrscheinlich *lata* Reeve, nur die Form des Ohrs passt nicht recht."

Pteria (Electroma) zebra, Reeve.

(Pl. II, Figs. 16—18).

Avicula zebra, REEVE, Conchol. icon., X, *Avicula*, Sp. 36.

— — — MARTINI u. CHEMNITZ, Conchyl. Cabin., VII, 3 Abth., p. 60, pl. 21, fig. 3.

Koh Kram, 30 fathoms (2). Koh Mesan, 15 fathoms, stones (2). Between Koh Mesan and Koh Chuen, 25—38 fathoms, stones (6).

Long. 3—12 mm.

Distribution: — N. Male Atoll (EDG. SMITH). — Gulf of Manaar (STANDEN & LEICESTER), Tuticorin (THURSTON), Port Elizabeth (SOWERBY), Port Denison, Queensland ("Alert"), Moreton Bay, Australia (CUMING), King Island, Tasmania (TATE & MAY).

A variety, with twelve pale-brown lines radiating from the umbo, (without the characteristic oblique lines) was taken, to the number of three specimens in 30 fathoms at Koh Chuen; it was not found attached to any object as was the type form. — The specimens, from the localities mentioned above, were all found attached to *Plumularia* sp. As may be seen from the figures in Pl. II, Figs. 16—18, the mimicry is exceedingly striking; the beautiful colour-ornamentation upon the valves resembles exactly the branches of the Hydroid. REEVE describes and figures it as attached to a *Sertularia*. THURSTON¹ also mentions its mimicry in relation to *Aglaophenia urens* upon which it settles. G. J. ALLMAN mentions in the Report on the Hydroids of the Challenger Expedition,² when treating of *Plumularia abietina*, that "The specimen had numerous individuals of an *Avicula*-like fry adhering to it." Judging from the figure it can, however, scarcely be *A. zebra*, Reeve.

Pteria pulchella, Reeve.*Avicula pulchella*, REEVE, Conchol. icon., X, 1857, *Avicula*, Sp. 22.

— — — MARTINI u. CHEMNITZ, Conchyl. Cabin., VII Bd. 3 Abth., p. 42, pl. 13, fig. 6.

East of Cape Liant, 9 fathoms, shells (1).

Long. 20 mm., alt. 16 mm.

Distribution: — Philippines, East and South Australia.

On account of the small size of the specimen, there may perhaps be a slight doubt concerning the correctness of the determination.

Pteria (Margaritifera) vulgaris, Schum.*Perlamater vulgaris*, SCHUMACHER, Essai d'un nouv. syst. d. habitat. d. vers test., 1817, p. 108, pl. 20, fig. 3.*Margaritifera* — — JAMESON, Proc. Zool. Soc. Lond., 1901, I, p. 384, Sp. 13.

— — — W. A. HERDMAN, Report on the Pearl Oyster Fisheries of the Gulf of Manaar, II, 1904, pp. 37—76, pl. 1—9.

Avicula fucata, GOULD, Proc. of the Boston Soc. of Nat. Hist., III, 1850, p. 309.

— — — Un. St. Expl. Exped. Moll., p. 441, pl. 39, fig. 551.

— — — REEVE, Conchol. icon., X, *Avicula*, Sp. 74 (pl. XVII).

¹ Madras Government Museum, Bulletin No. 3, Rámésvaram Island and Fauna of the Gulf of Manaar, 2 ed., Madras 1895, p. 130.

² Zoology, vol. 7, 1883, p. 21, pl. 3. The specimen was from Prince Edward's Island, 150 fathoms(?).

Commonly distributed between Koh Rin and Koh Kong. 1—30 fathoms, mud, sand, gravel, shells and stones. The specimens gathered were almost all young individuals.

Long. 10—38 mm., alt. 10—32 mm.

Distribution: — Malacca, Singapore, Madras, Ceylon, Palk's Strait, Gulf of Manaar,¹ Maldives, Persian Gulf, Gulf of Aden, Red Sea, Suez (since the opening of the Suez Canal this species has wandered into the Mediterranean. There are typical examples from Alexandria and Malta in the British Museum.²), Mauritius, Bazaruto Isl., Durban. — Philippines, Japan (?), Flores, Sandwich Isls., Torres Strait, North Australia, East Australia (as far as Sydney), West Australia (as far as Sharks Bay), New Guinea, New Zealand (GOULD).

I have followed H. L. JAMESON (l. c.) in his opinion regarding *P. vulgaris*, Schum., although I feel convinced that several of the species in his "Section c" are nothing else but varieties of this species. SCHUMACHER's original specimen is in the Zoological Museum of the University of Copenhagen, and I can only confirm JAMESON's opinion that *P. vulgaris*, Schum., is identical with *P. fucata*, Gould. *P. vulgaris*, Schum., has had numerous names given to it, owing to its variability in shape and colour. Thus A. H. COOKE³ enumerates the following of REEVE's species as identical (the original specimens in the "British Museum" were at his disposal): — *imbricata*, *muricata*, *lentiginosa*, *occa*, *fimbriata*, *anomioides*, *aerata*, *irradians*, and *nebulosa*, CONR. JAMESON (who has had the same specimens for examination) gives: — *occa*, Reeve, *aerata*, Reeve, *perviridis*, Reeve, *varia*, Dunker, and *badia*, DUNKER, as synonyms of *P. vulgaris*, Schum. G. B. SOWERBY⁴ believes that *Avicula flabellum*, Reeve,⁵ and *A. lacunata*, Reeve, may be added to these. *A. Martensi*, DUNKER,⁶ is also, no doubt, nothing but a form of the present species. G. F. ANGAS⁷ considers *A. placunoides*, Reeve, a variety of *fimbriata*, Reeve.

¹ For details comp. L. G. SEURAT, l'Huitre perlière. Paris 1901. — E. IM THURN, Sketch of the Ceylon Pearl Fishery of 1903. (Spolia Ceylanica, I. Colombo 1903). — J. HORNELL, The Biolog. Results of the Ceylon Pearl Fishery of 1904. (Reports from the Ceylon Marine Biological Laboratory No. 1, Colombo 1905. — J. CALCOTT GASKIN (Proc. Zool. Soc. London, 1906, p. 803), A Memorandum on the Pearl-shells in the Persian Gulf. — EDG. THURSTON, Notes on the Pearl and Chank Fisheries and Marine Fauna of the Gulf of Manaar, Madras 1890. — Report on the Pearl Oyster Fisheries of the Gulf of Manaar, by W. A. HERDMAN. 1—5. London 1903—6. — *P. vulgaris*, Schum., is fished here on a large scale for the sake of the pearls.

² H. L. JAMESON (l. c. p. 385) and VASSEL, Sur la Pintadine du Golfe de Gabes (Comptes-rendus. Assoc. franç. p. l'avancem. d. sc., 1896, pp. 458—66).

³ The Annals and Magaz. of Nat. Hist., vol. XVII, 1886, pp. 136—37.

⁴ Appendix to Marine shells of South Africa, Lond. 1897, p. 27.

⁵ This is a form from Venezuela and A. H. COOKE says (l. c. p. 137) that the type in the British Museum differs from *A. fucata*, Gould.

⁶ Index molluscor. mar. Japon. Cassel 1882, p. 229, pl. 10, figs. 7—8.

⁷ Proc. Zool. Soc. London, 1867, p. 930.

Pteria (Margaritifera) vulgaris, Schum. var. occa, Reeve.

Avicula occa, REEVE, Conchol. icon., X, 1857, *Avicula*, Sp. 24.

— (*Meleagrina*) *occa*, REEVE, MARTINI u. CHEMNITZ, Conchyl. Cabin., VII Bd. 3 Abth., p. 42, pl. 13, fig. 5.

Koh Kram, 30 fathoms ($1\frac{1}{2}$).

Long. 28 mm., alt. 29 mm.

Distribution: — Red Sea, Gulf of Aden (JOUSSEAUME).

Professor ED. v. MARTENS, to whom I sent the specimen for comparison, writes to me as follows: "vermuthlich *occa* Reeve, wenn man annehmen kann, dass bei der Ihrigen die Schuppen abgerieben seien." A. H. COOKE¹ and H. L. JAMESON² are certainly right in considering *A. occa*, Reeve, a form of *Marg. vulgaris*, Schum. (= *A. fucata*, Gould).³ The present species has probably a far wider distribution than that stated above, but to ascertain this, further investigations will be necessary. A. GIARD⁴ has collected what he believes to be its synonyms, and according to these its geographical distribution becomes considerably wider.

Pteria (Margaritifera) nigra, Gould.

Avicula nigra, GOULD, Proc. of the Boston Soc. of Nat. Hist., vol. 3, 1850, p. 309.

— — — — — Un. St. Expl. Exped. Moll., p. 438, pl. 40, fig. 454.

— *tristis*, DUNKER, MARTINI u. CHEMNITZ, Conchyl. Cabin., VII, 3 Abth., p. 44, pl. 14, fig. 3.

East of Koh Chuen, 9—10 fathoms, shells.

Long. 48 mm., alt. 38 mm.

Distribution: — Singapore.

A smaller specimen (long. 19 mm., alt. 16 mm.), which, with some doubt, I refer to the present species, was taken at Koh Kahdat in one fathom, on a sandy bottom.

Pteria (Margaritifera) citrina, Dunk.

Avicula (Meleagrina) citrina, DUNKER, Zeitschr. f. Malakozoologie, IX, 1852, p. 78.

— — — — — MARTINI u. CHEMNITZ, Conchyl., Cabin., VII Bd. 3 Abth., pp. 14 and 71, pl. 3, fig. 4, and pl. 25, fig. 1.

Pteria (Margaritifera) — — — — JAMESON, Proc. Zool. Soc. London, 1901, p. 383.

Strand of Koh Kahdat ($1\frac{1}{2}$).

Long. 24 mm., alt. 25 mm.

Distribution: — Dutch India (E. v. MARTENS in litt.).

¹ Annals and Magaz. Nat. Hist., Ser. 5, vol. 17, pp. 136—37.

² Proc. Zool. Soc. London, 1901, p. 384.

³ A. PAGENSTECHEER describes various forms of *P. occa*, Reeve, from the Red Sea in "Ueber die v. R. Kossmann am Rothen Meere gesamm. Mollusken," 1877, p. 35.

⁴ Comptes rendus hebdomad. d. seances de la Soc. de Biologie, Paris, Tome 56, 1904, pp. 255—57.

Malleus figuratus, Chemn.

Ostrea figurata, CHEMNITZ (Anas domestica Spengleri), Conchyl. Cabin., VIII, 1785, p. 17, pl. 70, fig. 658; pl. 71, fig. 659.

— *anatina*, GMELIN, Syst. Nat., ed. XIII, p. 3333, No. 101.

Malleus anatinus, LAMARCK, Anim. s. vert., éd. 2, VII, p. 93.

— — — REEVE, Conchol. icon., XI, *Malleus*, Sp. 3.

— — — GMELIN, MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 1 Abth., p. 8, pl. 2, fig. 4, and pl. 3, fig. 1.

— — — P. FISCHER, Catal. d. Moll. de l'Indo-Chine, p. 210.

Koh Kram, 30 fathoms (1 specimen, long. 3 mm.). E. of Cape Liant, 9 fathoms, shells (1). The northern side of Koh Mesan, 10—15 fathoms, stones (3). Between Koh Mesan and Koh Chuen, 25—38 fathoms, stones with shells (1 specimen, long. 7 mm.).

Long. 3—16 mm., alt. 5—53 mm.

Distribution:— Nicobars, Kolumadulu Atoll (Maldive Archip.). — Poulo Condor, Java, Timor, Moluccas.

Malleus albus (Chemn.), Lam.

Ostrea Malleus albus, CHEMNITZ, Conchyl. Cabin., XI, 1795, p. 257, pl. 206, figs. 2029—30.

Malleus albus, LAMARCK, Hist. nat. d. anim. s. vert., VI, 1819, p. 144, No. 1. — 2 éd., VII, p. 91, No. 1.

— — — REEVE, Conchol. icon., XI, *Malleus*, Sp. 1.

— — — MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 1 Abth., p. 4, pl. 1, figs. 1—2.

— — — CROSSE & FISCHER, Journ. de Conchyl., vol. 40, 1892, p. 75.

— — — PRITCHARD & GATLIFF, Proc. Roy. Soc. Victoria, vol. 17, pl. 1, p. 258.

Between Koh Rin and Cliff Rock, 15 fathoms (2). Koh Chuen, 30 fathoms (1). S. of Koh Kahdat, 8—10 fathoms, mud (¹/₂).

Gulf of Siam, west coast of Cambodge (CROSSE & FISCHER).

Alt. 2—58 mm.

Distribution:— Singapore, Ceylon, Gulf of Aden. — Philippines, China, Japan; north, east, and south coast of Australia.

Malleus regula, Forsk.

Ostrea regula, FORSKÅL, Descript. animal. quæ in itinere orient. observ., 1775, p. 124.

Malleus — — SAVIGNY, Descript. de l'Égypte. Coquilles, pl. 13, figs. 1—4.

— — — REEVE, Conchol. icon., XI, *Malleus*, Sp. 4.

— — — PAGENSTECHEER, Ueber die von Kossmann am Rothen Meere gesamm. Mollusken, 1877, p. 31, pl. 1, figs. 17—19.

— — — ISSEL, Malacol. d. Mar Rosso, 1869, p. 97.

Ostrea Volsella, CHEMNITZ, Conchyl. Cabin., VIII, 1785, p. 15, pl. 70, fig. 657.

— — — GMELIN, Syst. Nat., ed. XIII, p. 3333, No. 100.

Malleus vulsellatus, LAMARCK, Anim. s. vert., éd. 2, VII, p. 92.

— — — MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 1 Abth., p. 7, pl. 2, fig. 3.

var. *decurtatus*, Lam.

Malleus decurtatus, LAMARCK, Anim. s. vert., éd. 2, VII, p. 93.

— — — REEVE, Conchol. icon., XI, *Malleus*, Sp. 10.

— — — A. H. COOKE, Ann. & Mag. Nat. Hist., Ser. 5, vol. 17, 1886, p. 137.

— *ligrinus*, REEVE, Conchol. icon., XI, *Malleus*, Sp. 7.

D. K. D. Vidensk. Selsk. Skr., 7. Række, naturvidensk. og mathem. Afd. V. 3.

E. of Koh Chuen, 9—10 fathoms, shells (1). Koh Kahdat, 1 fathom, sand (1 abnormal specimen). Koh Kram, 30 fathoms (1 specimen, alt. 11 mm.).

Long. 19 mm., alt. 31 mm.

Distribution:— Persian Gulf, Gulf of Aden, Red Sea, Suez, Ascension Isl. (EDG. A. SMITH). — Philippines, Japan, Timor, Moluccas; North-west and South Australia.

The specimen from Koh Chuen belongs to var. *decurtatus*, Lam., while the specimens from Koh Kahdat and Koh Kram must be referred more especially to *M. regula*, Forsk. A single valve (long. 13 mm., alt. 15 mm.) was taken between Koh Kut and Koh Kahdat (in about 10 fathoms, on a shelly bottom); this must undoubtedly be referred to var. *decurtatus*, Lam.

Perna vespertilio, Reeve.

Perna vespertilio, REEVE, Conchol. icon., XI, *Perna*, Sp. 26.

— — — MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 1 Abth., p. 37, pl. 13, fig. 2.

Koh Kram, 30 fathoms ($1\frac{1}{2}$).

Long. 53 mm., alt. 55 mm.

Distribution:— Philippines.

As far as I can judge from the scanty material at my disposal, this species varies exceedingly, and if a number of specimens could be obtained for comparison from the same district, several forms, which are now regarded as distinct species, would undoubtedly be reduced to synonyms; indeed perhaps it would be necessary to refer the whole "species" to another form.

Perna Spengleri, Chemn.

Siliqua Spengleri, CHEMNITZ, Conchyl. Cabin., VII, 1784, p. 250, pl. 59, fig. 578.

Ostrea Legumen, GMELIN, Syst. Nat., ed. XIII, p. 3339, No. 128.

Perna dactylus, VALENCIENNES, Encycl. méthod., pl. 175, figs. 2—3.

— *legumen*, GMELIN, REEVE, Conchol. icon., XI, *Perna*, Sp. 22.

— *linguaeformis*, — — — Sp. 7.

— *laticostata*, — — — Sp. 9.

— *caudata*, — — — Sp. 5.

— — REEVE, A. H. COOKE, Ann. & Mag. Nat. Hist., XVII, 5 Ser., 1886, p. 138.

Common at Koh Chang, Koh Lom and Koh Kahdat, 1—12 fathoms, sand and old coral blocks.

Long. 4—12, alt. 5—26 mm.

Distribution:— Mergui Archip., Nicobars, Red Sea, Lifu Isls., Society Isls.

I have re-introduced CHEMNITZ's name, which, strangely enough, in spite of its priority, has hitherto been disregarded. The original specimen figured by CHEMNITZ (besides a smaller one from SPENGLER's collection), is in the Zoological Museum of the University of Copenhagen. It is somewhat worn and deformed, but nevertheless agrees entirely with GMELIN's *P. legumen*. The deep-blue spots at the beaks mentioned by CHEMNITZ, are due to the fact, that the valves of his specimen, when

young, were dark-coloured, quite an individual character. In the new edition of "MARTINI & CHEMNITZ, Conchyl. Cabinet," CLESSIN has worked out the genus *Perna*,¹ but nowhere does he mention CHEMNITZ's *P. Spengleri*.

Perna isognomon, L.

- Ostrea isognomon*, LINNÉ, Syst. Nat., ed. X, 1758, p. 699, No. 176. — ed. XII, p. 1149. — Mus. Ludov. Ulr., p. 533, No. 120.
Melina Isognonum, — RETZIUS, Nova Testaceor. Gen., 1788, p. 23.
Ostrea isognomon, — GMELIN, Syst. Nat., ed. XIII, p. 3338, No. 125.
Perna isognomum, — REEVE, Conchol. icon., XI, *Perna*, Sp. 24.
 — *isognonum*, — CLESSIN in MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 1 Abth., pl. 8, fig. 1.

East of Koh Chuen, 9–10 fathoms, shells (2).

Distribution: — Singapore, Mergui Archip., Madras, Madagascar and Mozambique, Mauritius. — Poulo Condor, Philippines, Amboina, Moluccas, Sorong, New Guinea, Thursday Isl.

Of the two specimens brought home from the above-mentioned locality the larger (long. 59 mm., alt. 99 mm.) should be referred to the variety *femoralis*, Lam.,² and the smaller (long. 34 mm., alt. 73 mm.) to the variety *curvata*, Ch.³

Perna rudis, Reeve.

- Perna rudis*, REEVE, Conchol. icon., XI, *Perna*, Sp. 20.
 — — — MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 1 Abth., p. 31, pl. 9, fig. 6.

North end of Koh Chang, 1 fathom, old coral blocks (1). Koh Kahdat, 1 fathom, sand (3).

Alt. 14–98 mm.

Distribution: — JOUSSEAUME⁴ records that one specimen of this species was taken at Obock (Gulf of Aden). Collected by VOELTZKOW at Zanzibar.

The present species is closely allied to *P. isognomon* L. A. H. COOKE⁵ thinks that *P. rudis*, Reeve, is synonymous with *P. legumen*, Gmel. (= *linguaeformis*, Reeve = *laticostata*, Reeve = *caudata*, Reeve).

Perna Cumingi, Reeve.

- Perna Cumingii*, REEVE, Conchol. icon., XI, *Perna*, Sp. 3.
 — *Cumingi*, — MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 1 Abth., p. 40, pl. 15, fig. 1.
Melina cumingii, — EDG. SMITH, Zoolog. Collect. of H. M. S. "Alert," p. 113.

¹ The extremely unsatisfactory and unscientific way in which this has been done is much to be regretted. As an example of the superficiality which characterises the work may be mentioned that one of the best-known species, *P. isognomon* L., is called *P. isognonum* L. throughout the whole work.

² Hist. nat. d. anim. s. vert., 2 éd., VII, p. 76, No. 5.

³ CHEMNITZ, Conchyl. Cabin., VII, 1784, p. 256, pl. 59, fig. 583.

⁴ Mém. de la Soc. zoolog. de France, I, 1888, p. 219.

⁵ Annals and Magaz. of Nat. Hist., 5 Ser., vol. 17, p. 138.

The Gulf of Klong Salakpat (south end of Koh Chang); many specimens; occurred in large lumps, attached to each other by their byssus-threads.

As the relation between the height and the breadth varies greatly in the different individuals, I give here the measurements of 3 different specimens: long. 96 mm., alt. 75 mm. — long. 92 mm., alt. 105 mm. — long. 4 mm., alt. 5 mm.

Distribution: — Annam (DAUTZENBERG), Australia (REEVE), Port Curtis ("Alert"). "*P. ehippium* L." has been recorded from the following localities:— Singapore, Mergui Archip., Nicobars, Mozambique and Madagascar, Mauritius. — Celebes, Philippines, Sorong (TAPPARONE CANEFRI), Port Curtis (East Australia), West Australia.

The West-Indian species *P. alata*, Gmel., bears much resemblance to *P. Cumingi*, Reeve; they may, however, be distinguished from each other by the radiating lines in the latter species, which give the growth-margins a crenulated appearance. But what is to become of *P. ehippium* L., if these two species are maintained?

***Perna nucleus*, Lam.**

Perna nucleus, LAMARCK, Hist. nat. d. anim. s. vert., éd. 2, VII, 1836, p. 78, No. 10.

— — — REEVE, Conchol. icon., XI, *Perna*, Sp. 4.

— — — REEVE, MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 1 Abth., p. 36, pl. 13, fig. 1.

Melina — LAMARCK, LAMY, Bull. Mus. d'Hist. Nat. Paris, 1906, p. 314, No. 70.

Perna pectinata, REEVE, Conchol. icon., XI, *Perna*, Sp. 2.

— *quadrangularis*, REEVE, loc. cit., Sp. 6.

Koh Lom, W. of Koh Chang (many specimens).

1) Long. 10 mm., alt. 14 mm. 2) Long. et alt. 9 mm. 3) Long. 7 mm., alt. 9 mm.

Distribution:— Mergui Archip., Red Sea, Suez, (Natal and Bourbon, *P. dentifera*, Krauss). — Poulo Condor, Philippines, Samoa Isls., Fiji Isls., New Holland (LAMARCK).

This species is highly variable, as are all the forms belonging to this group. A. H. COOKE has enumerated the following species, which he believes to be identical with the present one:— *P. nana*, Gould, *P. rostrata*, Schum., *P. lobata*, Reeve, *P. spathulata*, Reeve, *P. dentifera*, Krauss.

***Pinna inflata*, Chemn.**

Pinna inflata, CHEMNITZ, Conchyl. Cabin., VIII, 1785, p. 215, pl. 87, fig. 771.

— — — REEVE, Conchol. icon., XI, *Pinna*, Sp. 5.

— — — MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 1 Abth., p. 80, pl. 34, fig. 1.

W. of Koh Chang, 20 fathoms, mud (1).

Long. 136 mm., alt. 82 mm.

Distribution:— Nicobars, Ceylon. — Philippines.

***Pinna hystrix*, Hanl.**

Pinna hystrix, HANLEY, Proc. Zool. Soc. London, XXVI, 1858, p. 226.

— — — REEVE, Conchol. icon., XI, *Pinna*, figs. 60–61 (and the register).

¹ Annals and Magaz. of Nat. Hist., 5 Ser., vol. 17, 1886, p. 138.

Koh Chuen, 30 fathoms (3).

1) Long. 172 mm., alt. 112 mm. 2) Long. 183 mm., alt. 112 mm.

Distribution: — Gulf of Suez, Red Sea. — Amboina, Australia.

Pinna Strangei, Hanl., is undoubtedly only a form of the present species without scales upon the ribs. L. MORLET¹ records *Pinna Chemnitzii*, Hanl., from "the islands in the Gulf of Siam;" can this be due to erroneous determination? The Danish Expedition, at any rate, did not bring home any specimen of this species. CLESSIN, in his Monograph of the genus *Pinna*, in "MARTINI and CHEMNITZ, Conchylien Cabinet," figures and describes quite another species under the name of *P. Strangei*, Hanl. PAGENSTECHER² records *P. hystrix*-forms from the Red Sea, and also forms having ribs without scales (from the same locality), which he names *P. atropurpurea*, Sow.

***Pinna attenuata*, Reeve.**

Pinna attenuata, REEVE, Conchol. icon., XI, *Pinna*, 1858, Sp. 46.

— — — — — MENKE, MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 1 Abth., p. 59, pl. 27, fig. 1.

— *Stutchburii*, REEVE, Conchol. icon., XI, *Pinna*, 1859, Sp. 64.

— — — — — MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 1 Abth., p. 74, pl. 30, fig. 2.

Off Tung Kaben, 6 fathoms, mud mixed with sand (1).

Long. 173 mm., alt. 51 mm.

Distribution: — Madras, Gulf of Manaar, Gulf of Suez, Red Sea. — Moluccas, Moreton Bay (Australia).

The specimen from the Gulf of Siam bears a few scales on some of the raised, longitudinal ribs; this is also found often to be the case in specimens from the Red Sea.³ I have given *P. Stutchburii*, Reeve, as a synonym, as I cannot see any difference, worthy of mention, between these two forms.⁴

***Pinna mutica*, Reeve.**

Pinna mutica, REEVE, Conchol. icon., XI, *Pinna*, 1858, Sp. 33.

— — — — — MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 1 Abth., p. 68, pl. 26, fig. 2.

Koh Chuen, 30 fathoms (1). Koh Kram, 30 fathoms (1 young specimen).

Long. 38—147 mm., alt. 13—63 mm.

Distribution: — Philippines.

Pinna madida, Reeve, *P. euglypta*, Hanl., and *P. vespertina*, Reeve, show great resemblance to the present species, and will perhaps prove to be synonyms of *P. mutica*, Reeve.

***Pinna serra*, Reeve.**

Pinna serra, REEVE, Conchol. icon., XI, 1858, *Pinna*, Sp. 43.

— — — — — CLESSIN in MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 1 Abth., 1891, p. 60, pl. 28, fig. 2.

¹ Journal de Conchyliologie, vol. 37, 1889, p. 161.

² Ueber die von Kossmann am Rothen Meere gesamm. Mollusken. Lpzg. 1877, p. 30.

³ For details concerning this and the variation, etc. of *P. Stutchburii* comp. PAGENSTECHER, Ueber die von Kossmann am Rothen Meere gesamm. Mollusken. Leipz. 1877, pp. 30—31.

⁴ Professor ED. v. MARTENS says in a letter to me, that these two forms: "sind einander sehr ähnlich und gehören vielleicht beide zu Einer Art."

East of Koh Chuen, 9–10 fathoms, shells (2).

Long. 30 mm.

Distribution:— Aden (EDG. SMITH), Durban (SOWERBY). — Moreton Bay, Queensland (REEVE).

Note. In Pl. II, Figs. 19–20, I have given figures of a young specimen of *Pinna* sp. (taken between Koh Kut and Koh Kahdat, in 10 fathoms; 18 mm. long) with a very well-preserved prodissoconch, which is distinctly separated from, and highly different from the later increment to the valve. (R. T. JACKSON says in "Phylogeny of the Pelecypoda," Boston 1890, p. 332, when mentioning the group *Perna*, *Avicula*, and their near allies: "The genera *Malleus* and *Pinna* might be considered in this section, but I have not succeeded in getting very young specimens of either genus," and later on, p. 385, "I have not had opportunity to study the *Pinnidæ* satisfactorily as attempts to obtain very young specimens have so far failed;" in the specimen of a young *Pinna* sp. figured in his Fig. 53 the prodissoconch is also wanting). PELSENEER,¹ in his "System," places the genus *Pinna* under the order *Eulamellibranchia*, near to *Ostrea* and *Lima*, while *Avicula* (*Pteria*) is found under the order *Filibranchia*. F. BERNARD,² who has later examined the development of the shell of the gen. *Pinna*, has reached another opinion, though the material at his disposal, as he says, has been very small. The result of his researches is, that the gen. *Pinna* belongs to *Mytilidæ*. The scanty material at my disposal prevents me from entering more fully into the question.

Fam. Spondylidae.

Spondylus Sinensis, Sow.

Spondylus Sinensis, SOWERBY, Thesaurus Conchyliorum, I, 1847, p. 427, pl. 87, figs. 32–34.

— — — REEVE, Conchol. icon., IX, 1856, *Spondylus*, Sp. 7.

S. of Koh Chuen, 30 fathoms, shells (1). West coast of Koh Chang, 10 fathoms, mud (1 + ²/₂). Between Koh Chuen and Koh Chang, 15 fathoms, mud (¹/₂). E. of Koh Mak, 20 fathoms, mud (1). Between Koh Kut and Koh Kahdat, 10 fathoms, shells (1 + ⁴/₂). S. of Koh Kahdat, 8–10 fathoms, mud (1). W. of Koh Kut, 15 fathoms, mud (2).

Long. 3 mm., alt. 3.5 mm.

— 46 mm., — 56 mm.

Distribution:— Poulo Condor, Cochin China, Annam, China, Japan.

The valves are quite white in one of the specimens from the Gulf of Siam.³

Spondylus coccineus, Lam. (Reeve).

Spondylus coccineus, LAMARCK, Hist. nat. d. anim. s. vert., VI, 1 part., 1819, p. 190, No. 11. — éd. 2, VII, 1836, p. 188, No. 11.

— — — REEVE, Conchol. icon., IX, *Spondylus*, 1856, Sp. 44.

— *ocellatus*, REEVE, Conchol. icon., IX., *Spondylus*, Sp. 43.

¹ A Treatise on Zoology, ed. by E. RAY LANKESTER, V, Mollusca by P. PELSENEER, London 1906, p. 263.

² Recherches ontogén. et morphol. sur la coquille d. Lamellibranches. Annales d. sc. natur. Zoologie, VIII, Paris 1898, pp. 45 et 85–86.

³ Comp. DUNKER, Index moll. mar. Japon., 1882, p. 245.

Koh Chuen, 30 fathoms (on *Pinna hystrix*, Hanl.). Koh Mak, sandy coast (³/₂). North end of Koh Chang, 1 fathom, old coral blocks; a very large specimen (long. 79 mm., alt. 76 mm., crass. 42 mm.). Besides agreeing well with REEVE's figure of *ocellatus* it closely resembles his figure and description of *Sp. spectrum*, Reeve.

Long. 23 mm., alt. 28 mm.

— 13 — — 13 mm.

Distribution:— Singapore (2–3 fathoms, attached to coral reefs; Danish Exp. to Siam), Mauritius and Cargados (*coccineus*, Lam.). — Amboina and Flores (*coccineus*, Reeve), Philippines (*ocellatus*, Reeve, and *coccineus*, Reeve), Torres Strait (*ocellatus*, Reeve), Lifu (*ocellatus*, Reeve).

The specimen taken at Singapore (long. 18 mm., alt. 23 mm.) entirely agrees with *Sp. plurispinosus*, Reeve (v. MARTENS records this species from the Mergui Archipelago); in this specimen, and also in the young specimen from Koh Chuen, the somewhat flattened spines are furnished with a row of small teeth along each of the two sides; these teeth are visible, however, only under the lens, and is found, undoubtedly, only in quite young specimens.

Spondylus maculatus, Chemn., is very closely allied to the present species (I have had CHEMNITZ's original specimen for examination), but as the original specimen is rather worn, no definite conclusion can be drawn at present. It is doubtful whether REEVE's *coccineus* is identical with LAMARCK's species of the same name. v. MARTENS¹ states that *coccineus*, Reeve, is identical with *Spondylus zonalis*, Lam. (For further details see *S. spectrum*, Reeve).

Spondylus spectrum, Reeve.

Spondylus spectrum, REEVE, Conchol. icon., IX, 1856, *Spondylus*, Sp. 49.

— *fragum*, REEVE, Conchol. icon., IX, 1856, *Spondylus*, Sp. 61.

East of Koh Chuen, 9–10 fathoms, shells (¹/₂).

Long. 38 mm., alt. 43 mm.

Distribution:— Poulo Condor, Philippines.

After having examined REEVE's original specimens in the British Museum, I have put *S. spectrum* = *S. fragum*. Without doubt several others are synonymous with these species, for instance, *camurus*, Reeve, *castus*, Reeve, and others; and perhaps it will be proved, when these highly variable forms have been more closely examined, that the numerous species from the Philippines and the surrounding waters (for instance, *S. mus*, Reeve, *S. tenuispinosus*, Sow., *S. ducalis*, Ch., *S. zonalis*, Lam., *S. virgineus*, Reeve, *S. ocellatus*, Reeve, *S. coccineus*, Lam., *S. fragilis*, Sow., *S. Nicobaricus*, Ch., *S. aurantius*, Lam., *S. variegatus*, Ch., and others), in which the young valves are ornamented with dark dots and spots, but later on have a very different sculpture and colour-ornamentation, are only varieties of the same form. I have at my disposal, a very considerable quantity of material of the West Indian

¹ Rumphius Gedenkboek, 1902, Die Mollusken, p. 128 (20).

species *S. spathuliferus*, Lam., which presents an almost incredible variability concerning the colour-ornamentation, and the occurrence and arrangement of spines, spatulate scales, etc.; but they may all be at once recognized by the characteristic colours and appearance of the young valve which is insensible to other influences. With such an example for consideration, I think it very probable that my supposition concerning the relationship between some of the East Indian forms, will prove to be right.

Spondylus Layardi, Reeve.

Spondylus Layardi, REEVE, Conchol. icon., IX, *Spondylus*, 1856, Sp. 66.

Strand of Koh Kahdat ($1\frac{1}{2}$).

Long. 27 mm., alt. 26 mm.

Distribution:— Ceylon (CUMING), Gulf of Manaar (THURSTON, STANDEN & LEICEISTER).

Plicatula imbricata, Menke.

Plicatula imbricata, MENKE, Molluscor. Novae Hollandiae specim., 1843, p. 35, No. 196.

— — — HANLEY, Catalogue of recent bivalve shells, p. 288.

— — — SOWERBY, Thesaurus Conchyl., I, p. 437, No. 6, pl. 90, fig. 6; pl. 91, figs. 15—18.

— — — SOWERBY in REEVE, Conchol. icon., XIX, 1874, *Plicatula*, Sp. 4.

— *chinensis*, MÖRCH, Catal. conch. quæ reliq. Yoldi, II, 1853, p. 61, No. 766.

Between Koh Rin and Cliff Rock, 15 fathoms ($2\frac{1}{2}$). Koh Kram, 30 fathoms (1). N. of Koh Kam, 5 fathoms, gravel ($1\frac{1}{2}$). Off Koh Kam, 10 fathoms, gravel (1). North side of Koh Mesan, 10—15 fathoms, stones ($1 + 2\frac{1}{2}$). Between Koh Mesan and Cape Liant, 5—9 fathoms ($2\frac{1}{2}$). Between Koh Mesan and Koh Chuen, 25—38 fathoms, stones and shells (2). Koh Chuen, 10—30 fathoms ($1 + 2\frac{1}{2}$). E. of Koh Chuen, 9—10 fathoms, shells ($1\frac{1}{2}$). S. of Koh Chuen, 30 fathoms, shells ($1 + 3\frac{1}{2}$). Gulf of Rayong, 7—10 fathoms, sand, mud, shells ($2\frac{1}{2}$). North end of Koh Chang, 1 fathom, old coral blocks ($1\frac{1}{2}$). Between Koh Kut and Koh Kahdat, 10 fathoms, shells (2).

Long. 7 mm., alt. 8 mm. — long. 28 mm., alt. 33 mm.

Distribution:— Singapore (Danish Exp. to Siam, and Sv. GAD), Andamans (MELVILL & SYKES), Aden (SHOPLAND), Gulf of Tadjourah (GRAVIER, ANTHONY), Ile Cameran, subfossil (JOUSSEAUME), Mascarenes (v. MARTENS). — China (HANLEY), Philippines (SOWERBY), Amboina? (EDG. SMITH), Torres Strait (MELVILL & STANDEN), West Australia (MENKE, HANLEY), Port Jackson and Port Stephens (ANGAS), Funafuti Atoll? (HEDLEY). (SOWERBY records it also from Honduras Bay).

The species belonging to the genus *Plicatula*, owing to their great variability, are exceedingly difficult to define and to characterize. Hence, numerous species have been established which cannot be maintained and many erroneous determinations have been made, which have resulted in the records of the geographical distribution of the species frequently becoming quite misleading. Thus *Pl. spondyloidea*, Meusch. (= *Pl. ramosa*, Lam.),¹ has been recorded, e. g. from: Aden (JOUSSEAUME),

¹ *Pl. spondyloidea*, Meusch. = *Pl. ramosa*, Lam. = *Barbadensis* (Petiv.), d'Orb. = *plicata*, Chemn. = *cristata*, Lam. = *reniformis*, Lam. = *gibbosa*, (Lam.) Sow. = *marginata*, Say.

the Red Sea (STURANY, PAGENSTECHER, and others), Suez (VAILLANT), Mauritius (v. MARTENS), Mozambique (PETERS), Querimba Isl. (v. MARTENS), Poulo Condor? (ROCHEBRUNE, *P. reniformis*, Lam.), China (MITCHELL), Lord Hood's Isl. (SOWERBY), and also from the east coast of North, Central, and South America, from Cape Hatteras to Patagonia (D'ORBIGNY, MÖRCH, KREBS, SOWERBY, ADAMS, PAGENSTECHER, DALL, EDG. SMITH, BEAU, and others). — It will doubtless be proved later, that several of the species closely allied to *P. imbricata*, Mke., are synonymous with it, e. g. *P. depressa*, Lam. (from Singapore and Mergui Isl., v. MARTENS¹), *P. Novae Zelandiae*, Sow. (New Zealand), *P. Essingtonensis*, Sow. (Port Essington), *P. Philippinarum*, Hanl. (Philippines, SOWERBY; Red Sea, COOKE; Hong-kong, FRAUENFELD), *P. Ceylanica*, Sow. (Ceylon), *P. Australis*, Lam.² (Philippines, HANLEY; Australia, LAMARCK, HEDLEY), *P. horrida*, Dunk. (Japan and China, DUNKER), *P. aculeata*, Sow., and others. — Among the specimens from the Gulf of Siam several individuals occur, which agree both with the figure given by REEVE (Pl. 1, Fig. 4c) and that by SOWERBY (Pl. 90, Fig. 6), they bear a very close resemblance to corresponding individuals of *P. spondyloidea*, Meusch., from St. Thomas.

Fam. Pectinidae.

Pecten pyxidatus, Born.

- Ostrea pyxidata*, BORN, Testacea Musei Cæsarei Vindobon., 1780, p. 108, pl. 6, figs. 5–6.
Pecten pyxidatus, — REEVE, Conchol. icon., VIII, *Pecten*, Sp. 96.
 — — — MARTINI u. CHEMNITZ, Conchyl. Cabin., VII, 2 Abth., p. 57, pl. 15, figs. 5–6; pl. 35, figs. 1–2.
 — — — FISCHER, Catalogue d. Moll. de l'Indo-Chine, p. 209.
 — *crebricostatus*, PHILIPPI, Abbild. u. Beschreib. neuer od. wen. gekannt. Conchylien, I, p. 100 (2), pl. 1, fig. 2.

Common from Koh Lan to Koh Kut, 6–30 fathoms, mud and clay.

Gulf of Siam, west coast of Cambodja (CROSSE & FISCHER).

Long. 8–36 mm.

Distribution:— Singapore (2–3 fathoms, coral reef, Dr. MORTENSEN), Mergui Archip., Andamans, Tranquebar, Gulf of Manaar, Persian Gulf, Gulf of Oman. — Annam, China, Philippines.

Pecten senatorius, Chemn. (Gmel.).

- Pallium senatoris*, CHEMNITZ, Conchyl. Cabin., VII, p. 320, pl. 65, fig. 617.
Ostrea senatoria, GMELIN, Syst. Nat., ed. XIII, 1790, p. 3327, No. 61.
Pecten senatorius, — REEVE, Conchol. icon., VIII, *Pecten*, Sp. 81.
 — — — MARTINI u. CHEMNITZ, Conchyl. Cabin., VII, 2 Abth., pp. 63 and 83, pl. 16, fig. 7; pl. 21, fig. 4.
 — — — EDG. A. SMITH, Challenger Report, Lamellibranchiata, 1885, p. 300.

¹ LIENARD records it from Mauritius, but v. MARTENS considers it (in: Mollusken d. Maskarenen u. Seychellen, p. 137) to be “wahrscheinlich amerikanisch.”

² non *P. Australis*, Krauss (from Natal) = *multiplicata*, Desh.

Among the *Pecten*-species this was the one which was taken most frequently; from Koh Rin to Koh Kut in 5—38 fathoms, on a bottom of mud and shells.

Long. 4—67 mm.

Distribution:— As the question regarding the variations in form of the present species has not yet been quite settled, its distribution cannot be given with any certainty, but the following localities may doubtless be regarded as certain:— Salanga, Mergui Archip., Madras, Gulf of Manaar, Bombay, Karachi, Persian Gulf, Maldive Archip., Gulf of Aden, Red Sea, Gulf of Suez, Mauritius, Inhambane (SE. Africa). — Philippines, China, Japan, Blitang (post-tertiary), Moluccas, Torres Strait, Mast Head Reef (Queensland), New Caledonia.

The considerable variations in form, to which the present species is subject, have caused that an enormous number of different names has been given to it. EDG. A. SMITH¹ has enumerated a large number of these forms, most of which can scarcely be regarded as varieties. The large quantity of material brought home from the Gulf of Siam shows plainly the variability of the species, both as regards sculpture and colour. The form *porphyreus*, Chemn.,² occurs most frequently; there are developed upon it, when the individuals have reached a certain size, smaller ribs on each side of the main ribs, which thereby become tripartite; the whole surface is closely covered with scale-sculpture; this form strongly recalls *P. asperrimus*, Lam. (*P. australis*, Sow.). I have compared CHEMNITZ's original specimen of *P. porphyreus*, which is in the Zoological Museum of the University of Copenhagen, with the specimens from the Gulf of Siam; they correspond in all respects with the latter. E. v. MARTENS³ distinguishes, but scarcely correctly, between *P. porphyreus*, Chemn. (= *P. senatorius*, Reeve, non Chemn.), and *P. senatorius*, Chemn.; these forms cannot be kept distinct from each other, as transitional forms occur. In the Gulf of Siam are found specimens, some with quite smooth ribs, and others with strong scale-sculpture on all the ribs. BAVAY⁴ thinks that *P. splendidulus*, Reeve, belongs to the variety-series of *P. senatorius*.

Pecten rugosus, Sow.

(Pl. III, Figs. 1—2).

Pecten rugosus, SOWERBY, Thesaurus Conchyl., I, *Pecten*, p. 66, No. 64, pl. 19, fig. 226.

— — — REEVE, Conchol. icon., VIII, *Pecten*, Sp. 144.

— — — MARTINI u. CHEMNITZ, Conchyl. Cabin., VII, 2 Abth., p. 232, pl. 61, fig. 8.

¹ Zoology of the voyage of H. M. S. Challenger. Report on the Lamellibranchiata, p. 300.

² I have at my disposal several specimens from the Gulf of Siam which correspond exactly with the figure in SAVIGNY, Iconographie d. Mollusques de l'Egypte, pl. 13, fig. 5, 2 of '*Pecten australis*, Sowerby' (ISSEL, Malacol. d. Mar Rosso, p. 372). In my opinion this figure represents most closely a very well-preserved individual of *P. senatorius*, Ch. var. *porphyreus*, Ch.

³ Die Mollusken d. Maskarenen u. Seychellen, 1880, p. 138. — Journ. of the Linnean Soc., Zoology, vol. 21, 1887, p. 202. — Rumphius Gedenkboek, 1902. Mollusken, p. 126 (18).

⁴ Bull. du Museum d'Hist. Nat. Paris, 1904, p. 366.

S. of Koh Chuen, 30 fathoms, shells ($1/2$). From Koh Chuen to Koh Chang, 15 fathoms, mud ($4/2$). S. of Koh Bidang, 9 fathoms, shells ($2/2$). E. of Koh Mak, 20 fathoms, mud ($2/2$). Between Koh Kut and Koh Kahdat, 10 fathoms, shells ($1 1/2$). W. of Koh Kut, 15 fathoms, mud ($6/2$).

Long. 7—25 mm., alt. 8—26 mm. (1 specimen long. 22 mm., alt. 25 mm.).

Distribution:— Philippines.

I am relying upon ED. V. MARTENS'S identification, in referring these forms to *P. rugosus*, Sow.; as may be seen from my figures, the forms in question are very different from those of SOWERBY (REEVE). In my specimens, the intercostal parts are not always smooth, but are often irregularly striated. EDG. SMITH considers *P. rugosus*, Sow., to belong to a series of forms which will probably prove to be varieties of *P. senatorius*, Ch. Young specimens are in many cases difficult to distinguish from the young of *P. senatorius*, Ch.

Pecten Singaporinus, Sow.

Pecten Singaporinus, SOWERBY, Thesaurus Conch., I, p. 74, pl. 13, fig. 55; pl. 14, fig. 71.

— — — REEVE, Conchol. icon., VIII, *Pecten*, Sp. 74.

— — — MARTINI U. CHEMNITZ, Conchyl. Cabin., VII, 2 Abth., p. 94, pl. 25, figs. 2—4.

— — — P. FISCHER, Catalogue d. Moll. de l'Indo-Chine, p. 209.

The coast of Lem Ngob ($4/2$).

Long. 23—48 mm., alt. 25—51 mm.

Distribution:— Singapore, Madras, Gulf of Manaar, Bombay, Gulf of Aden. — Annam, Hong-kong, Port Curtis (East Australia).

EDG. A. SMITH¹ considers *P. pica*, Reeve (from New Zealand), and *P. Cumingii*, Reeve (from Moreton Bay), to be identical with the present species. PILSBRY,² has described from Japan an allied form, with fewer ribs, under the name of *P. Awajiensis*.

Pecten cretatus, Reeve.

Pecten cretatus, REEVE, Conchol. icon., VIII, 1853, *Pecten*, Sp. 129.

— — — MARTINI U. CHEMNITZ, Conchyl. Cabin., VII, 2 Abth., p. 172, pl. 47, figs. 8—9.

North of Koh Kahdat, 4—5 fathoms, coarse sand ($1/2$). Between Koh Kut and Koh Kahdat, 10 fathoms, shells ($1 1/2$).

Long. 5—7 mm. (long. 7 mm., alt. 7 mm.).

Distribution unknown.

Pecten nux, Reeve.

Pecten nux, REEVE, Conchol. icon., VIII, 1853, Sp. 143 (see Sp. 149).

N. of Koh Kahdat, 4—5 fathoms, coarse sand ($1/2$).

Long. 7 mm., alt. 7 mm.

¹ Report on the zool. collect. made during the voyage of H. M. S. "Alert." Lond. 1884, p. 115.

² Proc. Acad. Nat. Hist. Philadelphia, 1905, p. 121.

Distribution:— Maldive Archip. (EDG. SMITH). — Nukahiva, Marquesas Isl. (REEVE).

P. sugillatus, Reeve, is closely allied to the present species.

Note. *Pecten hybridus*, Gmel. (*P. squamosus*, Gmel.), was taken by the Danish Expedition at Singapore in 2—3 fathoms, on coral-reefs.

Pecten (Pallium) plica L.

Ostrea plica, LINNÉ, Systema Nat., ed. X, 1758, p. 697, No. 162. — ed. XII, p. 1145, No. 192. — Mus. Ludov. Ulr. Reg., p. 526, No. 106.

Pecten — — REEVE, Conchol. icon., VIII, *Pecten*, Sp. 16.

— — — MARTINI u. CHEMNITZ, Conchyl. Cabin., VII, 2 Abth., pp. 53 and 96, pl. 14, figs. 3—4; pl. 26, fig. 4.

— *plicatus*, CHEMNITZ, Conchyl. Cabin., VII, p. 292, pl. 62, fig. 598.

E. of Cape Liant, 9 fathoms, shells (1). S. of Koh Chuen, 30 fathoms, shells (2). Long. 41—42 mm., alt. 44—46 mm.

Distribution:— Nicobars, Ceylon and Gulf of Manaar, Persian Gulf, Gulf of Oman, Maldive Archip., Gulf of Aden, Red Sea and Gulf of Suez. — China Sea, Japan (Nagasaki).

Pecten subplicatus, Sow.

Pecten subplicatus, SOWERBY, Thesaurus Conch., I, 1842, p. 64, pl. 13, fig. 37; pl. 14, figs. 72, 73 and 81.

— — — REEVE, Conchol. icon., VIII, *Pecten*, Sp. 17.

— — — MARTINI u. CHEMNITZ, Conchyl. Cabin., p. 157, pl. 44, figs. 3—5.

Koh Kram, 30 fathoms (1). North side of Koh Mesan, 10—15 fathoms, stones (1). 1 mile south of Koh Chuen, 30 fathoms, shells ($1/2$). Koh Kahdat, 1 fathom, sand ($1/2$). Between Koh Kut and Koh Kahdat, 10 fathoms, shells ($1/2$). N. of Koh Kut, 15 fathoms, mud ($1/2$).

Long. 15—30 mm., alt. 15—33 mm.

Distribution:— Gulf of Aden. — South Japan, Philippines, Moluccas, Celebes.

Pecten velatinus, Sow., in my opinion is identical with the present species.¹

Pecten fulvicostatus, A. Adams & Reeve.

Pecten fulvicostatus, A. ADAMS & REEVE, Mollusca of the voyage of H. M. S. Samarang, 1848, p. 74, pl. 21, fig. 11.

— — — REEVE, Conchol. icon., VIII, *Pecten*, Sp. 123.

— — — MARTINI u. CHEMNITZ, Conchyl. Cabin., VII, 2 Abth., p. 226, pl. 60, fig. 6.

— *Dringi*, REEVE, Conchol. icon., VIII, 1853, *Pecten*, Sp. 152.

— — — MARTINI u. CHEMNITZ, Conchyl. Cabin., VII, 2 Abth., p. 207, pl. 55, figs. 7—8.

— *luculenta*, REEVE, Conchol. icon., VIII, 1853, *Pecten*, Sp. 59.²

— *luculentus*, — MARTINI u. CHEMNITZ, Conchyl. Cabin., VII, 2 Abth., p. 170, pl. 47, fig. 3.

¹ KÜSTER has expressed the same opinion in his Monograph of *Pecten* in MARTINI & CHEMNITZ, loc. cit. p. 96.

² A. H. COOKE, Ann. and Mag. Nat. Hist., Ser. 5, vol. 17, p. 134. — BAVAY, Bull. du Muséum d'Hist. Nat. Paris, 1904, p. 366.

Koh Kram, 20—30 fathoms (4). Between Koh Mesan and Cape Liant, 9 fathoms (1). South of Koh Chuen, 30 fathoms, shells (1). Between Koh Mesan and Koh Chuen, 25—38 fathoms (1).

Long. 9—19 mm., alt. 10—23 mm.

Distribution:— Gulf of Aden (*luculentus*, Reeve var.), Red Sea. — Sulu Archip., North Australia, Bathurst Isl. (north-west coast of Australia), Port Molle (Queensland), Cape Capricorn (East Australia), Paumotu Isl.

Pecten (Vola) Sannionis, Chemn.

Pallium Sannionis, CHEMNITZ, Conchyl. Cabin., VII, p. 313 (p. p. synonym.), pl. 65, fig. 614.

Pecten spectabilis, REEVE, Conchol. icon., VIII, 1853, Sp. 128.

— — — MARTINI u. CHEMNITZ, Conchyl. Cabin., VII, 2 Abth., p. 61, pl. 16, fig. 3.

— — — DUNKER, Index molluscor. mar. Japon., 1882, p. 241, pl. XI, figs. 12—13.

— *histrionicus*, GMELIN var., PETIT, Journ. de Conchyl., IV, 1853, p. 150; pl. 5, fig. 2.

Koh Chuen, 9—38 fathoms, shells (1 + ²/₂). Between Koh Kut and Koh Kahdat, 10 fathoms, shells (¹/₂).

Long. 22—30 mm.

Distribution:— Mauritius (ROBILLARD). — Japan, Nagasaki (LISCHKE, DUNKER).

CHEMNITZ'S original specimen exists in the Zoological Museum of the University of Copenhagen; on comparing it with the specimens from the Gulf of Siam,¹ it will be seen that the colouring in the latter is less variegated and conspicuous, but the shape and the characteristic hollow ring-sculpture on the ribs are the same. I have re-introduced CHEMNITZ'S name, hitherto ignored, which has the priority. The species *P. histrionicus*, which was afterwards established by GMELIN, and which is moreover badly characterized (REEVE'S figure and description also scarcely represent the species correctly), needs to be more thoroughly investigated on the basis of a greater quantity of material than has hitherto been the case.

Pecten (Chlamys) madreporarum, Petit (Sow.).

Pecten madreporarum, PETIT, SOWERBY, Thesaurus Conch., I, p. 68, pl. 14, fig. 68.

— — — REEVE, Conchol. icon., VIII, *Pecten*, Sp. 117.

— — — MARTINI u. CHEMNITZ, Conchyl. Cabin., VII, 2 Abth., p. 131, pl. 36, fig. 6.

— — — P. FISCHER, Catal. d. Moll. de l'Indo-Chine, p. 209.

— — — SOWERBY, CH. HEDLEY, Australian Museum, Sydney, Memoir III, 1896—1900, p. 494.

North end of Koh Chang, 1 fathom, old coral blocks (³/₂).

Long. 20 mm., alt. 24 mm.

Distribution:— Singapore, Poulo Condor, Philippines, Java, New Guinea, Torres Strait, North-east Australia, Fitzroy Isl., New Caledonia, Funafuti (Ellice Isl.).

Amussium paucilirata, Smith.

Amussium paucilirata, EDG. SMITH, The Fauna and Geography of the Maldive and Laccadive Archipelagoes II, 1903, p. 622, No. 301, pl. 36, figs. 23—24.

¹ These correspond exactly with DUNKER'S figures in "Index moll. mar. Japon," loc. cit.

West of Koh Kut, 30 fathoms, sand and mud ($1/2$).

Long. 6 mm., alt. 6 mm.

Distribution:— S. Nilandu Atoll (Maldive Isl.).

In the collections of the Danish Expedition from the Gulf of Siam only one small, transparent, white valve, the left, is found; in this the interior posterior lira is very slightly developed.

Amussium pleuronectes L.

Ostrea pleuronectes, LINNÉ, Systema Nat., ed. X, 1758, p. 696. — ed. XII, p. 1145, No. 190. — Mus. Ludov. Ulr. Reg. 1764, p. 524.

Pecten — — MARTINI u. CHEMNITZ, Conchyl. Cabin, VII Bd., 2 Abth., p. 49, pl. 13, fig. 4.
— — — REEVE, Conchol. icon., VIII, *Pecten*, Sp. 48.

Commonly distributed from Koh Lan to Koh Kut, 8–30 fathoms, mud.

Long. 7–87 mm.

Distribution:— Andamans, Madras, Negapatam, Ceylon. — Poulo Condor, China, Formosa, Japan, Philippines, Moluccas, Java, New Guinea, Torres Strait, Flinders and Clairmont Isls. (North-east Australia).

The number of the internal ribs in the valves varies greatly, therefore *Amussium Balloti*, Bernardi,¹ can scarcely be maintained as a distinct species.

Order Eulamellibranchiata.

Fam. Limidae.

Lima (*Mantellum*) *fragilis*, Chemn.

Pecten fragilis, CHEMNITZ, Conchyl. Cabin., VII, 1784, p. 349, pl. 68, fig. 650.

Lima — — SOWERBY, Thesaurus Conchyl., I, 1847, p. 86, No. 14, pl. 22, figs. 34–37.

— — — REEVE, Conchol. icon., vol. 18, *Lima*, Sp. 18.

— — — P. FISCHER, Catalogue d. Mollusques de l'Indo-Chine, p. 210.

Koh Kram, 30 fathoms ($1/2$). Gulf of Rayong, 7–10 fathoms, sand, mud ($2/2$).
Between Koh Chuen and Koh Mesan, 15 fathoms, mud ($1/2$). S. of Koh Kahdat,
8–10 fathoms, mud ($1/2$). Koh Kahdat ($1/2$). S. of Koh Mak, 5–6 fathoms ($1/2$).

Long. 5–15 mm., alt. 8–26 mm.

Distribution:— Singapore, Mergui Archip., Nicobars, Persian Gulf, Laccadive and Maldive Archip., Suez, Mauritius, Mozambique. — Poulo Condor, Philippines, Amboina, New Guinea, Timor, Sorong, Torres Strait, North and East Australia,

¹ Journ. de Conchyl., IX, 1861, p. 46.

New Caledonia, Sandwich Isls., Fiji Isls., Funafuti (Ellice Isl.), Gilbert Isls., Society Isls.

Several authors (E. v. MARTENS, and others) give *L. linguatula*, Lam., as a synonym of the present species.

Lima (Mantellum) angulata, Sow.

Lima angulata, SOWERBY, Thesaurus Conchyl., I, 1843, p. 86, No. 12, pl. 22, figs. 39–40 (and as *L. aperta*, fig. 29).

— — — REEVE, Conchol. icon., vol. 18, *Lima*, Sp. 13.

Radula (Mantellum) angulata, SOW., ANGAS, Proc. Zool. Soc. London, 1865, p. 656.

Lima angulata, SOW., EDG. SMITH, Lamellibranchiata of the Challenger Exped., p. 289.

— *orientalis*, ADAMS and REEVE, The Zoology of the voyage of "Samarang." Mollusca, 1848, p. 75, pl. 21, fig. 7.

Radula (Mantellum) orientalis, ADAMS & REEVE, ANGAS, Proc. Zool. Soc. London, 1871, pl. 101.

Lima Basilanica, ADAMS & REEVE, op. cit., p. 75, pl. 21, fig. 6.

Koh Kram, 30 fathoms (1). Koh Mesan, 15 fathoms, stones ($1\frac{1}{2}$). Between Koh Mesan and Cape Liant, 5–9 fathoms, sand ($1\frac{1}{2}$). S. of Koh Chuen, 30 fathoms, shells (2). North of Koh Chang, 1 fathom, old coral blocks (1). N. of Koh Kahdat, 4–5 fathoms, coarse sand ($2\frac{1}{2}$ dead). Koh Kahdat, 1 fathom, sand ($2\frac{1}{2}$ dead). S. of Koh Mak, 5–6 fathoms ($1\frac{1}{2}$).

Long. 5–17 mm., alt. $6\frac{1}{2}$ –26 mm.

Distribution: — Madras, Gulf of Manaar. — Philippines, North, East, and South Australia, New Caledonia, New Zealand, Funafuti (Ellice Isl.). Recorded also from Panama and the Bay of Carracas by CUMING and CARPENTER.

Lima (Mantellum) dentata, Sow.

Lima dentata, SOWERBY, Thesaurus conchyl., I, 1843, p. 87, No. 17, pl. 22, figs. 30–31.

— — — REEVE, Conchol. icon., vol. 18, *Lima*, Sp. 14.

— — — HANLEY, Catalogue of rec. biv. shells, p. 268.

North end of Koh Chang, 1 fathom, old coral blocks (8). Koh Kahdat, 1–5 fathoms, sand, and stones (1).

Long. 11 mm., alt. 20 mm. (sp. maj.).

— 4 mm., — 8 mm. (sp. min.).

Distribution unknown.

Note. *Lima squamosa*, Lam., was taken by the Danish Expedition at Singapore, on coral reefs, in 2–3 fathoms (two specimens; long. 12–27 mm., alt. 16–37 mm.).¹ The "*Radula squamosa*, Lam., var. ? *interlirata*" mentioned by MØRCH² is founded on an

¹ For further details regarding this species consult: — LISCHKE, Japanische Meeres-Conchylien, I, pp. 162–64; II, pp. 155–56. — E. v. MARTENS, Rumphius Gedenkboek. Mollusken, 1902, p. 18. (*Lima Sowerbyi*, Dsh.). — BUCQUOY, DAUTZENBERG et DOLLFUS, Les Mollusques marins du Roussillon, II, p. 51. (*Radula lima* L.) — EDG. SMITH, Lamellibranchiata of the Challenger Expedition, p. 287. — MELVILL & STANDEN, Journ. of the Linn. Soc. Zoology, vol. 27, p. 182. — TAPPARONE CANEFRI, Annali d. Mus. Civ. di St. Nat. di Genova, IX, 1876–77, p. 300.

² Catalogue conchyl. quæ reliq. com. de Yoldi, II, 1853, p. 57. The original specimen is in my collection.

older individual of *L. squamosa*, Lam., in which have developed, between some of the central ribs towards the ventral margin, very slight indications of a rib; the lines of growth also are somewhat prominent; these being individual characters, the form can by no means be maintained as a variety.

Fam. Ostreidae.

Ostrea cucullata, Born.

Ostrea cucullata, BORN, Testacea Musei Caesarei Vindobon., 1780, p. 114, pl. VI, figs. 11—12.

var. *Barclayana*, Sowerby.

REEVE, Conchol. icon., XVIII, 1871, *Ostræa*, Sp. 77.

Koh Chang, on stones at the strand (many specimens). Coast of Lem Ngob (2).
Coast of Koh Kahdat (1).

Long. 35 mm., alt. 42 mm.

var. *Forskåli*, Chemnitz.

Conchyl. Cabin., VIII, 1785, p. 30, pl. 72, fig. 671.

South of Koh Chuen, 30 fathoms, shells ($1\frac{1}{2}$). Coast of Koh Chang (2).

Long. 37 mm., alt. 55 mm.

“Bangkok” (Coll. DAUTZENBERG).

Young individuals of both forms were found in several places in the Gulf of Siam. Ed. v. MARTENS records¹ that he has taken numerous specimens of *O. cucullata*, Born, at Bangpra in the Gulf of Siam.

Distribution:—Salanga, Mergui Archip., Nicobars, Ceylon, Bombay, Persian Gulf, Gulf of Aden, Red Sea, Suez, Mozambique, Querimba Isls., Mascarenes, coast of Natal, Ascension Isl. — Poulo Condor, Cochin China, China, Formosa, Loo-Choo Isls., Japan, Philippines, Sumatra, Moluccas, Timor, Thursday Isl., Mast Head Reef (Queensland), South Australia (? ANGAS), Viti Isls., New Zealand.

DESHAYES,² characterizes this oyster very correctly when he says that it “aurait mérité le nom de multiformis” because its variability is exceedingly great, and consequently, as may be expected, it has an endless number of synonyms;³ to these the following, besides many others, may doubtless be added:—*O. circumscuta*, Gould,⁴ *O. attenuata*, Sow.,⁵ and perhaps *O. vitrefacta*, Sow.⁶ Specimens of *O. cucul-*

¹ Zoolog. Ergebnisse ein. Reise in Niederl. Ost-Indien hrsg. v. M. WEBER, IV, 1897, p. 223.

² Catal. d. Mollusques de l'île de la Réunion, 1863, p. 36.

³ For further details cf. PAGENSTECHEER, Ueber d. v. R. KOSSMANN am Rothen Meere gesamm. Mollusken, 1877, pp. 16—24. — STURANY, Lamellibranchiaten d. Rothen Meeres, 1899, p. 37. — LISCHKE, Japanische Meeres Conchyl., II, p. 161. — COOKE, Ann. and Magaz. Nat. Hist., Ser. 5, vol. 17, p. 134.

⁴ GOULD, Unit. States Explor. Expedit., pl. 43, fig. 576. — REEVE, Conchyl. Cabin., XVIII, *Ostrea*, Sp. 64. Why REEVE records “Massachusetts?” as its habitat is difficult to understand, as GOULD (Proc. Boston Soc. of Nat. Hist., 1850, p. 346) says that his species was found in the “Feejee and Samoa Islands.” ANGAS (Proc. Zool. Soc. London, 1867, p. 934) records it from Botany Bay.

⁵ REEVE, loc. cit. Sp. 49.

⁶ REEVE, loc. cit. Sp. 80.

lata, Born (and var. *Forskåli*, Chemn.), were taken in Pliocene Deposits in Egypt "in the Lake Deposits of Wadi Natrun at the hill known as Moluk."¹

Ostrea hyotis L.

Mytilus Hyotis, LINNÉ, Syst. Nat., ed. 10, 1758, p. 704, No. 207. — ed. 12, p. 1155, No. 244. — Mus. Ludov. Ulr., p. 538, No. 129.
Ostrea hyotis, — REEVE, Conchol. icon., XVIII, 1870, *Ostrea*, Sp. 7.

Var. *imbricata*, Lamarck.

Ostrea imbricata, LAMARCK, Hist. nat. d. anim. s. vert., VI, 1 part. 1819, p. 215, No. 46. — éd. 2, VII, 1836, p. 235, No. 46.
Ostrea — — REEVE, Conchol. icon., XVIII, *Ostrea*, Sp. 36.

Koh Kram, 30 fathoms (¹/₂). S. of Koh Chuen, 30 fathoms, shells (³/₂). Coast of Lem Ngob (1). S. of Koh Kahdat, 8—10 fathoms, mud (1). E. of Koh Mak, 20 fathoms, mud (1) (Singapore; Sv. GAD. ¹/₂).

Specimen from Koh Kram: long. 74 mm., alt. 46 mm.

— — Koh Kahdat: long. 33 mm., alt. 49 mm.

— — Koh Chuen: long. 21 mm., alt. 24 mm.

— — Koh Mak: long. 57 mm., alt. 49 mm.

Distribution: — *O. hyotis* has been recorded from: — Ceylon, Gulf of Manaar, Gulf of Aden, Seychelles, Amirantes, Mauritius, Zanzibar. — Poulo Condor, China, Loo Choo Isls., Japan, Philippines, Moluccas, Viti Isls.

O. imbricata has been recorded from: — China, Japan, Java, New Guinea, and by MELVILL & STANDEN from the Persian Gulf and the Mekran coast.

Since DESHAYES (in the second ed. of Lamarck, Anim. s. vert.) wrote regarding *O. imbricata* that "Cette espèce est inutile, elle a été faite avec une variété jaune de la suivante (*O. hyotis*, Ch.); il faudra donc les réunir sous la dénomination d'*Ostrea hyotis*," some later authors have upheld the specific distinctness of both the species (DUNKER, REEVE, PILSBRY), some regard them either as varieties or as the same species (KÜSTER, HANLEY, MØRCH).

O. inermis, Sow., is no doubt synonymous with *O. imbricata*, Lam.

Ostrea rivularis, Gould (Lischke).

Ostrea rivularis, GOULD, Proceed. Boston Soc. Nat. Hist., vol. VIII, 1861, p. 39.
 — — — LISCHKE, Japanische Meeres Conchyl., I, 1869, p. 176, pl. 14, figs. 2—3.

Gulf of Rayong, 7—10 fathoms, sand and mud (¹/₂). S. of Koh Samit, 20 fathoms, mud (¹/₂). Coast of Lem Ngob (1). Sound of Koh Chang, 5 fathoms, soft clay (4). E. of Koh Mak, 20 fathoms, mud (¹/₂). Between Koh Kut and Koh Kahdat, 10 fathoms, shells (one specimen, and some young odd valves). Strand of Koh Kahdat (²/₂) (Singapore, shallow water, one specimen; Sv. GAD).

¹ R. BULLEN NEWTON, On some Pliocene and Post-Pliocene Shells from Egypt (The Geological Magazine. New Ser., dec. IV, vol. 6, 1899, p. 402, pl. 19, figs. 1—5).

Long. 74 mm., alt. 54 mm.

— 59 mm., — 64 mm.

Distribution:— China Sea, Nagasaki, Yaeyama (?).

A few of the specimens collected were attached to Mangrove-roots. Future comparative investigations will doubtless prove that *O. rivularis*, Gould (Lischke), is only a form of a previously known species,¹ but I have thought it right to stop my researches at *rivularis* (with which the specimens from Siam entirely correspond), as a large quantity of material is required to arrive at a reliable conclusion. The whole group (with thin, not folded shell-margin), which includes *O. mytiloides*, Lam., *nigromarginata*, Sow., *tuberculata*, Lam. (= *tubercularis*, Reeve), *Paulucciae*, Crosse (= *palmipes*, Sow.), the collective species *arborea*, Ch. and *parasitica*, Gm. (which constantly reappear), and many more, must, on account of their great variability, and the hitherto very uncritical and superficial treatment to which they have been subjected, be carefully investigated and may, no doubt, be considerably reduced.

Ostrea Paulucciae, Crosse.

Ostrea Paulucciae, CROSSE, Journ. de Conchyl., vol. 17, 1869, p. 188; vol. 18, 1870, p. 108, pl. 2, fig. 5.

Ostræa palmipes, SOWERBY, REEVE, Conchol. icon., vol. 18, 1871, *Ostræa*, Sp. 56.

S. of Koh Tulu, 10 fathoms, sand mixed with mud (²/₂). Sound of Koh Chang, 5 fathoms, soft clay (1). S. of Koh Kahdat, 8–10 fathoms, mud (many young odd valves). Between Koh Kahdat and Koh Kut, 6 fathoms, sand mixed with mud (³/₂). W. of Koh Kut, 15 fathoms, mud (²/₂).

Long. 28 mm., alt. 20 mm.

Distribution:— Annam, China, Philippines.

At Koh Chang (in 5 fathoms, on a soft muddy bottom) a smaller specimen was obtained (long. 15 mm., alt. 18 mm.) which seems to me to agree in all points with *O. pes-tigris*, Hanl.;² it is doubtful whether this form also is entitled to rank as a species.

The specimens from the Gulf of Siam do not correspond exactly with CROSSE'S description as regards colour, as in almost all cases they are white with a few lilac rays or shades.

Note. In MØRCH'S *Catalogus conchyl. quæ reliq. comes de Yoldi*, II, p. 62, No. 783, there is recorded an *Ostrea siamensis*, Yoldi, from "Singapuhra," as it is, however, not described, either there or anywhere else, I cannot state anything regarding that form.

¹ DUNKER (*Index moll. mar. Japon.*, p. 250) refers it to *O. arborea*, Ch.

² Proc. Zool. Soc. London, XIII, 1845, p. 107. Taken by CUMING at Luzon, Philippines. REEVE, *Conchol. icon.*, XVIII, Sp. 78. SOWERBY (*Append. to marine shells of South Africa*, 1897, p. 28) is of opinion that *O. pes-tigris* (REEVE, fig. 78) is synonymous with *O. lacerata*, Hanl. (= *O. lacerans*, REEVE).

Fam. Carditidae.

Cardita variegata, Brug.

- Cardita variegata*, BRUGUIÈRE, Encyclopédie méthodique. Hist. nat. d. vers., I, 1792, p. 407, No. 6, pl. 233, fig. 6 (*C. calyculata*, Lam.).
- — — REEVE, Conchol. icon., I, 1843, *Cardita*, Sp. 3.
- — — KRAUSS, Südafrikan. Mollusken, 1848, p. 13.
- Mytilicardia* — — — DE ROCHEBRUNE, Faune malacol. de la Cochinchine et du Cambodge (Bull. Soc. Philomathique de Paris 1881), p. 12, No. 32.
- Cardita* — — — CLESSIN in MARTINI u. CHEMNITZ, Conchyl. Cabin., X Bd., 1 Abth., 1888, p. 23, No. 43, pl. 3, figs. 8—9, and pl. 11, figs. 5—6.
- — — P. FISCHER, Catalogue d. Moll. de l'Indo Chine, p. 228.
- *calyculata*, LAMARCK (non LINNÉ), Hist. nat. d. anim. s. vert., 2 éd., VI, 1835, p. 431, No. 15.
- — — SOWERBY, Genera of rec. and fossil shells. *Cardita*, figs. 1—2.
- *subaspera*, — Hist. nat. d. anim. s. vert., VI, 1819, p. 25, No. 16. — éd. 2, VI, p. 432, No. 16.
- — — DELESSERT, Recueil de coquilles décr. p. Lamarck, 1841, pl. 11, fig. 9.

“Siam” (P. FISCHER, loc. cit.).

Distribution:— Singapore, Mergui Isls., Nicobars, Ceylon, Gulf of Manaar, Maldive Isls., Ratnagiri, Persian Gulf, Gulf of Aden, Red Sea, Suez, Seychelles, Amirantes, Zanzibar, Natal, Querimba Isls., Mascarenes. — Poulo Condor, China, Yokohama, Philippines, Sulu Isls., Java, Moluccas, Mast Head Reef (Queensland), Port Essington, Samoa Isls., Viti Isls., Lifu.

The Danish Expedition collected no specimens of this species from the Gulf of Siam, but it has been taken at Singapore in shallow water (by Sv. GAD). A. H. COOKE¹ writes: “I cannot separate *radula*, REEVE, from this species.”

Fam. Crassatellidae.

Crassatella radiata, Sow.

- Crassatella radiata*, G. B. SOWERBY, Catalogue of the shells in the collect. of the Earl of Tankerville, 1825, Appendix, p. II, pl. 1, fig. 2.
- — — REEVE, Conchol. icon., I, *Crassatella*, Sp. 12.
- — — MARTINI u. CHEMNITZ, Conchyl. Cabin., X Bd., 1 Abth., p. 14, pl. 6, fig. 2.
- — — CROSSE & FISCHER, Journ. de Conchyl., vol. 40, 1892, p. 76.

Many specimens taken from Koh Lan to Koh Kut, 2—30 fathoms, clay, mud, shells, sand. Very common.

Long. 2—27 mm. (sp. maj. long. 27 mm., alt. 20 mm., crass. 10 mm.).

Gulf of Siam, west coast of Cambodge (PAVIE).

Distribution:— Singapore (Danish Exp. to Siam, 2—3 fathoms), Mergui Archip., Nicobars, Andamans, Gulf of Manaar, off Mangalore (Malabar-Coast), Gulf of Aden, Red Sea.

¹ Annals and Magaz. of Nat. Hist., 1886, p. 101.

Several specimens of a shorter, and ventricose form (long. 18 mm., alt. 13 mm., crass. 9 mm.) were taken at Koh Kahdat (in 1—5 fathoms, on a sandy and stony bottom); a similar form was taken at Koh Mak (in 5—6 fathoms).

Fam. Astartidae.

Carditella pusilla, n. sp.

(Pl. III, Figs. 3—5).

This species is rounded (with the exception of the somewhat prominent beaks), a little inequilateral, dully pellucid, and whitish, (some specimens have brownish-red spots and tints); fairly thick and convex valves, provided with a broad, smooth, heart-shaped lunule, which is distinctly prominent along the middle. The sculpture consists of 12—13 broad, rounded, radiating ribs, which are at least 3 times as broad as the interstices between them, and are covered with close-set, fine, transverse tubercles. The umbones are acute, median in position, well incurved, and inclined over towards the front. There is a single central, strong, acute triangular cardinal tooth in the right valve which fits in between two divergent but smaller teeth in the left. The lateral teeth are distinct on both sides, the anterior in the right valve and the posterior in the left being separated from the outer margin by a deepish groove, the posterior in the former and the front one in the latter being, on the contrary, on the margin. The hinge-plate between the cardinal and the lateral teeth is seen under magnification to be finely transversely striated. The interstices between the ribs, wherever they appear at the margin, make the latter dentate, and these teeth are each provided on the inner side with a small nodule.

Long 2.5 mm., alt. 2.5 mm., crass. 2 mm.

Between Koh Rin and Cliff Rock, 15 fathoms ($3\frac{1}{2}$). Koh Kram, 30 fathoms ($2 + 19\frac{1}{2}$). Koh Mesan, 15 fathoms, stones (2). Between Koh Mesan and Cape Liant, 5—9 fathoms, sand ($4\frac{1}{2}$). Between Koh Mesan and Koh Chuen, 25—38 fathoms, stones ($1 + 4\frac{1}{2}$). Koh Chuen, 10—30 fathoms ($9\frac{1}{2}$). South of Koh Chuen, 30 fathoms, shells ($7\frac{1}{2}$). Koh Kahdat, 1—5 fathoms, sand and stones ($1\frac{1}{2}$).

This species is most nearly related to *Carditella infans*, Edg. Smith, and in my diagnosis I have kept closely to EDG. SMITH'S description of that species, so that by comparing the diagnoses it may be easier to form an idea of the differences between the two species. In the British Museum there is a *Carditella*-form labelled "*Psephis delecta*, A. Ad. (*Gouldia delecta*)" which is closely related to my species, but differs from it specifically.

Carditella pulchella, n. sp.

(Pl. III, Figs. 6—8).

This little species is oval in form, whitish, often ornamented with brownish-red spots which appear most distinctly on the interior of the valves; the shell is

thick and convex. The surface-sculpture consists of 13—14 strong, distinctly prominent, rounded radiating ribs which bear numerous rather close-set, arched scales, and transverse tubercles. The interstices between the ribs are about as broad as the ribs and have close-set, rough folds and lines of growth. The beaks are situated towards the anterior end, they are acute and slope rather suddenly down towards that end, which is rather pointed as compared with the truncated posterior end, towards which the dorsal side descends gradually from the beaks in a straight line. The lunule, which is smooth and oblong, projects a little along the central line. The hinge consists of a single, central, conical, triangular tooth in the right valve, which fits in between two more slender, divergent teeth in the left; the lateral teeth are well developed and equidistant. The hinge-plate between the cardinal and lateral teeth is seen under magnification to be provided with close-set, fine folds and striæ. In the interior the margin is dentate owing to the external ribs projecting there.

Long. 3 mm., alt. 2.5 mm., crass. 2 mm.

Koh Kram, 30 fathoms ($3 + \frac{1}{2}$). Between Koh Mesan and Cape Liant, 5—9 fathoms, sand ($\frac{2}{2}$). Between Koh Rin and Cliff Rock, 15 fathoms ($\frac{2}{2}$). E. of Koh Chuen, 9—10 fathoms, shells (1). Koh Chuen, 10—15 fathoms ($\frac{3}{2}$). Koh Chuen, 30 fathoms ($1 + \frac{1}{2}$). S. of Koh Chuen, 30 fathoms, shells ($1 + \frac{15}{2}$). Koh Kahdat, 1—5 fathoms, sand ($1 + \frac{5}{2}$). N. of Koh Kahdat, 4—5 fathoms, coarse sand ($\frac{1}{2}$). Between Koh Kut and Koh Kahdat, 10 fathoms, shells (1). S. of Koh Kut, 17—20 fathoms, mud ($\frac{1}{2}$).

Singapore, shallow water ($\frac{6}{2}$).

The individuals vary greatly in regard to outline, the position of the umbones, and the sculpture. I am convinced that *Card. pulchella* does not become much larger than the individuals I have before me, because several of the largest specimens are greatly thickened and solid, i. e. increase in size has ceased, and growth is continued only as regards the thickening of the valves. — *Card. pulchella* is most nearly related to *Carditella Torresi*, Edg. Smith, which is, however, larger, and differs in several essential points from my species.

Fam. Cyprinidae.

Trapezium angulatum, Lam.

- Cypricardia angulata*, LAMARCK, Hist. nat. d. anim. s. vert., VI, 1819, p. 28, No. 2. — éd. 2, VI, 1835, p. 438, No. 2.
- — — DESHAYES, Traité élém. de Conchyliologie, II, p. 18, pl. 24, figs. 10—11 (*C. angulosa*, Lam.).
- — — REEVE, Conchol. icon., I, 1843, *Cypricardia*, Sp. 2.
- Trapezium angulatum*, — H. & A. ADAMS, Genera of rec. Mollusca, II, 1858, p. 439, pl. 109, fig. 5 a, b.
- Cypricardia angulata*, — HIDALGO, Fauna malacol. de l. isl. Filipinas, II, 1903, p. 365, No. 462.
- Chama oblonga*, LINNÉ var., CHEMNITZ, Conchyl. Cabin., XI, 1795, p. 238, pl. 203, figs. 1993—94.
- Libitina bicarinata*, SCHUMACHER, Essai d'un nouv. système d. habitations d. vers testacés, 1817, p. 169, pl. 17, fig. 2.

- Cypricardia rostrata*, LAMARCK, Hist. nat. d. anim. s. vert., VI, 1819, p. 28, No. 3. — éd. 2, VI, 1835, p. 439, No. 3.
 — — — REEVE, Conchol. icon., I, 1843, *Cypricardia*, Sp. 3.
Trapezium rostratum, — DUNKER, Index molluscor. mar. Japon., 1882, p. 210.

Koh Kahdat, 1 fathom, sand (2). Koh Mak, sandy coast ($1/2$).
 Long. 11—26 mm.

Distribution:— Andamans, Madagascar, Mauritius, Ile S^t Marie, Natal, Durban. — Philippines, Japan, Aru Isl., Torres Str., Port Denison, Kangaroo Isl. (New Holland), New Caledonia, Boston Isl., Viti Isl.

All the specimens from the Gulf of Siam belong to the form *rostrata*, Lam.

Trapezium vellicatum, Reeve.

- Cypricardia vellicata*, REEVE, Proc. Zool. Soc. London, 1843, p. 195.
 — — — Conchol. icon., I, 1843, *Cypricardia*, Sp. 7.
Trapezium vellicatum, — DUNKER, Index moll. mar. Japon., 1882, p. 210.
 — — — var., EDG. SMITH in Zoolog. Collect. of H. M. S. "Alert," Lond. 1884, p. 97, No. 21.
Libitina vellicata, — MELVILL & SYKES, Proc. Malacol. Soc. London, III, 1898, p. 48.
Cypricardia vellicata, — HIDALGO, Fauna malacol. de l. Isl. Filipin., II, 1903, p. 367, No. 463.
Libitina — — — DAUTZENBERG & FISCHER, Journ. de Conchyl., vol. 53, 1905, p. 213.

Coast of Lem Ngob, shallow water, stones (29). Gulf of Klong Salakpat (4).
 Koh Chang, shallow water, stones (5).

Long. 7—30 mm.

Distribution:— Mergui Archip., Andamans, Bombay, Karachi, Persian Gulf. — Philippines, Tonkin, China, Japan, North Australia (Port Darwin), East Australia (Port Curtis).

In all the specimens from the Gulf of Siam the valves, upon their exterior and interior, are quite white without rays or coloration at the posterior end (in some of the specimens the umbones are purplish-brown). Similar forms have been recorded from the Philippines (CUMING), Japan (DUNKER), and North Australia (COPPINGER).

Coralliophaga coralliophaga, Chemn.

- Chama coralliophaga*, CHEMNITZ, Conchyl. Cabin., X, 1788, p. 359, pl. 172, figs. 1673—74.
 — — — GMELIN, Syst. Nat., ed. XIII, 1790, p. 3305, Nr. 25.
Cypricardia — GMELIN, LAMARCK, Hist. nat. d. anim. s. vert., VI, I, 1819, p. 28, No. 4. — éd. 2, VI, p. 439, No. 4.
 — — — LAMARCK, REEVE, Conchol. icon., I, 1843, *Cypricardia*, Sp. 12.
Coralliophaga coralliophaga, GMELIN, H. & A. ADAMS, Genera of recent Mollusca. pl. 109, fig. 6.
Cypricardia — CHEMNITZ, LISCHKE, Japan. Meeres-Conchyl., II, p. 140.
Lithophagella, — — — v. MARTENS, Journ. Linn. Soc.; Zool., vol. 21, 1887, p. 214, No. 372.
Coralliophaga — GMELIN, VERRILL and BUSH, Trans. Connecticut Acad., X, 1900, p. 520, pl. 63, figs. 9—10.
 — — — CHEMNITZ, HIDALGO, Fauna malacol. d. las isl. Filipinas, II, 1903, p. 369, No. 467.
Cardita dactylus, BRUGUIÈRE, Encyclop. méthod. Vers., I, 1792, p. 412, No. 13.
Coralliophaga dactylus, BRUGUIÈRE, MÖRCH, Catal. conchyl. quæ reliq. Yoldi, II, p. 19, No. 199.

- Trapezium dactylus*, BRUGUIÈRE, H. KREBS, West-Indian mar. shells, 1864, p. 123.
Coralliophaga dactylus, BRUGUIÈRE, P. FISCHER, Moll. de l'Indo-Chine, p. 230.
 — *carditoidea*, BLAINVILLE, Manuel de Malacol. et de Conchyl., 1825, p. 560, pl. 76, fig. 3.
Cypricardia Hornbeckiana, D'ORBIGNY, Moll. de l'île de Cuba, II, 1853, pl. 266, No. 464, pl. 26, figs. 33—34.
 — *gracilis*, SHUTTLEWORTH.
Trapezium — — H. KREBS, West-Indian mar. shells, 1864, p. 123.
Coralliophaga striolata, H. ADAMS, Proc. Zool. Soc. London, 1870, p. 791, pl. 48, fig. 12.
 — *lithophagella*, DUNKER (non LAMARCK), Index moll. mar. Japon., 1882, p. 209.

Koh si Chang (²/₂). Klong Salakpat (1). Koh Chang, 1 fathom, old coral blocks (taken in great numbers). North end of Koh Chang, 1 fathom, old coral blocks (²/₂). Koh Kahdat, 1 fathom, sand (1).

Long. 2—32 mm.

Distribution:— Mergui Isl., Aden, Red Sea, Mauritius. — Poulou Condor, Philippines, Japan, Yap Isl., Uvea (Wallis Isl.), Lord Howe's Isl. — East coast of America: Florida (Cedar Keys), Greater and Lesser Antilles.

A. H. COOKE is of opinion that REEVE'S *C. laminata* is probably synonymous with *C. coralliophaga*, Chemn. — Several of the specimens from the Gulf of Siam (at any rate the individual which was taken alive at Koh Kahdat, on a sandy bottom) convey the impression of not always boring in corals. It is a characteristic mark of distinction in this species that it has, on both apices, a small, dark stripe, which occurs in the specimens from both American and Asiatic waters.

Fam. Lucinidae.

Lucina (*Thyasira*) *edentula* L.

- Venus edentula*, LINNÉ, Syst. Nat., ed. X, 1758, p. 689, No. 122. — ed. XII, p. 1135, No. 146. — Mus. Ludov. Ulr., 1764, p. 508, No. 74 (non *L. edentula*, LAMARCK).
Lucina — — PHILIPPI, Zeitschr. f. Malakozool., 1845, p. 179.
 — — — — — Abbild. u. Beschreib. neuer od. wen. gek. Conchyl., II, 1847, p. 205, pl. 1, fig. 1.
 — — — — — DUNKER, Index molluscor. mar. Japon., 1882, p. 216, pl. 8, figs. 7—8.
 — (*Anodontia edentula* L., v. MARTENS, Journ. Linn. Soc., Zoology, vol. 21, 1887, p. 173, No. 65.
 — *edentula*, LINNÉ, v. MARTENS, Süß- u. Brackwasser-Mollusk. d. Ind. Archip., p. 229, pl. XI, figs. 1—2.
 — *Philippiana*, REEVE, Conchol. icon., VI, 1850, *Lucina*, Sp. 23, and pl. V, fig. 25.

S. of Koh Chuen, 30 fathoms (³/₂).

Long. 32—60 mm.

Distribution:— Singapore, Mergui Archip., Nancowry Isl. (Nicobars, "Gala-thea" Exp.), Gulf of Manaar, Suez, Red Sea (FORSKÅL, according to specimens from him, in the Zool. Mus., Copenhagen¹). — Japan, Liukiu Isl., Philippines, Moluccas, Lifu, Sulu Isl., Upolu, Tongatabu.

In the Zoological Museum of the University of Copenhagen there are preserved under the name of *L. fragilis*, Phil. (Krauss), ³/₂ specimens (which undoubtedly were contributed by KRAUSS himself) of *L. edentula* L. from Port Elizabeth (Cape), size as follows:— long. 49 mm., alt. 45 mm., crass. 37 mm., a size never attained by

¹ The specimens were determined as *L. globosa*, Forsk.

L. fragilis, Phil. (or *L. lacteus* L.).¹ SOWERBY (Marine shells of South Africa, 1892, p. 61) also states Port Elizabeth as the locality for *L. fragilis*, Phil.; this is, however, due to erroneous determination, as the most southerly limit of distribution for these forms is the Cape Verd Islands and Loanda Island. In the supplement to "Marine Shells of South Africa" SOWERBY also says, regarding *Loripes clausus*, Phil., from Natal: "This is the shell quoted by me, pl. 61, as *Loripes lacteus*" (according to SOWERBY *L. lacteus* L. is identical with *L. fragilis*, Phil.). In the specimens in the Museum in Copenhagen the cardinal and lateral teeth are entirely wanting; moreover, they do not at all resemble *Luc. clausa*, Phil. (= *L. barbata*, Reeve). KRAUSS's description of his specimens, which are also from Port Elizabeth, ("auf dem linken Ufer des Zwartkopflusses")² corresponds exactly with *L. edentula* L., therefore I do not hesitate to put *L. fragilis*, Krauss = *L. edentula* L. DUNKER's figure (Index moll. mar. Japon., Pl. VIII, Figs. 7—8) of *L. edentula* L. testa junior, looks very remarkable and conveys the impression that the specimen figured must be abnormal.

Lucina (Thyasira) ovum, Reeve.

Lucina ovum, REEVE, Conchol. icon., VI, 1850, *Lucina*, Sp. 21.

Loripes — — ANGAS, Proc. Zool. Soc. London, 1867, p. 926, No. 89.

Koh Mak, sandy coast ($1\frac{1}{2}$).

Long. 15 mm.

Distribution:— Andamans (Zool. Mus., Copenhagen). — Philippines, Botany Bay.

As mentioned under *L. vesicula*, *L. ovum* is not easy to unravel. It is not so tumid as *L. tumida*, neither does the rather straight dorsal side pass so roundly into the posterior end, the transition being more sudden. A great many authors have looked upon *Diplodonta globosa*, Forsk., quite erroneously and have considered it to be identical with *Luc. ovum*, Reeve (for further details compare *Diplodonta globosa*, Forsk.).

Lucina (Thyasira) bullula, Reeve.

Lucina bullula, REEVE, Conchol. icon., VI, 1850, *Lucina*, Sp. 35.

Cryptodon bullulus, REEVE, EDG. SMITH, Rep. on the Lamellibranchiata of the Challenger Exped., p. 189.

Between Koh Mesan and Cape Liant, 5—9 fathoms ($\frac{2}{2}$). West coast of Koh Chang, 10 fathoms, mud ($\frac{1}{2}$). N. of Koh Kahdat, 4—5 fathoms, coarse sand ($\frac{1}{2}$). W. of Koh Kut, 15 fathoms, mud ($\frac{1}{2}$).

Long. 5—10 mm.

Distribution:— Amboina ("Challenger"), Adelaide, Port Essington (Brit. Mus.).

¹ BUCQUOY, Dautzenberg et Dollfus, Moll. mar. de Roussillon, II, p. 627, give the following measurements for *L. lacteus*:— long. 23 mm., alt. 22 mm., crass. 13 mm. KOBELT, Prodr. faunae moll. test. mar. europ. inhab., p. 370, gives the following measurements for *L. fragilis*, Phil.:— long. 9 mm., alt. 10 mm.

² Die südafrikanischen Mollusken, 1848, p. 5, No. 3.

Lucina (Thyasira) vesicula, Gould.

- Lucina vesicula*, GOULD, Proc. Boston Soc. Nat. Hist., III, 1850, p. 256. — Expedition Shells, p. 82. — Unit. States Expl. Exped., 1838–42, Mollusca & Shells, 1852, p. 414, pl. 36, fig. 525.
Cryptodon — — THURSTON, Rámésvaram Isl. and Fauna of the Gulf of Manaar, 2 ed., 1895, p. 129.

Strand of Koh Mak and Koh Kahdat (²/₂).

Long. 20–28 mm.

Distribution: — Gulf of Manaar. — Tonga Isl.

From the descriptions and figures of REEVE'S species *ovum*, *tumida*, and *pila*, it is not possible for me to form an opinion of their reciprocal relation and position to *vesicula*, Gould, and so I have adopted the name of GOULD'S form *vesicula*, which entirely agrees with the specimens from the Gulf of Siam.

Lucina (Codakia) punctata L.

- Venus punctata*, LINNÉ, Syst. Nat., ed. X, 1758, p. 688, No. 116. — ed. XII, p. 1134, No. 140. — Mus. Ludov. Ultricæ, p. 505, No. 69.
 — — — CHEMNITZ, Conchyl. Cabin., VII, p. 15, pl. 37, figs. 397–98.
Lentillaria punctata, LINNÉ, SCHUMACHER, Essai d'un nouv. syst. d. habit. d. vers. testacés, 1817, p. 148, pl. 15, fig. 4.
Cytherea — — — LAMARCK, Hist. nat. d. anim. s. vert., V, 1818, p. 574, No. 54. — éd. 2, VI, p. 319, No. 54.
Lucina — — — DESHAYES, Dictionn. class. d'hist. nat., IX, 1826, p. 531.
Codakia — — — GRAY, Proc. Zool. Soc. London, XV, 1847, p. 196, No. 684.
Lucina — — — REEVE, Conchol. icon., VI, 1850, *Lucina*, Sp. 2.
 — — — PFEIFFER, in MARTINI u. CHEMNITZ, Conchyl. Cabin., XI, 1 Abth., 1869, p. 262, No. 4, pl. 19, figs. 8–9.
 — (*Lentillaria*) *punctata* L., v. MARTENS, Moll. d. Maskarenen u. Seychellen, 1880, p. 145.
 — *punctata* L., MORLET, Journ. de Conchyl., vol. 37, 1889, p. 173, No. 94.

“Iles du golfe de Siam” (MORLET).

The Danish Expedition to Siam collected no specimens of this species.

Distribution: — Maldive Archip., Seychelles, Amirantes, Iles Glorieuses, Mascarenes, Querimba Isls. — Philippines, Ceram, Timor, Marianne Isls., New Caledonia, Lifu, Funafuti Atoll, Viti Isls., Samoa Isls., Rarotonga.

Lucina (Codakia) venusta, Phil.

- Lucina venusta*, PHILIPPI, Abbild. u. Beschreib. neuer od. wen. gek. Conchyl., II, 1847, p. 206, No. 3, pl. I, fig. 2.
 — — — REEVE, Conchol. icon., VI, 1850, *Lucina*, Sp. 15.
 — (*Myrtea*) *venusta*, PHILIPPI, TRYON, Proc. Acad. Nat. Sc. Philadelphia, 1872, p. 89, No. 16.
 — *venusta*, PHILIPPI, MORLET, Journ. de Conchyl., vol. 37, 1889, p. 173, No. 95.

“Iles du golfe de Siam” (L. MORLET).

The Danish Expedition to Siam collected no specimens of this species.

Distribution: — Philippines.

Lucina (Codakia) divergens, Phil.

- Lucina divergens*, PHILIPPI, Abbild. u. Beschreib. neuer od. wenig gek. Conchyl., III, 1850, p. 103, pl. 2, fig. 4.
- — — E. v. MARTENS u. LANGKAVEL, Donum Bismarckianum, 1871, p. 63.
- — — LISCHKE, Japanische Meeres-Conchyl., II, 1871, p. 132.
- (*Lentillaria divergens*, E. v. MARTENS, Moll. d. Maskarenen u. Seychellen, 1880, p. 145.
- *fibula*, REEVE, Conchol. icon., VI, 1850, *Lucina*, Sp. 33, pl. 7, figs. 33, 37, 38.
- — — ADAMS & REEVE, Zoology of "Samarang" Mollusca, p. 80, pl. 24, fig. 5.
- *ramulosa*, GOULD, Unit. States Explor. Exped. 1838-42, XII, Moll. & Shells, 1852, p. 415, pl. 36, fig. 523. — Proceed. Boston Soc. Nat. Hist., III, 1850, p. 255. — Expedition Shells, p. 82.
- (*Codakia munda*, A. ADAMS, Proc. Zool. Soc. London, 1855, p. 225, No. 18.
- Codakia bella delicatula*, PILSBRY, Proc. Acad. Nat. Sc. Philadelphia, vol. 56, 1904, p. 555, pl. 41, figs 15-16.

North end of Koh Chang, old coral blocks, 1 fathom ($1\frac{1}{2}$). Koh Lom, west of Koh Chang (1). Between Koh Kahdat and Koh Kut, 6 fathoms, clay mixed with sand ($1\frac{1}{2}$). Koh Kahdat ($4\frac{1}{2}$). Koh Mak, sandy coast ($1\frac{1}{2}$).

Long. 5-13.5 mm.

Distribution:— Mergui Archip., Gulf of Manaar, Maldive Isls., Bombay, Persian Gulf, Red Sea, Mascarenes, Isl. of Rodriguez. — Philippines, China Seas, Japan, Torres Strait, Port Essington, east coast of Australia as far as Sydney (New South Wales), King Isl. (Tasmania), Mariannes, Ladrones, New Caledonia, Lifu, New Hebrides, Viti, Funafuti Atoll, Samoa, Hervey Isls., Rarotonga, Tahiti, Paumotu Isl.

The specimens from the Gulf of Siam come nearest to the variety *delicatula*, from Riukiu Island, described by PILSBRY (loc. cit.). — The boundary line of this species is not quite settled and requires to be investigated more closely; REEVE's "*fibula*" is no doubt also a collective species. DALL (Synopsis of the Lucinacea, 1901, p. 798) is of opinion that PHILIPPI's name *divergens* must yield place to CONRAD's *L. bella*, which has the priority; it is, however, doubtful if these two species are synonymous. In 1834 CONRAD (Journal of the Acad. of Natur. Sciences of Philadelphia, VII, p. 254) described *Lucina bella* from specimens collected by Mr. TH. NUTTALL "in muddy marshes near Sta. Diego" (Upper California);¹ but DALL thinks that there must have been a mistake, and that the specimens were "probably" collected at the Sandwich Islands. Before rejecting PHILIPPI's "*divergens*," all the forms in question should be thoroughly investigated.

Lucina (Codakia) fijiensis, Sm.

- Lucina (Codakia) fijiensis*, EDG. SMITH, Rep. on the Lamellibranchiata of the Challenger Expedition, 1885 p. 184, pl. 13, fig. 9.

Between Koh Mesan and Cape Liant, 5-9 fathoms ($1\frac{1}{2}$). Strand of Koh Kahdat (A single worn valve).

Long. 9.5 mm., alt. 9 mm., crass. 8 mm.

¹ See also P. P. CARPENTER, Monogr. of the Shells collected by T. Nuttall on the Californian Coast (Proc. Zool. Soc. London 1856, p. 218, No. 47).

Distribution:— Off Levuka, Fiji Isls. (EDG. SMITH).

The fresh, left valve obtained from the Gulf of Siam is about double the size of the right valve from the Fiji Islands on which EDG. SMITH founded the species, but it exactly agrees with his description. To EDG. SMITH'S diagnosis, which is otherwise very good, may be added: It is not only on the hinder side that the fine transverse striæ are a little lamelliform, but also on the anterior side; in the left valve are two cardinal teeth, separated by a deepish pit, the anterior is the larger; there is, moreover, a corresponding lateral tooth, exactly like the one described by SMITH, in the right valve. The interior of the valves have fine, white radiating rays, which stop at the pallial line. *Luc. pisidium*, Dkr., is very closely allied to the present species.

Lucina (Codakia) minima, Ten. Woods.

Lucina minima, TENISON WOODS, Descript. of New Tasmanian Shells, 1875, p. 30 (Proc. R. Soc. Tasmania, 1876, p. 162).

— — — — TATE and MAY, Proc. Linn. Soc. New South Wales, 1901, p. 431.

— — — — PRITCHARD and GATLIFE, Proc. R. Soc. Victoria, 1903, XVI, p. 138.

— (*Codakia Tatei*, ANGAS, Proc. Zool. Soc. London, 1878, p. 863, pl. 54, fig. 15.

Between Koh Mesan and Cape Liant, 5–9 fathoms ($\frac{2}{2}$). Between Koh Kahdat and Koh Kut, 6 fathoms, clay mixed with sand ($\frac{1}{2}$). Sound of Koh Chang, 3–5 fathoms, soft clay (2).

Long. 1–3 mm.

Distribution:— Singapore, shallow water (SV. GAD). — Victoria ("coast generally"), Cape Northumberland, Tasmania, St. Vincent's Gulf.

Lucina (Loripes) desiderata, Sm.

Lucina (Loripes) desiderata, EDG. SMITH, Report on the Lamellibranchiata of the voyage of H. M. S. "Challenger," 1885, p. 185, pl. 13, fig. 10.

Koh Chuen, 10–15 fathoms ($\frac{1}{2}$). W. of Koh Chuen, soft clay and mud ($\frac{3}{2}$). W. of Koh Kut, 15 fathoms ($\frac{1}{2}$). S. of Koh Kut, 17–20 fathoms, mud ($\frac{1}{2}$).

Long. 3–7 mm., (long. 7 mm., alt. 7 mm., crass. 4.5 mm.).

Distribution:— South of New Guinea.

The individuals collected by the "Challenger" Expedition reached a size of only $3\frac{1}{3}$ mm. in length; the largest specimens from the Gulf of Siam measure 7 mm., and are in addition very thin-valved and fragile. The individuals measuring 3 mm. in length agree exactly with Edg. Smith's figures; in the larger specimens (dead ones) the dentiform projections at the lunule and on the hinder dorsal side are not so prominent, but this is perhaps due to a bad state of preservation.

Lucina (Phacoides) Dalli n. sp.

(Pl. III, Figs. 9–12).

This species is a little higher than long, somewhat inequilateral, moderately convex and thick, white, and marked with two (often more) radiating depressions

down the anterior side and one broader radiating depression down the posterior side. It is almost circular in outline, but the posterior end is rather straightly truncated. The surface is covered with numerous close-set, regularly-arranged, fine, slender liræ, which towards the lunule and hinder dorsal slope are more elevated. The lunule is rather deep and large, cordiform, smooth. The area is long and narrow. The beaks are small, sharp, well-curved over the lunule. The valves are covered (in quite fresh individuals) with an extremely thin epidermis, which under the lens exhibits a few fine radiating lines. In both valves the lateral teeth are well-developed, the posterior being the smaller, and the cardinal teeth are obsolete; the internal ligament is in a groove just within the dorsal margin. The interior of the valves is of a dull white colour and under the lens is seen to have fine, faint, radiating lines.

Long. 7.5 mm., alt. 8 mm., crass. 5 mm.

The strand off the mangrove at the station on Koh Chang (54).

The peculiar depressions down the anterior side are characteristic of this species. The shell varies rather considerably in form; especially in older specimens it has a tendency to be drawn obliquely towards the anterior end, so that the umbones may even be situated far back in the hinder half of the shell, while in other individuals they are situated in the middle of the length of the shell. I have named this new species after Mr. W. H. DALL of Washington to whom malacological science owes so many valuable papers, and who has also revised the genus *Lucina*.

Lucina (*Phacoides*) *pisum*, Reeve.

Lucina pisum, REEVE, Conchol. icon., VI, 1850, *Lucina*, Sp. 66 (non *Lucina pisum*, Philippi¹ = *Divaricella perparvula*, Dall²).

— (*Codakia*) *pisum*, REEVE, EDG. SMITH, Lamellibranchiata of the Challenger Exped., p. 181.
Parvilucina eucosmia, DALL, Synopsis of the Lucinacea, 1901, p. 806.

Between Koh Mesan and Cape Liant, 5–9 fathoms, sand (¹/₂). Between Koh Riot and Koh Mesan, 3–5 fathoms, sand (²/₂). S. of Koh Chuen, soft clay and mud (¹⁵/₂). Gulf of Rayong, 7–10 fathoms, sand, mud, and shells (¹/₂). S. of Koh Samit, 14–20 fathoms, mud (1 + ²/₂). Off Tung Kaben, 6 fathoms, mud mixed with sand (¹/₂). Koh Chang, between stones, very low tide (1). West coast of Koh Chang, 10 fathoms, mud (¹/₂). N. of Koh Kahdat, 4–5 fathoms, coarse sand (¹/₂). Koh Kahdat, on the strand (about ²⁰⁰/₂ specimens). S. of Koh Kahdat, 8–10 fathoms, mud (⁸/₂). Between Koh Kut and Koh Kahdat, 10 fathoms, shells (³⁶/₂). W. of Koh Kut, 18 fathoms, mud (9).

Long. 2–6 mm.

Distribution: — Singapore (CUMING; Sv. GAD, 2–3 fathoms). Mergui Isls. (E. v. MARTENS), Madras (MELVILL & STANDEN), Gulf of Manaar (THURSTON). — S. of New Guinea ("CHALLENGER"), Port Essington (Brit. Mus.).

¹ Abbild. u. Beschr. neuer od. wen. gek. Conchyl., III, 1850, p. 105.

² Synopsis of the Lucinacea. Wash. 1901, p. 815.

EDG. SMITH¹ says regarding this species that "The radiating costæ in this species are only about eleven in number, very strong, and crossed by about sixteen stout concentric ridges, which are somewhat nodose upon the costæ, and gradually attenuated at both ends, which are devoid of longitudinal ribs." This does not exactly correspond with the rather large quantity of material which I have at my disposal from the Gulf of Siam. From this it appears that the radiating ribs are not so prominent at the anterior end² as at the middle, where there are about 15–20 radiating ribs and (in a specimen measuring 6 mm. in height) about 23 concentric folds;³ the latter are, at the posterior end, almost smooth and without radiating striæ.

Lucina (Phacoides) pulchella, n. sp.

(Pl. III, Figs. 13–15).

This little species is irregularly rounded, rather thin, white, convex, inequilateral. The sculpture consists of about 11 stout, strong, radiating costæ, of which several divide, so that in larger specimens there are about 20 ribs at the ventral side. The ribs, which are broader than the interstices between them, are crossed by close-set, fine, raised concentric liræ. The radiating ribs are considerably predominant over the concentric lines. At the anterior and posterior ends of the valves the radiating ribs are absent, but the thread-like concentric liræ are present. The lunule, which is smooth and oblong-cordate, is deeply excavated beneath the overcurving umbones, each of which is smooth at the bluntish tip. The area is oblong, rather narrow, and smooth. In the left valve are two cardinal teeth, and in the right valve there is one. The lateral teeth are small in both the valves. The somewhat thickened inner margin is dentate, most decidedly towards the ventral and front sides; at the upper part of the anterior end these marginal teeth are very fine and small, and they disappear at the upper part of the posterior end.

Long. 4 mm., alt. 4 mm., crass. 3 mm.

Koh Lan, 30 fathoms, mud (²/₂). Koh Kram, 30 fathoms (¹/₂). Koh Chuen (²/₂). E. of Cape Liant, 9 fathoms, shells (¹/₂). Koh Mesan, 15 fathoms, stones (³/₂). Between Koh Mesan and Cape Liant, 9 fathoms, sand (6). S. of Koh Samit, 20 fathoms, mud (¹/₂). S. of Koh Chuen, soft clay and mud (⁶/₂). Between Koh Chuen and Koh Chang, 15 fathoms, mud (¹/₂). Koh Kahdat, 1–5 fathoms, sand and stones (3). Between Koh Kahdat and Koh Kut, 6 fathoms, clay mixed with sand (⁶/₂). W. of Koh Kut, 15 fathoms (2). W. of Koh Kut, 30 fathoms, sand and mud (⁴/₂).

This little species is most nearly related to the small group of species:—*seminula*, Gould, *pisum*, Reeve, and *Semperiana*, Issel, from which it differs, however,

¹ Report on the Lamellibranchiata of the Challenger Expedition, p. 181.

² See REEVE'S figure, pl. XI, fig. 66 b.

³ This causes the folds to become strongly crenulated, which results in the lower margin of the valves becoming strongly dentate within; the lower inner posterior side, owing to the very feeble radial striation, is only (as EDG. SMITH states) "very minutely crenulated."

by the absence of the strong depression down the hinder side of the valves and the feebler one in front, and by some of its radiating ribs — which are considerably stronger than the concentric ribs — dividing in the middle of the valves.

Lucina (Phacoides) seminula, Gould.

Lucina (Myrtea) seminula, GOULD, Proc. Boston Soc. Nat. Hist., VIII, 1861, p. 36.

— (*Codakia*) — EDG. SMITH, Rep. Lamellibranchiata of the Challenger Exped., p. 180, pl. 13, fig. 5.

S. of Koh Samit, 20 fathoms, mud ($1/2$).

Long. 1.5 mm.

Distribution: — Hong Kong Harbour; south of New Guinea.

DALL refers this and allied forms (*L. pisum*, Reeve, and others) to the subgenus *Parvilucina*, section *Bellucina*.

Diplodonta amboinensis, Sm.

Diplodonta amboinensis, EDG. SMITH, Report on the Lamellibranchiata of the Challenger Exp., 1885, p. 199, pl. 14, fig. 12.

Gulf of Rayong, 7—10 fathoms, sand and mud ($1/2$). Between Koh Chuen and Koh Chang, 15 fathoms, mud ($2/2$). Koh Mak, sandy coast ($2/2$). N. of Koh Kahdat, 4—5 fathoms, coarse sand ($2/2$). Koh Kahdat, 1 fathom, sand ($3/2$). Between Koh Kut and Koh Kahdat ($2/2$).

Long. 5—19 mm.

Distribution: — Amboina (“Challenger”).

This species is very closely related to *Dipl. rotundata*, Mont.

Diplodonta ethima, Melv. & Stand.

Diplodonta ethima, MELVILL and STANDEN, Journ. Linn. Soc. Zoology, vol. 27, 1899, p. 197, pl. 11, fig. 17.

Koh Kram, 30 fathoms (2). Gulf of Rayong, 7—10 fathoms, sand and mud ($4/2$). Between Koh Mesan and Koh Chuen, 25—30 fathoms, stones and shells ($1/2$). S. of Koh Chuen, 30 fathoms, shells ($3/2$). Between Koh Chuen and Koh Chang, 15 fathoms, mud ($1/2$). Off Tung Kaben, 6 fathoms, mud mixed with sand (1). Coast of Lem Ngob, low tide ($1/2$). Between Koh Kut and Koh Kahdat, 10 fathoms, shells ($13/2$). Koh Kahdat, 1—5 fathoms, sand and stones ($2/2$). S. of Koh Kahdat, 8—10 fathoms, mud ($5/2$). W. of Koh Kut, 30 fathoms, sand and mud ($1/2$).

Long. 4—10 mm. (long. 10 mm., alt. 9.5 mm., crass. 6.5 mm.).

Distribution: — Singapore, low water (SV. GAD), Torres Strait (MELVILL & STANDEN).

The specimens from the Gulf of Siam vary rather considerably in form, and it will doubtless, at some time, be proved, when the *Diplodonta*-group has been critically investigated — which it greatly needs — that *D. ethima* has a wider distribution; it hides itself perhaps under other names.

Diplodonta conspicua, Smith.

Diplodonta conspicua, EDG. SMITH, Report on the Lamellibranchiata of the Challenger Exped., 1885, p. 198, pl. 14, fig. 11.

Sound of Koh Chang, 5 fathoms, soft clay ($1/2$). Koh Kahdat, 1 fathom, sand ($64/2$). S. of Koh Kahdat, 8—10 fathoms, mud ($5/2$). Between Koh Kut and Koh Kahdat, 6—10 fathoms, clay mixed with sand, and shells ($28/2$). N. of Koh Kut, 10 fathoms, mud ($3/2$). W. of Koh Kut, 15 fathoms, mud ($2/2$). W. of Koh Kut, 30 fathoms, sand and mud ($1/2$).

Long. 2—11 mm. (long. 11 mm., alt. 10.5 mm., crass. 7 mm.).

Distribution:— Flinders Passage, Torres Strait.

SMITH's specimens from the Challenger Expedition have a length of only 4 mm., while the specimens from the Gulf of Siam may measure as much as 11 mm. in length. EDG. SMITH has overlooked (or perhaps they were but indistinctly visible in his small individuals) that besides the characteristic denticulations on the inner front margin there also occur 3—5 corresponding denticles on the inner hinder margin, at the same level as those on the front side. SMITH mentions the presence of 5 to 6 distinct denticles on the inner front margin, this is certainly often the case, but most frequently 7—9 denticles occur both on larger and smaller specimens.

Note. It is strange how *Diplodonta globosa*, Forskål, has been misapprehended, and confusion thereby brought into the literature, although both FORSKÅL and CHEMNITZ have given good diagnoses and figures of it. FORSKÅL's original specimens, contained in SPENGLER's collection, on the basis of which CHEMNITZ wrote his description, are now preserved in the Zoological Museum of the University of Copenhagen. In the following I shall give a summary of the views, partly erroneous, of the different authors, concerning this species and its synonymy:—

Venus globosa, FORSKÅL, Descript. animal. quæ in itin. orient. observ., 1775, p. 122, No. 53.

— — CHEMNITZ, Conchyl., Cabin., VII, 1784, p. 36, pl. 40, figs. 430—31.

Lucina sp., SAVIGNY, Iconographie d. Moll. de l'Égypte, pl. 8, fig. 7 = *Dipl. globosa*, Forsk. In the explanation of the figures AUDOUIN erroneously names this species *Lucina edentula*. VAILLANT (Journ. de Conchyl., XIII, 1865, pp. 124—125) and, on his authority, ISSEL (Malacologia d. Mar Rosso, 1869, p. 358) refer SAVIGNY's figure to *Diplodonta Savignyi*, Vaill. E. v. MARTENS (Vorderasiat. Conchylien, p. 103) says in regard to this point: "FISCHER und ISSEL haben übrigens Unrecht, die Abbildung in der Description de l'Égypte Pl. 8, Fig. 7 hierher zu citiren, da diese nach der Zeichnung der Muskeleindrücke eine richtige *Lucina* darstellt, ohne Zweifel *L. globosa*, Forsk." VAILLANT's *Diplodonta Savignyi*, according to my opinion, is identical with *Diplodonta globosa*; on the other hand VAILLANT's *Lucina globosa* can scarcely be CHEMNITZ's (Forskål's) species of this name.

— *globosa*, CHEMNITZ, GRAY, The Annals of Philosophy, New Ser. IX, 1825, p. 136.

— *Globosa*, — HANLEY, Ill. Catal. rec. biv. shells, p. 78.

Diplodonta bullata, DUNKER, Novitates Conchologicae, II, Meeres Conchyl., p. 76, No. 83, pl. 26, figs. 1—3 = *Dipl. globosa*, Forsk.

Lucina globosa, FORSKÅL, PFEIFFER in MARTINI u. CHEMNITZ, Conchyl. Cabin., XI, 1 Abth., 1869, p. 267, pl. 20, figs. 11—12.

— (*Loripes*) *globosa*, CHEMNITZ, ISSEL, Malacol. del Mar Rosso, 1869, p. 85, No. 107.

— (*Anodontia*) *globosa*, FORSKÅL, v. MARTENS, Mollusken d. Maskarenen u. Seychellen, 1880, p. 146. (v. MARTENS regards here erroneously, *L. pila*, Reeve (Conchol. icon., Sp. 24), as a synonym of the present species. REEVE (Conchol. icon.) says expressly regarding the species figured on Pl. V, (Sp. 21—24), that they have "the hinge toothless," which is not at all the case in *L. globosa*, Forsk. The fact that v. MARTENS refers this species to the subgenus *Anodontia* (as also the observations he makes elsewhere regarding this species) proves that his view of it is wrong, and that he has overlooked what is expressly stated in CHEMNITZ's diagnosis: "Im Schlosse stehen in jeder Schale nur zween Zähne.")

- Lucina globosa*, FORSKÅL, A. H. COOKE, Rep. on the Testac. Moll. obt. in the Gulf of Suez (Ann. and Mag. Nat. Hist., 1886), V., p. 99 (COOKE, like v. MARTENS, is wrong with regard to *L. globosa*, as he gives REEVE'S species *L. pila*, *tumida* and *ovum* as its synonyms, and adds: "In the Brit. Mus. *pila*, Reeve, is given as = *chrysostoma* Mensch. (o: Meusch.). The same authority unites *vesicula*, Gould, with *globosa*, Forsk., but this appears to me most unlikely." On the same page he writes: "*Diplodonta Savignyi*, Vaill., figured in Savigny, pl. VIII, fig. 7." This misapprehended figure is a very good illustration of the real *Diplodonta globosa*, Forskål).
- Loripes globosus*, CHEMNITZ, JOUSSEAUME, Descr. d. Moll. rec. par Faurot dans la Mer Rouge et le Golfe d'Aden, 1888. (Mém. Soc. Zool. France, I, pl. 2, p. 210, No. 164).
- — FORSKÅL, SOWERBY, Marine Shells of South Africa, 1892, p. 61, pl. 4, fig. 91 (is scarcely *Diplodonta globosa*, Forsk.).
- Lucina (Cyclas) globosa*, FORSKÅL, CASTO DE ELERA, Catálogo sist. d. Fauna de Filipinas, III, 1896, p. 779, No. 8.
- Cryptodon globosum*, FORSKÅL, HEDLEY, The Mollusca of Funafuti (Mem. Austral. Mus., III, pl. 8, p. 498), 1899. (HEDLEY regards it = *L. ovum*, Reeve). — Mollusca of Mast Head Reef, Queensland. (Proc. Linn. Soc. N. South Wales, vol. 31, 1906, p. 465).
- Loripes globosa*, FORSKÅL, R. BULLEN NEWTON, Pleistocene Shells from the Raised Beach Deposits of the Red Sea. (The Geological Magazine, New Ser., Dec. IV, vol. 7, 1900, p. 552).
- Cryptodon globosum*, FORSKÅL, TATE and MAY, A revised Census of the mar. Moll. of Tasmania, 1901, p. 432. The authors have the same opinion of the species as HEDLEY.
- Lucina globosa*, — W. H. DALL, Synopsis of the Lucinacea, 1901, p. 802. (DALL writes: "Hanley has shown that the Linnæan edentula (1758) was probably that named by Reeve *L. ovum*, an oriental form described by Forskål under the specific name of *globosa* (1776), and with which, according to von Martens (1880), *L. pila*, Reeve is synonymous.")
- Cryptodon globosus*, — EDG. SMITH, Mar. Mollusca of the Maldive and Laccadive Archipelagoes, 1903, p. 626. — Journ. of Malacology, vol. XI, 1904, p. 25.
- Cryptodon globosum*, FORSKÅL, LAMY, Liste de Lamellibranches rec. p. M. Seurat aux îles Tuamotu et Gambier (Bull. du Mus. d'Hist. Nat. Paris, 1906, p. 213). LAMY regards it as identical with *Luc. ovum*, Reeve.

As the above comparison shows, the erroneous view of FORSKÅL-CHEMNITZ'S species *globosa*, originates from AUDOUIN'S wrong opinion of SAVIGNY'S figure in "Iconographie d. Mollusques de l'Égypte;" afterwards are included, as synonyms, REEVE'S species *pila*, *tumida*, and *ovum*, which species have nothing whatever to do with *D. globosa*, Forsk., consequently, wherever, in the literature *globosa* is given as = *L. ovum*, Reeve, it is doubtful which species is meant.

Diplodonta (Joannisiella) oblonga, Hanl.

- Cyrenoida oblonga*, HANLEY, Catalogue of rec. biv. shells, 1856, p. 353, pl. 15, fig. 6.
- Mysia* — SOWERBY, H. & A. ADAMS, Genera of rec. Mollusca, II, p. 473.
- Joannisia* — — W. H. DALL, Transact. Wagner Free Inst. Science. Philadelphia, III, 1895, p. 545.
- Joannisiella* — — — The Nautilus, IX, 1895, p. 78.
- — — — Synopsis of the Lucinacea, 1901, p. 792.

Sound of Koh Chang, 5 fathoms, soft clay ($^{32}/_2$). E. of Koh Mak, 20 fathoms, mud ($^{2}/_2$).

Long. 8—30 mm.

Distribution: -- Philippines.

DALL has given *Dipl. oblonga* as the type for his genus *Joannisiella*.

Fam. Erycinidae.

Kellya lineata n. sp.

(Pl. III, Figs. 16—18).

This shell is oblong-ovate, white, convex and semitransparent. The umbo is situated in the posterior part of the length of the shell, the anterior end is much

prolonged, rounded. The valves are compressed in the middle, which makes the ventral side concave; in this concavity there occurs between the valves an oblong aperture through which the byssus protrudes. The surface is entirely covered with close-set, uniform, parallel, concentric, raised, longitudinal folds. The interior of the valves is glossy; the right valve has two triangular, prominent cardinal teeth, one on each side under the apex; there is just below the apex a small obtuse tooth in close proximity to the anterior tooth; on each side is a long lateral tooth, parallel with the upper margin and separated from it by a groove; these grooves receive corresponding long, lateral teeth which are situated directly upon the upper margin of the left valve; this valve has moreover two diverging cardinal teeth separated by a triangular space in which the ligament is located.

Long. 4.5 mm., alt. 2.75 mm., crass. 2.5 mm.

Koh Kram, 30 fathoms (1). S. of Koh Samit, 20 fathoms, mud (2). Off Tung Kaben, 6 fathoms, mud mixed with sand (3). Between Koh Chuen and Koh Chang, 15 fathoms, mud (1). Between Koh Kahdat and Koh Kut, 6—10 fathoms, clay mixed with sand, and shells (4). E. of Koh Mak, 20 fathoms, mud (1).

Singapore, 2—3 fathoms (1).

I shall not enter more closely, in this place, into the question how far the genera *Kellya* and *Erycina* should be kept distinct, but it appears to me that the characters given by several authors as distinguishing characteristics are not especially valid. WEINKRUFF¹ even advises to retain the name *Kellya* for the recent and *Erycina* for the fossil forms (though, as is well-known, there are not a few fossil typical *Kellya*-forms). STOLICZKA² puts *Kellya* = *Erycina*. P. FISCHER³ refers only the fossil forms to *Erycina*. COSSMANN⁴ says regarding the genus *Kellya* in connection with *Erycina*: "La forme générale de la coquille peut elle-même servir, à première vue, à distinguer les deux genres: les *Erycina* sont orbiculaires et, quand elles ne sont pas équilatérales, c'est le côté antérieur qui est le plus long; au contraire, les *Kellia* sont plutôt subtriangulaires ou obrondes et le côté antérieur est généralement le plus court." According to this, my species *Kellya lineata* should be referred to *Erycina*; the dental formula also closely resembles that of the latter genus and several of the *Erycina*-species described by COSSMANN (loc. cit.) come, also in regard to the main characters, very near to *K. lineata*.

Kellya cycladiformis, Desh.

Erycina Cycladiformis, DESHAYES, Traité élément. de Conchyliologie (1839—53), pl. 11, figs. 6—9.

— — — Proc. Zool. Soc. London, XXIII, 1855, p. 181, No. 2.

Kellia cycladiformis, — HUTTON, Manual of the New Zealand Moll., 1880, p. 157.

¹ Die Conchylien d. Mittelmeeres, I, 1867, p. 180.

² Palæontologia Indica. Cretaceous fauna of the Southern India, III. The Pelecypoda, 1871, p. 263.

³ Manuel de Conchyliologie, 1887, p. 1025.

⁴ Annales de la Soc. roy. Malacolog. de Belgique, XXII, 1887, p. 61.

W. of Koh Chuen, soft clay and mud ($1/2$).

Long. 6.5 mm.

Distribution: — North Australia, Mast Head Reef (Queensland), Sydney and Port Jackson, Flinders (Victoria), New Zealand.

With regard to the generic name *Kellya*, it was established by TURTON in 1822 as *Kellia*. JEFFREYS says that the genus is named after "the Rev. J. M. O'Kelly of Dublin," consequently, it can neither be written *Kellia*, nor (as BUCQUOY, DAUTZENBERG and DOLLFUS write) *Kellyia*,¹ but must be written *Kellya*.

Kellya rotunda, Desh.

Erycina rotunda, DESHAYES, Proc. Zool. Soc. London, XXIII, 1855, p. 181, No. 1.

Kellia — — — ANGAS, Proc. Zool. Soc. London, 1867, p. 927, No. 98.

— — — var., EDG. SMITH, Rep. on the Lamellibranchiata of the Challenger Exped., p. 202, pl. XI, fig. 5.

— — — SOWERBY, Marine Shells of South Africa, 1892, p. 62, pl. 4, fig. 93.

— — — PRITCHARD and GATLIFF, Proc. R. Soc. Victoria, XVII, 1904, p. 225.

Koh Kram, 30 fathoms (2). Between Koh Mesan and Cape Liant, 9 fathoms (1). Between Koh Mesan and Koh Chuen, 25—38 fathoms, stones and shells (13).

Long. 3—10 mm.

Distribution: — Moreton Bay, Newcastle (New South Wales), Sydney and Port Jackson, Holdfast Bay (South Australia, Brit. Mus.), Bass Straits. (SOWERBY records it from Port Elizabeth and EDG. SMITH from Port Alfred (Cape Colony)²).

Probably the forms from South Africa which SOWERBY and EDG. SMITH have had before them do not belong to DESHAYES's species from South Australia. SOWERBY's figure does not agree exactly with DESHAYES's diagnosis, but as the figure is very bad, nothing definite can be concluded on this basis. EDG. SMITH regards *K. rotunda*, Desh., to be "doubtfully separable" from *K. suborbicularis*, Mtg.,³ and in this he is undoubtedly right. Among the specimens collected in the Gulf of Siam both DESHAYES's type-form (from Moreton Bay), and the variety EDG. SMITH describes and figures from the Challenger Expedition, are to be found.

Kellya rosea n. sp.

(Pl. III, Figs. 19--20).

This species is almost circular in outline. It is thin and of a dull glass-like consistency, pink, gently arching, with fine concentric lines of growth, not particularly convex. The umbones, which are situated at about the middle of the length of the shell, are slightly elevated above the hinge-line. The hinge consists of two cardinal teeth in the left valve and a single one in the right. The right valve has also an oblong, flat, triangular lateral tooth, parallel with the hinder

¹ See W. H. DALL, Transact. Wagner Free Inst. Sc. Philadelphia, vol. III, 1895, p. 563.

² Journal of Malacology, vol. XI, 1904, p. 26.

³ Annals & Mag. Nat. Hist., (6) X, 1892, p. 132. — Proc. Malac. Soc. London, V, 1902, p. 163.

dorsal margin, from which it is separated by a narrow groove which receives a corresponding tooth in the other valve. The internal ligament is small and is located just beneath the apices and behind the cardinal teeth in both the valves. The interior is dully pink.

Long. 9 mm., alt. 8.5 mm., crass. 5 mm.

Between Koh Mesan and Koh Chuen, 25–38 fathoms (⁸/₂).

Kellya rosea somewhat resembles *K. rotunda*, Desh., but is easily distinguished from it by its pink colour, and by the absence of the glossy iridescent surface of *K. rotunda*; neither is it so convex, and the valves are more gently and regularly rounded than in *rotunda*. For the rest, the species belonging to the genus *Kellya* vary considerably; not only do young and old individuals often differ greatly in form, but also full-grown specimens may often be very different in both form and outline. Young individuals of *K. rosea* (and also of other species) are usually longer in proportion to their height, and the ventral margin is straighter, than is the case in larger specimens.

***Kellya vitrina* n. sp.**

(Pl. III, Figs. 21–22).

This little species is hyaline, and somewhat silver-shining, thin, rather flat and triangular in form. The umbones are situated at about the middle of the longitudinal axis and the upper margin slopes gradually down on each side. The anterior and the posterior ends are rounded, the ventral side is fairly straight, and somewhat concave in the middle. The surface is smooth and ornamented with fine lines of growth; the concavity mentioned above extends from the ventral side upwards beyond the middle of the valves as a slight depression and disappears gradually towards the umbones. The interior of the valves is highly glossy, the hinge is composed of a single little posterior cardinal tooth in the right valve and two strong diverging teeth in the left, between which the internal ligament is situated. The right valve has, moreover, two long lateral lamellæ, one on each side, parallel with and closely along its dorsal margin; and in the left valve is one solitary, very slightly developed lateral lamella directly upon the anterior dorsal margin.

Long. 2.5 mm., alt. 2 mm., crass. 1 mm.

Koh Chuen, 30 fathoms (1).

In spite of its small size this characteristic species is undoubtedly full-grown; in outline it somewhat resembles *Pythina Deshayesiana*, Hinds.

***Kellya elongata* n. sp.**

(Pl. III, Figs. 23–24).

This species is oblong-ovate and convex, and opaque white in colour. The umbones which are situated towards the anterior end are slightly elevated above the hinge-line and terminate in obtuse, circular, glossy, shield-like bosses (the embryonic

shell). The posterior side is somewhat higher than the anterior, and both are gently rounded towards the ventral side which is straight. The very concave valve is flattened in the middle, so that towards the sides rounded keels are formed in passing to the anterior and posterior ends. The surface is somewhat glossy, and is rough owing to irregular, concentric, coarse lines of growth. The interior of the valve is white and slightly glossy. In the left valve, just under the apex, are two cardinal teeth of which the anterior one is the smaller; the internal ligament is situated immediately behind the posterior tooth. There is also a small posterior lateral tooth which is very slightly developed.

Long. 6 mm., alt. 3.5 mm., crass. 3.7 mm.

South of Koh Tulu, 10 fathoms, mud mixed with sand ($1/2$).

Unfortunately, the Danish Expedition obtained only the left valve described above; it is, however, very characteristic in form.

Kellya lilium n. sp.

(Pl. III, Figs. 25—26).

The shell is oblong-ovate, white, semitransparent, dully glossy, rather flat and thin. The upper margin slopes from the umbo gradually down on both sides, most sharply towards the posterior end, which is somewhat more acutely rounded than is the anterior. The ventral side is slightly convex. The umbones, which are not especially prominent, are situated somewhat towards the posterior end. At the apex the embryonic shell remains as a small, globular, smooth tubercle. Upon the surface the lines of growth appear as irregular, coarse striæ. In the shell-substance are seen, both internally and externally, close-set, fine lines which radiate from the umbo. The interior of the valves is white and glossy. The hinge-teeth are very slightly developed in comparison to the size of the valve; under the apex and somewhat in front of it there is, in the right valve, a well-developed, prominent, flat, triangular and acute cardinal tooth, and a small posterior tooth, more slightly developed; between these two teeth there is a triangular pit. The left valve has an anterior, long, rather stout, triangular tooth, at the hinder border of which, just below the beak, is a small insignificant rudimentary tubercle (in other *Kellya*-species this is developed into a fairly large tooth). Upon the posterior upper margin there is a rather small triangular tooth, at the hinder border of which the ligament is attached; between the cardinal teeth there is a triangular space. The muscular scars are fairly distinct.

Long. 13 mm., alt. 9 mm., crass. 5 mm.

The sound of Koh Chang, 3—5 fathoms, soft clay ($2/2$). N. of Koh Kut, 10 fathoms, mud ($1/2$).

In outline and external appearance this species somewhat resembles *Abra alba*, Wood.

Montacuta costata n. sp.

(Pl. III, Fig. 27).

This little species is oblong-ovate and rather flat, white, semitransparent, somewhat glossy and provided with a thin yellowish epidermis. The anterior end is regularly rounded, the posterior end forms a somewhat sharp angle with the dorsal side, and then slopes in a straight line down towards the ventral side, with which it forms a roundly-acute angle; a sharp keel extends from the latter across the shell up towards the apex. The ventral margin is rather straight. The umbones which are not very prominent, are situated towards the posterior end. The surface is smooth around the apex, but gradually slight, concentric costæ are seen to appear, which upon the rest of the shell (about 1 mm. from the top right down to the ventral margin) occur as numerous, close-set, parallel, uniform, rounded ridges; at the keel mentioned above they turn abruptly and ascend parallel to each other straight up towards the sloping posterior side of the upper margin. The interior of the valves is white and glossy. The left valve has two erect lamellar very divergent long teeth, of which the posterior is rather more strongly developed; they are separated by a broad triangular space, and stand out freely from the outer margin. The shell-margin is somewhat thickened, especially along the ventral side.

Long. 3 mm., alt. 1.7 mm., crass. 1 mm.

West of Koh Kut, 30 fathoms, sand and mud (¹/₂).

Unfortunately only a single left valve of this little species was obtained, and it is perhaps not full-grown; when complete specimens are at hand, it will be proved whether I am right in referring it to the genus *Montacuta*. With regard to the generic name *Montacuta*, it was given in 1819 to this group of the *Lamelli-branchiata* by TURTON, under the form of *Montacuta* (after the zoologist GEORGE MONTAGU). In 1828 FLEMING employed the generic name *Montagua* for a group of *Aeolidae*, but RUD. BERGH afterwards (1864) replaced this by the name *Cratena*; in 1825 DESMAREST employed the name *Montagua* for a crustacean, but this was afterwards obliged to give place to *Callianassa*, Leach. In 1852 LEACH proposed the name *Montagua* for a group of *Trochus*-forms (= *Jujubinus*, *Monterosato*). BRONN, and later BUCQUOY, DAUTZENBERG and DOLLFUS, and also LAMY, use the name *Montaguia* for this group of *Lamelli-branchiata*,¹ but according to the rules for zoological nomenclature now in force this is not admissible, it should be *Montagua*, if it could be used at all.

Montacuta venusta n. sp.

(Pl. III, Figs. 28-29).

This species is oblong-ovate, donaciform, rather flat and white. The umbones are situated towards the front end, in the anterior third of the shell. The anterior end slopes in a slight curve abruptly down from the apex towards the ventral

¹ P. FISCHER says also (Manuel de Conchyliologie, p. 1027) that *Montaguia* is the most correct form of the name.

side, with which it forms a roundly-acute angle. The ventral margin descends towards the posterior end, at which point it is most convex. The upper margin slopes in a rather straight line down towards the somewhat pointed, drawn-out posterior end. The umbones terminate in a smooth, glossy, rounded, nodular apex, upon which the small, round embryonic shell is found. Below this and radiating from the umbo, an exceedingly close-set, fine, raised network extends over the whole surface towards the outer sides. The threads of the network divide often, especially towards the anterior and posterior ends, and are separated from each other only by very fine grooves. The concentric lines of growth are coarse, irregular and fairly prominent. The interior of the shell is dully white, and glossy only towards the outer margins; the left valve has two cardinal teeth, of which the hinder is the larger, and is triangular and tapering, separated from the upper margin of the shell by a deep groove; the other tooth is pointed near its commencement and forms a rather long, laminar ridge parallel with the upper margin. Between the divergent cardinals under the umbones is a triangular space which receives the internal ligament.

Long. 9 mm., alt. 6.5 mm., crass. 4 mm.

North of Koh Kut, 10 fathoms, mud ($1/2$).

Unfortunately only a single left valve was obtained of this beautiful species, the ray-like surface-sculpture of which is especially characteristic.

Montacuta (Tellimya) japonica, A. Ad.

Tellimya japonica, A. ADAMS, Ann. and Mag. Nat. Hist., 1862, p. 225.

— *Japonica*, — DUNKER, Index moll. mar. Japon., 1882, p. 219.

The sound of Koh Chang, 3—5 fathoms, soft clay ($1^{2/1}$). W. of Koh Chang, 20 fathoms, mud ($1/2$). Koh Kahdat, 4—5 fathoms, sand and stones ($1/2$).

Long. 1.75—5.75 mm. (long. 5.75 mm., alt. 3.5 mm., crass. 2.5 mm.).

Distribution:— Japan.

The specimens from the Gulf of Siam correspond closely to ADAM's diagnosis (unfortunately he does not give a figure of his species), but when he says that: "This species is more transversely oblong than *T. bidentata* from the seas of Europe, and the anterior side is much shorter," then only the first part of the above passage agrees with my observations, but with regard to the anterior end, it is almost of the same length as in *M. bidentata*. The form of my specimens of *Montacuta japonica* agrees therefore, in its main features, most closely with that of *M. ferruginosa*, Montagu; but like all other *Montacuta*-species, *M. japonica* probably varies somewhat both in form and outline.

Montacuta (Tellimya) paula, A. Ad.

Pythina paula, A. ADAMS, Proc. Zool. Soc. London, XXIV, 1856, p. 47, No. 3.

Montacuta paula, — EDG. SMITH, Rep. on the Lamellibranchiata of the Challenger Exped., p. 203.

Pythina — — — Annals and Mag. Nat. Hist., 6 Ser., VIII, 1891, p. 230.

Pythina peculiaris, — Proc. Zool. Soc. London, XXIV, 1856, p. 47, No. 4.

The strand off the mangrove at the station on Koh Chang (1). Off Koh Kut, 5 fathoms (2). Coast of Koh Kong (6).

Long. 3—7 mm.

Distribution: — Ceylon, Aden (SHOPLAND). — South of New Guinea, Torres Strait.

Montacuta (Tellimya) triangularis, A. Ad.

Pythina triangularis, A. ADAMS, Proc. Zool. Soc. London, XXIV, 1856, p. 47, No. 5.

— — — EDG. SMITH, Annals and Mag. of Nat. Hist., vol. VIII, 1891, p. 231, No. 8.

Maetra nucleus, REEVE, Conchol. icon., VIII, *Maetra*, Sp. 102 (non *M. nucleus*, CONRAD, Journ. Acad. Nat. Sc. Philadelphia, VI, part 2, 1830, p. 258, No. 3).

Koh Kahdat ($1\frac{1}{2}$). S. of Koh Kahdat, 8—10 fathoms, mud ($1\frac{1}{2}$). N. of Koh Kut, 10 fathoms, mud ($1\frac{1}{2}$).

Long. 5—7 mm.

Distribution: — Manilla (A. ADAMS).

Kellya subsinuata, Lischke, resembles the present species very much in form.

Montacuta (Tellimya) variabilis n. sp.

(Pl. III, Figs. 30—32).

This species is triangular in form, dully white, semitransparent, rather thin and flat. The umbones, which are situated in the front half of the length of the shell, sometimes quite anteriorly, sometimes nearer to the middle of the shell, are pointed and terminate in a smooth, round tubercle; the embryonic shell is very distinct. From the umbones the upper margin slopes abruptly downwards on both sides. The ventral margin is sometimes convex, sometimes straight, and sometimes somewhat concave. The concentric lines of growth make the surface rough and are sometimes coarse. The interior of the valves is glossy, and there are, in the left valve, two divergent, flat, pointed, triangular, highly prominent cardinal teeth, separated from the upper margin by a groove; between these teeth there is a triangular space in which are placed the cartilage and the ossicle, these fit into a corresponding triangular space in the hinge plate of the right valve. Directly upon the upper margin of the valve and close to the hinge plate there is in the right valve, on each side, a slightly developed lateral tooth, of which the anterior is the larger; these teeth fit into the groove between the teeth and the upper margin of the left valve.

Long. 4 mm., alt. 3 mm., crass. 2 mm.

The Gulf at the south end of Koh Chang (6).

As may be seen from the above diagnosis, this species varies highly in form, a fact which is undoubtedly due to its habitat and mode of living (commensalism?); the characteristic triangular form is common to all the individuals. I have figured on Pl. III, Figs. 30—31 the two most divergent forms, which limit the variation of the specimens obtained.

Montacuta (Tellimya) rudis n. sp.

(Pl. III, Figs. 33–34).

This shell, which is oblong-ovate, is, especially in the anterior half, somewhat ventricose; it is white and rather thin. Anteriorly the shell is truncated, but posteriorly it is pointed. The ventral side is straight; across the middle from the umbones to the ventral margin the valves are somewhat depressed. The umbones are situated in the anterior half of the shell, the apices are glossy, smooth and pointed. Upon the surface, which is covered with a yellowish epidermis, the rough and coarse concentric lines of growth may be seen; in addition to these are distributed, over the whole surface, numerous fine or coarse grains and tubercles which make the valve-surface peculiarly rough and uneven. The interior of the valves is glossy, the left valve has in it, separated from the upper margin by a groove, two diverging, triangular, compressed, acute cardinal teeth, between which are placed the ligament and the ossicle; these fit into a triangular pit just below the apex of the right valve; close to this pit and directly upon the upper margin there is on both sides in the right valve an oblong lateral fold, which fits into the corresponding groove above the cardinal teeth of the left valve. The muscle impressions are large and very conspicuous.

Long. 7.5 mm., alt. 5 mm., crass. 3 mm.

The north side of Koh Chang, 12 fathoms, in old coral blocks (1).

The peculiar surface is characteristic of this species, which lives in holes in coral blocks and which therefore, as is the case with all the forms which are found in such localities, is subject to changes in form according to the locality which it may chance to inhabit.

Lepton sp.

A single, somewhat damaged, left valve of a *Lepton* was taken in the sound of Koh Chang, in 3–5 fathoms, on a soft muddy bottom; it should be placed near to *L. trigonale*, Tait, but differs from it. In the British Museum there is a specimen of an undetermined *Lepton* from Port Lincoln which exactly agrees with my shell from the Gulf of Siam.

Fam. Galeommidae.**Galeomma angusta**, Desh.

Galeomma angusta, DESHAYES, Proc. Zool. Soc. London, XXIII, 1855, p. 170, No. 7.

— — — SOWERBY, Thesaurus Conchyl., III, p. 174, No. 8, pl. 234, fig. 10.

— — — SOWERBY in REEVE, Conchol. icon., vol. 19, *Galeomma*, Sp. 3.

Coast of Lem Ngob, low tide, stones (150 specimens). Gulf at the south end of Koh Chang (7). Koh Chang, very low tide, stones (5). North end of Koh Chang 1 fathom, old coral blocks (2).

Long. 3—10·5 mm.

Distribution: — Philippines.

I think that *G. chloroleuca*, Desh., can scarcely be separated from *G. angusta*, Desh., as a distinct species; I have compared DESHAYES's original specimens of these species in CUMING's collection in the British Museum, and am of opinion that they are without doubt identical.

Galeomma argentea, Desh.

Galeomma argentea, DESHAYES, Proc. Zool. Soc. London, 1855, p. 169, No. 6.

— — — SOWERBY, Thesaurus Conchyl., III, p. 174, No. 3, pl. 234, figs. 13—14.

— — — SOWERBY in REEVE, Conchol. icon., XIX, 1874, *Galeomma*, Sp. 7.

North end of Koh Chang, 1 fathom, old coral blocks (1).

Long. 6 mm.

Distribution: — Philippines.

Galeomma macrochisma, Desh.

Galeomma macrochisma, DESHAYES, Proc. Zool. Soc. London, 1855, p. 171, No. 12.

— — — SOWERBY, Thesaurus Conchyl., III, p. 174, No. 2, pl. 234, figs. 7—8.

— — — SOWERBY in REEVE, Conchol. icon., XIX, 1874, *Galeomma*, Sp. 9.

Bidang, 9 fathoms, mud and shells (1).

Long. 10 mm.

Distribution: — Philippines.

Scintilla hyalina, Desh.

Scintilla hyalina, DESHAYES, Proc. Zool. Soc. London, 1855, p. 180, No. 34.

— — — SOWERBY, Thesaur. Conchyl., III, p. 179, No. 33, pl. 234, figs. 23—24.

— — — SOWERBY in REEVE, Conchol. icon., XIX, *Scintilla*, Sp. 30.

W. of Koh Kam, 5 fathoms, gravel (1). Coast of Lem Ngob (5). Koh Chang, stones, low tide (1). North end of Koh Chang, 1 fathom, old coral blocks (1).

Long. 4—7 mm.

Distribution: — Torres Strait (DESHAYES, MELVILL & STANDEN).

Scintilla anomala, Desh.

Scintilla anomala, DESHAYES, Proc. Zool. Soc. London, 1855, p. 181, No. 37.

— — — SOWERBY, Thesaur. Conchyl., III, p. 179, No. 38, pl. 234, figs. 25—26.

— — — ANGAS, Proc. Zool. Soc. London, 1867, p. 928, No. 102.

— — — SOWERBY in REEVE, Conchol. icon., XIX, *Scintilla*, Sp. 37.

Coast of Lem Ngob (1).

Long. 4 mm.

Distribution: — Philippines (DESHAYES). Port Jackson (ANGAS).

DESHAYES records "Ins. Samar (Philippines)" as the locality for his type-specimens in the Cuming collection; on the other hand, ANGAS (loc. cit.) says: "M. DESHAYES's types in the Cumingian collection are from Borneo."

Scintilla candida, Desh.

Scintilla candida, DESHAYES, Proc. Zool. Soc. London, 1855, p. 177, No. 17.

— — — SOWERBY, Thesaur. Conchyl., III, p. 177, No. 17, pl. 235, fig. 33.

— — — SOWERBY in REEVE, Conchol. icon., XIX, *Scintilla*, Sp. 6.

Koh Kahdat, 1 fathom, sand (3). Koh Kahdat, 1—2 fathoms, corals (2). North end of Koh Chang, 12 fathoms, old coral blocks (3).

Long. 2·5—11·5 mm.

Distribution:— Gulf of Manaar. — Philippines.

Scintilla Philippinensis, Desh.

Scintilla Philippinensis, DESHAYES, Proc. Zool. Soc. London, 1855, p. 176, No. 14.

— — — H. & A. ADAMS, Genera of rec. Moll., 1858, II, p. 480, pl. 115, fig. 4.

— — — SOWERBY, Thesaur. Conchyl., III, p. 179, No. 36, pl. 235, figs. 31—32.

— — — SOWERBY in REEVE, Conchol. icon., XIX, *Scintilla*, Sp. 5.

Koh Kahdat, 1 fathom, sand (1).

Long. 9·5 mm., alt. 6 mm.

Distribution:— Philippines, Sorong (TAPPARONE CANEFRI).

Scintilla hydatina, Desh.

Scintilla hydatina, DESHAYES, Proc. Zool. Soc. London, 1855, p. 177, No. 19.

— — — SOWERBY, Thesaur. Conchyl., III, p. 180, No. 39, pl. 235, figs. 56—57.

— — — SOWERBY in REEVE, Conchol. icon., XIX, *Scintilla*, Sp. 38.

Coast of Lem Ngob, low tide, stones (many specimens).

Long. up to 6 mm.

Distribution:— Philippines.

S. Alberti, Smith,¹ from Torres Strait is very closely related to the present species.

The accompanying figure drawn from a sketch of *Scintilla hydatina*, Desh., made by Dr. TH. MORTENSEN from living specimens collected at Lem Ngob, shows that the animal agrees in many points with MÖBIUS's figure (v. MARTENS, Die Mol-



Scintilla hydatina, Desh.

lusken d. Maskarenen u. Seychellen, Berl. 1880, pl. 21, fig. 10) of *Scintilla aurantia*, Lam. The mantle, which covers both the valves, is pale yellow (the colour being due to numerous small, pale yellow drops which are present in the mantle), and bears

many, comparatively long papillæ, which are contractile; they are smallest in the middle of the valves and become larger towards the margins, where they reach a length of about 2 mm. They do not agree in form with those figured by MÖBIUS

¹ Report on the zoolog. collections made in the Indo-Pacific Ocean during the voyage of H. M. S. "Alert," 1881—82, Lond. 1884, p. 107, pl. 7, fig. G.

in *S. aurantia*, but are apparently cylindrical; each is deep red at the tip, the small papillæ in the middle of the valves being the palest in colour. There is also a red spot upon the foot, about 1.5 mm. from its end.

Fam. Tellinidae.

Tellina (*Tellinella*) *Deshayesi*, Hanl.

- Tellina Deshayesii*, HANLEY, Proc. Zool. Soc. London, XII, 1844, p. 148.
 — — — SOWERBY, Thesaur. Conchyl., I, p. 223, No. 2, pl. 57, fig. 66.
 — — — REEVE, Conchol. icon., XVII, *Tellina*, Sp. 200.
 — — — V. BERTIN, Révision d. Tellinidés, p. 251, No. 52.
 — *Deshayesi*, — CROSSE et FISCHER, Journ. de Conchyl., vol. 40, 1892, p. 76.
 (Non *Tellina Deshayesii*, P. CARPENTER, Proc. Zool. Soc. London, 1856, p. 160, Hab. in *Sinu Panamensi*).

Gulf of Siam, west coast of Cambodge (PAVIE).

Distribution: — Aden (SHOPLAND), Red Sea (HANLEY (?), V. BERTIN).

The Danish Expedition to Siam collected no specimens of this species.

Tellina (*Tellinella*) *Spengleri*, Martini (Chemn.).

- Das Elfenbeinerne Schifflein oder Navet*, L. SPENGLER, Beschäftig. d. Berlin. Gesellsch. Naturf. Freunde, I, 1775, pp. 387—94, pl. 9, figs. 1—3.
Die Spenglerischen Dünnmuschel, MARTINI, Beschäftig. d. Berlin. Gesellsch. Naturf. Freunde, I, 1775, p. 394.
Tellina Spengleri, MARTINI in CHEMNITZ, Conchyl. Cabin., VI, 1782, p. 98, pl. 10, figs. 88—90.
 — — — SPENGLER, Skrifter af Naturhistorie-Selskabet, IV, 2 H., 1798, p. 77, No. 6.
 — — — CHEMNITZ, LINNÉ, Systema Naturae, ed. XIII cur. GMELIN, p. 3234, No. 30.
 — — — SCHUMACHER, Essai d'un nouv. système d. habitations d. vers test. 1817, p. 162.
 — — — HIDALGO, Fauna malacol. de las isl. Filipinas, 1903, p. 118.
 — *rostrata*, (LINNÉ), HANLEY in SOWERBY, Thesaurus Conchyliorum, I, 1846, p. 222, No. 1, pl. 61, fig. 157.
 — — — REEVE, Conchol. icon., vol. XVII, *Tellina*, Sp. 83.
 — (*Tellinella*) *rostrata*, (LINNÉ), RÖMER, MARTINI u. CHEMNITZ, Conchyl. Cabin., X Bd., 4 Abth., 1871, p. 33, No. 19, pl. 3, figs. 5—7; pl. 11, figs. 4—5.
 — — — — V. BERTIN, Révision d. Tellinidés, p. 251, No. 51.
 — *rostrata*, (LINNÉ), MORLET, Journ. de Conchyl., vol. 37, 1889, p. 174.
 — — — P. FISCHER, Catal. d. Moll. de l'Indo-Chine, p. 245.

Hatien (Gulf of Siam) L. MORLET.

The Danish Expedition to Siam collected no specimens of this species.

Distribution: — Malacca, Nicobars, Bay of Bengal, Ceylon, Madras, Mauritius(?).
 — Cochin China, Philippines, Moluccas, Banka, Java.

LINNÉ, in spite of HANLEY's assertion in "Ipsa Linnæi Conchyliæ," has certainly not been clear in his judgment of his species *T. rostrata*; he has evidently confused *T. vulsella*, *T. Spengleri* and *T. perna* under this name; therefore, I have had no hesitation in following HIDALGO's example and employing MARTINI's (CHEMNITZ's) name *T. Spengleri* for the present species, *T. Spengleri* being both described and figured very clearly. SPENGLER already, both in his original collection (which is preserved in the Zoological Museum of the University of Copenhagen) and in his

description of the genus *Tellina*, distinctly differentiates between *T. rostrata* L. (= *vulsella*, Ch.) and *T. Spengleri*.

Tellina (*Tellinella*) *pulcherrima*, Sow.

- Tellina pulcherrima*, SOWERBY, Catal. of shells in the collect. of the Earl of Tankerville, 1825, Appendix, p. III, No. 184, pl. 1, fig. 1.
 — — — HANLEY, Monogr. gen. *Tellina* (SOWERBY, Thesaur. Conchyl., I), p. 226, No. 8, pl. 61, fig. 165.
 — — — REEVE, Conchol. icon., XIV, *Tellina*, Sp. 108.
 — — — BERTIN, Révision d. Tellinidés, p. 240, No. 22.
 — — — DUNKER, Index moll. mar. Japon., p. 189.

North of Koh Kahdat, 4—5 fathoms, coarse sand (1). Between Koh Kahdat and Koh Kut, 6 fathoms, sand mixed with mud ($\frac{1}{2}$). W. of Koh Kut, 15 fathoms, mud ($\frac{1}{2}$).

Long. 29—39 mm.

Distribution:— Singapore, Banca Strait, Philippines, Japan, Mast Head Reef (Queensland).

Tellina (*Tellinella*) *rugosa*, Born.

- Tellina rugosa*, BORN, Index rer. natur. Mus. Cæsar. Vindobon., I, 1778, p. 18. — Testacea Mus. Cæsar. Vindobon., 1780, p. 29, pl. 2, figs. 3—4.
 — — — CHEMNITZ, Conchyl. Cabin., VI, 1782, p. 81, pl. 8, fig. 62.
 — — — HANLEY, Monogr. of the gen. *Tellina* (SOWERBY, Thesaur. Conchyl., I), p. 267, No. 82, pl. 64, fig. 238.
 — (*Tellinella*) *rugosa*, BORN, RÖMER in MARTINI u. CHEMNITZ, Conchyl. Cabin., X, 4 Abth., p. 36, pl. 2, fig. 1; pl. 11, figs. 6—7.
 — *rugosa*, BORN, REEVE, Conchol. icon., XVII, *Tellina*, Sp. 36.
 — (*Tellinella*) *rugosa*, BORN, BERTIN, Révision d. Tellinidés, p. 242, No. 29.

Koh Mak, sandy coast ($\frac{2}{2}$).

Long. 29—37 mm.

Distribution:— Ceylon, Karachi, Hulule Isl., Gulf of Aden, Red Sea, Suez, Seychelles, Mauritius, Zanzibar, Querimba Isls. — Philippines, Yaeyama (Loo Choo Isls.), Sulu Isls., Java, Ceram, Banda Isls., New Guinea, Moreton Bay (Queensland), New Caledonia, Mariannes, Lifu, Viti Isls., Funafuti (Ellice Isls.), Samoa Isls., Sandwich Isls., Raratonga, Opara, Tahiti, Mangareva and Akamaru.

Tellina (*Tellinella*) *Hungerfordi*, Sow.

- Tellina Hungerfordi*, SOWERBY, Proc. Malacolog. Soc. London, I, 1894, p. 159, No. 23, pl. 12, fig. 22.

Off Koh Kam, 10 fathoms, gravel ($\frac{1}{2}$). Koh Chuen, 30 fathoms ($\frac{1}{2}$). S. of Koh Kahdat, 8—10 fathoms, mud ($\frac{2}{2}$). Between Koh Kut and Koh Kahdat, 10 fathoms, shells ($\frac{2}{2}$).

Long. 4—7 mm.

Distribution:— Singapore (2—3 fathoms, coral reef, and in shallow water; $\frac{5}{2}$ valves, Danish Exp. to Siam, and Sv. GAD). Hong Kong (SOWERBY).

SOWERBY states in his diagnosis: "laterales indistincti," but this is not the case in my specimens, in which the lateral teeth in the right valve are very well developed; the anterior stands close to the cardinal teeth.

Tellina fabrefacta, Pilsbry.

Tellina fabrefacta, PILSBRY, Proc. Acad. Nat. Sc. Philadelphia, vol. 56, 1904, p. 555, pl. 41, figs. 11—12.
— — — HEDLEY, Proc. Linn. Soc. New South Wales, vol. 31, 1906, p. 478.

Between Koh Rin and Cliff Rock, 15 fathoms ($\frac{2}{2}$).

Long. 5 mm.

Distribution: — Singapore, shallow water (long. 5.5 mm.), Sv. GAD; Hirado, Hizen (Japan), PILSBRY; Mast Head Reef (Queensland), HEDLEY.

Tellina (Arcopagia) capsoides, Lam.

Tellina capsoides, LAMARCK, Hist. nat. d. anim. s. vert., V, 1818, p. 531, No. 44. — éd. 2, VI, 1835, p. 205, No. 44.
— *Capsoides*, — HANLEY, Monogr. of the gen. *Tellina* (SOWERBY, Thes. Conchyl., I), p. 268, No. 85, pl. 62, fig. 185.
— *capsoides*, — REEVE, Conchol. icon., XVII, *Tellina*, Sp. 183.
— (*Tellinella*) *capsoides*, LAMARCK, RÖMER in MARTINI & CHEMNITZ, Conchyl. Cabin., X Bd., 4 Abth. p. 48, No. 28, pl. 14, figs. 1—3.
— — — — BERTIN, Révision d. Tellinidés, p. 250, No. 49.
— (*Arcopagia*) — — TRYON, Catalogue of the family Tellinidæ, p. 89, No. 127.

The strand off the mangrove at the station on Koh Chang, shallow water (3).

Long. 26—36 mm.

Distribution: — Andamans, from Goa to Bombay, Karachi, Gulf of Suez (MAC ANDREW), Natal coast (SOWERBY). — Philippines, Hong Kong, Giabu Lengan (ARU), "Australia", Saint-Pierre, Saint-François, Viti Isls.

Tellina negrosiensis, V. Bertin, judging from the description, no doubt scarcely differs specifically from the present species.

Tellina (Arcopagia) Siamensis, v. Mart.

Tellina (Arcopagia) siamensis, v. MARTENS, Proc. Zool. Soc. London, 1860, p. 18.
— *Siamensis*, v. MARTENS, Malakozool. Blätter, 1873, p. 175.
Arcopagia siamensis, — V. BERTIN, Révision d. Tellinidés, p. 326, No. 39.
Tellina (Arcopagia) Siamensis, v. MARTENS, P. FISCHER, Moll. de l'Indo Chine, p. 245.
— — — — MELVILL & STANDEN, Proc. Zool. Soc. London, 1906, p. 822.
— *perplexa*, RÖMER (non HANLEY), MARTINI u. CHEMNITZ, Conchyl. Cabin., X Bd., 4 Abth., p. 49, No. 29, pl. 14, figs. 4—6 (fide E. v. MARTENS).¹

Siam (Mr. MOUHOT).

The Danish Expedition to Siam collected no specimens of this species.

¹ Malakozool. Blätter, 1873, p. 168. Although E. v. MARTENS in the paper in question states that he thinks RÖMER's figure and description of *T. perplexa* agree with his *T. Siamensis* and not with "der ächte *perplexa* Hanl.," yet in "The Journal of the Linnean Society," vol. 21, 1887, p. 215, he refers to the same figure in the list of synonyms under *T. perplexa*, Hanley.

Distribution:— Karachi (MELVILL & STANDEN). PILSBRY records that FR. STEARNS took "a short form" of this species at Japan (Inland Sea).

T. capsoides, Lam., *T. ostracea*, Hanl., and *T. perplexa*, Hanl., according to v. MARTENS, are very closely allied to the present species.

Tellina (Arcopagia) elegantissima, Sm.

Tellina (Arcopagia) elegantissima, EDG. SMITH, Report on the Lamellibranchiata of the Challenger Exped., 1885, p. 105, pl. 4, fig. 3.

Koh Lan, 30 fathoms, mud ($1\frac{1}{2}$). Gulf of Rayong, 7—10 fathoms, sand and mud (2). S. of Koh Mak, 5—6 fathoms (2). Between Koh Kut and Koh Kahdat, 10 fathoms, shells ($2\frac{1}{2}$). Same locality, 6 fathoms, mud mixed with sand ($13\frac{1}{2}$). W. of Koh Kut, 15 fathoms, mud ($1\frac{1}{2}$). Koh Kahdat, 1—5 fathoms, sand (1).

Long. 10—18 mm. (long. 18 mm., alt. 15 mm., crass. 9 mm.).

Distribution:— Torres Strait.

Tellina (Arcopagia) habrotima, Melvill,¹ from Angrias Bank, Arabian Sea is very closely related to the present species.

Tellina (Arcopagia) carnicolor, Hanl.

Tellina carnicolor, HANLEY, SOWERBY, Thesaur. Conchyl., I, 1846, p. 263, No. 75, pl. 56, fig. 15.

— — — REEVE, Conchol. icon., XVII, *Tellina*, Sp. 126.

— (*Arcopagia carnicolor*, HANLEY, RÖMER in MARTINI u. CHEMNITZ, Conchyl. Cabin., X Bd., 4 Abth., p. 85.

Arcopagia carnicolor, HANLEY, V. BERTIN, Révision d. Tellinidés, p. 322, No. 16.

Tellina incarnata, HANLEY, Proc. Zool. Soc. London, XII, 1844, p. 68.

-- *Strangei*, DESHAYES, Proc. Zool. Soc. London, XXII, 1854, p. 362, No. 206 (fide EDG. A. SMITH).²

— *corbis*, SOWERBY, REEVE, Conchol. icon., XVII, *Tellina*, Sp. 127 (fide EDG. A. SMITH).

N. of Koh Kam, 5 fathoms, gravel (1). Koh Mesan, 15 fathoms, stones ($1\frac{1}{2}$). Between Koh Mesan and Cape Liant, 5—9 fathoms ($1\frac{1}{2}$). W. of Koh Kut, 15 fathoms, mud ($2\frac{1}{2}$).

Long. 4—13 mm. (long. 13 mm., alt. 10 mm., crass. 5 mm.).

Distribution:— Andamans, Maldive Archip. — Philippines, New Caledonia, New Zealand (*T. Strangei*).

The above measurements indicate that the specimens from the Gulf of Siam (which are not full-grown) are more oblong-ovate in form than is shown by the figures which have hitherto been published.

Tellina (Arcopagia) inflata, Chemn.

Tellina inflata, CHEMNITZ, Conchyl. Cabin., VI, 1782, p. 91, pl. 9, fig. 76.

— — — SPENGLER, Skrivter af Naturh. Selsk., IV, 2 H., 1798, p. 99, No. 27 (non varr.).

¹ Memoirs of the Liter. & Philos. Soc. Manchester, vol. 42, 1898, No. 4, p. 34.

² The Fauna and Geography of the Maldive and Laccadive Archipelagoes, ed. by J. ST. GARDINER, II, p. 627, 1903. MELVILL and SYKES have already stated (in Proc. of the Malacolog. Soc. London III, 1897, p. 47) that: "*T. carnicolor* Hanl. appears to be identical with *T. corbis* Sby. and *T. Strangei* Desh."

- Tellina (Tellinella) inflata*, CHEMNITZ, Edg. Smith, Proc. Zool. Soc. London, 1891, p. 426, No. 211.
 — *striatula*, LAMARCK, Hist. nat. d. anim. s. vert., V, 1818, p. 529, No. 33. — éd. 2, VI, p. 201, No. 33.
 — — — HANLEY, SOWERBY, Thes. Conchyl., I, p. 255, No. 61, pl. 61, fig. 175.
 — — — REEVE, Conchol. icon., vol. XVII, *Tellina*, Sp. 34.
Arcopagia — — BERTIN, Révision d. Tellinidés, p. 320, No. 9.
Tellina hippoidea, JONAS, PHILIPPI, Abbild. u. Beschreib. neuer od. wen. gek. Conchyl., I, p. 72 (8), *Tellina*, pl. 1, fig. 3.

Koh Lan, 30 fathoms, mud ($1/2$). Koh Kram, 30 fathoms (1). S. of Koh Chuen, 30 fathoms, shells ($1/2$). Cape Liant, 9 fathoms, shells ($1/2$). N. of Koh Kahdat, 4—5 fathoms, coarse sand (1). S. of Koh Kahdat, 8—10 fathoms, mud ($1/2$). Between Koh Kut and Koh Kahdat, 6—10 fathoms, shells ($2/2$). W. of Koh Kut, 15 fathoms, mud ($2/2$). S. of Koh Mak, 5—6 fathoms (2).

Long. 12—30 mm.

Distribution: — Singapore (shallow water, Sv. GAD), Nicobars, Andamans, Ceylon, Aden, Red Sea, Suez, Zanzibar, Mauritius. — Philippines, China, Celebes, Java, Port Curtis, New Caledonia.

CHEMNITZ's original specimens of *T. inflata* (in the Zoological Museum of the University of Copenhagen) are very large and rather thick-valved,¹ but they exactly agree with REEVE's figure of *T. striatula*, Lam., and with the specimens from the Gulf of Siam. V. BERTIN, who has had an opportunity of consulting LAMARCK's original specimens of *striatula*, in his "Révision" gives both REEVE's and HANLEY's (SOWERBY) *striatula* as synonyms of the present species. RÖMER (in MARTINI u. CHEMNITZ, Conchyl. Cabin.) is mistaken with regard to his *inflata*, Ch., neither his description nor his figures agree with CHEMNITZ's species;² BERTIN also says that RÖMER is wrong in reporting *striatula*, Lam., to be young specimens of the West Indian *T. fausta*, Pult. The specimens from the Gulf of Siam, all of which are rather small and consequently thin-valved, entirely agree with REEVE's figure of *striatula*. It appears as if the convexity of the valves varies somewhat in this species; thus, in a specimen from the Gulf of Siam, measuring 25 mm. in breadth and 21 mm. in height, the thickness is 10.5 mm., while in an individual from Suez,³ of the same breadth and height, it is only 7 mm.

Tellina languida, Edg. Smith, is very closely related to the present species.

Tellina (Arcopagia) pinguis, Hanl.

- Tellina pinguis*, HANLEY,* Proc. Zool. Soc. London, XII, 1844, p. 63.
 — — — SOWERBY, Thesaur. Conchyl., I, p. 252, No. 55, pl. 56, fig. 34.
 — — — REEVE, Conchol. icon., XVII, *Tellina*, Sp. 172.
 — (*Arcopagia pinguis*, HANLEY, RÖMER in MARTINI u. CHEMNITZ, Conchyl. Cabin., X Bd., 4 Abth., p. 96.
Arcopagia pinguis, HANLEY, V. BERTIN, Révision d. Tellinidés, p. 322, No. 15.

¹ CHEMNITZ's figure is not good and is partially misleading.

² RÖMER is hard to be understood, when his figure of *inflata* (pl. 15, figs. 1—3) is compared with the figure of *striatula* by HANLEY (pl. 61, fig. 175), which he gives as a synonym; the two figures do not resemble each other in the least.

³ In the Zoological Museum of the University of Copenhagen, received from L. VAILLANT, who has determined it as *T. truncata*, Hanl. (Journ. de Conchyl., 1865, p. 121, No. 79).

N. of Koh Kam, 5 fathoms, gravel (1). Off Koh Kam, 10 fathoms, gravel (1).
Koh Kahdat, 1 fathom, sand (1).

Long. 11—13·5 mm.

Distribution:— Philippines, Torres Strait, New Guinea (BRAZIER), New Caledonia, Viti Isls.

The specimens are covered with a thin epidermis which is ornamented with concentric elevations separated by fairly regular intermediate spaces (about 0.5—1 mm.); these elevations show most distinctly towards the ventral side, as the greater part of them is worn off upon the umbones, where they have left only concentric lines, which are, however, distinctly visible. Upon two of the specimens several red rays may be seen; and one of these two agrees almost completely with H. ADAMS' *Tellina Isseli* from the Red Sea (Proc. Zool. Soc. London, 1870, p. 790, pl. 48, fig. 10). A. H. COOKE and STURANY consider *T. Savignyi*, Ad. (from the Red Sea), to be identical with *T. pinguis*, Hanl.; this I can scarcely believe, but as I have only descriptions and figures to judge from, I cannot make any conclusive statement regarding this point; but it appears to me that *T. balaustina* L. (and *T. Isseli*, H. Ad.) are much more closely related to *T. pinguis*. It is almost impossible to distinguish between specimens of *balaustina* (from Algiers) and of *pinguis* from the Gulf of Siam.

Tellina (Arcopagia) Isseli, H. Ad.

Tellina (Arcopagia) Isseli, H. ADAMS, Proc. Zool. Soc. London, 1870, p. 790, pl. 48, fig. 10,

Arcopagia Isseli, H. ADAMS, V. BERTIN, Révision d. Tellinidés, p. 324, No. 26.

Tellina — — EDG. SMITH, Proc. Zool. Soc. London, 1891, p. 395, No. 15.

— (*Arcopagia*) *Isseli*, H. ADAMS, MELVILL and STANDEN, Proc. Zool. Soc. London, 1906, p. 821.

Koh Kahdat, 1 fathom, sand (1).

Long. 9 mm.

Distribution:— Bombay (MELVILL, Brit. Mus.), Mekran coast, Gulf of Oman, Persian Gulf (MELVILL & STANDEN), Aden, Red Sea, Gulf of Suez.

When EDG. SMITH in 1891 published "On a Collection of Marine Shells from Aden"¹ he said regarding this species: "I am not aware that it has been found anywhere except in the Gulf of Suez." But, as may be seen from the above list of distribution, it has since been recorded as occurring considerably farther towards the east.

Tellina (Arcopagia?) nux, Hanl.

Tellina nux, HANLEY, Proc. Zool. Soc. London, XII, 1844, p. 62.

— — — SOWERBY, Thesaurus Conchyl., I, p. 251, No. 54, pl. 56, fig. 33.

— — — REEVE, Conchol. icon., XVII, *Tellina*, Sp. 76.

— *Nux*, — RÖMER in MARTINI u. CHEMNITZ, Conchyl. Cabin., X Bd., 4 Abth., p. 88, No. 53.

Arcopagia nux, HANLEY, V. BERTIN, Révision d. Tellinidés, p. 321, No. 10.

Tellina — — DUNKER, Index molluscor. mar. Japon., 1882, p. 191.

Arcopagia Nux, — HIDALGO, Obras malacológicas, I, tom. II, 1903, p. 151, No. 266.

¹ Proc. Zool. Soc. London, 1891, pp. 390—436.

Sound of Koh Chang, 5 fathoms, soft clay ($1/2$). Koh Mak, sandy coast ($1/2$). Between Koh Chuen and Koh Chang, 15 fathoms, mud (2). Between Koh Kut and Koh Kahdat, 10 fathoms, shells ($1/2$). W. of Koh Kut, 30 fathoms, sand and mud ($2/2$).

Long. 6.5–13 mm. (long. 13 mm., alt. 10 mm.).

Distribution:— Karachi (MELVILL & STANDEN). — Philippines, Japan, Upolu (Mus. Godeffroy).

The figures in RÖMER'S Monograph (pl. 24, figs. 1–3) bear no resemblance whatever to *T. nux*, Hanl.; they undoubtedly represent quite a different species.

Tellina (*Arcopagia*?) *casta*, Hanl.

Tellina casta, HANLEY, Proc. Zool. Soc. London, XII, 1844, p. 63.

— — — SOWERBY, Thesaur. Conchyl., I, p. 253, No. 57, pl. 56, fig. 9.

— — — REEVE, Conchol. icon., XVII, *Tellina*, Sp. 269.

— (*Arcopagia casta*, HANLEY, RÖMER in MARTINI u. CHEMNITZ, Conchyl. Cabin., X Bd., 4 Abth., p. 95.

Arcopagia casta, HANLEY, V. BERTIN, Révision d. Tellinidés, p. 323, No. 21.

Tellina (?) *casta*, — EDG. SMITH, Lamellibranchiata of the Challenger Exped., p. 109.

E. of Koh Chuen, 9–10 fathoms, shells (1). Gulf of Rayong, 7–10 fathoms, sand and mud ($3 + 1/2$). S. of Koh Samit, 20 fathoms, mud (1). Koh Kahdat, 1–10 fathoms, mud, sand and clay ($5 + 26/2$). W. of Koh Kut, 15 fathoms, mud (2).

Long. 5–16 mm.

Distribution:— Singapore (HANLEY; Danish Exp. to Siam, 2–3 fathoms, coral-reef (5); Sv. GAD, shallow water), Mergui Archipel. — Torres Strait, Tonga Isls., Upolu (Mus. Godeffroy).

The present species is easily distinguishable from forms allied to it, by the left valve being more convex than the right; it is always quite white in colour. The specimens from the Gulf of Siam are more oblong than the figures given by REEVE and SOWERBY; the height of an individual, 13 mm. long, is 10 mm.

Tellina (*Arcopagia*?) *declivis*, Sow.

Tellina declivis, SOWERBY, REEVE, Conchol. icon., vol. 17, 1868, *Tellina*, Sp. 261.

Arcopagia declivis, SOWERBY, V. BERTIN, Révision d. Tellinidés, p. 324, No. 25.

W. of Koh Chang, 30 fathoms ($1/2$). Koh Kahdat, at the strand ($3/2$). Between Koh Kut and Koh Kahdat, 10 fathoms, shells ($2/2$). W. of Kut, 15 fathoms, mud ($1/2$).

Long. 5–10 mm. (long. 10 mm., alt. 8.5 mm.).

Distribution unknown. (Singapore, 2–3 fathoms, coral-reef (1 right valve), Danish Exp. to Siam).

My specimens exactly agree with SOWERBY'S description and figure; they are easily distinguished from *T. pudica*, to which species they are most closely allied, by the greater convexity, and by the predominance of the height of the valves in comparison with their length.

Tellina (Arcopagia?) languida, Sm.

Tellina (?) *languida*, EDG. SMITH, Report on the Lamellibranchiata of the Challenger Expedition, 1885, p. 110, pl. 4, fig. 8.

Between Koh Rin and Cliff Rock, 15 fathoms ($1\frac{1}{2}$). Koh Kram, 30 fathoms (3). Koh Chuen, 30 fathoms ($1\frac{1}{2}$). Gulf of Rayong, 7—10 fathoms, sand and mud ($1\frac{1}{2}$). S. of Koh Samit, 20 fathoms, mud (1). Sound of Koh Chang, 3 fathoms, soft clay ($1\frac{1}{2}$). Around Koh Kahdat, 1—10 fathoms, sand, mud, clay, and shells ($5 + 1\frac{1}{2}$). W. of Koh Kut, 15—30 fathoms, mud ($2 + \frac{3}{2}$).

Long. 6—11 mm. (long. 11 mm., alt. 9 mm., crass. 5 mm.).

Distribution:— Torres Strait and Flinders Passage (CHALLENGER).

The species *T. nux*, *casta*, *robusta*, *declivis*, *languida*, *pudica*, etc., form a natural chain or group, which, on the one hand, cannot be placed entirely in LEACH'S subgenus *Arcopagia*, (H. and A. ADAMS have done this, notwithstanding the fact that the character "posterior side rounded" is wanting in several of the species), but, on the other hand, it shows how much the division into subgenera of the genus *Tellina* needs critical investigation. Several authors (e. g. RÉCLUZ¹ and RÖMER²) have already attached but little importance to this subgenus *Arcopagia*.

Tellina (Arcopagia?) pudica, Hanl.

(Pl. III, Figs. 35—37).

Tellina pudica, HANLEY, Proc. Zool. Soc. London, XII, 1844, p. 62.

— — — SOWERBY, Thesaurus Conchyl., I, p. 246, No. 46, pl. 56, fig. 7.

— — — REEVE, Conchol. icon., XVII, *Tellina*, Sp. 176.

— (*Arcopagia*) *pudica*, HANLEY, RÖMER in MARTINI u. CHEMNITZ, Conchyl. Cabin., X Bd., 4 Abth., p. 95.

— (*Peronæa*) — — — V. BERTIN, Révision d. Tellinidés, p. 272, No. 103.

A great many specimens taken from numerous localities between Koh Chuen and Koh Kong, 3—30 fathoms, mud, clay.

Long. 3—9.5 mm.

Distribution:— Philippines, Japan (ALLART).

The specimens from the Gulf of Siam have a somewhat longer rostrum than that shown in the figures by HANLEY and REEVE; this species is characterised by being strongly polished, glossy, smooth and milk-white in colour; the umbones are prominent and rounded at their apices, and the whole outline recalls that of a *Nuculana* or (as HANLEY says) of a *Neæra*.

Tellina (Arcopagia?) Smithi n. sp.

(Pl. III, Figs. 38—39).

This shell is ovately-triangular in form, very thick-valved, pure white in colour, and somewhat glossy. The anterior end, which is roundly elongated, passes evenly into the ventral side, the latter is slightly curving and passes without angle-forma-

¹ Revue zoologique publ. p. Guérin-Méneville, 1846, pp. 48—55.

² MARTINI u. CHEMNITZ, Conchyl. Cabin., X Bd., 4 Abth., p. 72.

tion into the somewhat truncated posterior side. The umbo is situated towards the posterior side and the apex bends towards it. The umbo is fairly high and slopes gradually downwards on both sides. The surface is covered with close-set, regularly-arranged, concentric striae; some of these terminate at the place on the posterior side where they bend upwards, and only every other is continued upwards to the area which is limited by a small keel. The interior of the valve is pure white; in the right valve (which alone is at hand) the lateral teeth are strongly developed on each side; there are two cardinal teeth, of which the hinder is the larger. The pallial sinus is large and deep, but appears very indistinctly upon the glossy inner surface.

Long. 5.5 mm., alt. 5 mm., crass. 3 mm.

West of Koh Kut, 30 fathoms, sand, mud.

As the left valve is not known I cannot decide with certainty whether this species belongs to the subgenus *Arcopagia*.

I have ventured to associate with the name of the present species that of Mr. EDG. SMITH, to whom malacological science is indebted for so many valuable works.

***Tellina (Merisca) Martensi* n. sp.**

(Pl. III, Figs. 40—42).

This shell is small, white, rather thick-valved and triangular in outline. The surface is ornamented with more or less close-set, raised, concentric lamellæ, the interspaces are smooth and somewhat glossy. The umbones, which are situated at about the middle of the shell, are pointed and prominent, and slope rather abruptly downwards on both sides. The somewhat swollen anterior end passes gradually, and with rounded outline, into the ventral side which is convex and forms a rather acute angle with the hinder side. The posterior part exhibits a slight "Tellina-curvature." The interior of the valves is white and glossy. In the right valve there are two cardinal teeth, and two oblong, strongly developed lateral teeth; in the left valve there are no lateral teeth and of the two cardinal teeth the anterior is the larger. The pallial sinus is large and deep.

South of Koh Kut, 17—20 fathoms, mud ($1\frac{1}{2}$). (Singapore, 2—3 fathoms, coral-reef; $\frac{5}{2}$).

Long. 3.5 mm., alt. 3 mm., crass. 2 mm.

This little characteristic *Tellina*-form must be referred to DALL's section *Merisca* of the subgenus *Arcopagia*; it somewhat resembles the much larger *T. (Merisca) crystallina*, Wood,¹ from South Carolina, but that species is longer, and has a more decided rostrum. The specimens at hand show that the species varies considerably in regard to form and the density and height of the lamellæ. I have named this species after the late Professor ED. v. MARTENS, the first zoologist who gave us a fauna of the Mollusca of Siam, and to whom malacological science is indebted for many profound and valuable papers and works.

¹ Proceed. Unit. Stat. Nat. Mus., vol. 23, 1900, p. 311, pl. 2, fig. 10.

Tellina (Quadrans) gargadia L.

- Tellina Gargadia*, LINNÉ, Syst. Nat., ed. X, 1758, p. 674, No. 33. — ed. XII, p. 1116, No. 44. — Mus. Ludov. Ulr., 1764, p. 476, No. 19.
- — — SPENGLER, Skrivter af Naturhist. Selskabet, IV, 2 H., 1798, p. 86, No. 14.
- — — CHEMNITZ, Conchyl. Cabin., VI, p. 83, pl. 8, figs. 63—64.
- *gargadia*, — HANLEY in SOWERBY, Thesaur. Conchyl., I, p. 263, No. 76, pl. 61, fig. 156; pl. 62, fig. 181.
- — — REEVE, Conchol. icon., XVII, *Tellina*, Sp. 84.
- *Gargadia*, — MARTINI u. CHEMNITZ, Conchyl. Cabin., X Bd., 4 Abth., p. 38, No. 21, pl. 2, figs. 2—4; pl. 11, figs. 8—10.
- *gargadia*, — V. BERTIN, Révision d. Tellinidés, p. 266, No. 87.

N. of Koh Kahdat, 4—5 fathoms, coarse sand ($1/2$). Koh Kahdat, 1 fathom, sand ($3/2$). Between Koh Riot and Koh Mesan, 3—5 fathoms, sand ($1/2$).

Long. 10—30 mm.

1) long. 30 mm., alt. 22·5 mm.

2) — 25 mm., — 18·5 mm.

Distribution: — Nicobars, Ceylon, Seychelles, Zanzibar. — Philippines, Batjan, Mast Head Reef (Queensland), New Caledonia, Pelew Isls.

This species varies considerably both in form and in sculpture. The specimens from the Gulf of Siam are all rather small, with slightly prominent sculpture and, as the above measurements show, of ovately-oblong form; they come nearest to HANLEY's *T. inaequalis*, but judging from the figures and descriptions I cannot see that that species is anything but a form of *gargadia*, to which species I have therefore referred my specimens. HIDALGO¹ arrived at the same conclusion, when treating the specimens from the Philippines; he regards *T. inaequalis*, Hanl., to be synonymous with *T. gargadia* L.

Tellina (Quadrans) minor, V. Bertin.

Tellina minor, V. BERTIN, Révision d. Tellinidés, 1878, p. 267, No. 90, pl. 9, fig. 5.

Between Koh Riot and Koh Mesan, 5 fathoms, sand ($3/2$). Between Koh Mesan and Cape Liant, 5—9 fathoms ($1/2$). Koh Kahdat, 1 fathom, sand (1). W. of Koh Kut, 15 fathoms, mud ($1/2$).

Long. 5—9 mm. (long. 9 mm., alt. 6·5 mm., crass. 3·5 mm.).

Distribution: — New Caledonia (BERTIN).

Tellina (Tellinides) carinata, Spengl.

Tellina tenuis ovalis, CHEMNITZ, Conchyl. Cabin., VI, 1782, p. 97, pl. 10, fig. 87.

— *carinata*, SPENGLER, Skrivter af Naturhistorie-Selskabet, IV, 2 H., 1798, p. 110.

— *oblonga*, GMELIN, LINNÉ, Syst. Nat., ed. XIII, 1790, p. 3234, No. 29.

Tellinides emarginatus, SOWERBY, A Catalogue of the Shells in the Collection of the Earl of Tankerville, 1825, Appendix, p. III, No. 199.

Tellina (Tellinides) emarginata, SOWERBY, HANLEY, Monogr. of the gen. *Tellina*. (SOWERBY, Thes. Conchyl., I) p. 290, No. 130, pl. 57, fig. 70.

¹ J. G. HIDALGO, Obras malacológicas, I, Tom. II, 1903, p. 122.

Tellina emarginata, SOWERBY, REEVE, Conchol. icon., XVII, *Tellina*, Sp. 99.

— (*Tellinides*) *emarginata*, SOWERBY, RÖMER in MARTINI u. CHEMNITZ, Conchyl. Cabin., X Bd., 4 Abth., p. 177, No. 105, pl. 36, figs. 1—3.

— (*Homala*) — — V. BERTIN, Révision d. Tellinidés, p. 291, No. 182.

Between Koh Rin and Cliff Rock, 15 fathoms (3). Gulf of Rayong, 7—10 fathoms, sand and mud ($1/2$). S. of Koh Chuen, 30 fathoms, shells (1). Koh Kahdat, 10 fathoms (several quite young individuals).

Long. 7—27 mm.

Distribution: — Singapore, Mergui Archip., Bombay. — Torres Strait.

As SPENGLER'S original specimens of *T. carinata* are in the Zoological Museum of the University of Copenhagen, it has been possible for me to verify the fact that SOWERBY'S species *emarginata* is synonymous with the present species. SOWERBY'S specific name must therefore give place to that given by SPENGLER, which has the priority. GMELIN'S name *oblonga* (from 1790) has not the priority, because CHEMNITZ, in 1782, mentions SPENGLER'S manuscript-name *carinata*, which SPENGLER himself afterwards published. The native land of the species has been very erroneously recorded; SPENGLER records the coast of Guinea, CHEMNITZ and SALIS MARSCHLINS¹ the European Seas, and SOWERBY Brazil, all of which localities are undoubtedly wrong.

Tellina (*Tellinides*) *psammotella*, Lam.

Tellina psammotella, LAMARCK, Hist. nat. d. anim. sans vertèbres, V, 1818, p. 528, No. 30. — éd. 2, VI, 1835, p. 199, No. 30.

— *Psammotella*, — HANLEY, Descript. Catal. of recent biv. shells, p. 65, pl. 14, fig. 6.

— — — HANLEY in SOWERBY, Thesaur. Conchyl., I, p. 290, No. 129, pl. 60, fig. 134.

— — — REEVE, Conchol. icon., XVII, *Tellina*, Sp. 71.

— (*Tellinides*) *Psammotella*, LAMARCK, RÖMER in MARTINI u. CHEMNITZ, Conchyl. Cabin., X Bd., 4 Abth., p. 176, No. 104, pl. 35, figs. 12—14.

Macoma psammotella, LAMARCK, V. BERTIN, Révision d. Tellinidés, p. 337, No. 11.

— *Psammotella*, — HIDALGO, Estud. prelim. sobre la fauna malacol. de las Islas Filipinas, I, 1903, p. 160, No. 280.

Sound of Koh Chang, 5 fathoms, soft clay ($6/2$).

Long. 11—16 mm. (long. 16 mm., alt. 9 mm.).

Distribution: — Singapore, shallow water (Danish Exp. to Siam, and Sv. GAD). Cebu (Philippines, QUADRAS).

LAMARCK states that the interior of his specimens are ornamented with orange, red, or purple rays, but this is not the case with the individuals which I have before me, all of which are interiorly (and exteriorly) uniform in colour, pale-red (flesh-coloured). As regards the lateral teeth, HANLEY (Thesaur. Conchyl.) observes, "lateral tooth distinct, approximated," while REEVE, in his diagnosis, says, "dentibus lateralibus nullis." V. BERTIN and HIDALGO, on the basis of the latter statement, without investigating the subject more closely, have referred the species to *Macoma*.

¹ Reisen in versch. Provinzen d. Königr. Neapel, I, 1793, p. 384, No. 108.

In reality the lateral teeth (and the hinge as a whole) are developed as in *Tellina emarginata*, Sow., to which species also, *T. psammotella* comes nearest in external appearance.

Tellina (*Tellinides*) *vestalis*, Hanl.

Tellina vestalis, HANLEY, Proc. Zool. Soc. London, XII, 1844, p. 141.

— — — Monograph of the gen. *Tellina* (SOWERBY, Thesaur. Conchyl., I), p. 291, No. 132, pl. 57, fig. 67.

— — — REEVE, Conchol. icon., XVII, *Tellina*, Sp. 230.

— (*Tellinides*) *vestalis*, HANLEY, RÖMER in MARTINI u. CHEMNITZ, Conchyl. Cabin., X Bd., 4 Abth., p. 174, No. 103, pl. 35, figs. 9—11.

S. of Koh Kahdat, 8—10 fathoms, mud (1). Between Koh Kahdat and Koh Kut, 6 fathoms, clay mixed with sand ($1\frac{1}{2}$). W. of Koh Kut, 15 fathoms, mud ($\frac{1}{2}$). Long. 9—28 mm.

Distribution: — Karachi (MELVILL & STANDEN), Mauritius. — Philippines.

I very much doubt whether RÖMER (loc. cit.) had the true *T. vestalis*, Hanl. before him; neither his figure nor his description agrees with HANLEY's species.

Tellina (*Tellinides*) *ovalis*, Sow.

Tellinides ovalis, G. B. SOWERBY, Catalogue of the Shells in the Collect. of the Earl of Tankerville, 1825, Append., p. III, No. 198.

— — — HANLEY, Catal. of rec. biv. shells, p. 73, pl. 13, fig. 56.

Tellina (*Tellinides*) *ovalis*, SOWERBY, HANLEY, Thesaur. Conchyl., I, p. 296, No. 142, pl. 60, fig. 147.

— *ovalis*, SOWERBY, REEVE, Conchol. icon., XVII, *Tellina*, Sp. 105.

— — — LISCHKE, Japan. Meeres-Conchyl., III, p. 94.

— — — BERTIN, Révision d. Tellinidés, 1878, p. 284, No. 140.

— — — DUNKER, Index moll. mar. Japon., 1882, p. 190.

— — — HIDALGO, Molusc. mar. de las Isl. Filipinas, 1903, p. 134, No. 238.

Solen ex albido radiatus, CHEMNITZ, Conchyl. Cabin., VI, 1782, p. 71, pl. 7, figs. 57—58.

— *striatus*, GMELIN, Syst. Nat., ed. XIII, p. 3227, No. 19.

Tellina tridentata, ANTON, Archiv f. Naturg., III, 1837, Bd. I, p. 283.

— *gratiosa*, RÖMER in MARTINI u. CHEMNITZ, Conchyl. Cabin., X Bd., 4 Abth., p. 170, No. 100, pl. 34 figs. 10—12.

Off Koh Kam, 10 fathoms, gravel ($\frac{1}{2}$).

Long. 37 mm., alt. 23·5 mm.

Distribution: — Nicobars, Karachi, Persian Gulf, Gulf of Suez, Red Sea (fossil, V. BERTIN), Madagascar. — Philippines, Moluccas, Japan.

Tellina (*Moerella*) *semen*, Hanl.

Tellina semen, HANLEY, Proc. Zool. Soc. London, XII, 1844, p. 164.

— — — SOWERBY, Thesaur. Conchyl., I, p. 249, No. 51, pl. 56, fig. 8.

— (*Arcopagia*) *semen*, HANLEY, RÖMER in MARTINI u. CHEMNITZ, Conchyl. Cabin., X Bd., 4 Abth., p. 95.

— (*Homala*) *semen*, — V. BERTIN, Révision d. Tellinidés, p. 303, No. 268.

— *semen*, HANLEY, EDG. SMITH, Report on the Zool. Collections made in the Indo-Pacific Ocean during the voyage of "Alert," 1884, p. 99.

— (?) *semen*, HANLEY, EDG. SMITH, Rep. on the Lamellibranchiata of the Challenger Exped., p. 111.

— (*Moera*) *semen*, HANLEY, MELVILL & STANDEN, Proc. Zool. Soc. London, 1906, p. 821.

Off Koh Kam, 10 fathoms, gravel ($1/2$). Between Koh Mesan and Cape Liant, 5—9 fathoms ($1/2$). Between Koh Kut and Koh Kahdat, 10 fathoms, shells ($2/2$).

Long. 6—9 mm. (long. 9 mm., alt. 7 mm.).

Distribution: — Karachi, Mekran coast, Persian Gulf, Durban.¹ — Philippines, Torres Strait, Flinders Passage, Viti Isls.

SOWERBY'S figure in REEVE'S "Conchol. icon." (pl. 41, sp. 232), which EDG. SMITH regards as "bad," agrees fairly well with the individuals from the Gulf of Siam, and although it is not perfectly typical, yet it can be recognised; besides, it agrees well with SOWERBY'S original figure in "Thesaurus Conchyliorum."

Tellina (Moerella) semitorta, Sow.

(Pl. III, Figs. 43—46).

Tellina semitorta, SOWERBY, REEVE, Conchol. icon., XVII, 1867, *Tellina*, Sp. 221.

— (*Mera*) *semitorta*, SOWERBY, ANGAS, Proc. Zool. Soc. London, 1867, p. 919.

— (?) — — — EDG. SMITH, Report on the Lamellibranchiata of the Challenger Exped., p. 111.

— (*Donacilla*) *semitorta*, SOWERBY, MELVILL & STANDEN, Journ. Linn. Soc. Zool., XXVII, p. 201.

— — — — V. BERTIN, Révision d. Tellinidés, p. 263, No. 81.

Between Koh Rin and Cliff Rock, 15 fathoms ($2/2$). Koh Kram, 30 fathoms ($4/2$). N. of Koh Kam, 5 fathoms, gravel ($4 + 3/2$). Off Koh Kam, 10 fathoms, gravel ($1/2$). Between Koh Mesan and Cape Liant, 5—9 fathoms (12). North side of Koh Mesan, 10—15 fathoms, stones ($3/2$). Gulf of Rayong, 7—10 fathoms, sand and mud ($1 + 1/2$). Between Koh Kut and Koh Kahdat, 10 fathoms, shells ($1/2$). W. of Koh Kut, 15—30 fathoms, mud ($1 + 2/2$). Koh Kahdat, 1—5 fathoms, sand ($2 + 2/2$).

Long. 2·5—12 mm.

Distribution: — Singapore (low water, Sv. GAD). Torres Strait, Port Jackson (Sydney), Watson's Bay (New South Wales).

This species varies considerably in form; on Pl. III, Figs. 43—46, I have given several instances of this;² the sculpture, also, is very variable. Thus, for instance, the concentric striation may be more or less close-set; and the place where the less close-set, posterior striation meets the rest of the valve-sculpture is often situated very far back, while in other specimens it may be at about the middle of the valve; and often the more prominent lamellar sculpture upon the posterior end has almost entirely disappeared, and the sculpture is nearly uniform over the whole surface of the valve. Nor is the striation, as a rule, the same on both valves. The tortuosity of the posterior end of the valves, mentioned by EDG. SMITH (loc. cit., p. 112), is in one specimen directed towards the right, and in another towards the left. SMITH'S statement that: "the anterior lateral teeth and the plate supporting the ligament are tinged with pale-red," is not found in the specimens from the Gulf

¹ EDG. SMITH, Proc. Malacolog. Soc. London, vol. 5, p. 400.

² EDG. SMITH'S criticism of SOWERBY'S figure in REEVE'S "Conchol. icon." is unjustified; several specimens from the Gulf of Siam have the form shown in SOWERBY'S figure.

of Siam; only in one individual is there any indication of this tinge of colour; in that specimen the red colour radiates downwards over the valves, both within and without, but in all the others the shells are quite white, with a thin yellow epidermis, which is often quite worn off, or is present only in remnants.

Tellina (Moerella) Berghi n. sp.

(Pl. III, Figs. 47—49).

This shell is oblong-ovate, white and rather thick-valved; the umbones are situated towards the posterior end; a slight indication of a keel extends from the umbo obliquely down towards the posterior angle of the ventral side, which curves gently like the anterior and posterior sides, into which it passes without angle-formation. The surface is sculptured with close-set, parallel, raised, concentric striæ; on the posterior side some of these striæ, for want of space, do not extend quite to the hinder upper margin, but otherwise all the striæ extend entirely round the valve. These raised concentric striæ, and also the spaces between them, are ornamented with very fine, close-set, concentric lines, which are again crossed by fine radiating grooves which become more distinct the nearer they approach the ventral side; all of which produces, if seen under the lens, an exceedingly beautiful and fine beadlike sculpture, resembling fine weaving. The interior of the valves is white and glossy. In the right valve there are two well developed, oblong lateral teeth and two cardinal teeth, of which the hinder is bifid and considerably larger than the anterior.

Long. 7 mm., alt. 5 mm., crass. 3 mm.

The strand of Koh Kahdat ($1/2$).

This species belongs to the group *T. semen*, Hanl., *T. semitorta*, Sowb., *T. miracyllium*, Melv., etc., but its characteristic and beautiful sculpture easily distinguishes it from nearly-allied species. Unfortunately only one right valve was obtained. I have dedicated this species to the late Professor RUD. BERGH, the eminent author of so many valuable works on Mollusca, who has also described the *Nudibranchs* of the Gulf of Siam, and to whom I personally owe thanks for much encouragement and kindness.

Tellina (Moerella) tenuilirata, Sow.

Tellina tenuilirata, SOWERBY, REEVE, Conchol. icon., XVII, 1867, *Tellina*, Sp. 219 (non *T. tenuilirata*, Sowerby, Conchol. icon., Sp. 253 = *T. semilævis*, v. Martens).

— — — ANGAS, Proc. Zool. Soc. London, 1867, p. 919, No. 48.

— — — EDG. SMITH, Rep. Lamellibranchiata of the Challenger Exped., p. 106.

— (*Homala*) *tenuilirata*, SOWERBY, V. BERTIN, Révision d. Tellinidés, p. 299, No. 234.

— *tenuilirata*, SOWERBY, PRITCHARD & GATLIFF, Proceed. Roy. Soc. Victoria, XVI, 1903, p. 116.

Koh Kram, 30 fathoms ($2/2$). Between Koh Mesan and Cape Liant, 5—9 fathoms, sand ($4/2$). N. of Koh Kam, 5 fathoms, gravel ($1/2$). Off Koh Kram, 10 fathoms, gravel ($1/2$). Gulf of Rayong, 7—10 fathoms, sand, mud (1). Koh Kahdat, 1—5 fathoms, sand ($2/2$).

Long. 4—11 mm.

Distribution:— Flinders Passage (Torres Str.); Port Kembla and off Cape Three Points (New South Wales, HEDLEY); Port Jackson, Sydney; Frankston, Port Philip (Victoria); Levuka, Viti Isls.

Tellina (Moerella) obtusalis, Desh.

- Tellina obtusalis*, DESHAYES, Proc. Zool. Soc. London, 1854, p. 355, No. 176.
 — — — REEVE, Conchol. icon., XVII, 1868, *Tellina*, Sp. 281.
 — — — EDG. SMITH in: Report Zool. Collect. made during the Voyage of H. M. S. "Alert," 1884, p. 99.
 — (*Homala*) *obtusalis*, DESHAYES, V. BERTIN, Révision d. Tellinidés, p. 298, No. 231.
 — *Malaccana*, SOWERBY, REEVE, Conchol. icon., XVII, 1867, *Tellina*, Sp. 125.
 — (*Donacilla*) *Malaccana*, SOWERBY, V. BERTIN, Révision d. Tellinidés, p. 262, No. 80.

Koh Kahdat, on the strand ($\frac{2}{2}$). Between Koh Kut and Koh Kahdat, 10 fathoms, shells ($\frac{1}{2}$).

Long. 7.5—10 mm.

Distribution:— Malacca, Karachi (MELVILL & STANDEN). — Viti Isls. (Brit. Mus.).

As the specimens are in a bad state of preservation the determination is somewhat uncertain.

Note. *Tellina (Moerella) compacta*, Edg. Smith, has been taken by Sv. GAD (a single left valve, worn) at Singapore, in shallow water.

Tellina (Angulus) lux, Hanl.

- Tellina lux*, HANLEY, Proc. Zool. Soc. London, XII, 1844, p. 140.
 — — — SOWERBY, Thesaur. Conchyl., I, p. 288, No. 126, pl. 57, fig. 71.
 — — — REEVE, Conchol. icon., vol. XVII, *Tellina*, Sp. 286.
 — (*Angulus*) *Lux*, HANLEY, RÖMER in MARTINI u. CHEMNITZ, Conchyl. Cabin., X Bd., 4 Abth., p. 159.
 — — — *lux*, — EDG. SMITH, Report on the Lamellibranchiata of the Challenger Exped., p. 102.
 — (*Homala*) — — V. BERTIN, Révision d. Tellinidés, p. 296, No. 217.

W. of Koh Kut, 30 fathoms, sand and mud ($1 + \frac{2}{2}$).

Long. 14—16 mm., alt. 9—10 mm.

Distribution:— Persian Gulf, Gulf of Suez (MAC ANDREW). — Philippines, Torres Strait, Arafura Sea.

The specimens from the Gulf of Siam are pale-red in colour.

Tellina (Angulus) corbuloides, Hanl.

- Tellina Corbuloides*, HANLEY, Proc. Zool. Soc. London, XII, 1844, p. 70.
 — — — SOWERBY, Thesaur. Conchyl., I, p. 280, No. 108, pl. 57, figs. 50, 57.
 — *corbuloides*, — REEVE, Conchol. icon., XVII, *Tellina*, Sp. 70.
 — — — V. BERTIN, Révision d. Tellinidés, p. 280, No. 129.
 — — — HIDALGO, Moluscos mar. de las Isl. Filipinas, 1903, p. 129, No. 233.

The coast of Lem Ngob (1).

Long. 13·5 mm.

Distribution:— Philippines, Borneo.

The form which RÖMER figures and describes (MARTINI u. CHEMNITZ, Conchyl. Cabin., X Bd., 4 Abth., p. 155, No. 95, pl. 33, figs. 8—10) under the name of *T. corbuloides* is not HANLEY'S species.

Tellina (Angulus) iridescens, Bens.

Sanguinolaria iridescens, W. H. BENSON, Annals and Magaz. of Nat. Hist., vol. 9, 1842, p. 490.

<i>Tellina</i>	—	—	PHILIPPI, Abbild. u. Beschreib., II, p. 23 (91), No. 5, pl. 4, fig. 5.
—	—	—	HANLEY in SOWERBY, Thesaur. Conchyl., I, p. 286, No. 122, pl. 58, fig. 88.
—	(<i>Angulus</i>)	—	MARTINI u. CHEMNITZ, Conchyl. Cabin., X Bd., 4 Abth., p. 134, No. 77, pl. 29, figs. 15—17.
—	—	—	REEVE, Conchol. icon., vol. XVII, <i>Tellina</i> , Sp. 129 and 189.
—	—	—	LISCHKE, Japan. Meeres-Conchyl., III, 1874, p. 93.
—	(<i>Fabulina</i>)	—	V. BERTIN, Révision d. Tellinidés, p. 276, No. 112.
—	—	—	HIDALGO, Moluscos marin. de las Isl. Filipinas, 1903, p. 126, No. 228.
—	<i>carnea</i> ,	PHILIPPI,	Zeitsch. f. Malakozool., 1844, p. 162, No. 3.

The sound of Koh Chang, 5 fathoms, soft clay ($\frac{3}{2}$).

Long. 14—20 mm. (long. 20 mm., alt. 11·5 mm.).

Distribution:— Karachi (MELVILL & STANDEN). — Philippines, China, South Japan, Torres Strait.

The individuals from Koh Chang exactly agree with some specimens in the Zoological Museum in Copenhagen from Chusan (forwarded by TH. CANTOR). REEVE'S figures give the characteristics of the species most accurately.

Tellina (Angulus) iridella, Mart.

Tellina iridella, E. v. MARTENS, Annals and Magaz. of Nat. Hist., 3 Ser., vol. XVI, 1865, p. 431, No. 9.

—	(<i>Macoma</i>)	<i>iridella</i> ,	E. v. MARTENS, RÖMER in MARTINI u. CHEMNITZ, Conchyl. Cabin., X Bd., 4 Abth., p. 256, No. 160, pl. 49, figs. 4—6.
—	<i>iridella</i> ,	E. v. MARTENS,	LISCHKE, Japan. Meeres-Conchyl., II, p. 114, pl. 10, figs. 8—9.
<i>Macoma</i>	—	—	V. BERTIN, Révision d. Tellinidés, p. 350, No. 55.

W. of Koh Kut, 15 fathoms, mud (1).

Long. 13 mm., alt. 8 mm., crass. 3·5 mm.

Distribution:— Japan, Loo-Choo Isls.

My specimen, like that of LISCHKE, has in the right valve a lateral tooth in front of the cardinal teeth. The species must therefore be referred to the subgenus *Angulus*, and not to *Macoma*, as previous authors have done.

Tellina (Angulus) unifasciata, Sow.

Tellina unifasciata, SOWERBY, REEVE, Conchol. icon., XVII, 1867, *Tellina*, Sp. 156.

—	(<i>Angulus</i>)	<i>unifasciata</i> ,	SOWERBY, ANGAS, Proc. Zool. Soc. London, 1867, p. 919, No. 49.
—	(<i>Fabulina</i>)	—	—
—	—	—	V. BERTIN, Révision d. Tellinidés, p. 281, No. 130.

W. of Koh Kut, 15 fathoms, mud ($1\frac{1}{2}$). Between Koh Kut and Koh Kahdat, 10 fathoms, shells ($1\frac{1}{2}$).

Long. 9—10 mm.

Distribution: — Arabian Sea (MELVILL & STANDEN), Gulf of Suez (COOKE), Seychelles (Brit. Mus.). — Port Jackson (ANGAS).

The specimen from the collection of PETIT DE LA SAUSSAYE mentioned by V. BERTIN, which is recorded with doubt from Florida, should unquestionably be omitted from the literature.

Tellina (Angulus) dispar, Conr.

- Tellina dispar*, CONRAD, Journ. Acad. Nat. Sc. Philadelphia, VII, part 2, 1837, p. 259, No. 4.
 — — — HANLEY in SOWERBY, Thesaur. Conchyl., I, p. 306, No. 164, pl. 59, figs. 108, 113—14.
 — — — RÖMER in MARTINI u. CHEMNITZ, Conchyl. Cabin., X Bd., 4 Abth., p. 148, No. 90, pl. 32, figs. 7—9.
 — — — SOWERBY in REEVE, Conchol. icon., XVII, *Tellina*, Sp. 10.
 — — — E. v. MARTENS, Donum Bismarckianum, 1871, p. 62.
 — (*Fabulina*) *dispar*, CONRAD, V. BERTIN, Révision d. Tellinidés, p. 277, No. 117.
 — *dispar*, CONRAD, HIDALGO, Fauna malacol. de I. Isl. Filipinas, II, 1903, p. 126, No. 229.

Koh Kahdat, 1 fathom, corals (1).

Long. 15 mm.

Distribution: — Maldive Isls., Mauritius, Querimba Isls. (Mozambique), Natal. — Philippines, Port Curtis and Moreton Bay (Queensland), Marianne Isls., New Caledonia, Lifu, Samoa Isls., Tahiti, Funafuti Atoll, Sandwich Isls.

The records of the occurrence of this species along the coast of California (TRYON and JAY) and in the Strait of Magelhaens (BERTIN) are undoubtedly due to erroneous determination of allied species.

Tellina (Angulus?) rhomboides, Quoy & Gaim.

- Tellina rhomboides*, QUOY et GAIMARD, Voyage de l'astrolabe, Zoologie, II, 1833, p. 502, pl. 81, figs. 4—7.
 — *Rhomboides*, — HANLEY in SOWERBY, Thesaur. Conchyl., I, p. 304, No. 162, pl. 58, figs. 92, 96 and 97.
 — *rhomboides*, — REEVE, Conchol. icon., XVII, *Tellina*, Sp. 114.
 — (*Angulus*) *rhomboides*, QUOY et GAIMARD, RÖMER in MARTINI u. CHEMNITZ, Conchyl. Cabin., X Bd., 4 Abth., p. 144, No. 87, pl. 31, figs. 14—17.
 — (*Fabulina*) — — BERTIN, Révision d. Tellinidés, p. 279, No. 123.
 — (*Angulus?*) — — EDG. SMITH, Rep. on the Lamellibranchiata of the Challenger Exped., p. 103.
 — *clathrata*, (QUOY) DESHAYES, LAMARCK, Hist. nat. d. anim. s. vert., 2 éd., 1835, VI, p. 208, No. 57.
 — — — HANLEY, Catal. of rec. biv. shells, p. 65, pl. 14, fig. 12.
 — *compta*, GOULD, WILKES' Explor. Exped., vol. XII, p. 406, Atlas fig. 575. — Otia Conchol., 1862, p. 79.
 — *lauta*, — loc. cit., p. 408, Atlas fig. 514. — Otia Conchol., p. 79.
 — *silicula*, DESHAYES, Proc. Zool. Soc. London, XXII, 1854, p. 363, No. 209.
 — — — REEVE, Conchol. icon., XVII, *Tellina*, Sp. 278.
 — *caseus*, SOWERBY, — — — — — Sp. 115.
 — *texturata*, — — — — — pl. 41, Sp. 233; pl. 45, fig. 233 b.
 — *reticulata*, — — — — — Sp. 252.

- Tellina* (*Peronæa*) *pura*, H. ADAMS, Proc. Zool. Soc. London, 1870, p. 789, pl. 48, fig. 6.
 — — — *erythrænsis*, H. ADAMS, Proc. Zool. Soc. London, 1870, p. 790, pl. 48, fig. 8.
 — — — *lactea*, H. ADAMS, Proc. Zool. Soc. London, 1870, p. 790 (fide A. H. COOKE).
 — *subrosea*, RÖMER (non HANLEY), MARTINI u. CHEMNITZ, Conchyl. Cabin., X Bd., 4 Abth., pl. 32, figs. 14–16 (fide HIDALGO).
 — *bifaria*, BAIRD, BRENCHELEY'S Cruise of the Curaçoa, 1873, p. 451, pl. 41, fig. 13.

Koh Kahdat, 1 fathom, sand (2). N. of Koh Kahdat, 4–5 fathoms, sand ($1\frac{1}{2}$).
 S. of Koh Mak, 5–6 fathoms (1).

Long. 13–18 mm. (long. 18 mm., alt. 10 mm., crass. 5.5 mm.).

Distribution:— Minikoi (Laccadive Archip.), Red Sea, Suez, Madagascar, Mauritius, Durban (EDG. SMITH). — Philippines, Gulf of Jedo, Timor, Keeling Isls., New Guinea, Marianne Isls., New Hebrides, New Caledonia, New Zealand, Cape York (North Australia), Viti Isls., Funafuti (Ellice Isls.), Lifu, Upolu, Paumotu Isls.

All the specimens from the Gulf of Siam agree most closely with HANLEY'S figure (pl. 58, fig. 96).

Note. When ED. v. MARTENS records (Malakozoolog. Blätter, vol. 21, 1873, p. 176) that *Tellina* (*Scissula*) *virgo*, Hanl., was taken "Am Eingang des Golfs von Siam, 8° 29' Nordbreite, 16 Faden," it is certainly due to erroneous determination. According to DALL (Synopsis of the family Tellinidæ, 1900, p. 304) the species occurs from "Gulf of California, la Paz, to Chiriqui." Also HANLEY'S original specimens are recorded from Chiriqui, West Columbia.

Tellina (*Peronæa*) *cygnus*, Hanl.

- Tellina cygnus*, HANLEY, Proc. Zool. Soc. London, XII, 1844, p. 144.
 — — — SOWERBY, Thesaur. Conchyl., I, p. 310, No. 175, pl. 59, fig. 122.
 — — — REEVE, Conchol. icon., XVII, *Tellina*, Sp. 157.
 — (*Peronæa*) *cygnus*, HANLEY, V. BERTIN, Révision d. Tellinidés, p. 271, No. 100.

NW. of Koh si Chang, 10 fathoms, mud ($1\frac{1}{2}$). W. of Koh Chuen, soft clay and mud ($2\frac{1}{2}$). Gulf of Rayong, 7–10 fathoms, mud ($1\frac{1}{2}$). S. of Koh Samit, 20 fathoms, mud ($6\frac{1}{2}$). S. of Koh Tulu, 10 fathoms, mud mixed with sand ($5\frac{1}{2}$). Koh Chang, 3–5 fathoms, soft clay (many specimens). W. of Koh Chang, 20 fathoms, mud ($1\frac{1}{2}$). S. of Koh Bidang, 9 fathoms, mud ($1\frac{1}{2}$). S. of Koh Mak, 5–6 fathoms ($1\frac{1}{2}$). W. of Koh Kut, 15–30 fathoms, mud ($4\frac{1}{2}$). Around Koh Kahdat and Koh Kut, 6–10 fathoms, clay mixed with sand, and mud (many specimens). Around Koh Kong, 8–15 fathoms, mud (7).

Long. 5–16 mm.

Distribution:— Philippines, China, New Caledonia.

Tellina (*Peronæa*) *micans*, Hanl.

- Tellina micans*, HANLEY, Proc. Zool. Soc. London, XII, 1844, p. 72.
 — — — Monogr. of the gen. *Tellina* (SOWERBY, Thesaur. Conchyl., I), p. 309, No. 170, pl. 59, fig. 106.
 — — — REEVE, Conchol. icon., XVII, *Tellina*, Sp. 130.
 — (*Peronæa*) *micans*, HANLEY, RÖMER in MARTINI u. CHEMNITZ, Conchyl. Cabin., X Bd., 4 Abth., p. 120, No. 71, pl. 28, figs. 5–7.

Tellina (Homala) micans, HANLEY, BERTIN, Révision d. Tellinidés, p. 297, No. 222.

Psammobia micans, HANLEY, EDG. SMITH, Ann. and Magaz. Nat. Hist., 7 Ser., XVIII, 1906, p. 260.

Tellina depauperata, v. MARTENS, Ann. and Magaz. of Nat. Hist., 3 Ser., vol. 16, 1865, p. 429, No. 4.

— — — RÖMER in MARTINI u. CHEMNITZ, Conchyl. Cabin., X Bd., 4 Abth., p. 254, No. 158, pl. 49, figs. 1—3.

S. of Koh Samit, 20 fathoms, mud (14). W. of Koh Chang, 20 fathoms, mud (1). Sound of Koh Chang, 3—5 fathoms, soft clay (⁸/₂ dead specimens). Koh Kahdat (fragment).

Long. 11—29 mm.

Distribution:— Persian Gulf (EDG. SMITH), Mekran coast (MELVILL & STANDEN), Aden (SHOPLAND). — Philippines.

EDG. SMITH (loc. cit.) thinks that the present species “on account of the absence of lateral teeth and the oblique sculpture” must be referred to *Psammobia*, but I am convinced that he is wrong in this; the absence of the lateral teeth being typical of the subgenus *Peronaea*, and the oblique sculpture being found in so many other species of *Tellina*.

Tellina (Metis) coarctata, Phil.

Tellina coarctata, R. A. PHILIPPI, Zeitschrift f. Malakozool., 1845, p. 151, No. 11.

— *lacunosa*, (non CHEMNITZ), HANLEY in SOWERBY, Thesaur. Conchyl., I, p. 322, No. 197, pl. 65, fig. 252.

— — — REEVE, Conchol. icon., XVII, *Tellina*, Sp. 25.

— (*Metis lacunosa*, (non CHEMNITZ), RÖMER in MARTINI u. CHEMNITZ, Conchyl. Cabin., X Bd., 4 Abth., p. 201, No. 120, pl. 38, figs. 10—12.

North of Koh Kam, 5 fathoms, gravel (¹/₂).

Long. 49 mm.

Distribution:— China.

I have specimens at hand labelled “Algoa Bay” and “Senegal.”

It seems to me that PHILIPPI has good reason for doubting whether CHEMNITZ's *lacunosa* “from Guinea” is identical with the “*lacunosa* from China” of later authors; therefore, I have adopted his name *coarctata* for the latter form. Unfortunately, it is very probable that CHEMNITZ's original specimen of *lacunosa* no longer exists, at any rate it is not to be found in the Zoological Museum of the University of Copenhagen, so actual comparison is impossible; but as CHEMNITZ's figure and description present many characteristic points which are not to be found in *coarctata*, I think we have here two distinct species.

It is no doubt due to a mistake that SPENGLER¹ gives “East India” as the locality of his *T. ephippium*. His original specimens are in the Zoological Museum of the University of Copenhagen, but on the label, in his own handwriting, no locality is given. On comparing SPENGLER's original specimens of *T. ephippium* with specimens of SAY's *intastriata* (= *T. Gruneri*, Phil.²) it is seen that these species are absolutely identical, and as SPENGLER's name has the priority, SAY's *intastriata* and PHILIPPI's *Gruneri* should consequently be regarded only as synonyms of

¹ Skrivter af Naturhistorie-Selskabet, 4 Bind, 2 Hefte, 1798, p. 104.

² From Florida Keys, St. Anna (east coast of Mexico) and from many different localities in the Lesser Antilles, especially the Danish West Indies.

T. ehippium, Spengler. PHILIPPI¹ had already some idea of this when he established his *T. Gruneri*. REEVE'S figure, Sp. 111, of *T. ehippium*, Spglr., exactly corresponds with SPENGLER'S original specimens and with *T. Gruneri*, therefore I fail to see the reason why RÖMER finds that HANLEY'S figure of *ehippium* is "himmelweit verschieden" from REEVE'S figure; they are almost identical if the figures are placed in the same position.

Tellina (Macoma) candida, Lam.

Psammotæa candida, LAMARCK, Hist. nat. d. anim. s. vert., V, 1818, p. 517, No. 6. — éd. 2, VI, 1835, p. 183, No. 6.

Tellina sericina, JONAS, PHILIPPI, Abbild. u. Beschreib. neuer od. wen. gek. Conchyl., I, (1843), p. 71, No. 1, *Tellina*, pl. 1, fig. 1.

— *Galatæa*, HANLEY in SOWERBY, Thesaur. Conchyl., I, p. 301, No. 154, pl. 64, fig. 223 (non *T. galatæa*, Lamarck).

— *Galathæa*, REEVE, Conchol. icon., XVII, *Tellina*, Sp. 102 (non *T. galatæa*, Lamarck).

— (*Macoma*) *Galatæa*, RÖMER in MARTINI u. CHEMNITZ, Conchyl. Cabin., X Bd., 4 Abth., p. 249, No. 154, pl. 47, figs. 7—9 (non *T. galatæa*, Lamarck).

Macoma candida, LAMARCK, V. BERTIN, Révision d. Tellinidés, p. 342, No. 27.

Coast of Lem Ngob, low tide (¹/₂). Sound of Koh Chang, 3—5 fathoms, soft clay (1 + ²/₂). W. of Koh Chang, 30 fathoms (1). Between Koh Kut and Koh Kahdat, 10 fathoms, shells (²/₂). W. of Koh Kut, 30 fathoms, sand and mud (²/₂). Long. 10—46 mm.

Distribution: — "Am Eingang d. Golfs v. Siam in 16 Faden" (E. v. MARTENS). Philippines, China, Japan, Moluccas, Java, Timor, Australia.

All the specimens from the Gulf of Siam are entirely destitute of the granulated sculpture characteristic of *galatæa* (Hanley); at first I determined them as belonging to a form near to *T. candida*; but on account of the confusion which has prevailed within this group (and which V. BERTIN has but partially dispersed) I asked Mr. EDG. SMITH to be kind enough to compare them for me, and he determined them as *M. candida*, Lam., "in which the peculiar granose epidermis is obsolete. *T. arafurensis*, Smith, is different in form." HANLEY (Proc. Zool. Soc. London, XII, 1844, p. 147) has described, under the name of *T. Diana*, a form of his *galatæa* with a smooth surface, and it must undoubtedly be this variety to which the specimens from the Gulf of Siam are most closely allied.

Tellina (Macoma) papyracea, Spengl.

(Pl. III, Figs. 50—52).

Tellina papyracea, SPENGLER, Skrivter af Naturhistorie-Selskabet, 4de Bd., 2det Hefte, 1798, p. 98, No. 25.²

— *gubernaculum*, HANLEY, Proc. Zool. Soc. London, XII, 1844, p. 142.

— — — SOWERBY, Thesaur. Conchyl., I, p. 325, No. 201, pl. 62, fig. 186.

— — — REEVE, Conchol. icon., XVII, *Tellina*, Sp. 181.

— (*Macoma*) *Gubernaculum*, HANLEY, RÖMER in MARTINI u. CHEMNITZ, Conchyl. Cabin., X Bd., 4 Abth., p. 247, No. 152, pl. 47, figs. 1—3.

Macoma gubernaculum, HANLEY, V. BERTIN, Révision d. Tellinidés, p. 344, No. 31.

¹ Abbild. u. Beschreib. neuer od. wen. gek. Conchyl., III, p. 56.

² GMELIN'S *Tellina papyracea* = *Tellina (Metis) lacunosa*, Ch. SPENGLER quotes: LISTER, Hist. Conch., pl. 395, fig. 242 as a synonym of his *T. papyracea*; this figure according to MÖRCH, resembles more closely SPENGLER'S *T. sinuata*.

The sound of Koh Chang, 3—5 fathoms, soft clay ($3/2$). N. of Koh Kong, 8 fathoms, mud ($1/2$).

Long. 14—48 mm. — (Long. 48 mm., alt. 37 mm., crass. 14 mm.) — (Long. 44 mm., alt. 31 mm., crass. 15 mm.).

Distribution:— Tranquebar (SPENGLER and SEIDELIN, Zool. Mus. Copenhagen), Manilla (Zool. Mus. Copenhagen). EDG. SMITH writes to me: "I think 'Central America,' the locality given by HANLEY (*T. gubernaculum*) is a mistake. We have it from Bombay." I believe here reference is made to the specimens from Bombay determined by MELVILL and ABERCROMBIE¹ as *Macoma truncata*, Jonas. As *M. truncata*, Jonas, is easily mistaken for the species we are here considering, some of the localities given for *truncata* should undoubtedly be transferred to *T. papyracea*, Spengl.

As the original specimens of SPENGLER's *papyracea* are in the Zoological Museum of the University of Copenhagen it has been possible for me to verify the fact that the specimens from the Gulf of Siam belong to the same species. I sent some of the specimens from the Gulf of Siam to Mr. EDG. SMITH, and he kindly informed me that they "agree with *gubernaculum* of Hanley;" consequently, it is proved that HANLEY's species should be regarded as a synonym of SPENGLER's *papyracea*, which name has the priority. MÖRCH² states that *T. truncata*, Jonas, is identical with *T. papyracea*, Spengl., but this is certainly wrong; *truncata*, according to JONAS's diagnosis, presents several peculiarities which are undoubtedly characteristic of that species.

Tellina (Macoma) fallax, Bertin.

Macoma fallax, V. BERTIN, Révision d. Tellinidés (Nouv. Archives du Muséum d'Histoire Naturelle, 2 Sér., I, Paris), 1878, p. 343, No. 29, pl. 8, fig. 4.

Sound of Koh Chang, 3—5 fathoms, soft clay ($29/2$). Between Koh Kahdat and Koh Kut, 6 fathoms, clay mixed with sand ($19/2$).

Long. 5—29 mm. (long. 29 mm., alt. 17 mm., crass. 12 mm.).

Distribution unknown.

Although the shells from the Gulf of Siam do not reach the size of that figured by BERTIN, and although BERTIN's brief diagnosis is not of much use as a guide, I think I can safely refer my individuals to the present species, which has undoubtedly often been confused with *T. candida*, Lam.

Tellina (Macoma) lilium, Hanl.

(Pl. IV, Figs. 1—2)

Tellina Lilium, HANLEY, Proc. Zool. Soc. London, 1844, p. 147.

— *lilium*, — HANLEY in SOWERBY, Thesaur. Conchyl., I, p. 303, No. 158, pl. 58, fig. 85.

— — — REEVE, Conchol. icon., XVII, *Tellina*, Sp. 174.

¹ Mem. and Proc. of the Manchester Liter. and Phil. Soc., 4 Ser., vol. VII, p. 50.

² Malakozoolog. Blätter, XVII, 1870, p. 116.

- Tellina Lilium*, HANLEY, RÖMER in MARTINI u. CHEMNITZ, Conchyl. Cabin., X Bd., 4 Abth., p. 253, No. 157, pl. 48, figs. 4—6.
- Macoma lilium*, HANLEY, V. BERTIN, Révision d. Tellinidés, p. 337, No. 12.
- *Lilium*, — HIDALGO, Fauna malacol. de l. Isl. Filipinas, II, 1903, p. 160, No. 279.
- Tellina donaciformis*, DESHAYES, Proc. Zool. Soc. London, 1854, p. 357, No. 182.
- *donaciniformis*, — REEVE, Conchol. icon., XVII, *Tellina*, Sp. 299.
- (*Homala*) *donaciformis*, DESHAYES, V. BERTIN, Révision d. Tellinidés, p. 290, No. 178.
- (*Donax*) *Tellina Essingtonensis*, DESHAYES, REEVE, Conchol. icon., XVII, 1866, *Tellina*, Sp. 73.
- Macoma Essingtonensis*, DESHAYES, V. BERTIN, Révision d. Tellinidés, p. 342, No. 26.

E. of Koh Mak, 20 fathoms, mud ($1\frac{1}{2}$). Between Koh Kut and Koh Kahdat, 6—10 fathoms, clay and shells ($2 + \frac{6}{2}$). W. of Koh Kut, 30 fathoms, sand and mud ($\frac{6}{2}$).

Long. 10—18 mm.

Distribution:— Singapore (2—3 fathoms, Danish Exp. to Siam). — Philippines, Torres Strait, Port Essington, Lane Cove (Port Jackson), Isl. Ravvak (FREYCINET).

Tellina (Macoma) Moluccensis, Mart.

- Tellina Moluccensis*, E. v. MARTENS, Annals and Magaz. of Nat. Hist., 3 Ser., vol. 16, 1865, p. 430, No. 5.
- (*Metis*) *Moluccensis*, E. v. MARTENS, RÖMER in MARTINI u. CHEMNITZ, Conchyl. Cabin., X Bd., 4 Abth. p. 213, No. 129, pl. 41, figs. 4—6.
- Metis Moluccensis*, E. v. MARTENS, V. BERTIN, Révision d. Tellinidés, p. 332, No. 13.

Surface mud along the coast of Lem Ngob, low tide ($1\frac{1}{2}$). Coast of Lem Ngob, low tide, stones ($\frac{2}{2}$).

Long. 17 mm., alt. 13 mm.

Distribution:— Moluccas.

I have referred the present species to the subgenus *Macoma*; it is difficult to understand why previous authors have referred it to the subgenus *Metis*.

Tellina (Macoma) tenuisculpta n. sp.

(Pl. IV, Figs. 3—5).

The valves of this species are triangular in form, white and rather thin, and compressed; they are somewhat gaping at the ends, especially the posterior end. The umbones are situated at about the middle of the axis of the shell, the upper margin slopes abruptly down on both sides, the posterior end is prolonged somewhat in an acute, rostrum-like manner, and the ventral side is gently curved. The different individuals exhibit a more or less distinct "Tellina-curvature." The surface is covered with narrow, close-set, finely crenulated, concentric, raised lines which are irregular and at different mutual distances. The interstices between the concentric striæ are closely set with fine, irregular radial folds and striæ which are not all equally fine; this sculpture gives a rough appearance to the surface. The interior of the valves is white and somewhat glossy. The right valve has two cardinal teeth of which the hinder is the larger and is bifid; the left valve has also two cardinal teeth, the anterior is stout and bifid while the posterior is slender. The

pallial sinus ascends from the posterior muscle-impression upwards in a curve and then descends obliquely down towards the pallial line, which it meets somewhat before the pallial line has reached the anterior muscle-impression.

Long. 9 mm., alt. 6.5 mm., crass. 3.5 mm.

North end of Koh Chang, 1 fathom, coral blocks ($2 + 10/2$). North end of Koh Chang, 12 fathoms, old coral blocks ($1 + 10/2$). West coast of Koh Chang, 1 fathom, old coral blocks ($2/2$). South-west end of Koh Chang, 1 fathom, corals ($1/2$). Koh Kahdat, 1 fathom, sand ($1/2$). Koh Kahdat, 1—2 fathoms, corals ($1/2$).

This species is most closely allied to the group:— *M. inquinata*, Desh., *nasuta*, Conr., *constricta*, Brug., etc. It is, however, easily distinguished from them by its characteristic sculpture. It varies considerably in form, which is no doubt due to its inhabiting old coral blocks. In the material collected are several individuals which are more ovate-oblong in form than the above description indicates; but this is more particularly the case with the younger individuals, almost all of which are more oblong than are the (apparently) full-grown ones.

Fam. Psammobiidae.

Asaphis deflorata L.

- Venus deflorata*, LINNÉ, Systema Naturae, ed. X, 1758, p. 687, No. 108. — ed. XII, p. 1133, No. 132. — ed. XIII cur. GMELIN, p. 3274, No. 24.
- — — DILLWYN, Descript. catalogue of rec. shells, I, 1817, p. 186, No. 65.
- — — RÖMER, Krit. Untersuch. d. Arten d. Molluskengeschl. Venus, 1857, p. 52, No. 24.
- Asaphis* — — — MÖRCH, Journ. de Conchyl., VII, 1858, p. 139, No. 3. — Catal. Yoldi, II, 1853, p. 9, No. 83.
- Capsa* — — — REEVE, Conchol. icon., X, 1856, *Capsa*, Sp. 1.
- Asaphis* — — — V. BERTIN, Révision d. Garidées, 1880, p. 80, No. 5.
- — — HIDALGO, Fauna malacol. de I. isl. Filipinas, 1903, II, p. 73, No. 149.
- Capsa eflorata*, D'ORBIGNY, Moll. de l'île de Cuba, II, 1853, p. 258, No. 457.
- Venus violascens*, FORSKÅL, Descript. animal. quæ in itinere orientali observ., 1775, p. XXXI, No. 28.
- Asaphis* — — — MÖRCH, Journ. de Conchyl., VII, 1858, p. 138, No. 2.
- — — V. BERTIN, Révision d. Garidées, 1880, p. 80, No. 2.
- Tellina anomala*, BORN, Index rer. natur. Mus. Cæs. Vindobon., I, Testacea, 1778, p. 20. — Testacea Mus. Cæs. Vindobon., 1780, p. 31.
- — — CHEMNITZ, Conchyl. Cabin., VI, 1782, p. 93, pl. 9, figs. 79—82.
- Cardium coccinea*, MARTYN, The Universal Conchologist, 1784, No. 135.
- Asaphis* — — — MÖRCH, Journ. de Conchyl., VII, 1858, p. 140, No. 4.
- — — V. BERTIN, Révision d. Garidées, 1880, p. 79, No. 1.
- — — DALL and SIMPSON, The Mollusca of Porto Rico, 1901, p. 476.
- Venus versicolor*, GMELIN, Systema Naturae, 1790, p. 3281, No. 63.
- *purpurata*, — loc. cit., p. 3289, No. 100, (Monstr.?).
- Capsa rugosa*, LAMARCK, Système d. anim. s. vert., 1802, p. 125.
- Sanguinolaria rugosa*, LAMARCK, Hist. nat. d. anim. s. vert., V, 1818, p. 511, No. 4. — éd. 2, VI, 1835, p. 170, No. 4.
- Capsula* — — — SCHUMACHER, Essai d'un nouv. syst. d. habit. d. vers. test., 1817, pp. 130—31, pl. 9, fig. 1.
- Psammobia* — — — SOWERBY, Genera of shells, No. 35, pl. 55, fig. 1.

- Psammocola rugosa*, LAMARCK, BLAINVILLE, Manuel de Malacologie, 1825, p. 564.
Asaphis — — MORLET, Journ. de Conchyl., vol. 37, 1889, p. 172, No. 84.
 — — — P. FISCHER, Moll. de l'Indo-Chine, p. 241.
 — — — E. v. MARTENS, Süß- u. Brackwasser-Moll. d. Indischen Archipels, 1897, p. 252.
Sanguinolaria dichotoma, ANTON, Verzeichn. d. Conchyl. in d. Samml. v. H. E. ANTON, 1839, p. 4, No. 123.
Asaphis — — MÖRCH, Journ. de Conchyl., VII, 1858, p. 138, No. 1.
Sanguinolaria — — V. BERTIN, Révision d. Garidées, 1880, p. 80, No. 4 (*Asaphis arenosa*, Rumph.).
Asaphis — — HIDALGO, Fauna malacol. de l. isl. Filipinas, 1903, II, p. 74, No. 150.
 — — — DAUTZENBERG et FISCHER, Journ. de Conchyl., vol. 53, 1905, p. 233.

Koh Chang (¹/₂). Coasts of Koh Chang (⁵/₂). Koh Lom (13). Koh Mak, sandy coast (³/₂). Strand of Koh Kahdat (¹/₂).

Islands in the Gulf of Siam (MORLET).

Long. 8—74 mm.

Distribution:— Singapore, Salang, Mergui Isls., Andamans, Nicobars, Tranquebar, Ceylon, Maldive Isls., Karachi, Bombay, Persian Gulf, Aden, Red Sea, Suez, Zanzibar, Amirantes, Seychelles, Madagascar, Mascarenes. — Poulo Condor, Tonkin, Hong Kong, Japan, Loo Choo Isls., Philippines, Sumatra, Java, Moluccas, Flores, Timor, Aru Isls. (and several localities in the Malay Archip.), New Guinea, Salomon Isls., Torres Strait, North and East Australia, New Caledonia, New Zealand, Mariannes, South Sea Isls. — Bermuda Isls., Florida, Vera Cruz, Mexico to Brazil, Greater and Lesser Antilles.

I have at my disposal a great number of specimens of *Asaphis deflorata* from different West Indian localities, but it has not been possible for me to find constant characters which would distinguish them from individuals from East Indian habitats.

Psammobia scabra, Chemn.

- Tellina scabra*, CHEMNITZ, Conchyl. Cabin., VI, 1782, p. 102, pl. 10, fig. 94.
Psammobia scabra, CHEMNITZ, E. v. MARTENS, Süß- u. Brackwasser-Mollusken d. Ind. Archipels, 1897, p. 248, No. 12.
 — *maculosa*, LAMARCK, Hist. nat. d. anim. s. vert., V, 1818, p. 513, No. 5. — éd. 2, VI, 1835, p. 174, No. 5.
Gari — — V. BERTIN, Révision d. Garidées, p. 105, No. 5.
Psammobia ornata, DESHAYES, Proc. Zool. Soc. London, XXII, 1854, p. 323, No. 27.
 — — — REEVE, Conchol. icon., X, *Psammobia*, Sp. 26.
Gari — — V. BERTIN, Révision d. Garidées, p. 105, No. 8.
Psammobia — — HIDALGO, Fauna malacol. de l. isl. Filipinas, II, p. 77, No. 154.
 — *rubicunda*, — Proc. Zool. Soc. London, XXII, 1854, p. 324, No. 30.
 — — — REEVE, Conchol. icon., X, *Psammobia*, Sp. 34.
Gari — — V. BERTIN, Révision d. Garidées, p. 105, No. 6.
Psammobia — — HIDALGO, Fauna malacol. d. l. isl. Filipinas, II, p. 76, No. 152.
 — *corrugata*, — Proc. Zool. Soc. London, XXII, 1854, p. 324, No. 31.
 — — — REEVE, Conchol. icon., X, *Psammobia*, Sp. 9.
Gari — — V. BERTIN, Révision d. Garidées, p. 105, No. 7.
Psammobia — — DUNKER, Index molluscor. mar. Japon., 1882, p. 187.
 — — — HIDALGO, Fauna malacol. de l. isl. Filipinas, II, p. 76, No. 153.

- Psammobia marmorea*, DESHAYES, Proc. Zool. Soc. London, XXII, 1854, p. 324, No. 32.
 — — — REEVE, Conchol. icon., X, *Psammobia*, Sp. 27.
Gari — — — V. BERTIN, Révision d. Garidées, p. 106, No. 10.

South of Koh Chuen, 30 fathoms, shells (fragment). Between Koh Mesan and Koh Chuen, 25—38 fathoms, stones with shells ($1/2$).

Long. 42 mm.

Distribution:— Andamans, Ceylon, Persian Gulf, Muscat (Arabia), Gulf of Aden, Comoro, Madagascar, Zanzibar, Durban (S. Africa). — Philippines, Japan, Moluccas, Torres Strait, east and south coasts of Australia, New Caledonia, Darnley Isl., Viti Isls., Tahiti.

Psammobia zonalis, Lam.

- Psammotea zonalis*, LAMARCK, Hist. nat. d. anim. s. vert., V, 1818, p. 517. No. 2. — éd. 2, VI, 1835, p. 182, No. 2.
Psammotea — — — DELESSERT, Recueil de coquilles décr. p. Lamarck, 1841, pl. 5, fig. 9.
Psammobia — — — REEVE, Conchol. icon., X, *Psammobia*, Sp. 29.
Gari — — — V. BERTIN, Révision d. Garidées, p. 109, No. 27.
Psammobia — — — EDG. SMITH, Lamellibranchiata of the Challenger Exped., pp. 94, (and 93).
Gari — — — PRITCHARD and GATLIFF, Proc. Roy. Soc. Victoria, vol. 16, 1903, p. 113.
Psammobia radiata, DUNKER in PHILIPPI, Abbild. u. Beschreib. neuer od. wen. gek. Conchyl., I, 1845, p. 194, No. 3, pl. 2, fig. 5.
 — — — DUNKER, Index molluscor. mar. Japon., 1882, p. 187.
 — — — v. MARTENS, Süß- u. Brackwasser-Moll. d. Ind. Archipels, 1897, p. 244, No. 7.
 — *puella*, DESHAYES, Proc. Zool. Soc. London, XXII, 1854, p. 320, No. 14.
 — — — REEVE, Conchol. icon., X, *Psammobia*, Sp. 2.
Gari — — — V. BERTIN, Révision d. Garidées, p. 111, No. 35.
Psammobia striata, — Proc. Zool. Soc. London, XXII, 1854, p. 321, No. 20.
 — *compta*, — loc. cit., p. 321, No. 18.
 — — — REEVE, Conchol. icon., X, *Psammobia*, Sp. 24.
 — — — HIDALGO, Estud. prelim. sobre la fauna malacol. de las isl. Filipinas, II, 1903, p. 83, No. 165.
Gari — — — V. BERTIN, Révision d. Garidées, p. 110, No. 34.
Psammobia amethystus, REEVE (non WOOD), REEVE, Conchol. icon., X, *Psammobia*, Sp. 19.
 — *Tellinæformis*, DESHAYES in REEVE, loc. cit., Sp. 31.
 — — — V. BERTIN, Révision d. Garidées, p. 109, No. 26.

Between Koh Mesan and Cape Liant, 5—9 fathoms (2). North of Koh Kahdat, 4—5 fathoms, coarse sand ($1/2$). Koh Kahdat, 1 fathom, sand (1).

Long. 20—41 mm.

Distribution:— Ceylon. — Japan, Loo Choo Isls., Philippines, Moluccas, Java, east and south coasts of Australia, Tasmania, New Caledonia.

The specimens from the Gulf of Siam exactly agree with *P. compta*, Desh. I rely upon EDG. SMITH's authority (loc. cit.) in referring this species to *P. zonalis*, Lam.

Psammobia tenuis, Desh.

- Psammobia tenuis*, DESHAYES, Proc. Zool. Soc. London, XXII, 1854, p. 320, No. 16.
 — — — REEVE, Conchol. icon., X, *Psammobia*, Sp. 37 b (non 37 a = *P. anomala*, Desh. var.).

Gari tenuis, DESHAYES, V. BERTIN, Révision d. Garidées, p. 110, No. 30.

Psammobia tenuis, DESHAYES, HIDALGO, Estud. prelim. sobre la fauna malacol. de las isl. Filipinas, II, p. 82, No. 164.

N. of Koh Kahdat, 4–5 fathoms, coarse sand (1). Koh Kahdat, 1 fathom, sand (3). W. of Koh Kut, 30 fathoms, sand and mud ($\frac{3}{2}$).

Long. 5–25 mm.

Distribution: — Philippines.

The specimens from the Gulf of Siam are pink in colour.

Psammobia anomala, Desh.

Psammobia anomala, DESHAYES, Proc. Zool. Soc. London, XXII, 1854, p. 320, No. 15.

— — — REEVE, Conchol. icon., X, *Psammobia*, Sp. 5.

— — — EDG. SMITH, Lamellibranchiata of the Challenger Expedition, p. 95.

Gari — — — V. BERTIN, Révision d. Garidées, p. 110, No. 33.

Psammobia — — — HIDALGO, Estud. prelim. sobre la fauna malacol. de las isl. Filipinas, II, p. 87, No. 170.

Gulf of Rayong, 7–10 fathoms, sand, mud ($1\frac{1}{2}$). Koh Chuen, 30 fathoms (1). Between Koh Kut and Koh Kahdat, 10 fathoms, shells ($\frac{1}{2}$).

Long. 19–23 mm.

Distribution: — Madras. — Philippines, Japan, Borneo, Torres Strait, north and east coasts of Australia.

Psammobia simplex, Sow.

(Pl. IV, Figs. 6–8).

Psammobia simplex, G. B. SOWERBY, Proceed. Malacolog. Soc. London, I, 1894 (1895), p. 159, pl. 12, fig. 21.

Gulf of Rayong, 7–10 fathoms, sand and mud ($1 + \frac{1}{2}$). Around Koh Kahdat, 8–10 fathoms, mud ($\frac{9}{2}$). Between Koh Kut and Koh Kahdat, 10 fathoms, shells ($\frac{6}{2}$). South and west of Koh Kut, 15–20 fathoms, mud ($1 + \frac{2}{2}$). N. of Koh Kut, 10 fathoms, mud ($\frac{4}{2}$).

Long. 5–14 mm. (long. 14 mm., alt. 8 mm.).

Distribution: — Singapore (Sv. GAD, shallow water; $\frac{3}{2}$ valves). Karachi (MELVILL & STANDEN), Hong Kong (SOWERBY).

SOWERBY gives “Longit. 9, alt. 5 mm.” as the measurements of his specimens; those from the Gulf of Siam are of larger dimensions; they are of a pure white colour.

Elizia orbiculata, Wood.

Solen orbiculatus, WOOD, Index Testaceologicus, 1828, Supplem. p. 3, No. 4, pl. 1, fig. 4.

Psammobia orbicularis, DESHAYES, Magazin de Zoologie p. Guérin-Méneville. Mollusques, 1839, pl. 7.

Soletellina orbiculata, WOOD, REEVE, Conchol. icon., X, *Soletellina*, Sp. 18.

Elizia — — — ADAMS, Genera of recent Mollusca, II, p. 393, pl. 103, fig. 5.

— *orbicularis*, — BERTIN, Révision d. Garidées, p. 129, No. 2.

— *orbiculata*, — J. DE MORGAN, Bull. de la Soc. Zool. de France, X, 1885, p. 366, No. 26.

— — — E. V. MARTENS, Süß- u. Brackwasser-Moll. d. Ind. Archip., p. 233.

Soletellina reversa, REEVE, Conchol. icon., X, *Soletellina*, Sp. 17.

Siam (J. de MORGAN).

The Danish Expedition to Siam collected no specimens of this species.

Distribution: — Malacca, Singapore, Poulo-Penang. — Borneo, Sumatra.

Soletellina Chinensis, Chemn.

- Solen Diphos Chinensis*, CHEMNITZ, Conchyl. Cabin., XI, 1795, p. 200, pl. 198, fig. 1933.
Solenotellina chinensis, — MÖRCH, Catal. conchyl. quæ rel. com. de Yoldi, II, 1853, p. 9, No. 88.
 — *Chinensis*, — DUNKER, Index moll. mar. Japon., 1882, p. 187.
Soletellina chinensis, — E. v. Martens, Süß- u. Brackwasser-Moll. d. Ind. Archip., p. 233.
 — *truncata*, REEVE, Conchol. icon., X, *Soletellina*, Sp. 9.
 — — GMEL.?, E. v. MARTENS, Proc. Zool. Soc. London, 1860, p. 18.
 — *planulata*, REEVE, Conchol. icon., X, *Soletellina*, Sp. 15.
Hiatula — — BERTIN, Révision d. Garidées, p. 87, No. 8.

Siam (ED. v. MARTENS).

The Danish Expedition to Siam collected no specimens of this species.

Distribution: — China, Japan, Moluccas.

Psammotæa violacea, Lam.

- Psammotæa violacea*, LAMARCK, Hist. nat. d. anim. s. vert., V, 1818, p. 517, No. 1. — éd. 2, VI, p. 181, No. 1.
 — — — HANLEY, Catal. of rec. biv. shells, p. 60, Suppl. pl. 12, fig. 60.
Capsella — — REEVE, Conchol. icon., X, *Capsella*, Sp. 6.
 — — — E. v. MARTENS, Proc. Zool. Soc. London, 1860, p. 18.
Hiatula (Psammotæa) violacea, LAMARCK, V. BERTIN, Révision d. Garidées, p. 96, No. 34.
Psammotæa violacea, HANLEY, E. v. MARTENS, Süß- u. Brackwasser-Moll. d. Ind. Archip., p. 239, No. 2.
Psammotæa — LAMARCK, HIDALGO, Fauna malacol. de l. isl. Filipinas, II, p. 95, No. 186.
Soletellina, — — MELVILL & STANDEN, Proc. Zool. Soc. London, 1906, p. 842.
Psammotæa serotina, — Hist. nat. d. anim. s. vert., V, 1818, p. 517, No. 5. — éd. 2, VI, p. 182, No. 5.

Siam (ED. v. MARTENS).

The Danish Expedition to Siam collected no specimens of this species.

Distribution: — Karachi (MELVILL & STANDEN), Zanzibar (L. ROUSSEAU according to V. BERTIN), Seychelles.¹ — Hong Kong, Formosa, Japan, Philippines, Java, Amboina, Adenare, New Guinea, Kei-Isl., New Caledonia.

E. v. MARTENS doubts whether LAMARCK's *violacea* is the same species as that of HANLEY and other authors; V. BERTIN, who had LAMARCK's original specimens for comparison does not, however, mention anything about this and gives them as synonyms.

Fam. Scrobiculariidae.

Semele amabilis, A. Ad.

- Semele amabilis*, A. ADAMS, Proc. Zool. Soc. London, 1853, p. 97, No. 17.
Amphidesma amabilis, A. ADAMS, Conchol. icon., VIII, *Amphidesma*, Sp. 32.
Semele — — EDG. SMITH, Rep. on the Lamellibranchiata of the Challenger Exped., p. 83.

¹ Recorded from there by DUFO, L. ROUSSEAU and LANTZ (V. BERTIN); ED. v. MARTENS thinks that this is perhaps due to confusion, on the part of DUFO, with *P. radiata*, Desh.

Gulf of Rayong, 7—10 fathoms, sand and mud (3). Between Koh Chuen and Koh Chang, 15 fathoms, mud (1). Koh Kahdat, 1—5 fathoms, sand with stones (1). Between Koh Kut and Koh Kahdat, 10 fathoms, shells ($1\frac{1}{2}$).

Long. 13—33 mm. (Long. 33 mm., alt. 29 mm., crass. 12 mm.).

Distribution:— Arafura Sea (Challenger), Port Curtis (A. ADAMS).

The concentric lamellæ upon the surface are placed more closely together than is indicated in REEVE's figure. EDG. SMITH (loc. cit.) gives an excellent and exhaustive diagnosis of this comparatively large and beautiful species, which strangely enough, has hitherto been obtained from so few localities.

Semele casta, A. Ad.

Semele casta, A. ADAMS, Proc. Zool. Soc. London, XXI, 1853, p. 96, No. 15.

Amphidesma casta, A. ADAMS, REEVE, Conchol. icon., VIII, *Amphidesma*, Sp. 18.

Koh Chuen, 30 fathoms ($1\frac{1}{2}$). Between Koh Chuen and Koh Chang, 15 fathoms, mud (1). South-west end of Koh Chang, 1 fathom, corals (1). Koh Mak, sandy coast (1).

Long. 11—25 mm.

Distribution:— Gulf of Manaar (THURSTON). — Moreton Bay (Australia, STRANGE).

The sculpture at the umbo differs from that of the rest of the shell, the distance between the first 7—8 concentric ribs being greater and the interstices between them being nearly smooth, almost quite without the radiating sculpture which is found upon the rest of the shell.

Note. *Semele Jukesi*, A. Ad., and *Semele exarata*, Ad. & Reeve, have been taken at Singapore in shallow water by Mr. SV. GAD.

Theora lata, Hinds.

(Pl. IV, Figs. 9—11).

Næra lata, HINDS, Proc. Zool. Soc. London, XI, 1843, p. 79.

Theora — — H. & A. ADAMS, Gen. of rec. Moll., II, p. 370, pl. 97, fig. 5.

— — — HIDALGO, Fauna malacol. de l. isl. Filipin., II, 1903, p. 71, No. 146.

Næra fragilis, A. ADAMS, Proc. Zool. Soc. London, XXIII, 1855, p. 226, No. 25.

Theora — — Ann. and Mag. Nat. Hist., 1864, p. 209.

— — — HEDLEY, Proc. Linn. Soc. New South Wales, 1901, XXVI, p. 706, pl. 34, figs. 4—6.

Sound of Koh Chang, 3—5 fathoms, soft clay ($2\frac{5}{2}$). The strand off the Mangrove at the station on Koh Chang ($1\frac{1}{2}$). Between Koh Kut and Koh Kahdat, 10 fathoms, shells (5). North of Koh Kong, 8 fathoms, mud (15).

Long. 3·5—20 mm.

Distribution:— Gulf of Manaar. — Philippines, Niegata (Japan), Cardwell (Queensland), Moreton Bay, Lane Cove (Sydney).

After having compared in the British Museum, *T. lata*, Hinds, with *T. fragilis*, A. Ad., I see no reason for separating these two forms and making distinct species of them.

Leptomya spectabilis, Hanl.

Leptomya spectabilis, HANLEY, Proc. Zool. Soc. London, 1882, p. 576.

— — — Journ. Linnæan Society, Zoology, XVI, 1883, p. 541, pl. 12, fig. 7.

South of Koh Mak, 5—6 fathoms ($1\frac{1}{2}$).

Long. 3.5 mm.

Distribution:— Japan(?).

In spite of the small size of the specimen, I do not doubt that the determination is correct.

Fam. Donacidae.**Donax (Hecuba) acuticarinatus, Sow.**

Donax acuticarinatus, SOWERBY, Thesaur. Conchyl., III, 1866, p. 305, No. 3, pl. 280, figs. 6—7.

— (*Hecuba*) *acutocarinatus*, SOWERBY, V. BERTIN, Révision d. Donacidées, p. 81, No. 6.

— *acutocarinatus*, SOWERBY, P. FISCHER, Catal. d. Moll. de l'Indo-Chine, p. 240.

“Siam” (SOWERBY).

The Danish Expedition to Siam collected no specimens of this species.

Donax (Serrula) incarnatus, Chemn.

(Pl. IV, Figs. 12—13).

Donax incarnata, CHEMNITZ, Conchyl. Cabin., VI, 1782, p. 265, pl. 26, fig. 259.

— — — REEVE, Conchol. icon., VIII, *Donax*, Sp. 53.

— *incarnatus*, — SOWERBY, Thesaur. Conchyl., III, p. 311, No. 43, pl. 283, figs. 98—99.

— (*Serrula*) *incarnatus*, CHEMNITZ, RÖMER in MARTINI u. CHEMNITZ, Conchyl. Cabin., X Bd., 3 Abth., p. 76, No. 47, pl. 2, fig. 11; pl. 13, figs. 9—12.

— — — — V. BERTIN, Révision d. Donacidées, p. 90, No. 26.

— *incarnatus*, CHEMNITZ, DAUTZENBERG & FISCHER, Journ. de Conchyl., vol. 53, 1905, p. 468. — vol. 54, 1906, p. 219.

— *Dysoni*, DESHAYES, Proc. Zool. Soc. London, XXII, 1854, p. 353, No. 167.

— — — REEVE, Conchol. icon., VIII, *Donax*, Sp. 54.

— (*Serrula*) *Dysoni*, DESHAYES, RÖMER in MARTINI & CHEMNITZ, Conchyl. Cabin., X Bd., 3 Abth., p. 69, No. 42, pl. 12, figs. 8—10.

— — — — V. BERTIN, Révision d. Donacidées, p. 90, No. 27. (non *D. Dysoni*, Lischke = *D. semigranosus*, Dkr.).

“Siam” (SOWERBY).

The Danish Expedition to Siam collected no specimens of this species.

Distribution:— Malacca, Tranquebar, Malabar Coast, Bombay. — Annam, Cochin China.

It is doubtful whether the authors (e. g. RÖMER) have really had CHEMNITZ's species *incarnatus* for examination, RÖMER writes that REEVE does not indicate the same species by the name *incarnatus*, as that to which he himself has applied that name, and he is undoubtedly right in this. SPENGLER's specimens of *D. incarnatus* from Tranquebar (determined by him as *D. muricata* L.) are in the Zoological Museum of the University of Copenhagen; they precisely agree with CHEMNITZ's figure of *incarnatus*.

I quite agree with J. C. MELVILL and ABERCROMBIE when they write¹ that: "*D. Dysoni* appears to be *incarnatus* in a young form."

Donax (Serrula) nitidus, Desh.

- Donax nitida*, DESHAYES, Proc. Zool. Soc. London, XXII, 1854, p. 350, No. 153.
 — — — REEVE, Conchol. icon., VIII, *Donax*, Sp. 34.
 — (*Serrula*) *nitidus*, DESHAYES, RÖMER in MARTINI u. CHEMNITZ, Conchyl. Cabin., X Bd., 3 Abth., p. 51 (non *D. nitidus*, Sowerby, Thesaur. Conchyl., fide EDG. SMITH).
 — — — — V. BERTIN, Révision d. Donacidées, p. 88, No. 21.
 — *nitidus*, DESHAYES, EDG. SMITH, Lamellibranchiata of the Challenger Expedition, p. 112.

Between Koh Rin and Cliff Rock, 15 fathoms ($1\frac{1}{2}$). N. of Koh Kam, 5 fathoms, gravel ($1\frac{1}{2}$). Between Koh Mesan and Cape Liant, 5—9 fathoms, sand ($1\frac{1}{2}$). W. of Koh Kut, 15 fathoms ($1\frac{1}{2}$).

Long. 3—10 mm.

Distribution:— Karachi and Mekran Coast (MELVILL & STANDEN). — Cape York, Moreton Bay, Port Jackson (Sydney).

Donax (Latona) cuneatus L.

- Donax cuneata*, LINNÉ, Systema Naturae, ed. X, 1758, p. 683, No. 87 (p. p.). — ed. XII, p. 1127, No. 108. — Mus. Lud. Ulricæ reg., p. 495, No. 52.
 — — — CHEMNITZ, Conchyl. Cabin., VI, 1782, p. 266, pl. 26, fig. 260.
 — — — LAMARCK, Hist. nat. d. anim. s. vert., V, 1818, p. 546, No. 3; — éd. 2, VI, p. 240, No. 3.
 — — — REEVE, Conchol. icon., VIII, *Donax*, Sp. 15.
 — (*Latona*) *cuneatus*, LINNÉ, RÖMER in MARTINI u. CHEMNITZ, Conchyl. Cabin., X Bd., 3 Abth., p. 82, No. 51, pl. 2, fig. 10; pl. 14, figs. 9—10.
 — *cuneatus*, LINNÉ, SOWERBY, Thesaur. Conchyl., III, p. 311, No. 39, pl. 282, figs. 88—90.
 — — — V. BERTIN, Révision d. Donacidées, 1881, p. 114, No. 105.
 — — — HIDALGO, Fauna malacol. de I. isl. Filipinas, II, p. 173, No. 296.
 — *bicolor*, GMELIN, Syst. Nat., ed. XIII, 1790, p. 3265, No. 16.
 — — — LAMARCK, Hist. nat. d. anim. s. vert., V, p. 548, No. 13. — éd. 2, VI, p. 243, No. 13.
 — — — LAMARCK, REEVE, Conchol. icon., VIII, *Donax*, Sp. 28.
 — — — SOWERBY, Thesaur. Conchyl., III, p. 311, No. 42, pl. 283, figs. 102—3 (non *D. bicolor*, Römer).
 — *granosa*, — Hist. nat. d. anim. s. vert., V, 1818, p. 547, No. 8. — éd. 2, VI, p. 242, No. 8.
 — *granosus*, — V. BERTIN, Révision d. Donacidées, p. 114 (non *D. granosus*, Römer).
 — *australis*, — Hist. nat. d. anim. s. vert., V, 1818, p. 548, No. 11. — éd. 2, VI, p. 242, No. 11.
 — — — QUOY et GAIMARD, Voyage de l'Astrolabe, II, 1833, p. 493, pl. 81, figs. 20—22.
 — *obscura*, DESHAYES, Encyclop. méthod., II, 1830, p. 98, No. 13.

Koh Kahdat, 1 fathom, sand (17). Koh Mak, sandy coast ($4 + \frac{1}{2}$).

Long. 15—28 mm.

Distribution:— Andamans, Coromandel Coast, Ceylon, Seychelles and Amirantes, Madagascar, Mascarenes, Zanzibar. — Poulo Condor, Philippines, Japan, Amboina, Timor, New Guinea, Bismarck Archip., New Caledonia, Lifu, Viti Isls., Samoa Isls.

¹ The marine Mollusca of Bombay (Mem. and Proceed. Manchester Lit. and Phil. Soc., 4 Ser., vol. VII), p. 47.

The specimens from the Gulf of Siam exhibit, as is always the case in this species, great variation in their coloration; there are specimens which are almost entirely white, and individuals in which the rays are slightly indicated, also forms in which the rays are very definite, and dark brown, lilac, etc. in colour. RÖMER'S *D. Deshayesii* (Dkr.) is scarcely DUNKER'S species; it is more probably a form of *D. cuneatus*, and this V. BERTIN and HIDALGO also think. ZELEBOR'S *Donax* (*Latona*) *granosus*¹ from Amboina does not belong to the present species; as far as I can see it is nearer to *D. euglyptus*, Dkr. (= *D. compressus*, Lam.), at any rate it is not LAMARCK'S *granosus*.

Donax (*Latona*) *faba*, Ch.

- Donax Faba*, CHEMNITZ, Conchyl. Cabin., VI, 1782, p. 270, pl. 26, figs. 266—67.
 — — — SOWERBY, Thesaur. Conchyl., III, 1866, p. 312, No. 45, pl. 283, figs. 108—9.
 — (*Latona*) *Faba*, CHEMNITZ, RÖMER in MARTINI u. CHEMNITZ, Conchyl. Cabin., X Bd., 3 Abth., 1869, p. 88, pl. 2, figs. 12—13 and 15—17.
 — — — — V. BERTIN, Révision d. Donacidae, p. 109, No. 94.
 — *faba*, CHEMNITZ, P. FISCHER, Catalogue d. Moll. de l'Indo Chine, p. 241.
 — *Faba*, — HIDALGO, Fauna malacol. de l. isl. Filipinas, II, p. 169, No. 293.
 — *radiata*, SPENGLER, SCHRÖTER, Einleit. in d. Conchylienkenntn., III, 1786, p. 104, No. 11, pl. 8, fig. 3.
 — — SCHRÖTER, GMELIN, Syst. Nat. ed. XIII, 1790, p. 3266, No. 17.
 — *radians*, LAMARCK, Hist. nat. d. anim. s. vert., V, 1818, p. 547, No. 6. — éd. 2, VI, p. 241, No. 6.
 — — — Encyclop. méthod. Moll., pl. 261, fig. 7 (non *radians*, Reeve et Sowerby).

Coast of Lem Ngob (1). South coast of Koh Chang, sand (5). Koh Kahdat, 1 fathom, sand (43). Koh Mak, sandy coast (1 + ¹²/₂).

Islands in the Gulf of Siam (L. MORLET).

Long. 14—26 mm.

Distribution:— Salanga, Madras, Gulf of Manaar, Malabar Coast, Gulf of Oman, Assab (CARAMAGNA), Mauritius, "South Africa" (SOWERBY). — Cochin China, Tonkin (banks of Song-kai (Red River)), Hong Kong, Liukiu Isls. (BÖTTGER), Philippines, Moluccas, Java, New Guinea, Sorong, Port Jackson, New Caledonia, Viti Isls.

SOWERBY² considers *D. Deshayesii*, Dunker (from Lower Guinea), to be a variety of *D. faba*, Chemn. — *D. splendens*, Dkr.,³ is very closely related to the present species.

Fam. Cardiliidae.

Cardilia *inermis*, Desh.

- Cardilia inermis*, DESHAYES, Magazin de Zoologie, 1844, p. 6, pl. 100.
 — — — P. FISCHER, Journ. de Conchyl., 1861, vol. IX, p. 342.
 — — — REEVE, Conchol. icon., vol. XIX, *Cardilia*, Sp. 2.

¹ DUNKER u. ZELEBOR, Verhandl. d. k. k. zool. botan. Ges. Wien, 1866, p. 916. — G. v. FRAUENFELD, Mollusken d. Novara Expedition, p. 15, pl. 2, fig. 27.

² Thesaurus Conchyliorum, III, *Donax*, pl. IV, figs. 108—9 (and the explanation of plates).

³ Novitates Conchologicae. Meeres Conchyl., p. 79, No. 87, pl. 25, fig. 5.

West of Koh Kut, 30 fathoms, sand and mud ($1\frac{1}{2}$).

Long. 6 mm., alt. 8 mm.

Distribution:— Philippines (CUMING), Sumatra (MARTIN, DESHAYES).

Fam. Mesodesmatidae.

Mesodesma (Atactodea¹) glabrata, Lam.

- Crassatella glabrata*, LAMARCK, Annales du Mus. d'Hist. Nat., VI, 1805, p. 408 (nomen).
 — — — Hist. nat. d. anim. s. vert., V, 1818, p. 482, No. 5. — éd. 2, VI, p. 111, No. 5.
Mesodesma — — — DESHAYES, Hist. nat. d. anim. s. vert., éd. 2, VI, p. 133, No. 2.
 — — — LAMARCK, SAVIGNY, Descript. de l'Égypte. Mollusques, pl. 8, fig. 5.
Paphia — — — GMELIN, H. & A. ADAMS, Genera of recent Mollusca, III, 1858, pl. 106, fig. 1.
Mesodesma — — — DESHAYES, REEVE, Conchol. icon., VIII, *Mesodesma*, Sp. 20.
 — — — LAMARCK, ISSEL, Malacol. d. Mar Rosso, 1869, p. 53, No. 18.
 — — — PAGENSTECHE, Ueber d. v. Kossmann am Rothen Meere ges. Mollusken, 1877, p. 41, No. 32.
 — *glabratum*, — — — E. v. MARTENS, Moll. d. Maskarenen u. Seychellen, 1880, p. 152.
 — (*Paphia*) *glabratum*, LAMARCK, E. v. MARTENS, Journ. Linnean Soc., Zoology, vol. 21, 1887, p. 215, No. 375.
 — *glabratum*, LAMARCK, DAUTZENBERG & FISCHER, Journ. de Conchyl., vol. 53, 1905, p. 233.
Maetra sulcata, VALENCIENNES, Encyclop. méthod., 1791, pl. 257, fig. 3 (nomen).
Mesodesma mitis, DESHAYES, REEVE, Conchol. icon., VIII, *Mesodesma*, Sp. 29.
 — *Savignyi*, JOUSSEAUME, Descr. d. Moll. rec. p. Faurot dans la mer Rouge et le golfe d'Aden, (1888), p. 206, No. 142.

South coast of Koh Chang, shallow water, buried in the sand (79). Koh Kahdat, 1 fathom, sand (8). Koh Mak, sandy coast ($\frac{3}{2}$).

Long. 10—31 mm.

Distribution:— Singapore, Salang, Mergui Isls., Andamans, Ceylon ("Extends from Ceylon throughout the Indian Ocean," MELVILL and SYKES), Maldives, Gulf of Aden, Red Sea, Suez, Seychelles, Amirantes, Madagascar, Mascarenes, Mozambique, Querimba Isls. — Philippines (v. MARTENS), Tonkin, Thursday Isl. (Torres Strait), "Australia" (v. MARTENS).

Mesodesma striata, Chemn., and *M. glabrata*, Lam., have undoubtedly frequently been confused with each other by several authors; thus, *M. striata* is recorded by CARAMAGNA² and MÖRCH,³ to have been taken from the Red Sea and at Aden; and I believe that also MORLET'S⁴ *M. striata*, from "Iles du golfe de Siam" unquestionably refers to specimens of *M. glabrata*, Lam. In addition to this, these two species are very badly characterized and figured. CHEMNITZ says, e. g. regarding his *striata*, that "nur allein die Wirbelspitzen sind fast völlig glatt," but this is seen very

¹ P. FISCHER (Manuel de Conchyl., p. 113) rejects LAMARCK'S generic name *Paphia* and adopts SWAINSON'S name *Eryx*. DALL (Proc. Malacol. Soc. London, I, p. 213) thinks that this name is not satisfactory as it is "preoccupied in zoology" and makes a new name, viz. *Atactodea*.

² Proc. Zool. Soc. London, 1891, p. 435.

³ Catal. conchyl. quæ rel. Yoldi, II, p. 16, No. 166.

⁴ Journal de Conchyliologie, vol. 37, 1889, p. 172, No. 87.

indistinctly in his figure; and LAMARCK observes regarding *glabrata*: "natibus umbonibusque glabratis," but this slight difference which is probably intended to be the chief distinguishing point (the striation of the rest of the shell being no doubt almost similar in both the species), is confined to a matter of taste. On examining the figures, e. g. of *glabrata* by ADAMS (loc. cit.) and of *striata* by REEVE (sp. 10), it will be seen that the sculpture is almost similar, and that the form differs but slightly; but the material of *M. glabrata* at my disposal shows that the outline varies highly — from a high triangle (long. 27 mm., alt. 23 mm.) to an oblong-ovate form (long. 24 mm., alt. 18 mm.). — It is desirable that these two forms should be compared with each other, and especially that *striata* should be more accurately characterized. In *glabrata* the regularly-arranged concentric striation begins generally when the shell has reached a height of about 8–12 mm., but it may often be traced before this.

Davila crassula, Desh.

- Mesodesma crassula*, DESHAYES, Proc. Zool. Soc. London, XXII, 1854, p. 336, No. 87.
 — — — REEVE, Conchol. icon., VIII, *Mesodesma*, Sp. 26.
Davila — — — H. & A. ADAMS, Genera of rec. Mollusca, pl. 106, fig. 6.
Mesodesma — — — HIDALGO, Fauna malacol. de l. isl. Filipinas, II, p. 66, fig. 135.

Koh Kahdat, 1–5 fathoms, sand (3). On the coast of Koh Kahdat ($\frac{8}{2}$).

Long. 8–18 mm.

Distribution:— Elphinstone Isl. (Mergui Archip., v. MARTENS), Philippines.

Ervilia biscalpta, Gould.

(Pl. IV, Figs. 14–16).

- Ervilia biscalpta*, GOULD, Proceed. Boston Soc. Nat. Hist., VIII, 1861–62, p. 28. — Otia Conchol., p. 166.
 — — — EDG. SMITH, Report on the Lamellibranchiata of the Challenger Exped., p. 80.
Ervillia — — — PILSBRY, Catal. Mar. Moll. Japan, 1895, p. 118.
Ervilia — — — HEDLEY, Proc. Linn. Soc. New South Wales, vol. 31, 1906, p. 479, pl. 36, fig. 8.
 — *australis*, ANGAS, Proc. Zool. Soc. London, 1877, p. 175, pl. 26, fig. 21.
 — *incolor*, DESHAYES, MSS. in Brit. Mus.
Corbula isomeros, HINDS, MSS. in Cuming's Collection, Brit. Mus.

Koh Kram, 30 fathoms ($\frac{5}{2}$). N. of Koh Kam, 5 fathoms, gravel (1). Koh Mesan, 15 fathoms, stones (3). Between Koh Mesan and Cape Liant, 5–9 fathoms, sand (42). W. of Koh Chuen, 5 fathoms, gravel (1). North end of Koh Chang, 1–2 fathoms, old coral blocks ($\frac{1}{2}$). Koh Kahdat (6). Between Koh Kut and Koh Kahdat, 10 fathoms, shells ($\frac{1}{2}$). W. of Koh Kut, 15 fathoms, mud (4).

Long. 1.5–5 mm.

Distribution:— Singapore (shallow water, Sv. GAD). Durban (BURNUP). — Philippines, Japan, Mast Head Reef (Queensland), Port Jackson (Sydney), Sandwich Isls.

ANGAS's figure of *E. australis* (Proc. Zool. Soc. London, 1877) corresponds badly with his diagnosis of the same species, and it is upon EDG. SMITH's authority alone that I give it as a synonym of *E. biscalpta*.

Fam. Mactridae.

Mactra (Trigonella) achatina, Ch.

- Mactra achatina*, CHEMNITZ, Conchyl. Cabin., XI, 1795, p. 218, pl. 200, figs. 1957—58.
 — — — REEVE, Conchol. icon., VIII, *Mactra*, Sp. 51.
 — — — WEINKAUFF in MARTINI u. CHEMNITZ, Conchyl. Cabin., XI Bd., 2 Abth., p. 50, No. 49, pl. 17, figs. 3—4.
 — — — EDG. SMITH, Lamellibranchiata of the Challenger Exped., p. 59.
 — — — CROSSE et FISCHER, Journ. de Conchyl., vol. 40, 1892, p. 76, No. 24.
 — *maculosa*, LAMARCK, Hist. nat. d. anim. s. vert., V, 1818, p. 474, No. 8. — éd. 2, VI, p. 100, No. 8.
 — *ornata*, GRAY, The Magaz. of Nat. Hist., I, 1837, p. 371.
 — — — REEVE, Conchol. icon., VIII, *Mactra*, Sp. 58.
 — — — WEINKAUFF in MARTINI u. CHEMNITZ, Conchyl. Cabin., XI Bd., 2 Abth., p. 37, No. 35, pl. 12, figs. 1—3.
 — *adpersa*, DUNKER, Zeitschr. f. Malakozoologie 1848, p. 186, No. 20. — PHILIPPI, Abbild. u. Beschreib., III, p. 135, *Mactra*, pl. 3, fig. 2.

Koh Kahdat (several young individuals).

Gulf of Siam, west coast of Cambodge (PAVIE).

Distribution:— Singapore (shallow water, Sv. GAD), Nicobars, Andamans, Tranquebar, Ceylon, Angrias Bank (MELVILL and STANDEN), Persian Gulf, Aden, Red Sea, Suez, "South Africa" (SOWERBY). — Philippines, China, Japan, Torres Strait, Admiralty Isl.

Mactra (Trigonella) maculata, Ch.

- Mactra maculata*, CHEMNITZ, Conchyl. Cabin., VI, 1782, p. 217, pl. 21, figs. 208—9.
 — — — REEVE, Conchol. icon., VIII, *Mactra*, Sp. 56.
 — — — WEINKAUFF in MARTINI u. CHEMNITZ, Conchyl. Cabin., XI Bd., 2 Abth., p. 10, No. 7, pl. 3, figs. 4—5; pl. 16, figs. 5—6.
 — — — HIDALGO, Fauna malacol. de l. isl. Filipinas, II, p. 48, No. 100.
 — *squalida*, LAMARCK, Hist. nat. d. anim. s. vert., V, 1818, p. 478, No. 26. — éd. 2, VI, p. 105, No. 26.
 — — — HANLEY, Catal. of rec. div. shells, p. 31, pl. 11, fig. 30.
 — *setosa*, QUOY, Voyage de l'Astrolabe, Zoologie, III, 1833, p. 519, pl. 83, figs. 3—4.
 — *Reevei*, DESHAYES, Proc. Zool. Soc. London, XXI, 1853, p. 15, No. 3.
 — — — REEVE, Conchol. icon., VIII, *Mactra*, Sp. 85.
 — — — WEINKAUFF in MARTINI u. CHEMNITZ, Conchyl. Cabin., XI Bd., 2 Abth., p. 66, No. 67, pl. 23, fig. 4.
 — — — MORLET, Journ. de Conchyl., vol. 37, 1889, p. 172, No. 88.

Islands in the Gulf of Siam (L. MORLET).

The Danish Expedition to Siam collected no specimens of this species.

Distribution:— Nicobars. — Philippines, Loo Choo Isls. (Yaeyama), Amboina, Sorong, Sulu Isls., Mast Head Reef (Queensland), New Caledonia, Vanikoro Isl., Pelew Isls.

Mactra (Trigonella) cuneata, Ch.

(Pl. IV, Figs. 17—19).

- Mactra cuneata*, CHEMNITZ, Conchyl. Cabin., VI, 1782, p. 221, pl. 22, fig. 215.
 — — — GMELIN, Syst. Nat., ed. XIII, 1790, p. 3260, No. 19.
 — — — REEVE, Conchol. icon., VIII, 1854, *Mactra*, Sp. 109.

- Maetra cuneata*, CHEMNITZ, WEINKAUFF in MARTINI u. CHEMNITZ, Conchyl. Cabin., XI Bd., 2 Abth., p. 13, No. 10, pl. 4, figs. 3—4.
 — *purpurea*, SPENGLER, Skrivter af Naturhistorie-Selskabet, V Bd., 2 Hefte, 1802, p. 111, No. 17.
 — *corbiculoides*, DESHAYES, Proc. Zool. Soc. London, XXII, 1854, p. 62, No. 4.
 — — — REEVE, Conchol. icon., VIII, *Maetra*, Sp. 98.
 — — — WEINKAUFF in MARTINI u. CHEMNITZ, Conchyl. Cabin., XI Bd., 2 Abth., p. 91, No. 97, pl. 31, fig. 3.

The strand off the Mangrove at the station on Koh Chang, shallow water (3).
 The strand of Koh Kahdat ($\frac{5}{2}$).

Long. 4—15 mm.

Distribution:— Nicobars, Ceylon, and Gulf of Manaar.

The small individuals from the Gulf of Siam agree fairly well with REEVE's *cuneata*, which is probably founded on not full-grown individuals, at any rate SPENGLER's original specimens of *M. purpurea* are considerably larger (long. 31 mm., alt. 27.5 mm., crass. 18 mm.) and are thick-valved. I cannot find any difference between the latter and DESHAYES's *corbiculoides*, which, judging from the figure and description, agrees in all points with it; therefore, I have not hesitated in giving them as synonyms. Setting aside the outline, the following features are characteristic of *M. cuneata*, Ch.:— the intense dark-lilac colour of the interior of the valves (the lateral teeth are pale), the pale lilac and ash-gray colour of the exterior of the valves, and the beautiful regular striation of the lunule and area. Besides this typical form there are also individuals which are entirely white, without a trace of colour (CHEMNITZ has already mentioned such specimens), several specimens of this variety were taken at Koh Kahdat. I entirely agree with WEINKAUFF when he writes (loc. cit. p. 29) that *M. lurida*, Phil., is very near to *M. corbiculoides*, Desh.; I think that *lurida* can scarcely be separated from *M. cuneata*, Ch. (= *corbiculoides*, Desh.), as a good species.

Maetra (*Trigonella*) *Luzonica*, Desh.

- Maetra Luzonica*, DESHAYES, Proc. Zool. Soc. London, 1854, p. 64, No. 12.
 — — — REEVE, Conchol. icon., VIII, *Maetra*, Sp. 81.
 — — — WEINKAUFF in MARTINI u. CHEMNITZ, Conchyl. Cabin., XI Bd., 2 Abth., 1884, p. 49, No. 48, pl. 17, figs. 1—2.
 — — — HIDALGO, Fauna malacol. de I. isl. Filipinas, II, 1903, p. 50, No. 102.

Koh Kahdat ($\frac{1}{2}$).

Long. 14 mm., alt. 9.5 mm.

Distribution:— Arakan Coast (BLANFORD), Calcutta (Lady HERSCHEL), Madras (HENDERSON), Ceylon (HERDMAN), Bombay (MELVILL & ABERCROMBIE), the coast of Continental India (from Karachi to Panjim, MELVILL & STANDEN). — Philippines (CUMING).

Though the small valve which is at hand is somewhat worn, I have no doubt as to the correctness of the determination. G. F. ANGAS (Proc. Zool. Soc. London, 1867, p. 916. — J. C. COX, Exchange List of Land and Marine Shells from Australia,

1868, p. 24, No. 344) records *M. Luzonica*, Desh., from Port Jackson and Botany Bay, but EDG. SMITH¹ thinks that the specimens from these localities are identical with *M. pusilla*, A. Ad.

Maetra (Maetrinula) angulifera, Desh.

- Maetra angulifera*, DESHAYES, Proc. Zool. Soc. London, XXII, 1854, p. 70, No. 37.
 — — — REEVE, Conchol. icon., VIII, *Maetra*, Sp. 83.
 — — — WEINKAUFF in MARTINI u. CHEMNITZ, Conchyl. Cabin., XI Bd., 2 Abth., p. 83, No. 87, pl. 28, fig. 5.
Maetrinula — — — EDG. SMITH in Rep. Zool. Collect. made during the Voyage of H. M. S. "Alert," 1884, p. 101.
 — — — HIDALGO, Fauna malacol. de I. isl. Filipin., II, p. 56, No. 115.
Maetra ovalina (non LAMARCK), REEVE, Conchol. icon., VIII, *Maetra*, Sp. 66.

South of Koh Chuen, 30 fathoms, shells ($1\frac{1}{2}$). North of Koh Kahdat, 4—5 fathoms, coarse sand (1). West of Koh Kut, 30 fathoms, sand and mud ($\frac{3}{2}$).

Long. 7—31 mm.

Distribution: — Singapore (shallow water, Sv. GAD), Mergui Archip. (E. v. MARTENS), Persian Gulf (E. v. MARTENS). — Philippines (CUMING).

EDG. SMITH² is of opinion that *M. angulifera*, Desh., is not specifically distinct from *M. depressa*, Spengler (Reeve), but in this he is probably mistaken. I have on Pl. IV, Figs. 20—23 given figures of *M. depressa*, Spgl., drawn from SPENGLER'S original specimens in the Zoological Museum of the University of Copenhagen. On comparing these figures with REEVE'S figure of *M. angulifera*, Desh., one can soon be convinced that they are two distinct species (the valves of *M. depressa* are much thicker and more solid than those of *M. angulifera*). REEVE'S description and figure of SPENGLER'S *depressa* (Sp. 67) agree well with the original specimen. It is quite natural that EDG. SMITH should doubt whether REEVE has correctly apprehended SPENGLER'S form, as SPENGLER'S description is not good, and his statement that Guinea is the locality is undoubtedly wrong. *M. ovalina*, Lam., has been greatly misapprehended by various authors; WEINKAUFF³ records it (= *falcata*, Gould) from Puget Sound; TATE and MAY⁴ record it (= *depressa*, Reeve) from Tasmania; G. B. SOWERBY⁵ records it (= *depressa*, Spgl.) from Durban in South Africa; D'ORBIGNY⁶ (= *M. fragilis*, Ch.) from Cuba, Brazil, and Patagonia; etc. It is fairly certain that these authors have had quite different species for investigation.

¹ Report on the Lamellibranchiata of the Challenger Expedition, p. 61.

² Report on the Lamellibranchiata of the Challenger Expedition, p. 57.

³ MARTINI u. CHEMNITZ, Conchyl. Cabin., XI Bd., 2 Abth., p. 69, No. 70.

⁴ Proc. Linnæan Society of New South Wales, 1901, p. 423.

⁵ Marine Shells of South Africa, Appendix, 1897, p. 22. EDG. SMITH also records it (Journ. of Malacology, 1904, p. 25) from Port Alfred, Cape Colony.

⁶ Mollusques de l'île de Cuba, 1853, II, p. 222. List of the Shells of South America in the collect. of the British Museum, 1854, p. 56, No. 489.

Mactra (Mactrinula) Reevesi, Gray.

- Mactra Reevesii*, GRAY, The Magazine of Natural History, I, 1837, p. 372.
 — — — REEVE, Conchol. icon., VIII, *Mactra*, Sp. 92.
 — — — WEINKAUFF in MARTINI u. CHEMNITZ, Conchyl. Cabin., XI Bd., 2 Abth., p. 82, No. 85, pl. 28, fig. 2.
Mactrinula Reevesii, GRAY, EDG. SMITH, Annals and Mag. Nat. Hist., 7 Ser., vol. 14, 1904, p. 9.

East of Koh Chuen, 9—10 fathoms, shells ($1/2$). South of Koh Samit, 14—18 fathoms (1).

Long. 40 mm., alt. 25 mm., crass. 13 mm.

Distribution: — Malacca Strait. Off Chedubar (Aracan coast). — China.

Lutraria impar, Desh.

- Lutraria impar*, DESHAYES, Proc. Zool. Soc. London, XXII, 1854, p. 70, No. 38.
 — — — REEVE, Conchol. icon., VIII, *Lutraria*, Sp. 10.

West of Koh Kong, 10—15 fathoms ($1/2$).

Long. 69 mm., alt. 26 mm.

Distribution: — Moreton Bay, Australia (STRANGE).

Of this characteristic species only one dead left valve, without epidermis, is found in the collections of the Danish Expedition to Siam.

Lutraria maxima, Jonas.

- Lutraria maxima*, JONAS, Zeitschr. f. Malakozoologie, 1844, p. 34. — Molluskologische Beiträge (Abhandl. aus d. Gebiete d. Naturwiss., I, Hamburg 1846), p. 110, No. 2, pl. 7, fig. 1 (non *Lutraria maxima*, MIDDENDORFF, Malacozoologia Rossica, III, p. 582).
 — — — REEVE, Conchol. icon., VIII, *Lutraria*, Sp. 11.
 — — — LISCHKE, Japan. Meeres-Conchyl., I, 1869, p. 138.
 — — — DUNKER, Index molluscor. mar. Japon., 1882, p. 185.

The sound of Koh Chang, 5 fathoms, soft clay ($1/2$).

Long. 72 mm.

Distribution: — China, Japan (Nagasaki).

Lutraria curta, Desh.

- Lutraria curta*, DESHAYES, Proc. Zool. Soc. London, 1854, p. 71, No. 42.
 — — — REEVE, Conchol. icon., VIII, 1854, *Lutraria*, Sp. 5.
 — — — HIDALGO, Fauna malacol. de las isl. Filipinas, II, 1903, p. 59, No. 120.

Between Koh Rin and Cliff Rock, 15 fathoms ($1/2$).

Distribution: — Aden (SHOPLAND). — Philippines (REEVE).

Only a small fragment of the left valve of a young individual has come to hand from the above locality, so the determination is somewhat uncertain.

Raëta pulchella, Ad. and Reeve.

(Pl. IV, Fig. 24).

- Poromya pulchella*, ADAMS & REEVE, Zoology of the voyage of H. M. S. Samarang, Mollusca, 1848, p. 83, pl. 23, fig. 1.
Raëta — — — EDG. SMITH, Lamellibranchiata of the Challenger Expedit., p. 56.

- Raeta pulchella*, ADAMS & REEVE, HIDALGO, Fauna malacol. de l. isl. Filipinas, II, p. 58, No. 119.
Maetra rostralis, DESHAYES, Proc. Zool. Soc. London, XXII, 1854, p. 69, No. 32.
 — — — REEVE, Conchol. icon., VIII, *Maetra*, Sp. 119.
Raëta — — — DUNKER, Index molluscor. mar. Japon., 1882, p. 185.

The sound of Koh Chang, 5 fathoms, soft clay ($1\frac{1}{2}$).

Long. 25 mm., alt. 17 mm.

Distribution: — Borneo, Philippines, China, Japan (Yokohama).

The specimen from Koh Chang is larger than the individuals which have hitherto been described (long. 20 mm., alt. 14 mm.); it bears a very strong resemblance to the form taken by R. STURANY¹ at Ras Mallap in the Gulf of Suez in 50 fathoms, which he names *Raëta bracheon*; how far this species is synonymous with *R. pulchella*, Ad. and Reeve, I am not prepared to say. Unfortunately, my material consists only of a solitary, broken, left valve, of which I give a figure for future comparison.

Raëta anatinoides, Reeve.

Maetra Anatinoides, REEVE, Conchol. icon., VIII, 1854, *Maetra*, Sp. 123.

The sound of Koh Chang, 3—5 fathoms, soft clay ($7\frac{1}{2}$, partially fragments) N. of Koh Kong, 8 fathoms, mud ($2\frac{1}{2}$).

Long. 5—14 mm. (long. 14 mm., alt. 12 mm.).

Distribution unknown.

By comparisons in the British Museum, I have convinced myself that the specimens from the Gulf of Siam are really identical with *R. anatinoides*, Reeve, and not with *R. pellicula*, Desh., which, however, comes near to *R. anatinoides*, Reeve.

Standella pellucida, Ch.

- Maetra pellucida*, CHEMNITZ, Conchyl. Cabin., VI, 1782, p. 235, pl. 24, fig. 234.
 — — — SPENGLER, Skriveret af Naturhistorie-Selskabet, V Bd., 2 H., 1802, p. 123, No. 29.
 — — — REEVE, Conchol. icon., VIII, *Maetra*, Sp. 118.
 — — — WEINKAUFF in MARTINI u. CHEMNITZ, Conchyl. Cabin., XI Bd., 2 Abth., p. 17, No. 14, pl. 5, fig. 1.
Standella — — — HIDALGO, Fauna malacol. de l. isl. Filipin., II, p. 57, No. 117.
 — (*Merope*) *pellucida*, CHEMNITZ, MELVILL & STANDEN, Proc. Zool. Soc. London, 1906, p. 828.
Maetra depressa, LAMARCK, Hist. nat. d. anim. s. vert., V, 1818, p. 479, No. 29. — éd. 2, VI, p. 106, No. 29.
 — — — Encyclop. méthod., II, 1830, p. 398.

Coast of Lem Ngob ($1 + 2\frac{1}{2}$). The strand off the Mangrove at the station on Koh Chang, quite shallow water (6).

Long. 7—48 mm.

Distribution: — Bombay, extending southwards to Ratnagiri (MELVILL & STANDEN). — Philippines.

MELVILL and ABERCROMBIE write that dead specimens of the present species are common at Bombay; the two right valves from Lem Ngob are also from dead individuals, all the other individuals, which are small, were taken alive.

¹ R. STURANY, Lamellibranchiata d. Rothen Meeres. Wien 1899, p. 12, No. 10, pl. 3, figs. 1—6.

Eastonia (Merope) Nicobarica, Gmel.

- Maetra rugosa Indiae orientalis*, CHEMNITZ, Conchyl. Cabin., VI, 1782, p. 238, pl. 24, fig. 237.
 — *nicobarica*, GMELIN, Syst. Nat. ed. XIII, 1790, p. 3261, No. 24.
Anatinella Nicobarica, GMELIN, TENNANT, Natural History of Ceylon, 1861, p. 389.
Lutraria (Merope) Nicobarica, GMELIN, v. MARTENS, Journ. Linnean Society, Zoology, 1887, vol. 21, p. 217, pl. 16, fig. 7.
 — — *nicobarica*, GMELIN, THURSTON, Rámésvaram Island and Fauna of the Gulf of Manaar, 2 ed., 1895, p. 128.
Maetra Aegyptiaca, CHEMNITZ, Conchyl. Cabin., XI, 1795, p. 218, pl. 200, figs. 1955—56.
Lutraria Aegyptiaca, GRAY, HANLEY, Catalogue of rec. biv. shells, p. 26, pl. 6, fig. 34.
Maetra Aegyptiaca, CHEMNITZ, REEVE, Conchol. icon., VIII, 1854, *Maetra*, Sp. 112.
Lutraria Aegyptiaca, — ISSEL, Malacologia d. Mar Rosso, 1869, p. 52.
Merope Aegyptiaca, GRAY, ANGAS, Proc. Zool. Soc. London, 1871, p. 100.
 — *Aegyptiaca*, CHEMNITZ, DUNKER, Index molluscor. mar. Japon., 1882, p. 184.
Maetra (Merope) aegyptiaca, CHEMNITZ, EDG. SMITH, Proc. Zool. Soc. London, 1891, p. 428, No. 222.
Eastonia — *aegyptiaca*, — PILSBRY, Marine Mollusks of Japan, 1895, p. 120.
Standella Aegyptiaca, CHEMNITZ, SHOPLAND, Proc. Malacol. Soc. London, V, p. 177.
Maetra reticulata, SPENGLER, Skrivter af Naturhistorie Selskabet, V Bd., 2 Hefte, 1802, p. 119.
Lutraria Chemnitzii, PHILIPPI, Zeitschr. f. Malakozool., 1849, p. 26, No. 99.

Between Koh Riot and Koh Mesan, 3—5 fathoms, sand ($1\frac{1}{2}$). Koh Kahdat, 1 fathom, sand ($1\frac{1}{2}$).

Long. 18—43 mm.

Distribution: — Singapore (shallow water, Sv. GAD), Mergui Archip., Nicobars, Ceylon, Karachi, Aden, Red Sea (CHEMNITZ, ISSEL, FORSKÅL (Mus. Univ. Hafn.), STURANY). — Java, Panay Isl. (Mus. Univ. Hafn.), Japan, Liukiu Isls., Lake Macquarie (New South Wales).

As the original specimens of CHEMNITZ's "*Maetra rugosa Indiae orientalis*" and *Maetra Aegyptiaca* have been at my disposal, it has been possible for me to verify the reciprocal relation of these forms. *Maetra rugosa Indiae orientalis* has been described by CHEMNITZ from a specimen in SPENGLER's collection, and was afterwards named *Maetra reticulata* by the latter. The figure given by CHEMNITZ is very bad, but REEVE's figure, Sp. 112, is an excellent illustration of the species, both as regards its form and its sculpture; the *reticulata*-form thus indicates the individuals with pointed posterior end and coarser radiating ribs, and the interstices between the ribs 2—3 times the width of the ribs. The other species *M. Aegyptiaca* has been figured fairly well by CHEMNITZ; it comprises the forms with oval shells, and finer, more closely set radiating ribs; but between these two extremes there is an extensive series of intermediate forms, which I have before me, and which distinctly show that it is same species which varies. I have also at hand that small characteristic form which ED. v. MARTENS describes and figures from "King Island, mud-bank exposed at spring-tide;" my specimen was taken at Singapore in shallow water, it is only a thin-valved, littoral, local form of *E. Nicobarica* Gm., ornamented with rather slight and delicate ribs.

Caecella Cumingiana, Desh.

Caecella Cumingiana, DESHAYES, Proc. Zool. Soc. London, XXII, 1854, p. 334, No. 78.

— — — — — HIDALGO, Fauna malacolog. d. I. Isl. Filipinas, II, p. 60, No. 123.

Koh Chang (14). Coast of Koh Chang (1).

Long. 10—26 mm.

Distribution:— Philippines.

I have at my disposal some specimens of *C. Cumingiana*, Desh., from the Philippines which were contributed by CUMING himself; they are somewhat larger than the specimens from the Gulf of Siam, but otherwise exactly correspond with them. The epidermis in the small individuals (measuring as much as 23 mm. in length) is pale yellow, while in older individuals it is brownish. It will undoubtedly be proved in the future that the series of species established by DESHAYES of the genus *Caecella*, can be considerably reduced.

Fam. Veneridae.

Cytherea (Meretrix) meretrix L.

Venus Meretrix, LINNÉ, Syst. Nat., ed. X, 1758, p. 686, No. 102. — ed. XII, p. 1132, No. 127. — Mus. Ludovicæ Ultricæ reg., p. 501, No. 60.

Cytherea meretrix, LINNÉ, LISCHKE, Japanische Meeres-Conchylien, I, pp. 122—26.

Meretrix — — — — — DAUTZENBERG et FISCHER, Journ. de Conchyl., vol. 53, 1905, p. 216.

Venus lusoria, CHEMNITZ, Conchyl. Cabin., VI, 1782, p. 337, pl. 32, fig. 340.

Meretrix — — — — — RÖMER, Monogr. d. Molluskengatt. Venus, I, p. 30, pl. 12, fig. 1; pl. XI, figs. 1—2.

Cytherea petechialis, LAMARCK, Hist. nat. d. anim. s. vert., V, 1818, p. 561, No. 2. — éd. 2, VI, p. 299, No. 2.

Meretrix — — — — — RÖMER, Monogr. d. Molluskengatt. Venus, I, p. 29, pl. 9, fig. 1.

Venus zonaria, — — — — — Hist. nat. d. anim. s. vert., V, 1818, p. 562, No. 5. — éd. 2, VI, p. 299, No. 5.

— *impudica*, — — — — — Hist. nat. d. anim. s. vert., V, 1818, p. 561, No. 3. — éd. 2, p. 299, No. 3.

North coast of Koh Chang (1).

Long. 51 mm.

Islands in the Gulf of Siam (*M. petechialis*, Lam. — L. MORLET). "Siam" (*M. impudica*, Lam., *M. zonaria*, Lam. — E. v. MARTENS).

Distribution:— Singapore, Salang (Malacca), Nicobars, Ceylon, Bombay, Aden. — Annam, Tonkin, China, Formosa, Japan, Liukiu Isls., Philippines, Borneo, Java, Timor, Moluccas. ("Mazatlan," CARPENTER; without doubt the determination is erroneous).

The specimen from Koh Chang belongs to the form *zonaria*, Lam. The many different species which have been established by LAMARCK and other authors on the basis of the present species, have for a long time rendered its determination difficult, and LISCHKE (loc. cit.) was the first to demonstrate, and that correctly, that all these forms belong to the same species. In spite of this, many later authors have persisted in maintaining the varieties as species, a view which is quite untenable when larger series and specimens in various ages are at hand for investigation.

HIDALGO (Obras malacológicas, I, Tom. 2, 1903, p. 182) has enumerated 10 different colour-variations of *Cyth. meretrix* from the Philippines. DAUTZENBERG and H. FISCHER (Journ. de Conchyl., vol. 53, 1905, pp. 216—20) enumerate the synonyms of this well-known species, which form a long list.

Cytherea (Meretrix) lyrata, Sow.

Cytherea lyrata, SOWERBY, Thesaurus Conchyl., II, 1855, p. 621, pl. 129, fig. 61.

Cytherea — — REEVE, Conchol. icon., XIV, *Cytherea*, Sp. 13.

— (*Meretrix*) *lyrata*, SOWERBY, RÖMER, Monogr. d. Moll. Venus, I, p. 36, No. 11, pl. 11, fig. 3.

Meretrix lyrata, SOWERBY, MORLET, Journ. de Conchyl., vol. 37, 1889, p. 168, No. 59.

— — — FISCHER, Catalogue de Moll. de l'Indo-Chine, p. 233.

Islands in the Gulf of Siam. (MORLET, loc. cit.).

Distribution:— Cambodge, Cochin China, Tonkin, Philippines.

The present large species, strangely enough, was not collected by the Danish expedition.

Cytherea (Caryatis) hebraea, Lam.

Cytherea hebraea, LAMARCK, Hist. nat. d. anim. s. vert., V, 1818, p. 568, No. 30. — éd. 2, VI, 1835, p. 308, No. 30.

— — — DELESSERT, Recueil de coquilles décr. p. Lamarck, 1841, pl. 8, fig. 6.

— (*Caryatis*) *hebraea*, LAMARCK, RÖMER, Monogr. d. Molluskengatt. Venus, I, p. 116, No. 44.

Circe Hebraea, LAMARCK, REEVE, Conchol. icon., vol. 14, 1863, *Circe*, Sp. 34.

— *hebraea*, — MORLET, Journ. de Conchyl., vol. 37, 1889, p. 169, No. 64.

Cytherea (Caryatis) hebraea, LAMARCK, EDG. A. SMITH, Lamellibranchiata of the Challenger Expedition, 1885, p. 138.

Islands in the Gulf of Siam (MORLET, loc. cit.).

It is with doubt that I refer a small (8 mm.) single valve from the coast of Koh Kahdat to the present species.

Distribution:— Ceylon, Persian Gulf, Aden, Red Sea, Seychelles, Natal. — Philippines, Torres Strait, New South Wales.

It is doubtful whether all the authors who have recorded the present species from the above-mentioned localities have had the true *Cyth. hebraea*, Lam., before them. It is recorded by several authors (e. g. H. KREBS, O. MÖRCH, C. T. SIMPSON, W. H. DALL, etc.) from the West Indies, but these records are due to its having been confounded with *Cyth. varians*, Hanl.

Cytherea (Caryatis) affinis, Gmel. var. *inflata*, Sow.

Cytherea inflata, SOWERBY jun., Thesaurus Conchyl., II, 1855, p. 637, pl. 133, figs. 127—28.

Dione — — — REEVE, Conchol. icon., XIV, *Dione*, Sp. 37.

— — — — — DESHAYES, Catalogue of the Conchifera in Brit. Mus., 1853, p. 65, No. 28.

Cytherea affinis, GMELIN var. *inflata*, SOWERBY, PFEIFFER in MARTINI u. CHEMNITZ, Conchyl. Cabin., XI, 1 Abth., pp. 24—25.

— (*Caryatis*) *affinis*, GMELIN var. *inflata*, SOW., RÖMER, Monogr. d. Molluskengatt. Venus, I, p. 105, pl. 33, figs. 6—7.

Callista inflata, SOWERBY, DUNKER, Index moll. mar. Japon., 1882, p. 201.

Pitaria — — — HEDLEY, Proc. Linn. Soc. New South Wales, vol. 31, 1906, p. 466.

Between Koh Mesan and Koh Chuen, 25—38 fathoms, stones and shells ($1/2$). S. of Koh Chuen, 30 fathoms, shells ($1/2$). Koh Mak, sandy coast ($1/2$). S. of Koh Mak, 5—6 fathoms ($1/2$). N. of Koh Kahdat, 4—5 fathoms, sand (1). Koh Kahdat, 1 fathom, sand ($2/2$).

Long. 8—34 mm.

Distribution:— Nicobars, Andamans, Ceylon, Mauritius, Reunion, Rodriguez. — Philippines, Japan, Moluccas, Torres Strait, Mast Head Reef (Queensland), Port Curtis (Australia), Lifu.

Cytherea (Caryatis) striata, Gray.

Chione striata, GRAY, The Analyst, VIII, 1838, p. 306.

Cytherea citrina (non LAMARCK), SOWERBY, Thesaurus Conchyl., II, p. 636, pl. 132, figs. 117—18.

Dione striata, GRAY, REEVE, Conchol. icon., XIV, *Dione*, Sp. 44.

Cytherea (Caryatis) citrina, RÖMER, Monogr. d. Molluskengatt. Venus, I, p. 100, pl. 27, fig. 2.

Callista citrina, ROCHEBRUNE, Bull. de la Soc. Philomat. de Paris 1881, (Reprint, p. 15, No. 48).

Meretrix (Pitar) citrina, FISCHER, Catalogue d. Moll. de l'Indo-Chine, p. 233.

North coast of Koh Chang ($1/2$).

Long. 36 mm.

Distribution:— Poulo Condor, Philippines, Formosa, Sulu Isls., Kei Bandan, Jobi Isl. (Geelwinck Bay).

C. striata, GRAY, has always been referred to *C. citrina*, Lam., but sufficient proof that it is not that species appears to me to be given by LAMARCK's diagnosis ("testa cordata-trigona") and by DELESSERT's figure (Pl. 8, Fig. 8) of LAMARCK's original specimen. HIDALGO¹ has arrived at the same conclusion with regard to the specimens from the Philippines. HANLEY's *C. striata*, Gray?² from the "River Gambia" is not GRAY's species of that name, but is identical with *C. citrina*, Lam. The individual from the Gulf of Siam which I have before me exactly agrees with RÖMER's description and figure (loc. cit.) of *C. citrina* (= *C. striata*, Gray). The true *C. citrina*, Lam., occurs around Australia, and is easily distinguished from *striata* by its more triangular form and by its posterior end being considerably more pointed as compared with the more truncated form of *striata*.

Cytherea (Caryatis) minuta, Koch.

(Pl. IV, Figs. 25—27).

Cytherea minuta, KOCH, PHILIPPI, Abbild. u. Beschreib. neuer od. wenig gekannt. Conchylien., I, 1845, p. 22 (200), *Cytherea*, pl. 3, fig. 8.

— (*Caryatis*) *minuta*, KOCH, RÖMER, Monogr. d. Molluskengatt. Venus, I, p. 124, pl. 33, fig. 1.

Dione minuta, KOCH, DESHAYES, Catalogue of the Conchifera in Brit. Mus., I, p. 73, No. 58.

Koh Kram, 30 fathoms (1). Koh Chuen, 10—15 fathoms ($3/2$). W. of Koh Chuen, soft clay and mud ($40/2$). W. of Koh Chang, 30 fathoms ($3/2$). W. of Koh Chang, 20 fathoms, mud (3). The strand off the mangrove at the station on Koh

¹ OBRAS malacológicas, I, Tom. 2, 1903, p. 198.

² SOWERBY, Thesaurus Conchyl., I, p. 637, pl. 132, fig. 113.

Chang ($1\frac{1}{2}$). Between Koh Chuen and Koh Chang, 15 fathoms, mud ($1\frac{1}{2}$). Between Koh Kahdat and Koh Kut, 6–10 fathoms, clay mixed with sand (6). W. of Koh Kut, 15 fathoms, mud (2). W. of Koh Kut, 30 fathoms, sand and mud ($1\frac{1}{2}$). S. of Koh Kut, 17–20 fathoms, mud (1). S. of Koh Kahdat, 8–10 fathoms, mud ($1\frac{1}{2}$). E. of Koh Mak, 20 fathoms, mud (4). W. of Koh Kut, 15 fathoms, mud (1).

Long. 3–16 mm.

Distribution:— Mergui Archip. (E. v. MARTENS).

The figure by RÖMER (loc. cit.) is not good, therefore I have figured some of the specimens from the Gulf of Siam. E. v. MARTENS was the first (1887) to give a locality for this species. *C. chordata*, Römer, is perhaps the same species.

Cytherea (Caryatis) Yerburyi, Smith.

Cytherea (Caryatis) Yerburyi, EDG. SMITH, Proc. Zool. Soc. London, 1891, p. 423, No. 192.

Dione erubescens, REEVE (non DUNKER), Conchol. icon., XIV, 1863, *Dione*, Sp. 54.

Koh Kahdat, 1–5 fathoms, sand (1). W. of Koh Kut, 15 fathoms, mud (1). W. of Koh Kut, 30 fathoms, sand and mud ($2\frac{1}{2}$).

Long. 10–14 mm.

Distribution:— Ceylon (REEVE), Aden (Brit. Mus.). — Japan (Brit. Mus.), Queensland (BRAZIER).

The specimens from the Gulf of Siam are covered with a very thin, viscous epidermis, to which grains of sand, etc. are found attached.

Cytherea (Caryatis) Deshayesi, Pfr.

Cytherea Deshayesi, PFEIFFER, MARTINI u. CHEMNITZ, Conchyl. Cabin., XI Bd., 1 Abth., 1869, p. 74, No. 57, pl. 30, fig. 9.

Dione crocea, DESHAYES, Proc. Zool. Soc. London, 1853, p. 2, No. 5. — Catal. Conchif. Brit. Mus., I, 1853, p. 66, No. 34 (non *Cyth. crocea*, GRAY).

— — — REEVE, Conchol. icon., XIV, 1864, *Dione*, Sp. 53.

Caryatis crocea, DESHAYES, RÖMER, Monographie d. Molluskengatt. Venus, I, p. 99, No. 23, p. 27, fig. 1.

Specimens from Suracha, Siam (J. H. PONSONBY), are to be found in the British Museum under the name of *Callocardia Deshayesi*, Pfr. var.

Distribution:— Singapore (Miss ARCHER, Brit. Mus.). — Philippines.

Cytherea (Caryatis) isocardia, Sow.

Cytherea (Caryatis) isocardia, SOWERBY, Proc. Zool. Soc. London, 1888, p. 213.

— — — EDG. SMITH, Proc. Malacol. Soc. London, IV, p. 81.

Callocardia guttata, A. ADAMS, Annals & Magaz. Nat. Hist., Ser. 3, 1864, XIII, p. 307 (non *Callista guttata*, RÖMER).

— — — EDG. SMITH, Rep. of the Lamellibranchiata of the Challenger Exped., p. 156.

W. of Koh Kut, 15 fathoms, mud ($1\frac{1}{2}$).

Long. 26 mm., alt. 22 mm., crass. 20 mm.

Distribution:— Isl. of Quelpart, south of the Korea (ADAMS).

Though the shell which I have before me, from the Gulf of Siam, differs somewhat in form from *C. isocardia*, Sow., I can scarcely be wrong in referring it to this species.

Note. It is almost certainly due to erroneous determination when L. MORLET (Journ. de Conchyl., vol. 37, 1889, p. 169, No. 61) records *Tivela bicolor*, Gray, from the islands in the Gulf of Siam; this species has previously been taken only at Senegal.

Circe scripta L.

- Venus scripta*, LINNÉ, Syst. Nat. ed. X, 1758, p. 689, No. 121. — ed. XII, p. 1135, No. 145. — Mus. Ludov. Ulr. reg., p. 507, No. 73.
- Circe* — — SOWERBY, Thesaurus Conchyl., II, p. 651, No. 7, pl. 139, figs. 38—43.
- — — REEVE, Conchol. icon., XIV, *Circe*, Sp. 1, fig. 1; pl. 2, fig. 5 (*C. fulgurata*), fig. 6 (*C. peronata*), pl. 3, fig. 11 (*C. sugillata*).
- Cytherea scripta*, LINNÉ, MARTINI u. CHEMNITZ, Conchyl. Cabin., XI, 1 Abth., p. 54, pl. 20, figs. 1—4.
- Circe* — — RÖMER, Monogr. d. Molluskengatt. Venus, I, p. 193, pl. 52, fig. 1; pl. 59, figs. 3—4.
- — — MORLET, Journ. de Conchyl., vol. 37, 1889, p. 169, No. 65.

Many specimens were taken around Koh Kahdat and Koh Kut, in 1—15 fathoms, mud, clay mixed with sand, and sand.

Long. 7—51 mm.

Islands in the Gulf of Siam (MORLET).

Distribution:— Singapore, Mergui Archip., Nicobars, Ceylon, Gulf of Manaar, Mulaku Atoll, Mekran Coast, Persian Gulf, Red Sea, Aden, Suez, Seychelles, Coromandel. — Philippines, China, Japan, Moluccas, Flores Isl., Aru Isl., Torres Strait, Port Jackson (N. S. Wales).

Note. Many specimens of *Circe undatina*, Lam., have been taken at Singapore in shallow water by Mr. SV. GAD.

Circe sulcata, Gray.

- Circe sulcata*, GRAY, The Analyst, VIII, 1838, p. 307.
- — — RÖMER, Malakozool. Blätter, X, 1863, p. 11, No. 16.
- — — REEVE, Conchol. icon., XIV, *Circe*, Sp. 16.
- — — RÖMER, Monogr. d. Molluskengatt. Venus, I, p. 210, No. 16, pl. 57, fig. 2.
- — — EDG. SMITH, Lamellibranchiata of the Challenger Exped., 1885, p. 142.
- *Artemis*, DESHAYES, Catalogue of the Conchifera of British Museum, 1853, p. 86, No. 12.
- — — REEVE, Conchol. icon., XIV, *Circe*, Sp. 15.
- *Metcalfei*, — Proc. Zool. Soc. London, XXI, 1853, p. 7, No. 28.
- Cytherea erythraea*, JONAS, Zeitschr. f. Malakozool., 1845, p. 65.
- — — PHILIPPI, Abbild., III, 1851, p. 71, pl. 9, fig. 2.
- Circe paeta*, RÖMER, Malakozoolog. Blätter, VII, 1860, p. 155.
- Cytherea paeta*, RÖMER, MARTINI u. CHEMNITZ, Conchyl. Cabin., XI, 1 Abth., p. 59, pl. 22, figs. 6—7.
- *plebeja*, HANLEY, Proc. Zool. Soc. London, XII, 1844, p. 109.
- — — Rec. bivalve shells, p. 356, pl. 15, fig. 37.
- Circe* — — SOWERBY, Thesaurus conchyl., II, p. 653, No. 15, pl. 138, figs. 33—37.

N. of Koh Kam, 5 fathoms, gravel (10). Between Koh Riot and Koh Mesan, 3—5 fathoms, sand (2). Gulf of Rayong, 7—10 fathoms, sand and mud (3). Koh Kahdat, 1—5 fathoms, sand (15). W. of Koh Kut, 15 fathoms, mud (5).

Long. 4—17 mm.

Distribution:— Mergui Archip., Angrias Bank, Persian Gulf, Gulf of Tadjourah, Red Sea. — Philippines, Java, Viti Isls.

The specimens taken in the Gulf of Siam vary considerably in regard to colour-ornamentation. Some are quite white, others white with a few brown spots, or with one or two broken-off brown rays, or with brown zigzag lines, etc.

Circe lirata, Römer.

(Pl. IV, Figs. 28—31).

Venus (Circe) lirata, RÖMER, Monogr. d. Molluskengatt. Venus, I, 1869, p. 208, pl. 59, fig. 2.

Koh Kahdat, 1 fathom, sand (20).

Long. 7—24 mm.

Long. 24 mm., alt. 22·5 mm., crass. 11·5 mm.

Distribution: — “Mare chinense” (RÖMER).

The specimens from the Gulf of Siam correspond fairly well with RÖMER'S description; the concentric, raised striæ are not so regular and prominent as shown in RÖMER'S figure. The individuals vary greatly in regard to the coloration, and of the 20 specimens scarcely two are similar. The scale of colour graduates from quite white, to white with a few small brown spots, or with brown rays, or with larger scattered brown spots, to almost entirely brown. In individuals measuring as much as 16 mm. the whole shell is seen to be covered with the peculiar radiating sculpture which is characteristic of the species. The later growth of the shell is smoother, especially towards the ventral side. The great prominence of the umbonal region is very characteristic of this form. *Gafrarium navigatum*, Hedley, from Mast Head Reef (Queensland),¹ is no doubt only a young individual of *Circe lirata*, Römer, or another closely allied form.

Circe nana, Melv.

Circe nana, MELVILL, Memoirs and Proc. of the Manchester Liter. and Philos. Soc., vol. 42, 1898, No. 4, p. 31, pl. 2, fig. 9.

— — — Proc. Zool. Soc. London, 1906, p. 831.

Between Koh Kut and Koh Kahdat, 10 fathoms, shells ($1/2$). “Gulf of Siam” ($4/2$).

Long. 6—7·5 mm.

Distribution: — Indian Ocean (long. $26^{\circ} 10' N.$, lat. $52^{\circ} 50' E.$).

The figure which MELVILL gives of this species shows but imperfectly the beautiful sculpture which is produced by the fact that the grooves, which radiate from the umbo, turn off on either side and cross the fine concentric liræ; but at the middle of the valves only the concentric striation is usually present.

Circe Melvilli n. sp.

(Pl. IV, Figs. 32—33).

This little species is roundly triangular in form, milky white, and rather convex; the umbo is situated at about the middle, but in some specimens slightly

¹ Proc. Linnean Soc. New South Wales, vol. 31, 1906, p. 476, pl. 38, fig. 33.

towards the anterior end. The dorsal margin descends abruptly on both sides, in front in an almost straight line, and at the back somewhat convexly. The ventral side is decidedly curving. The surface is covered with close-set, fine, concentric ribs, all of which do not, however, pass entirely round the valve, but are most of them incomplete and inserted irregularly between each other. Upon the anterior and posterior sides these ribs are crossed by fine radiating grooves which make the surface granulated at these places; these radiating grooves are at different distances apart and are most evident at the anterior end. At the upper part of the middle of the valves, somewhat below the beaks, at the point where the valves are most convex, the concentric ribs disappear and a bare glossy spot is formed. The lunule is large and lanceolate, circumscribed by a distinct impressed line, not affected by the radiating sculpture, but merely striated by fine lines of growth; a well-defined area does not occur. The interior of the shells is smooth, white and glossy. In the right valve there are three cardinal teeth of which the central is triangular; the anterior is small, and from it proceeds a lamellar tooth which is situated between the lateral tooth and the upper margin which is double. In the left valve there are also three cardinal teeth; the posterior is the smallest, it is compressed, narrow and acute. Each valve has an anterior lateral tooth, oblong, compressed and triangular, parallel with the upper margin and separated from it by a deep groove. The inner ventral margin is flat.

Long. 4 mm., alt. 4 mm., crass. 2.5 mm.

Between Koh Rin and Cliff Rock, 15 fathoms ($3\frac{1}{2}$). Gulf of Rayong, 7—10 fathoms, sand and mud ($2\frac{1}{2}$). Koh Chuen, 30 fathoms ($3\frac{1}{2}$). W. of Koh Chuen, mud mixed with clay ($8\frac{1}{2}$). S. of Koh Chuen, 30 fathoms, shells ($19\frac{1}{2}$). S. of Koh Samit, 20 fathoms, mud ($2 + 10\frac{1}{2}$). South-east of Koh Samit, 13—14 fathoms, mud mixed with sand ($1\frac{1}{2}$). S. of Koh Tulu, 10 fathoms, mud mixed with sand ($2\frac{1}{2}$). Sound of Koh Chang, 3—5 fathoms, soft clay ($1\frac{1}{2}$). W. of Koh Chang, 20 fathoms, mud ($3 + 12\frac{1}{2}$). Between Koh Kut and Koh Kahdat, 10 fathoms, shells ($2 + 12\frac{1}{2}$). Between Koh Kahdat and Koh Kut, 6 fathoms, mud mixed with clay ($38\frac{1}{2}$). S. of Koh Kahdat, 8—10 fathoms, mud ($19\frac{1}{2}$). W. of Koh Kut, 15 fathoms, mud ($18\frac{1}{2}$). S. of Koh Kut, 17—20 fathoms, mud ($1\frac{1}{2}$).

This characteristic and beautiful little species is common in the Gulf of Siam; it is nearest related to *C. nana*, Melv., and *C. amica*, Smith, from which it is, however, easily distinguished. I have ventured to dedicate this species to Mr. JAMES COSMO MELVILL, who, by his valuable papers, has contributed so largely to our knowledge of the marine Molluscan fauna of Asia.

Circe (Lioconcha) picta, Lam.

Cytherea picta, LAMARCK, Hist. nat. d. anim. sans vert., V, 1818, p. 569, No. 33. — éd. 2, VI, 1835, p. 309, No. 33.

Lioconcha picta, LAMARCK, RÖMER, Malakozoolog. Blätter, IX, 1862, p. 144, No. 13.

Circe — — — REEVE, Conchol. icon., XIV, *Circe*, Sp. 42.

Cytherea (Lioconcha) picta, LAMARCK, RÖMER, Monogr. d. Molluskengatt. Venus, I, p. 164, No. 15, pl. 45, fig. 3.

Meretrix — — — ANTHONY, Bull. du Muséum d'Hist. Nat. Paris, 1905, p. 494.

Gulf of Rayong, 7–10 fathoms, sand and mud (10). N. of Koh Kam, 5 fathoms, gravel (2). Between Koh Mesan and Cape Liant, 9 fathoms (2). Koh Kahdat, 1–10 fathoms, sand, mud (23). Koh Mak, sandy coast ($\frac{1}{2}$). W. of Koh Kut, 15 fathoms, mud (5).

Long. 3–32 mm.

Distribution:— Andamans, Ceylon, Karachi, Persian Gulf, Laccadive and Maldive Archip., Red Sea, Obok (Aden), Tadjurah Bay, Mauritius, Rodrigues, Durban (Natal). — Philippines, China, Japan, Blitong (post-tertiary), Torres Strait, Upolu (Samoa Isls.), Lifu (Loyalty Isls.), Funafuti (Ellice Isls.).

The individuals from the Gulf of Siam are all covered with a pale, rather thick, tallow-like epidermis, which is, however, usually somewhat worn off upon the umbones; the specimens agree in outline and colour more nearly with REEVE'S figures. As the limits of the variation of this species are not fixed, authors¹ have, in course of time, had very variable opinions regarding it and also as to how far several other forms should be referred to this species; it varies greatly both in outline and colour, and many closely allied forms, which are designated as species, will unquestionably prove to be only varieties and local forms, which is also indicated by the somewhat scattered distribution of the species, as far as it is at present known.

Circe (Lioconcha) trimaculata, Lam.

- Cytherea trimaculata*, LAMARCK, Hist. nat. d. anim. s. vert., V, 1818, p. 571, No. 41. — éd. 2, VI, 1835, p. 313, No. 41.
 — — — PHILIPPI, Abbild. u. Beschreib. neuer od. wenig gekannt. Conchyl., II, 1847, p. 179, *Cytherea*, pl. 5, fig. 2.
Cytherea — — — SOWERBY, Thesaur. conchyl., II, p. 641, No. 102, pl. 134, fig. 147.
Circe — — — REEVE, Conchol. icon., XIV, *Circe*, Sp. 33.
Lioconcha — — — RÖMER, Monogr. d. Moll. Venus, I, p. 166, pl. 46, fig. 2.

Koh Mak, sandy coast ($\frac{3}{2}$). The strand of Koh Kahdat ($\frac{2}{2}$).

Long. 11–27 mm.

Distribution:— Singapore, Andamans, Ceylon. — Philippines, Viti Isls.

HIDALGO² regards *Lioconcha Sphragitis*, Römer,³ as a variety of the present species.

Circe (Lioconcha) sulcatina, Lam.

- Cytherea sulcatina*, LAMARCK, Hist. nat. d. anim. s. vert., V, 1818, p. 568, No. 29. — éd. 2, VI, p. 308, No. 29.
Cytherea — — — SOWERBY, Thesaurus Conchyl., II, p. 641, No. 101, pl. 134, figs. 145–46.
Circe — — — REEVE, Conchol. icon., XIV, *Circe*, Sp. 40.
Cytherea (Lioconcha) sulcatina, LAMARCK, RÖMER, Monogr. d. Molluskengatt. Venus, I, p. 165, pl. 46, fig. 1.

¹ L. PFEIFFER in MARTINI u. CHEMNITZ, Conchyl. Cabin., XI Bd., 1 Abth., 1869, p. 39. — A. H. COOKE, Annals and Magaz. Nat. Hist. 1886, Ser. 5, vol. 18, p. 101. — CASTO DE ELERA, Fauna de Filipinas, III, p. 743. — EDG. A. SMITH, Rep. on the Lamellibranchiata of the Challenger Exped., pp. 146–47. — EDV. v. MARTENS, Rumphius Gedenkboek, 1902, p. 125 (17).

² HIDALGO, Obras malacológicas, I, Tome II, 1903, p. 220.

³ RÖMER, Monogr. d. Moll. Venus, I, p. 162, No. 13, pl. 43, fig. 3.

- Cytherea sulcatina*, LAMARCK, PFEIFFER in MARTINI u. CHEMNITZ, Conchyl. Cabin., XI Bd., 1 Abth., p. 36. pl. 12, figs. 1—2.
Lioconcha — — HIDALGO, Obras malacológicas, I, tom. II, 1903, p. 219, No. 329.
Meretrix (Lioconcha) sulcatina, LAMARCK, ANTHONY, Bull. du Muséum d'Hist. Nat. Paris, 1905, p. 494.

North of Koh Kahdat, 4—5 fathoms, sand ($1\frac{1}{2}$).

Long. 34 mm.

Distribution: — Maldive Archip., Tadjurah Bay. — Philippines, Lifu.

In "Museum Godeffroy," Catalog V, 1874, p. 169, *C. sulcatina*, Desh., is recorded from "Africa merid." but this is perhaps due to erroneous determination.

Circe (Crista) gibbia, Lam.

- Cytherea gibbia*, LAMARCK, Hist. nat. d. anim. s. vert., V, 1818, p. 577, No. 64. — éd. 2, VI, 1835, p. 323, No. 64.
Circe — — SOWERBY, Thesaur. Conchyl., II, 1855, p. 649, No. 2, pl. 137, figs. 4—7.
Cytherea (Crista) gibbia, LAMARCK, RÖMER, Malakozool. Blätter, X Bd., 1862, p. 17, No. 2.
Circe gibbia, LAMARCK, REEVE, Conchyl. icon., XIV, *Circe*, Sp. 21.
Cytherea gibbia, LAMARCK, MARTINI u. CHEMNITZ, Conchyl. Cabin., XI Bd., 1 Abth., p. 51, No. 36, pl. 18, figs. 7—9.
 — (*Crista*) *gibbia*, LAMARCK, RÖMER, Monogr. d. Molluskengatt. Venus, I, 1869, p. 176, pl. 47, fig. 2.
Circe gibbia, LAMARCK, EDG. SMITH, Rep. on the Lamellibranchiata of the Challenger Exped., p. 143.
 — (*Crista*) *gibbia*, LAMARCK, FISCHER, Catalogue d. Moll. de l'Indo-Chine, p. 231.
Crista gibbia, LAMARCK, HIDALGO, Obras malacológicas, I, tom. II, 1903, p. 231, No. 336.
 — — — DAUTZENBERG et FISCHER, Journ. de Conchyl., vol. 53, 1905, p. 213.
Cytherea ranella, LAMARCK, Hist. nat. d. anim. s. vert., V, 1818, p. 578, No. 65.

Coast of Lem Ngob (7). Coast of Koh Chang (8). North end of Koh Chang, 1 fathom, old coral blocks (2). Koh Kahdat ($1\frac{1}{2}$).

Long. 36 mm.

Islands in the Gulf of Siam (MORLET).

Distribution: — Singapore, Mergui Isls., Andamans, Nicobars, Madras, Ceylon, Red Sea (?), Seychelles, Amirantes. — Tonkin, Hong Kong, Formosa, Shanghai, Japan, Philippines, Java, Moluccas, Macassar, New Guinea, Port Denison, New Caledonia, South Sea Isls. (Mus. Godeffroy).

At present I can see no reason for regarding *C. gibbia*, Lam., and *C. pectinata* L. as forms of the same species, as do several authors.¹

Circe (Crista) pectinata, L.

- Venus pectinata*, LINNÉ, Syst. Nat., ed. X, 1758, p. 689, No. 120. — ed. XII, p. 1135, No. 144. — ed. XIII, p. 3285, No. 78. — Mus. Ludov. Ulricæ reg., p. 507, No. 72.
 — — — CHEMNITZ, Conchyl. Cabin., VII, p. 28, pl. 39, figs. 418—19.
Cytherea Savignyi, JONAS, Zeitschr. f. Malakozool., 1846, p. 65.
 — — — SAVIGNY, Descr. de l'Égypte, Coquilles, pl. VIII, fig. 17.
 — (*Crista*) *Savignyi*, JONAS, ISSEL, Malacol. d. Mar Rosso, 1869, p. 70, No. 67.
Circe pectinata, LINNÉ, SOWERBY, Thesaur. conchyl., II, p. 649, pl. 137, figs. 1—3.

¹ PAGENSTECHE, Ueber die von Kossmann am Rothen Meere gesamm. Mollusken, 1877, p. 40. — MELVILL and STANDEN, Journ. Linn. Soc., Zoology, vol. 27, p. 194. — MÖRCH, Catal. conchyl. quæ reliq. C. P. KIERULF, 1850, p. 23.

- Circe pectinata*, LINNÉ, REEVE, Conchol. icon., vol. XIV, *Circe*, Sp. 20.
Cytherea pectinata, LINNÉ, MARTINI u. CHEMNITZ, Conchyl. Cabin., XI, 1 Abth., p. 50, pl. 18, figs. 10—11.
 — (*Crista*) *pectinata*, LINNÉ, RÖMER, Monogr. d. Moll. Venus, I, 1867, p. 174, pl. 47, fig. 1.
Circe — — — FISCHER, Moll. de l'Indo Chine, p. 231.
 — — — — R. BULLEN NEWTON, The Geological Magazine. New Ser. Dec. IV, vol. 7, 1900, p. 555, pl. 21, fig. 3.
Crista pectinata, LINNÉ, HIDALGO, Obras malacológicas, I, tom. II, 1903, p. 228, No. 335.

Koh Kahdat, 1—5 fathoms, sand, stones ($1 + \frac{5}{2}$). Koh Mak, sandy coast ($\frac{2}{2}$).
 Long. 7—20 mm.

“Golfe de Siam” (FISCHER).

Distribution: — Andamans, Madras, Gulf of Manaar, Persian Gulf, Gulf of Aden, Red Sea, Suez, Suez Canal, Seychelles, Amirantes, Querimba Isls., Madagascar, Mascarenes, Natal coast, Port Elizabeth, Cape of Good Hope. — Poulo Condor, Philippines, China, Loo Choo Isls., Moluccas, Timor, Adenare, Bencoolen, New Guinea, Kei Bandan, Torres Strait, North-east Australia, New Caledonia, Mariannes, Gilbert Isls., Funafuti (Ellice Isls.), Viti Isls., Lord Hood's Isl., Upolu (Samoa Isls.), Paumotu Isl., Flint Isl. (PILSBRY).

Circe (Crista) dispar, Ch.

- Venus dispar*, CHEMNITZ, Conchyl. Cabin., XI, 1795, p. 230, pl. 202, figs. 1981—82.
Circe — — SOWERBY, Thesaur. Conchyl., II, 1855, p. 650, pl. 137, figs. 10—11; pl. 163, figs. 53—54.
 — — — REEVE, Conchol. icon., XIV, *Circe*, Sp. 24.
Cytherea dispar, — MARTINI u. CHEMNITZ, Conchyl. Cabin., XI, 1 Abth., p. 32, pl. 11, figs. 5—6.
 — (*Crista*) *dispar*, CHEMNITZ, RÖMER, Monographie d. Molluskengatt. Venus, I, 1869, p. 184, pl. 50, fig. 1; pl. 51, fig. 4.

Koh Mak, sandy coast (3). North end of Koh Chang, 1 fathom, old coral blocks (1).

Long. 24 mm.

Distribution: — Nicobars (FRAUENFELD), Ceylon (CHEMNITZ, HANLEY, SCHLAGINTWEIT), Gulf of Manaar (THURSTON), Ins. Bourbon (MAILLARD). — Japan (LISCHKE, ADAMS), New Caledonia (FISCHER, FRAUENFELD).

This species has been recorded by DESHAYES, ISSEL, and REEVE from the Red Sea, but none of the later authors (M'ANDREW, A. H. COOKE, PAGENSTECHE, L. VAILLANT, EDG. SMITH, JOUSSEAUME, E. R. SHOPLAND) record it either from the Red Sea, Suez or Aden.

Circe (Crista) divaricata, Ch.

- Venus divaricata*, CHEMNITZ, Conchyl. Cabin., VI, 1782, p. 317, pl. 30, fig. 316.
Circe æquivoca, SOWERBY, Thesaurus Conchyl., II, 1855, p. 650, No. 4, pl. 137, figs. 12—15 (non No. 3, *C. divaricata*).
 — *divaricata*, CHEMNITZ, REEVE, Conchol. icon., XIV, *Circe*, Sp. 23.
Cytherea — — MARTINI u. CHEMNITZ, Conchyl. Cabin., XI Bd., 1 Abth., p. 44, pl. 16, fig. 8.
Venus (Crista) divaricata, CHEMNITZ, RÖMER, Monogr. d. Molluskengatt. Venus, I, p. 181, pl. 49, fig. 1; pl. 51, fig. 5.

Circe (Crista) divaricata, CHEMNITZ, FISCHER, Catalogue d. Moll. de l'Indo-Chine, p. 231.

Crista divaricata, CHEMNITZ, HIDALGO, Obras malacológicas, I, tom. II, 1903, p. 233, No. 337.

— — — — — DAUTZENBERG & FISCHER, Journ. de Conchyl., vol. 53, 1905, p. 458.

Koh Mak, sandy coast ($1/2$).

Long. 36 mm.

Islands in the Gulf of Siam (MORLET).

Distribution:— Singapore, Salang, Mergui Archip., Andamans, Madras, Gulf of Manaar, Bombay, Karachi, Persian Gulf, Gulf of Oman, Red Sea (?), Zanzibar, Mozambique, Natal, Seychelles (DAUTZENBERG). — Poulo Condor, Annam, Philippines, Hong Kong, Shanghai, Japan (DUNKER), Japan (Inland Sea, STEARNS).

In spite of the statements of REEVE, SOWERBY and ISSEL, it is doubtful whether *C. divaricata*, Ch., occurs in the Red Sea. Later authors do not record it with certainty from Aden or from the Red Sea. When PAGENSTECHER¹ says regarding this species: "Von sechs Exemplaren gehören vier der Varietät *gibba* Lam., eins der *pectinata* Lin. an," he has evidently had other species before him.

Tapes (Paratapes) papilionaceus, Lam.

Venus papilionacea, LAMARCK, Hist. nat. d. anim. s. vert., V, 1818, p. 594, No. 36. — éd. 2, VI, p. 352, No. 36.

Tapes — — — SOWERBY, Thesaurus Conchyl., II, p. 679, No. 2, pl. 145, figs. 1—2.

— *rotundata*, REEVE, Conchol. icon., XIV, *Tapes*, Sp. 7.

Venus papilionacea, LAMARCK, PFEIFFER in MARTINI u. CHEMNITZ, Conchyl. Cabin., XI Bd., 1 Abth., p. 167

No. 33, pl. 15, fig. 6.

Tapes (Textrix) papilionacea, LAMARCK, RÖMER, Monogr. d. Moll. Venus, II, p. 21, No. 3, pl. 6, fig. 1.

— *papilionacea*, LAMARCK, CROSSE et FISCHER, Journ. de Conchyl., vol. 40, 1892, p. 76.

West coast of Cambodge in the Gulf of Siam (PAVIE).

Distribution:— Ceylon, Mauritius, Madagascar. — "New Holland," West Australia.

It is strange that this large, conspicuous, and well-known species, with the exception of the above quotation, has not been taken in the Gulf of Siam or adjacent waters, either by the Danish Expedition or by others. Can it perhaps be due to erroneous determination of *T. semirugatus*, Phil., when the specimen collected by PAVIE, is given as *T. papilionaceus*, Lam., by CROSSE and FISCHER?

Tapes (Paratapes) semirugatus, Phil.

Venus semirugata, PHILIPPI, Zeitschrift f. Malakozoologie, IV, 1847, p. 88, No. 22.

— — — — — Abbild. u. Beschreib., III, p. 24 (76), pl. 7, fig. 4.

Tapes — — — SOWERBY, Thesaurus conchyl., II, p. 681, No. 9, pl. 145, fig. 12.

— (*Textrix*) *semirugata*, PHILIPPI, RÖMER, Monographie d. Moll. Venus, II, p. 29, pl. 9, fig. 1.

— (*Paratapes*) — — — EDG. SMITH, Report on the Lamellibranchiata of the Challenger Exped., p. 115.

— *polita*, SOWERBY, Thesaurus conchyl., II, p. 682, No. 12, pl. 145, figs. 15—16.

— — — — — REEVE, Conchol. icon., XIV, Sp. 49.

¹ Ueber die von R. KOSSMANN am Rothen Meere gesamm. Mollusken, 1877, p. 40.

S. of Koh Chuen, 30 fathoms, shells (4). Between Koh Chuen and Koh Chang, 15 fathoms, mud (1). West side of Koh Chang ($1\frac{1}{2}$). W. of Koh Kut, 30 fathoms, sand and mud ($8\frac{1}{2}$). W. of Koh Kut, 15 fathoms, mud (1).

Long. 6–53 mm.

Distribution:— New Guinea, Inland Sea (Japan, STEARNS), Sydney.

All the specimens from the Gulf of Siam, like EDG. SMITH's individual from New Guinea, have the four interrupted, brown rays from the umbo to the ventral side very marked; on the other hand, "the brown apices to the umbones" cannot, as EDG. SMITH assumes, be regarded as characteristic of this species, for among the individuals, both the large ones and the eight young (= *T. polita*, Sow.), which I have before me, only one exhibits a slight indication of lilac at the tip of the umbones.

Tapes (Paratapes) undulatus, Born.

Venus undulata, BORN, Index Mus. Cæs. Vindobon., 1778, p. 54. — Testacea Musei Cæsarei Vindobon., 1780, p. 67.

Tapes — — REEVE, Conchol. icon., XIV, *Tapes*, Sp. 8.

— (*Textrix*) *undulata*, BORN, RÖMER, Monogr. d. Moll. Venus, II, p. 20, No. 2, pl. 5, fig. 2.

— *undulatus*, BORN, LISCHKE, Japan. Meeres-Conchylien, II, p. 171, III, p. 80.

— (*Paratapes*) *undulata*, BORN, EDG. SMITH, Report on the Lamellibranchiata of the Challenger Exped., p. 115.

— *undulatus*, BORN, FISCHER, Catalogue d. Moll. de l'Indo Chine, p. 273.

Venus rimosa, PHILIPPI, Zeitschr. f. Malakozool., IV, 1847, p. 88, No. 21.

— — — Abbild. u. Beschreib., III, p. 77 (25), pl. 7, fig. 7.

Tapes — — SOWERBY, Thesaurus Conchyl., II, p. 682, No. 11, pl. 146, fig. 29.

Koh si Chang ($1\frac{1}{2}$). Sound of Koh Chang, 3–5 fathoms, soft clay, exceedingly common, a great many specimens. West of Koh Chang, 20 fathoms, mud (2). W. of Koh Kut, 15 fathoms, mud ($1\frac{1}{2}$). North of Koh Kong, 8 fathoms, mud (1).

Long. 6–60 mm.

Gulf of Siam (MORLET).

Distribution:— Mergui Archip., Ceylon, Mekran Coast, Persian Gulf. — Philippines, China, Japan, Arafura Sea, Port Jackson and Sydney Harbour, Bass Strait.

Tapes (Protapes) Malabaricus, Ch.

Venus Malabarica, CHEMNITZ, Conchyl. Cabin., VI, 1782, p. 323, pl. 31, figs. 324–25.

Tapes — — SOWERBY, Thesaurus Conchyl., II, p. 682, pl. 145, figs. 6–8.

— — — REEVE, Conchol. icon., XIV, Sp. 27.

Venus malabarica, — L. PFEIFFER in MARTINI u. CHEMNITZ, Conchyl. Cabin., XI Bd., 1 Abth., p. 175, pl. 17, figs. 1–2.

Tapes (*Textrix*) *Malabarica*, CHEMNITZ, RÖMER, Monogr. d. Molluskengatt. Venus, II, p. 34, pl. 10, fig. 3.

— *Malabaricus*, CHEMNITZ, P. FISCHER, Catalogue d. Moll. de l'Indo Chine, p. 234.

— — — EDG. SMITH, Proc. Zool. Soc. London, 1891, p. 424.

Venus rhombifera, HANLEY, Catalogue of recent bivalve shells, p. 120, pl. 13, fig. 45.

Tapes lentiginosa, REEVE, Conchol. icon., XIV, Sp. 25 (fide EDG. SMITH).

Between Koh Mesan and Cape Liant, 5–9 fathoms (1). N. of Koh Kam, 5 fathoms, gravel ($1\frac{1}{2}$). Coast of Lem Ngob ($3\frac{1}{2}$). Between Koh Kahdat and Koh Kut, 6 fathoms, mud mixed with sand (2). W. of Koh Kut, 15 fathoms, mud ($1\frac{1}{2}$).

Long. 12—53 mm.

Distribution:— Bintang, Mergui Archip., Andamans, Madras, Ceylon, Gulf of Manaar, Malabar Coast from Goa to Bombay, Karachi, Persian Gulf, Aden. — Annam, Poulo Penang, China, Philippines, Moluccas, Torres Strait, Port Molle.

“*Venus gallus*, Spengler,” which J. S. SCHRÖTER¹ correctly gives as a synonym, cannot, as suggested by RÖMER² and PFEIFFER,³ have the priority of CHEMNITZ’s name,⁴ as *V. gallus* is merely a museum-name. Upon the label attached to SPENGLER’s specimens of *T. malabaricus* (which are now in the Museum of the University of Copenhagen) is written in SPENGLER’s handwriting: “*Venus Gallus* Forskaal” and reference is made to CHEMNITZ, Conchyl. Cabin., VI; neither FORSKÅL nor SPENGLER have published the name before CHEMNITZ.

As is well-known, this species varies considerably both in regard to form and sculpture; from the Gulf of Siam were collected both the oblong (long. 46.5 mm., alt. 32.5 mm.), and the high and relatively shorter form (long. 54 mm., alt. 42 mm.); as also individuals with very close-set and fine transverse ribs, and others with coarse, broad and flat transverse ribs.

Tapes (Protapes) sinuosus, Lam.

- Venus sinuosa*, LAMARCK, Hist. nat. d. anim. s. vert., V, 1818, p. 604, No. 72. — éd. 2, VI, 1835, p. 366, No. 72.
Tapes — — SOWERBY, Thesaurus Conchyl., II, p. 683, No. 14, pl. 145, fig. 10.
 — — — REEVE, Conchol. icon., XIV, *Tapes*, Sp. 18.
 — (*Textrix*) *sinuosa*, LAMARCK, RÖMER. Monogr. d. Molluskengatt. Venus, II, p. 35, No. 16, pl. 11, fig. 1.
 — *Malabaricus*, CHEMNITZ var. *sinuosus*, LAMARCK, MARTENS, Journ. of the Linnean Society, XXI, 1887, pp. 213—14.

E. of Cape Liant, 9 fathoms, shells (2). S. of Koh Chuen, 30 fathoms, shells (3). Between Koh Kut and Koh Kahdat, 10 fathoms, shells (1/2).

Long. 24—36 mm.

Distribution:— Salang, Mergui Archip. — China, “Australia”.

T. sinuosus, Lam., is nearly allied to *T. malabaricus*, Chemn., but among the material at my disposal it has always been easy to distinguish these two forms. The most conspicuous distinguishing feature in *T. sinuosus*, is the large “Tellina-curvature” which causes the hinder end to be abruptly truncated. The transverse ribs are narrow and thin, high, sharp and lamellate and are continued over the lunule and the area. The interstices between the ribs are deep, broad, and regular. Whether these features are constant, future investigations will show.

Tapes (Hemitapes) hiantinus, Lam.

- Venus hiantina*, LAMARCK, Hist. nat. d. anim. s. vert., V, 1818, p. 593, No. 32. — éd. 2, VI, p. 350, No. 32.
 — — — DELESSERT, Recueil de coquilles décr. p. Lamarck, pl. 10, fig. 8.

¹ Einleit. in d. Conchylienkenntniss, III, 1786, p. 159, No. 14.

² Krit. Unters. d. Arten d. Molluskengeschl. Venus, 1856, p. 68.

³ MARTINI u. CHEMNITZ, Conchyl. Cabin., XI Bd., 1 Abth., p. 176.

⁴ GMELIN, Syst. Nat., ed. XIII, p. 3277, has also adopted the name “Gallus.”

- Venus hiantina*, LAMARCK, PHILIPPI, *Abbild. u. Beschreib. neuer od. wen. gek. Conchyl.*, III, p. 21 (27), pl. 8, fig. 1.
- Tapes* — — REEVE, *Conchol. icon.*, XIV, *Tapes*, Sp. 28.
- — RÖMER, *Monogr. d. Molluskengatt. Venus*, II, p. 99, pl. 34, fig. 1.
- Venus flammulata*, — Hist. nat. d. anim. s. vert., V, 1818, p. 605, No. 77. — éd. 2, VI, p. 367, No. 77.
- Tapes* — — SOWERBY, *Thesaur. conchyl.*, II, p. 686, No. 26, pl. 148, figs. 56—61.
- Venus rimularis*, — Hist. nat. d. anim. s. vert., V, p. 604, No. 74. — éd. 2, p. 367, No. 74.
- Tapes* — — SOWERBY, *Thesaur. conchyl.*, II, p. 687, No. 27, pl. 148, fig. 55.
- — REEVE, *Conchol. icon.*, XIV, *Tapes*, Sp. 29.
- — BUCQOY, DAUTZENBERG & DOLLFUS, *Moll. mar. de Roussillon*, II, p. 399.
- Venus tristis*, — Hist. nat. d. anim. s. vert., V, p. 604, No. 73. — éd. 2, VI, p. 366, No. 73.
- — DELESSERT, *Recueil de coquilles*, pl. 10, fig. 10.
- — PHILIPPI, *Abbild. u. Beschreib.*, I, p. 2 (40), pl. 1, fig. 4.
- Tapes* — — REEVE, *Conchol. icon.*, XIV, *Tapes*, Sp. 44.
- — RÖMER, *Monogr. d. Molluskengatt. Venus*, II, p. 100, No. 78, pl. 34, fig. 2.
- — HIDALGO, *Obras malacológicas*, I, tom. II, 1903, p. 260, No. 358.
- Venus callipyga*, — Hist. nat. d. anim. s. vert., V, p. 601, No. 61. — éd. 2, VI, p. 361, No. 61.
- *vulvina*, — — V, p. 604, No. 75. — éd. 2, VI, p. 367, No. 75.
- *virginea*, LINNÉ, *Syst. Nat. ed. XII*, p. 1136, No. 150 (ex parte).
- — PHILIPPI, *Abbild. u. Beschreib.*, III, p. 22 (28), pl. 8, figs. 2—4.
- — MARTINI u. CHEMNITZ, *Conchyl. Cabin.*, XI, 1 Abth., p. 201, pl. 32, figs. 9—10.
- Tapes* — — (non auct. plur.) RÖMER, *Monogr. d. Molluskengatt. Venus*, II, p. 98, No. 76, pl. 33, fig. 3.
- *virgineus*, — HIDALGO, *Obras malacológicas*, I, tom. II, 1903, p. 262, No. 360.
- — DAUTZENBERG et FISCHER, *Journ. de Conchyl.*, vol. 53, 1905, p. 224.

Coast of Lem Ngob (3). Coast of Koh Chang (3).

Long. 37—42 mm.

Distribution: — Karachi (MELVILL & STANDEN), Aden (EDG. SMITH). — Philippines, Tonkin, China, Moluccas, Torres Strait, "New Holland."

LINNÉ's "*Venus virginea*" is a collective species which includes the European *Tapes rhomboides*, Penn., and the East Indian *T. hiantinus*, Lam. The limits and the variability in form of the latter species have not yet been sufficiently investigated, and in the future it will doubtless be proved that it includes still more forms than the Lamarckian species mentioned above. The specimens from the Gulf of Siam agree most closely with the *T. hiantinus-tristis* forms.

Tapes (Ruditapes) Philippinarum, Ad. & Reeve.

- Venus (Pullastra) Philippinarum*, A. ADAMS and REEVE, *The Zoology of the voyage of H. M. S. "Samarang."* Mollusca, 1848, p. 79, No. 1, pl. 22, fig. 10.
- Tapes Philippinarum*, A. ADAMS and REEVE, SOWERBY, *Thesaurus Conchyl.*, II, p. 694, No. 54, pl. 151, figs. 139—41.
- — REEVE, *Conchol. icon.*, XIV, *Tapes*, Sp. 60.
- (*Amygdale*) *Philippinarum*, A. ADAMS and REEVE, RÖMER, *Monogr. d. Moll. Venus*, II, p. 80, No. 60, pl. 28, fig. 2.
- *Philippinarum*, A. ADAMS and REEVE, LISCHKE, *Japan. Meeres-Conchylien*, I, p. 115; II, p. 108; III, p. 78.
- (*Cuneus*) *Philippinarum*, A. ADAMS and REEVE, DUNKER, *Index molluscor. mar. Japon.*, p. 207.
- *Japonica*, DESHAYES, *Proc. Zool. Soc. London*, XXI, 1853, p. 10, No. 44 (non *Venus japonica*, Gmel. = *Tapes striatus*, (Chemn.) Gmel.).
- *Indica*, HANLEY, SOWERBY, *Thesaurus Conchyl.*, II, p. 694, No. 55, pl. 151, figs. 146—47.
- — REEVE, *Conchol. icon.*, XIV, *Tapes*, Sp. 56.

- Tapes (Amygdale) indica*, HANLEY, RÖMER, Monogr. d. Moll. Venus, II, p. 75, pl. 26, fig. 1.
 — *Indicus*, HANLEY, HIDALGO, Obras malacológicas, I, tom. II, 1903, p. 273, No. 369.
denticulata, SOWERBY, Thesaurus Conchyl., II, p. 694, No. 53, pl. 150, fig. 114.
 — — — REEVE, Conchol. icon., XIV, *Tapes*, Sp. 63.
 — (*Amygdale*) *denticulata*, SOWERBY, RÖMER, Monogr. d. Moll. Venus, II, p. 74, pl. 25, fig. 3.
 — *semidecussata*, DESHAYES, REEVE, Conchol. icon., XIV, *Tapes*, Sp. 67.
 — (*Amygdale*) *semidecussata*, DESHAYES, RÖMER, Monogr. d. Moll. Venus, II, p. 79, pl. 28, fig. 1.
 — — *ducalis*, RÖMER, Monogr. d. Moll. Venus, II, p. 81, pl. 28, fig. 3. — Malakozool. Blätter, XVII, 1870, p. 9, No. 7.
 — — — — LISCHKE, Japan. Meeres Conchyl., III, pl. 5, figs. 17–20.

Strand of Koh Kahdat ($1/2$ worn specimen). Coast of Koh Chang (2).

Long. 14–27 mm.

Distribution: — Andamans, Ceylon, Bombay, Karachi. — Philippines, China, Formosa, Korea, Japan, Sachalin, South Sea Islands (Mus. Godeffroy).

The variability of this species has not yet been sufficiently investigated. It comes near *T. variegatus*, Sow., and the European *T. decussatus* L. JEFFREYS¹ even thinks that "it is impossible to separate the so-called *T. indicus* from *T. decussatus* by any other than a geographical character."

Tapes (Ruditapes) variegatus, Hanl.

- Tapes variegata*, HANLEY, SOWERBY, Thesaurus conchyl., II, 1855, p. 696, No. 61, pl. 151, figs. 133 and 136–38 (figs. 134–35 = *T. puniceus*, Desh.).
 — — — REEVE, Conchol. icon., XIV, Sp. 64.
Venus — — — MARTINI u. CHEMNITZ, Conchyl. Cabin., XI Bd., 1 Abth., p. 223, pl. 38, figs. 2–5.
Tapes variegatus, SOWERBY, LISCHKE, Japan. Meeres-Conchyl., I, p. 118; III, p. 79.
 — *variegata*, — RÖMER, Monogr. d. Moll. Venus, II, p. 78, pl. 27, fig. 2.
 — (*Cuneus*) *variegatus*, HANLEY, DUNKER, Index molluscor. mar. Japon., p. 207.
 — *variegatus*, SOWERBY, MORLET, Journ. de Conchyl., vol. 37, 1889, p. 170, No. 71.
 — — — HANLEY, HIDALGO, Obras malacológicas, I, tom. II, 1903, p. 724, No. 370.

The strand of Koh Kahdat ($1/2$). Koh Mak, sandy coast ($1/2$).

Long. 15–18 mm.

"Golfe de Siam" (MORLET).

Distribution: — Salanga, Mergui Archip. — Philippines, Hong Kong, Japan, Java, Port Curtis, Port Denison, Samoa Is., Tahiti.

I think that *T. violascens*, Desh., can scarcely be separated from *T. variegatus*, Sow.

Tapes (Parembola) radiatus, Ch.

- Venus literata, radiata*, CHEMNITZ, Conchyl. Cabin., VII, 1784, p. 45, pl. 42, fig. 439.
Tapes aspersa, REEVE, Conchol. icon., XIV, *Tapes*, Sp. 5 (non CHEMNITZ).
 — *radiata*, CHEMNITZ, RÖMER, Monogr. d. Moll. Venus, II, p. 41, pl. 14, fig. 3.
Venus — — — PFEIFFER in MARTINI u. CHEMNITZ, Conchyl. Cabin., XI, 1 Abth., p. 160, No. 28, pl. 15, fig. 1.
Tapes radiatus, — L. MORLET, Journ. de Conchyl., vol. 37, 1889, p. 170, No. 70.
 — — — HIDALGO, Obras malacológicas, I, tom. II, 1903, p. 245, No. 346.

¹ The Journal of the Linnean Society, Zoology, vol. XII, 1876, p. 105.

Islands in the Gulf of Siam (L. MORLET, loc. cit.).

Distribution:— Nicobars, Aden. — Philippines, Java, Sulu Isls., Torres Strait.

The Danish Expedition obtained no specimens of this species from the Gulf of Siam. E. v. MARTENS¹ records *T. radiatus*, Gm. (REEVE, Fig. 16 a, non RÖMER, Pl. 14, Fig. 3), from Seychelles.

Tapes obscuratus, Desh.

- Tapes obscurata*, DESHAYES, Proc. Zool. Soc. London, XXI, 1853, p. 9, No. 38. — Catalogue of the Conchifera of the Brit. Mus., I, 1853, p. 169, No. 29.
 — — — REEVE, Conchol. icon., XIV, *Tapes*, Sp. 12.
 — (*Parembola*) *obscurata*, DESHAYES, RÖMER, Monogr. d. Moll. Venus, II, p. 52, No. 32, pl. 18, fig. 3.
 — *obscurata*, DESHAYES, EDG. SMITH, Lamellibranchiata of the Challenger Expedit., p. 113.
 — *quadriradiata*, DESHAYES, Proc. Zool. Soc. London, XXI, 1853, p. 9, No. 40, pl. 19, fig. 6. — Catal. Conchif. Brit. Mus., I, 1853, p. 171, No. 34.
 — — — REEVE, Conchol. icon., XIV, *Tapes*, Sp. 6.
 — — — RÖMER, Monogr. d. Moll. Venus, II, p. 51, No. 31, pl. 18, fig. 2.
Venus — — — PFEIFFER in MARTINI u. CHEMNITZ, Conchyl. Cabin., XI Bd., 1 Abth., p. 199, No. 55, pl. 32, fig. 6.
Tapes quadriradiatus, DESHAYES, HIDALGO, Obras malacológicas, I, tom. II, 1903, p. 253, No. 354.
 — *grata*, DESHAYES, Proc. Zool. Soc. London, XXI, 1853, p. 9, No. 41. — Catal. Conchif. Brit. Mus., p. 170, No. 31.
 — *similis*, REEVE (non DESHAYES), Conchol. icon., XIV, *Tapes*, Sp. 10.

Koh Mak, sandy coast (¹/₂).

Long. 43 mm.

Distribution:— Singapore, Salanga, Mergui Archip., Ceylon? (W. DENISON), Aden. — Philippines, Moluccas.

Cryptogramma squamosa L.

- Venus squamosa*, LINNÉ, Systema Naturae, ed. X, 1758, p. 688, No. 111; ed. XII, p. 1133, No. 135.
 — — — SOWERBY, Thesaurus Conchyliorum, II, 1855, p. 716, No. 38, pl. 156, figs. 83—84.
 — — — REEVE, Conchol. icon., vol. XIV, *Venus*, Sp. 101.
Cryptogramma squamosa, LINNÉ, RÖMER, Malakoözoolog. Blätter, XIV Bd., 1867, p. 26, No. 10.
Venus — — — MARTINI u. CHEMNITZ, Conchyl. Cabin., XI, 1 Abth., p. 178, pl. 17, fig. 12.
 — (*Cryptogramma*) *squamosa*, LINNÉ, FISCHER, Catalogue d. l'Indo-Chine, p. 233.
 — — — — DAUTZENBERG et FISCHER, Journ. de Conchyl., vol. 53, 1905, p. 222.

The strand off the Mangrove at the station on Koh Chang, in very shallow water (2).

Long. 24 mm.

Islands in the Gulf of Siam (MORLET).

Distribution:— Singapore, Mergui Isls., Gulf of Manaar. — Poulo Condor, Philippines, Tonkin, Hong Kong, Formosa, Japan, Moluccas, Sydney (FRAUENFELD).

¹ Die Mollusken d. Maskarenen u. Seychellen, 1880, p. 151. In v. D. DECKEN'S Reise in Ost-Afrika, 1869, he records *T. radiata*, Anton (Chemn., VII, fig. 439), from Seychelles.

Chione (Omphaloclathrum) marica L. (Sow.).

(Pl. V, Figs. 1—4).

Venus marica, LINNÆUS, SOWERBY, Thesaurus Conchyl., II, p. 719, No. 47, pl. 157, fig. 108

Between Koh Riot and Koh Mesan, 3—5 fathoms, sand (¹/₂). N. of Koh Kahdat, 4—5 fathoms, coarse sand (2). W. of Koh Kut, 15 fathoms, mud (1).

Long. 8—19 mm.

Distribution ?

EDG. SMITH says in the report on the *Lamellibranchiata* of the Challenger Expedition (p. 125) "This species (*Venus (Chione) marica* L.) is so well known that it is unnecessary to give further references than those above mentioned." This may be true as regards the name, because from as far back as the times of LINNÆ and CHEMNITZ it has constantly been recorded and mentioned from many localities all over the globe; but a comparison of the descriptions and figures given by LINNÆ, CHEMNITZ, SOWERBY, REEVE and others leaves an impression of great uncertainty with regard to the characteristics and limits of the species. For instance, it appears to me that LINNÆ-CHEMNITZ's species can scarcely be identical with SOWERBY's *Ch. marica*, Thes. Conchyl. fig. 108 (EDG. SMITH's species *Ch. recognita* is undoubtedly also frequently confused with *Ch. marica*). All the individuals from the Gulf of Siam agree precisely with SOWERBY's figure 108, but how far that is identical with, or is a form of LINNÆ's *Ch. marica* is perhaps doubtful. I have given a figure of the specimens from the Gulf of Siam to fix the form for future comparisons. The specimens from MOLTKE's collection, from which CHEMNITZ had his figures 282—84 made (Pl. 27 in the "Conchylien Cabinet". Figs. 285—86 scarcely belong here), exist no longer in the MOLTKE collection included in the Zoological Museum of the University of Copenhagen, so I have not been able to compare CHEMNITZ's specimens with mine from the Gulf of Siam. STURANY¹ is inclined to regard "*Venus Römeriana*, Issel," from the Red Sea, as a young form of *Ch. marica* L.

Chione (Omphaloclathrum) recognita, E. Sm.*Venus (Chione) recognita*, EDG. SMITH, Report on the Lamellibranchiata of the Challenger Expedition, 1885, p. 125, pl. 3, fig. 5.— *Marica*, REEVE p. p., Concholog. icon., XIV, 1863, *Venus*, fig. 104 a (non 104 b and c).

Koh Kahdat, sand, 1—5 fathoms (70). N. of Koh Kahdat, 4—5 fathoms, sand (14). Koh Mak, sandy coast (²/₂). S. of Koh Mak, 5—6 fathoms (2). W. of Koh Kut, 15 fathoms, mud (4).

Long. 6·5—20 mm.

Long. 20 mm., alt. 15 mm., crass. 10 mm.

— 17 mm., — 13·5 mm., — 8·5 mm.

Distribution:— Suvativa Atoll (Maldive Archip.), Philippines. — Mast Head Reef, Queensland (HEDLEY).

¹ Lamellibranchiaten d. Rothen Meeres, 1899, p. 27.

This beautiful species is doubtless often confused with *Ch. marica* L., which it somewhat resembles, and it is probably more widely distributed than is at present known. The specimens from the Gulf of Siam vary greatly both in outline and in colour, most of them are not as high as is shown in SMITH'S figure (but the measurements given in the text agree fairly well with those of my specimens), and resemble more closely REEVE'S figure (loc. cit.), which I think ought to be referred to the present species. The coloration varies exceedingly, there are scarcely two specimens which are alike in regard to painting; pale-red, white, and yellow individuals occur, with brown or red zigzag-lines, spots and rays, and many other paintings. In the interior of the valves the colour varies from entirely white to dark lilac. As the lamellæ upon the posterior end are often only slightly conspicuous, I think that ADAMS'S and REEVE'S species *Venus costellifera* is nothing but an individual of *Ch. recognita*, Sm., with worn or only slightly developed lamellæ; the other distinguishing characters given for *V. costellifera* are also not very good. H. A. PILSBRY,¹ under the name of *Ch. hizenensis*, has described a very closely allied form from Japan.

Chione (Omphaloclathrum) subnodulosa, Hanl.

(Pl. V, Fig. 5).

Venus subnodulosa, HANLEY, Proc. Zool. Soc. London, XII, 1844, p. 160.

— — — Catalogue of rec. biv. shells, p. 360, pl. 16, fig. 19.

Chione — — — DESHAYES, Catalogue of the Conchifera in Brit. Mus., I, 1853, p. 143.

Venus — — — REEVE, Conchol. icon., XIV, *Venus*, Sp. 102.

Off Koh Kam, 10 fathoms, gravel (²/₂). Between Koh Mesan and Cape Liant, 5—9 fathoms (8). Gulf of Rayong, 7—10 fathoms, sand, mud (13). S. of Koh Samit, 20 fathoms, mud (21). Off Tung Kaben, 6 fathoms, mud mixed with sand (2). S. of Koh Mak, 5—6 fathoms (¹/₂). N. of Koh Kahdat, 4—5 fathoms, coarse sand (8). Koh Kahdat, 1—5 fathoms, sand (5). Between Koh Kut and Koh Kahdat, 6—10 fathoms, shells, and clay mixed with sand (25). W. of Koh Kut, 15 fathoms, mud (4). W. of Koh Kut, 30 fathoms, sand, mud (¹/₂).

Long. 3—19 mm.

Long. 19 mm., alt. 13 mm., crass. 10 mm.

Distribution: — Singapore (2—3 fathoms, coral-reef (²/₂), Danish Exp. to Siam), Philippines (HANLEY), Thursday Island (v. MARTENS), Torres Strait (MELVILL & STANDEN), Mast Head Reef, Queensland (HEDLEY).

This species varies rather considerably, e. g. with regard to the distances between the concentric lamellæ. The coloration is also, as in *Ch. recognita*, Sm., very variable; usually the primary colour is light or yellowish, with brown rays or stripes; in the Gulf of Siam, however, entirely white specimens, with dark brown lunules, were taken. The interior of the valves is either quite white or ornamented with dark spots and rays.

¹ Proceed. Acad. Nat. Hist. Philadelphia, vol. 56, 1904, p. 553, pl. 41, figs. 1—2.

Chione (Timoclea) imbricata, Sow.

- Venus imbricata*, SOWERBY, Thesaurus Conchyl., II, 1855, p. 715, pl. 156, figs. 81—82.
 — — — REEVE, Conchol. icon., XIV, *Venus*, Sp. 118.
Chione — — RÖMER, Malakozool. Blätter, XIV, 1867, p. 59, No. 46.
Venus — — FISCHER, Catalogue d. Moll. de l'Indo-Chine, p. 273.
 — *Cochinensis*, — Thesaurus Conchyl., II, 1855, p. 716, pl. 156, figs. 79—80.
Chione — — RÖMER, Malakozool. Blätter, XIV, 1867, p. 60, No. 47.

“Gulf of Siam” (L. MORLET).

Distribution:— Mergui Archip., Ceylon, Red Sea (?). — Cochin China, China, Philippines.

This species does not occur in the collections made by the Danish Expedition.

Chione (Timoclea) scabra, Hanl.

- Venus scabra*, HANLEY, Proc. Zool. Soc. London, XII, 1844, p. 161. — Catal. of rec. biv. shells. Append., p. 361, pl. 16, fig. 24.
 — — — SOWERBY, Thesaurus Conchyl., II, 1855, p. 718, No. 45, pl. 157, figs. 101—2.
Venus — — REEVE, Conchol. icon., XIV, *Venus*, Sp. 97.
Chione — — RÖMER, Malakozool. Blätter, XIV, 1867, p. 58.
Venus (Chione) scabra, HANLEY, EDG. SMITH, Rep. on the Lamellibranchiata of the Challenger Exped., p. 124.
 — — — — DAUTZENBERG et FISCHER, Journ. de Conchyl., vol. 54, 1906, p. 217.
Chione scabra, HANLEY, MELVILL & STANDEN, Proc. Zool. Soc. London, 1906, p. 835.
 — *micra*, PILSBRY, Proceed. Acad. Nat. Hist. Philadelphia, vol. 56, 1904, p. 552, pl. 41, figs. 4—5.

Very common; many specimens were taken everywhere between Koh si Chang and Koh Kong, in 3—20 fathoms, on a muddy and clayey bottom.

Long. 2—16 mm.

Distribution:— Poulo Penang (“Galathea” Exped.), Mergui Archip., Gulf of Manaar, Madras, Persian Gulf, Gulf of Oman. — Annam, Philippines, Japan, Mast Head Reef (Queensland).

The present species varies considerably both in outline and in sculpture. Thus, *Ch. micra*, Pilsbry, is only a younger individual with fewer ribs; several specimens of similar forms (showing even transitional stages to the type-form) are at hand from the Gulf of Siam.

Chione (Timoclea) Siamensis n. sp.

(Pl. V, Figs. 6—7).

This species is roundly trigonal, moderately convex, whitish, longer than high, and the posterior end is elongated and rather pointed. The umbo is situated in the anterior half of the valve and the ventral margin is slightly convex. The sculpture consists of strong, parallel, concentric ridges crossed by close-set radiating ridges, and at the points of contact rounded, bead-like granules are formed. These radiating ribs differ in thickness and are placed at different distances apart; thus at the anterior end there are 3—4 strong and prominent ribs, then follow, over the

whole of the middle portion, numerous close-set, fine, regularly-arranged ribs, which fork towards the ventral margin; then, towards the posterior end, 6—9 strong ribs occur, which are less broad than the interstices between them; where these posterior radiating ribs meet the concentric ribs, the bead-like granules which occur upon the rest of the shell become strong scales. On the somewhat elongated lunule only slightly granulated, radiating ribs are found; the large oblong area is quite smooth, without any ribs. The interior of the valves is white and somewhat glossy. There are three teeth in each valve, the central one in the left valve and the central and posterior in the right are tripartite at the top; the posterior tooth in the left valve is only slightly developed. The inner margin is finely crenulated all the way round, but most strongly at the ventral margin, and most finely and closely at the lunule-margin. The pallial sinus is short.

Long. 8 mm., alt. 6 mm., crass. 4.5 mm.

West of Koh Kut, 30 fathoms, sand and mud ($6\frac{1}{2}$).

This new species is most nearly allied to *Ch. lionata*, SMITH, from which it is, however, easily distinguished by its peculiar sculpture.

Chione (Timoclea) lionata, E. Sm.

(Pl. V, Figs. 8—10).

Venus (Chione) lionata, EDG. SMITH, Report on the Lamellibranchiata of the Challenger Exped., 1885, p. 126, pl. 3, fig. 7.

Between Koh Rin and Cliff Rock, 15 fathoms ($5\frac{1}{2}$). Koh Kram, 30 fathoms ($2\frac{1}{2}$). Off Koh Kam, 10 fathoms, gravel ($1\frac{1}{2}$). E. of Cape Liant, 9 fathoms, shells ($1\frac{1}{2}$). S. of Koh Samit, 20 fathoms, mud ($1\frac{1}{2}$). S. of Koh Chuen, 30 fathoms, shells (15). Between Koh Chuen and Koh Chang, 15 fathoms, mud ($3\frac{1}{2}$). S. of Koh Kahdat, 8—10 fathoms, mud ($4\frac{1}{2}$). Between Koh Kut and Koh Kahdat, 10 fathoms, shells (17). S. of Koh Kut, 17—20 fathoms, mud ($4\frac{1}{2}$). W. of Koh Kut, 15 fathoms, mud ($2\frac{1}{2}$).

Long. 8 mm., alt. 6.5 mm., crass. 5 mm.

Distribution:— Singapore, shallow water (Danish Exp. to Siam). — Amboina, S. of New Guinea (Challenger).

I have compared my specimens with EDG. SMITH's original types in the British Museum; they exactly agree with his specimen from Amboina (which he regards as a variety), while his specimens from New Guinea are somewhat different. Judging from the large quantity of material at hand from the Gulf of Siam it appears, however, that the species varies considerably. As may be seen from the measurements given above, the specimens from the Gulf of Siam are larger than SMITH's from the Challenger Expedition. As SMITH's figure is not very good I have here given a new figure.

Chione (Antigona) lamellaris, Schumacher.

Antigona lamellaris, SCHUMACHER, Essai d'un nouv. système d. habitat. d. vers testacés, 1817, p. 155, pl. 14, fig. 2.

Venus — — MARTINI u. CHEMNITZ, Conchyl. Cabin., XI, 1 Abth., p. 142, pl. 8, figs. 10—11.

Venus (Antigona) lamellaris, SCHUMACHER, EDG. SMITH, Rep. on the Lamellibranchiata of the Challenger Exp., p. 121.

— *lamellaris*, SCHUMACHER, CROSSE et FISCHER, Journ. de Conchyl., vol. 40, 1892, p. 76.

Dosina Lamarckii, GRAY, The Analyst, VIII, 1838, p. 308.

Chione — — RÖMER, Malakozoolog. Blätter, XIV, 1867, p. 39.

Venus — — REEVE, Conchol. icon., XIV, *Venus*, Sp. 39.

— — — SOWERBY, Thesaurus Conchyl., II, p. 707, pl. 153, figs. 20—21.

— *nodulosa*, SOWERBY jun., Thesaurus Conchyl., II, p. 708, pl. 153, fig. 16.

— *cancellata* var., CHEMNITZ, Conchyl. Cabin., VI, 1782, p. 310, p. 29, figs. 306—7.

S. of Koh Chuen, 30 fathoms, shells (3). E. of Cape Liant, 9 fathoms, shells (2). Gulf of Rayong, 7—10 fathoms, mud (5). W. of Koh Kut, 15 fathoms, mud (1).

Long. 11—40 mm.

The Gulf of Siam, west coast of Cambodge (PAVIE).

Distribution:— Singapore, Tranquebar, Ceylon and Gulf of Manaar, Aden (SHOPLAND). — Philippines, China, Japan, North, East and West Australia (BRAZIER), Viti Isls.

Chione reticulata L.

Venus reticulata, LINNÉ, Syst. Nat., ed. X, 1758, p. 687, No. 110. — ed. XII, p. 1133, No. 134. — Mus. Ludov. Ulricæ reg., 1764, p. 503, No. 64.

— — — CHEMNITZ, Conchyl. Cabin., VI, p. 367, pl. 36, figs. 382—83.

— — — SOWERBY, Thesaur. Conchyl., II, p. 706, pl. 153, figs. 11—13.

— — — REEVE, Conchol. icon., XIV, *Venus*, Sp. 34.

— — — MARTINI u. CHEMNITZ, Conchyl. Cabin., XI Bd., 1 Abth., p. 143, No. 15, pl. 10, figs. 1—2.

Chione — — RÖMER, Malakozoolog. Blätter, XIV, 1867, p. 36, No. 12.

Venus (Antigona) reticulata, LINNÉ, E. v. MARTENS, The Journal of the Linnean Soc., Zoology, vol. 21, 1887, p. 212.

— *corbis*, LAMARCK, Hist. nat. d. anim. s. vert., V, 1818, p. 585, No. 4. — éd. 2, VI, p. 337, No. 4.

— — — MORLET, Journ. de Conchyl., vol. 37, 1889, p. 170, No. 68.

— — — FISCHER, Catalogue d. Moll. de l'Indo-Chine, p. 233.

— *reticulata*, LINNÉ, R. BULLEN NEWTON, The Geological Magazine, New Ser., Dec. IV, vol. 7, 1900, p. 553, pl. 21, fig. 2.

Islands in the Gulf of Siam (L. MORLET, loc. cit.).

Distribution:— Mergui Archip., Nicobars, Ceylon, Addu Atoll and Hululu Isl. (Maldivé Archip.), Persian Gulf, Aden, Red Sea, Madagascar. — Philippines, Japan, Moluccas, Torres Strait, New Caledonia, Marianne Isls., Lifu, Viti Isls., Society Isls., Marquesas Isls., Paumotu Isl.

Strangely enough, the Danish Expedition to Siam collected no specimens of this species.

Chione (Circomphalus) calophylla, Phil.

Venus calophylla, PHILIPPI, Archiv f. Naturgeschichte hrsg. v. Wiegmann, II Jahrg., 1 Bd., 1836, p. 229, pl. VIII, fig. 2.

— *calophylla*, HANLEY, SOWERBY, Thesaurus Conchyliorum, II, 1855, p. 724, pl. 160, fig. 176.

— *calophylla*, PHILIPPI, REEVE, Conchol. icon., XIV, *Venus*, Sp. 114.

— — — MARTINI u. CHEMNITZ, Conchyl. Cabin., XI, 1 Abth., p. 208, pl. 33, figs. 13—15.

— (*Chione*) *calophylla*, PHILIPPI, EDG. SMITH, Lamellibranchiata of the Challenger Exped., p. 122.

Anaitis calophylla, PHILIPPI, HIDALGO, Obras malacológicas, I, tom. II, 1903, p. 294, No. 387.

S. of Koh Samit, 20 fathoms, mud (1). W. of Koh Chuen, soft clay and mud ($3\frac{1}{2}$). Between Koh Chuen and Koh Chang, 15 fathoms, mud (1). N. and W. of Koh Chang, 10–20 fathoms, mud (6). S. of Koh Bidang, 9 fathoms, mud (4). Between Koh Kahdat and Koh Kut, 6–10 fathoms, mud, clay mixed with sand, and shells (12). S. and W. of Koh Kut, 15–20 fathoms, mud (9).

Long. 2–36 mm.

Distribution: — Singapore (Danish Exp. to Siam: one specimen in 2–3 fathoms; Sv. GAD: 5 specimens in shallow water), Mergui-Archip., Andamans, Madras, Gulf of Manaar. — Philippines, China, Japan, Thursday Isl. (SEMON), New Guinea, Torres Str., North Australia, Sydney.

Note. The Danish Expedition to Siam obtained two specimens, and Mr. Sv. GAD several specimens of *Chione (Circumphalus) foliacea*, Phil., at Singapore.

Chione (Circumphalus) isabellina, Phil.

- Venus isabellina*, PHILIPPI, Zeitschr. f. Malakozoologie, V, 1848, p. 188 (it is due to a misprint, which is corrected in the register, that this species is called *isabillnia*).
 — — — Abbild. u. Beschreib. neuer od. wen. gek. Conchyl., III, 1851, p. 83, No. 5, pl. X, fig. 5 (*Venus*).
 — — — MARTINI u. CHEMNITZ, Conchyl. Cabin., XI Bd., 1 Abth., p. 194, pl. 25, fig. 9.
 — — — REEVE, Conchol. icon., XIV, *Venus*, Sp. 112.
 — — — P. FISCHER, Catal. d. Moll. de l'Indo Chine, p. 233.
 — *Dysera*, CHEMNITZ, Conchyl. Cabin., VI, 1782, p. 297, pl. 28, figs. 291–92.
 — — — SOWERBY, Thesaurus Conchyl., II, p. 723, pl. 157, fig. 119.
Anaitis isabellina, PHILIPPI, HIDALGO, Obras malacológicas, I, tom. II, 1903, p. 291, No. 385.

The strand off the Mangrove at the station on Koh Chang, very shallow water (4). The coast of Lem Ngob (2).

Long. 16–26 mm.

Distribution: — Bombay. — Annam, China, Japan, Philippines, Port Curtis, Sydney (W. DENISON, Madras Museum).

MELVILL & STANDEN say regarding this species:¹ “Perhaps best treated as a variety of *A. foliacea*” (*Anaitis foliacea*, Philippi).

Chione (Ventricola) toreuma, Gould.

- Venus toreuma*, GOULD, Proceed. of the Boston Soc. Nat. Hist., III, 1850, p. 277. — Otia Conchologica, p. 84.
 — — — REEVE, Conchol. icon., XIV, 1863, *Venus*, Sp. 64.
 — — — LISCHKE, Japan. Meeres-Conchyl., I, 1869, p. 121, II, p. 108.
 — — — Report on the zool. collect. made during the voyage of “Alert,” 1884, p. 93.
 — *tourema*, — HIDALGO, Obras malacológicas, I, tom. II, 1903, p. 288, No. 382.
 — *Jukesi*, DESHAYES, Catalogue of the Conchifera in the Coll. of the British Mus., I, 1853, p. 100, No. 3.
 — — — MARTINI u. CHEMNITZ, Conchyl. Cabin., XI, 1 Abth., p. 217, pl. 35, figs. 7–9.
Chione (Ventricola) Jukesi, DESHAYES, RÖMER, Malakozool. Blätter, XIV, 1867, p. 123.
Venus crebriculca, SOWERBY, Thesaurus Conchyl., II, 1855, p. 728, pl. 161, figs. 187–89 (non LAMARCK).
 — *sculpta*, DESHAYES, REEVE, Conchol. icon., loc. cit., Sp. 5 (fide EDG. SMITH).

¹ Proc. Zool. Soc. London, 1906, p. 834.

Koh Kram, 30 fathoms ($1\frac{1}{2}$). North side of Koh Mesan, 10–15 fathoms, stones (2). Koh Chuen, 10–15 fathoms ($1\frac{1}{2}$).

Long. 10–29 mm.

Distribution:— Ceylon and Gulf of Manaar, Hululu Isl. (Maldive Archip.). — Philippines, Japan, Torres Strait, North and East Australia, Funafuti (Ellice Isls.), Mangsi Isl., Sooloo-Sea.

The present species is recorded (with doubt) from Mauritius and Cargados, and probably erroneously by J. G. COOPER from California.

I doubt whether *Chione embrithes*, MELVILL and STANDEN,¹ can be maintained as a distinct species.

Dosinia trigona, Reeve.

Artemis trigona, REEVE, Conchol. icon., VI, 1850, *Artemis*, Sp. 42.

Cytheræa — — SOWERBY, Thesaurus Conchyl., II, p. 633, pl. 133, fig. 120.

Artemis — — — loc. cit., II, p. 659, pl. 141, fig. 20.

Dosinia — — RÖMER, Monographie d. Molluskengatt. *Dosinia*, 1862, p. 20, pl. 4, fig. 5.

The strand off the Mangrove at the station on Koh Chang (2). Coast of Lem Ngob ($3\frac{1}{2}$).

Long. 20–39 mm.

Long. 35 mm., alt. 37 mm., crass. 27 mm.

— 31 mm., — 32 mm., — 20 mm.

Distribution:— Gulf of Manaar (THURSTON).

REEVE'S statement (repeated by DESHAYES, SOWERBY, RÖMER and others) that this species was found in the Red Sea has not hitherto been confirmed.

Dosinia laminata, Reeve.

Artemis laminata, REEVE, Conchol. icon., VI, 1850, *Artemis*, Sp. 41.

— — — SOWERBY, Thesaur. Conchyl., II, p. 674, No. 71, pl. 144, figs. 86–87.

Dosinia — — RÖMER, Monogr. d. Moll. *Dosinia*, 1862, p. 62, No. 72, pl. 16, fig. 2; pl. 10, fig. 3.

— — — MARTINI u. CHEMNITZ, Conchyl. Cabin., XI, 1 Abth., p. 104, pl. 26, figs. 10–12.

— — — HIDALGO, Obras malacológicas, I, tom. II, 1903, p. 305, No. 398.

Off Tung Kaben, 6 fathoms, mud mixed with clay (1). W. of Koh Chang, 20 fathoms, mud (2). S. of Koh Kahdat, 8–10 fathoms, mud (5). Koh Kahdat, 1–5 fathoms, sand (1). Between Koh Kut and Koh Kahdat, 6–10 fathoms, clay and sand ($2 + \frac{5}{2}$). S. of Koh Mak, 5–6 fathoms (1). East of Koh Mak, 20 fathoms, mud ($3 + \frac{1}{2}$). W. of Koh Kut, 15 fathoms, mud (20).

Long. $1\frac{1}{2}$ –34 mm. (Long. 34 mm., alt. 34 mm., crass. 18 mm.).

Distribution:— Andamans, Red Sea (pleistocene). — Philippines, China, Japan.

Almost all the individuals from the Gulf of Siam were full of clay between the transverse ribs owing to the clayey soil in which they had been living.

¹ Journal of the Linnean Society, Zoology, vol. XXVII, p. 195.

Dosinia exasperata, Phil.

- Cytherea (Artemis) exasperata*, PHILIPPI, Abbild. u. Beschreib. neuer od. wen. gek. Conchyl., III, 1847, p. 24 (36), pl. 8, fig. 4.
Artemis exasperata, PHILIPPI, SOWERBY, Thesaur. Conchyl., II, p. 670, No. 55. pl. 143, fig. 62.
 — — — REEVE, Conchol. icon., VI, *Artemis*, Sp. 21.
Dosinia — — — HIDALGO, Obras malacológicas, I, tom. II, 1903, p. 311, No. 407.

The sound of Koh Chang, 5 fathoms, soft clay ($\frac{5}{2}$). W. of Koh Kut, 15--30 fathoms, mud ($\frac{2}{2}$).

Long. 8—30 mm.

Distribution: — Coromandel Coast (?), Karachi, Mekran Coast. — Philippines.

Several authors have connected *Dosinia prostrata* with the present species; but, as far as I can see, the two species have nothing to do with each other. In the Zoological Museum of the University of Copenhagen SPENGLER's specimen of *Dos. prostrata* L. is labelled: "Venus prostrata Lin. Sp. 137. Chemn. Tom. 6, fig. 298, Tranquebar." It exactly agrees with the figures in HANLEY's *Ipsa Linnæi Conchyl.*, Pl. 1, Fig. 7; in *Encyclop. méthod.*, Pl. 277, Fig. 1; in REEVE, *Conchol. icon.*, Sp. 23; in HANLEY, *Monogr. (SOWERBY, Thes. Conchyl.)*, Pl. 144, Fig. 80, and with the description in CHEMNITZ, *Conchyl. Cabin.*, VI, p. 302.¹ It may probably be assumed that SPENGLER's specimen is correctly determined, at any rate it undoubtedly corresponds with CHEMNITZ's view of *prostrata*;² but SPENGLER's *prostrata* and PHILIPPI's *exasperata* differ widely, the outline in *prostrata* being angular, which (especially in full-grown individuals) gives a squarish appearance to the shell; this is compressed (like *Circe scripta* L.), and the lunule is elongated: while in *Dos. exasperata* the outline is almost circular, the shell is more arched, and the lunule is smaller and cordate; and as regards the sculpture, the transverse ribs are more close-set and much finer. *Dosinia exasperata*, Phil., should therefore be regarded as a distinct, well-characterized species. RÖMER's *Dos. prostrata* L. is certainly not SPENGLER's (CHEMNITZ's) species of that name; the latter RÖMER has determined as *Dos. Bruguieri*, Gray.

Dosinia dilecta, A. Ad.

(Pl. V, Figs. 11—13).

- Dosinia dilecta*, A. ADAMS, Proc. Zool. Soc. London, 1855, p. 224, No. 15.
 — — — RÖMER, Monogr. d. Molluskengatt. *Dosinia*, 1862, p. 66, No. 77.

The sound of Koh Chang, 5 fathoms, soft clay ($1\frac{1}{2}$).

Long. 40 mm., alt. 41 mm., crass. 21 mm.

¹ The figure on Pl. 29, Fig. 298 is not good, and does not agree with the description; the phrase "testa orbiculari valde compressa et complanata" suits the figure but badly; so also the synonyms given by CHEMNITZ unquestionably do not all refer to this form; how far on the whole LINNÉ and CHEMNITZ have had the same form before them I am not prepared to say.

² SPENGLER and CHEMNITZ were in daily communication with each other; see *Malakozool. Blätter*, XVII, 1870, p. 99.

Distribution:— Malacca (Dr. TRAILL), Pulo Bidang, N. of Penang (SKEAT, Brit. Mus.).

On the label of the specimens of *D. dilecta*, A. Ad., in the British Museum, *D. striatissima*, Sowerby, is given as a synonym; I very much doubt whether this is correct, as SOWERBY in "Thesaurus Conchyliorum" (p. 673) refers his species to "Sect. 6: Edge of the dorsal area raised above the circumscribing line," a feature which is not to be found at all in *D. dilecta*, A. Ad.

Dosinia cretacea, Reeve.

- Artemis cretacea*, REEVE, Conchol. icon., VI, 1850, *Artemis*, Sp. 35.
 — — — SOWERBY, Thesaur. Conchyl., II, p. 667, No. 46, pl. 142, fig. 51.
Dosinia — — RÖMER, Monogr. d. Moll. *Dosinia*, 1862, p. 34, No. 32, pl. 6, fig. 8.
 — — — L. MORLET, Journ. de Conchyl., vol. 37, p. 169.
 — — — HIDALGO, Obras malacológicas, I, tom. II, 1903, p. 309, No. 402.

"Iles du golfe de Siam" (L. MORLET).

Distribution:— Persian Gulf (v. MARTENS), Red Sea (P. FISCHER,¹ STURANY²).
 — Annam, Philippines.

The Danish Expedition to Siam brought home no specimens of this species.

Dosinia Hanleyana, H. & A. Ad.

- Dosinia simplex*, A. ADAMS, Proc. Zool. Soc. London, 1855, p. 224, No. 14 (non *Artemis simplex*, Hanley, Proc. Zool. Soc., 1845, p. 11).
 — — — RÖMER, Monogr. d. Gatt. *Dosinia*, 1862, p. 75, No. 90.
 — *Hanleyana*, H. & A. ADAMS, The Genera of recent Mollusca, II, 1858, p. 431.
 — *Singaporensis*, — MS., British Museum.

The strand off the Mangrove at the station on Koh Chang (1).

Long. 8.5 mm., alt. 8 mm., crass. 4 mm.

Distribution:— Singapore (CUMING).

By comparisons in the British Museum I have convinced myself that the small specimen from the Gulf of Siam corresponds with ADAMS's species *Singaporensis*; Mr. EDG. SMITH kindly tells me that that species is identical with *simplex*, A. Ad., a name which H. and A. ADAMS afterwards altered to *Hanleyana*, owing to its having previously been used by HANLEY.

Dosinia contusa, Reeve.

- Artemis contusa*, REEVE, Conchol. icon., VI, 1850, *Artemis*, Sp. 38.
 — — — SOWERBY, Thesaur. Conchyl., II, p. 672, No. 62, pl. 143, fig. 70.
Dosinia — — RÖMER, Monogr. d. Moll. *Dosinia*, p. 57, No. 65, pl. 11, fig. 2.
 — — — L. MORLET, Journ. de Conchyl., vol. 37, p. 170, No. 67.
 — — — J. BRAZIER, Proc. Linn. Soc. N. S. Wales, vol. 9, 1884, p. 801, No. 36.

¹ Catalogue d. Moll. de l'Indo-Chine, p. 231.

² Nachrichtenblatt d. Deutschen Malakozool. Gesellsch., 1905, 138.

“Iles du golfe de Siam” (L. MORLET).

Distribution:— New Guinea, North and North-west Australia.

This species does not occur among the material brought home by the Danish Expedition to Siam, and DAUTZENBERG and FISCHER think¹ that probably it is *Dosinia Gruneri*, Phil., which MORLET records from the Islands in the Gulf of Siam under the name of *D. contusa*, Reeve.

Dosinia pubescens, Phil.

Cytherea (*Artemis*) *pubescens*, PHILIPPI, Abbild. u. Beschreib. neuer od. wenig gekannt. Conchyl., III, 1847 (1851), p. 24 (36), pl. 8, fig. 3.

Artemis pubescens, PHILIPPI, SOWERBY, Thesaurus Conchyl., II, p. 672, No. 64, pl. 143, fig. 72.

Dosinia — — RÖMER, Monogr. d. Moll. *Dosinia*, p. 79, No. 96, pl. 15, fig. 1.

Koh Kahdat, 1—5 fathoms, sand (1). North of Koh Kahdat, 4—5 fathoms, coarse sand (¹/₂). Koh Mak, sandy coast (¹/₂). West of Koh Kut, 30 fathoms, sand and mud (¹/₂).

Long. 5—20 mm.

Distribution:— Bombay, Mekran Coast, Aden, Madagascar, Durban. — Philippines, Labuan (N. Borneo), New Holland.

All the specimens from the Gulf of Siam are young, and the lamellæ which limit the convex area are therefore not so well-developed as in older individuals. In one of the specimens from Koh Kahdat the apices are red and the umbones are ornamented with reddish-brown zig-zag lines and spots. MELVILL and ABERCROMBIE² say also “Young specimens are nearly circular, silky in appearance and often tinged with pink.” EDG. SMITH³ unites with this species the following:— *D. scabriuscula*, Reeve (? of PHILIPPI), *D. ovalis*, Römer, *D. eunice*, A. Adams, and *D. bisecta*, Reeve (?) (i. e. *biscocta*, Reeve), the last species is recorded from Japan.

Cyclina elegans, H. Ad.

(Pl. V, Figs. 14—15).

Lucina elegans, H. ADAMS, Proc. Zool. Soc. London, 1870, p. 791.

Gulf of Rayong, 7—10 fathoms, sand, mud, shells (2).

Long. 7 mm., alt. 7 mm., crass. 5 mm.

Distribution:— Red Sea (M' ANDREW).

By examining H. ADAMS'S original specimens in the British Museum I have convinced myself that my specimens from the Gulf of Siam are identical with *Lucina elegans*, H. Adams.⁴ It is, however, incorrect when ADAMS refers that species to the genus *Lucina*, it being a *Cyclina*; as his diagnosis is deficient and also partially misleading, I give here a description and figures of my individuals:— Valves

¹ Journal de Conchyliologie, vol. 54, 1906, p. 216.

² Memoirs and Proceed. of the Manchester Lit. and Phil. Soc., 4 Ser., vol. 7, p. 45.

³ Proc. Zool. Soc. London, 1891, p. 421.

⁴ Mr. EDG. A. SMITH has kindly verified my determination.

circular, convex, white, rather thin; umbones high and situated at the middle of the axis of the shell. Apex turning towards the anterior end. The whole surface covered with a network of close-set, fine, parallel lines, which cross each other; they proceed from the umbones and from the upper sides and radiate outwards towards both ends and towards the ventral side. Upon each valve there is a large, elongated, crescent-formed lunule, circumscribed by a groove; it is glossy, destitute of network sculpture, and striped only by the lines of growth; the brown ligament is external. The interior of the valves is glossy, milky white; in the right valve there are two diverging cardinal teeth of which the posterior is bifid; in the left valve there are three cardinal teeth of which the central and largest is bifid. The margin is smooth. The sinus is high and widely triangular.

Note. *Clementia papyracea*, Gray, has been taken at Singapore in shallow water (by SV. GAD).

Venerupis Irus L.

Donax Irus, LINNÉ, Syst. Nat., ed. XII, 1767, p. 1128, No. 111.

Venerupis Irus, LINNÉ, L. PFEIFFER in MARTINI u. CHEMNITZ, Conchyl. Cabin., XI Bd., 1 Abth., 1869, p. 245, pl. 31, figs. 17-19.

- *irus*, — BUCQUOY, DAUTZENBERG et DOLLFUS, Moll. mar. de Roussillon, II, p. 438, pl. 67, figs. 9-18.
- *macrophylla*, DESHAYES, Catal. of the Conchifera in the coll. of the British Museum, I, 1853, p. 193. — Proc. Zool. Soc. London, 1853, Moll. pl. XVIII, fig. 8.
- — — SOWERBY, Thesaur. Conchyl., II, p. 763, No. 2, pl. 165, fig. 20.
- — — SOWERBY in REEVE, Conchol. icon., XIX, *Venerupis*, Sp. 23.
- Rupellaria* — — PAGENSTECHE, Ueber d. v. Kossmann am Rothen Meere ges. Moll. 1877, p. 42, No. 35.
- — — ROCHEBRUNE, Matér. pour la faune de l'Archipel du Cap Vert. Nouv. Arch. du Muséum, 2 Sér., Mémoires, IV, p. 255, No. 34.
- Venerupis* — — A. H. COOKE, Ann. and Mag. Nat. Hist., 1886, p. 103.
- Irus* — — MELVILL and STANDEN, Journ. of Conchol., IX, p. 84.
- Venerupis* — — HIDALGO, Fauna malacol. de I. Isl. Filipin., II, p. 321, No. 417.
- *derelicta*, — Proc. Zool. Soc. London, 1853, p. 4, No. 17.
- — — SOWERBY, Thesaur. Conchyl., II, p. 765, No. 9, pl. 164, fig. 16.
- — — — in REEVE, Conchol. icon., XIX, *Venerupis*, Sp. 8.
- — — HIDALGO, Fauna malacol. de I. Isl. Filipin., II, p. 320, No. 415.
- *fimbriata*, SOWERBY, Thesaur. Conchyl., II, 1855, p. 766, No. 12, pl. 165, fig. 23.
- — — in REEVE, Conchol. icon., XIX, *Venerupis*, Sp. 25.
- *attenuata*, — REEVE, Conchol. icon., XIX, *Venerupis*, Sp. 7.

Koh Mesan, 15 fathoms, stones ($\frac{2}{2}$). Between Koh Mesan and Cape Liant, 5-9 fathoms, sand ($\frac{1}{2}$). Coast of Lem Ngob, low tide, stones ($\frac{3}{2}$). North end of Koh Chang, 1 fathom, coral blocks (1). Koh Chang, 1-2 fathoms, old coral blocks (6). Koh Kahdat ($\frac{2}{2}$).

Long. 1-14 mm.

Distribution: — Singapore (shallow water, SV. GAD), Madras, Bombay, Persian Gulf, Karachi, Aden, Red Sea, Suez, Mediterranean, Black Sea, Atlantic Ocean (the coast of Europe from England and Ireland to Cape Vert), Mauritius. — Annam (*V. attenuata*, Sow.), Philippines, Japan, Aru Isl. (*V. attenuata*, Sow.), Funafuti Atoll.

It is not possible for me to distinguish between specimens from the Gulf of Siam and European individuals, e. g. from the Mediterranean. Besides the synonyms above enumerated several more can undoubtedly be added, thus, e. g. *V. semi-purpurea*, Dunk.,¹ *milis*, Desh.,² *planicosta*, Desh., etc.³

Fam. Petricolidae.

Naranio lapicida, Chemn.

- Venus Lapicida*, CHEMNITZ, Conchyl. Cabin., X, 1788, p. 356, pl. 172, figs. 1664—65.
 — — — — — GMELIN, Syst. Nat., ed. XIII, p. 3269, No. 148.
Naranio lapicida, — — — — — DESHAYES, Catalogue of the Conchifera in the coll. of the Brit. Mus., I, 1853, p. 216, No. 2.
Petricola — — — — — SOWERBY, Thesaur. Conchyl., II, 1855, p. 776, No. 20, pl. 166, fig. 26.
 — — — — — KREBS, West-Ind. mar. shells, 1864, p. 108.
 — — — — — SOWERBY in REEVE, Conchol. icon., XIX, *Petricola*, Sp. 24.
 — — — — — EDG. SMITH in Zoolog. Collect. of H. M. S. Alert, 1884, p. 98, No. 22.
Choristodon lapicidum, CHEMNITZ, PRITCHARD and GATLIFF, Proceed. Roy. Soc. Victoria, vol. 16, 1903, p. 121.
Venus divaricata, CHEMNITZ, Conchyl. Cabin., X, 1788, p. 357, pl. 172, figs. 1666—67.
Petricola — — — — — D'ORBIGNY, Mollusques de l'île de Cuba, II, 1853, p. 265, No. 463.
Naranio — — — — — CHEMNITZ, Catal. Conchif. Brit. Mus., I, 1853, p. 216, No. 1.
Petricola — — — — — SOWERBY, Thesaur. Conchyl., II, p. 776, No. 19, pl. 166, figs. 24—25.
 — — — — — DESHAYES, MABILLE et LE MESLE, Journ. de Conchyl., vol. 14, 1866, p. 117.
 — — — — — CHEMNITZ, v. MARTENS in v. d. DECKEN's Reisen in Ost-Afrika, III, 1869, p. 66, pl. 3, fig. 3.
 — — — — — SOWERBY in REEVE, Conchol. icon., XIX, *Petricola*, Sp. 22.
Choristodon divaricatum, CHEMNITZ, H. & A. ADAMS, Genera of rec. Moll., II, 1858, p. 442, pl. 110, fig. 2.
Venus divergens, GMELIN, Syst. Nat., ed. XIII, 1790, p. 3269, No. 147.
Petricola costata, LAMARCK, Système d. anim. s. vert., 1802, p. 121.
Naranio — — — — — GRAY, Ann. and Mag. Nat. Hist., 1853, XI, p. 38.
Petricola lucinalis, — — — — — Hist. nat. d. anim. s. vert., V, 1818, p. 504, No. 4. — éd. 2, VI, p. 157, No. 4.

Koh Chang, 1 fathom, old coral blocks (12). Koh Kahdat, 1 fathom, sand (1).
 Long. 7—23 mm.

Distribution:— Gulf of Manaar, Maldive Archip., Persian Gulf, Gulf of Oman, Aden, Red Sea, Mauritius, Zanzibar, Mozambique, Querimba Isls. — Poulo Condor, Aru Isl., Torres Strait, Mast Head Reef (Queensland), St. Vincent's Gulf (South Australia), Victoria, Yap, Pelew Isls., Funafuti Atoll. — East coast of America: Florida, Greater and Lesser Antilles (to Martinique, DALL).

Fam. Cardiidae.

Cardium (Acanthocardium) setosum, Redf.

- Cardium setosum*, REDFIELD, Ann. Lyceum Nat. Hist. New York, IV, (1846) 1848, p. 168, pl. XI, fig. 1.
 — — — — — EDG. SMITH, Rep. Challenger Lamellibranchiata, 1885, p. 158.

¹ DUNKER, Index moll. mar. Japon., p. 208. — PILSBRY, Catal. of the Mar. Moll. of Japan, 1895, p. 129.

² Taken at Botany Bay (ANGAS) and Tasmania (TATE & MAY).

³ That *V. Irus* may also occur ornamented with vivid colours has been stated by DAUTZENBERG (loc. cit. p. 443) and PALLARY (Journ. de Conchyl., 1900, pp. 403—4); it then recalls *V. exotica*, Hanl.

- Cardium selosum*, REDFIELD, HIDALGO, Obras malacológicas, I, tom. II, 1903, p. 329, No. 428.
 — *latum*, CHEMNITZ, Conchyl. Cabin., VI, 1782, p. 197, pl. 19, figs. 192—93.
 — — *Autorum* (REEVE, RÖMER e. a. non BORN fide F. BRAUER¹ et EDG. A. SMITH; loc. cit.).

Islands in the Gulf of Siam (L. MORLET, Journ. de Conchyliologie, vol. 37, 1889, p. 168).

The Danish Expedition to Siam collected no specimens of this species.

Distribution:— Mergui Isls., Nicobars, Madras, Ceylon, Bombay, Persian Gulf, Gulf of Aden. — Hong Kong, Philippines, Java, Sulu Isls.

Cardium (Acanthocardium) Sueziense, Iss.

- Cardium Sueziensis*, ISSEL, Malacol. d. Mar Rosso, 1869, p. 76, pl. 3, fig. 4.
 — *sueziense* — EDG. SMITH, Lamellibranchiata of the Challenger Exped., p. 158, pl. VIII, figs. 2—2 b.
 — *fragum*, LINNÉ var. *sueziense*, ISSEL, CH. HEDLEY, Australian Museum, Sydney. Memoir III, 1896—1900, p. 504.

Between Koh Mesan and Cape Liant, 5—9 fathoms, sand (2). Between Koh Riot and Koh Mesan, 3—5 fathoms, sand (12). Koh Kahdat, 1 fathom, sand (2). West of Koh Kut, 15 fathoms, mud (15).

Long. 4—10 mm.

Distribution:— Ceylon, Gulf of Manaar, Angrias Bank, Laccadive and Maldivé Archip., Persian Gulf, Mekran Coast, Red Sea (STURANY), Gulf of Suez (common, ISSEL and M' ANDREW). — Torres Strait, Levuka, Viti Isls., 12 fathoms (CHALLENGER), Funafuti (Ellice Isls.).

EDG. A. SMITH (loc. cit. p. 159) is quite right in thinking that the present species may become larger than his specimens (7 mm.) from the Viti Islands; in the Gulf of Siam they attain, as stated above, 10 mm. ISSEL gives as the maximum for the specimens from the Gulf of Suez 6 mm., STURANY² mentions the following measurements for specimens from Massaua:— alt. 7.25 mm., long. 7.5 mm., crass. 5.75 mm. Several of the individuals from the Gulf of Siam were ornamented with distinct intercostal sculpture, and both entirely white individuals and also forms with red dots and spots occur; in the latter the red colour is also seen upon the white interior of the valves. Valves are often found which are vivid yellow upon the interior of the umbonal region. CH. HEDLEY (loc. cit.) is of opinion that the species under consideration is a variety of *Hemicardium fragum* L. Upon the basis of the material collected at Funafuti Atoll (Ellice Isls.) he says: "The four dozen odd valves before me exhibit much variation in contour, and they appear to pass by gradual transition into typical *C. fragum*," but I doubt whether he is right in this supposition. (I do not understand the reason why HEDLEY always in his paper gives "*C. fragum* L." for *C. fragum* L.).

¹ F. BRAUER, Sitzungsber. d. k. k. Akad. d. Wiss. Wien. Mathemat. naturw. Classe, Bd. 77, 1 Abth., p. 127.

² Nachrichtenblatt d. Deutsch. Malakozool. Gesellsch., 1905, p. 139.

Cardium (Bucardium) Asiaticum, Brug.

- Cardium Asiaticum*, BRUGIÈRE, Encyclop. méthod. Vers, Tom. I, 1792, p. 224, No. 19, pl. 293, fig. 2.
 — — — REEVE, Conchol. icon., II, *Cardium*, Sp. 90.
 — — — MARTINI u. CHEMNITZ, Conchyl. Cabin., X, 2 Abth., p. 66, pl. 2, figs. 4—5.
 — — — BÜLOW, Nachrichtsbl. d. Deutsch. Malakozool. Gesellsch., 1905, p. 81, pl. 2, fig. 7.
 — *lima*, SPENGLER, SCHRÖTER, Einleit. in d. Conchylienkenntn., III, 1786, p. 53.
 — — GMELIN, Systema Naturae, ed. XIII, p. 3253, No. 30.
 — *lamellatum*, SPENGLER, Skrivter af Naturhistorie Selskabet, V, 1799, p. 8.

North of Koh Kam, 5 fathoms, gravel. Koh Chuen, 30 fathoms.

Long. 30—46 mm.

Distribution:— Nicobar Isls., Ceylon and Madras, South Africa (Natal, Port Elisabeth). — China.

DUNKER¹ undoubtedly erroneously records Guinea as the locality for the present species. SPENGLER's original specimens in the Zoological Museum of the University of Copenhagen are labelled "*Card. lamellatum* Spengl., Niquebar."

Cardium (Bucardium) coronatum, Spengl.

- Cardium coronatum*, SPENGLER, J. S. SCHRÖTER, Einleit. in d. Conchylienkenntniss, 1786, III, p. 53, pl. VII (in II Bd.), fig. 13 a, b.
 — — — Skrivter af Naturhistorie-Selskabet, 1799, V, p. 9, pl. 1, fig. 1.
 — — — RÖMER in MARTINI u. CHEMNITZ, Conchyl. Cabin., X Bd., 2 Abth., p. 68, pl. 12, figs. 3—5.
 — — — BÜLOW, Nachrichtsbl. d. deutsch. Malakozool. Gesellsch., 1905, p. 81, pl. 2, fig. 6.
 — — — DAUTZENBERG et FISCHER, Journ. de Conchyl., vol. 54, 1906, p. 214.
 — *fimbriatum*, WOOD, General Conchology, 1835, p. 235, pl. 56, figs. 4—5.
 — — — REEVE, Conchol. icon., II, *Cardium*, Sp. 91.
 — — — P. FISCHER, Catal. d. Moll. de l'Indo-Chine, p. 229.

Commonly distributed from Koh Chang to Koh Samit, 3—30 fathoms, clay, mud and sand.

Long. 4—39 mm.

PAVIE in 1884 took it at the islands in the Gulf of Siam (Journ. de Conchyl., vol. 37, p. 168).

Distribution:— Mergui Archip. (v. MARTENS), Bay of Bengal (Madras, Aracan coast), from Goa to Bombay, Karachi. — Annam (CROSSE, FISCHER, BOUTAN), China (Hong Kong).

SPENGLER's original specimens in the Zoological Museum of the University of Copenhagen are labelled "aus Niquebar." MELVILL and STANDEN (Proc. Zool. Soc. London, 1906, p. 838) write: "After detailed examination of many examples in all stages of growth, it is the opinion of Mr. ALEXANDER ABERCROMBIE that *coronatum* Spengler is synonymous (with *Cardium Asiaticum*, Chemn.);" at present I cannot agree with this opinion.

¹ Index molluscor. quae in itinere ad Guineam infer. coll. G. Tams, 1853, p. 50, No. 134.

Cardium (Bucardium) multispinosum, Sow.

- Cardium multispinosum*, G. B. SOWERBY, Proc. Zool. Soc. London, 1840, p. 106.
 — — — Conchol. Illustrations, figs. 38—38 a.
 — — — REEVE, Conchol. icon., II, *Cardium*, Sp. 10.
 — — — MARTINI u. CHEMNITZ, Conchyl. Cabin., X Bd., 2 Abth., p. 67, pl. 12, figs. 1—2.
 — — — BÜLOW, Nachrichtsbl. d. Deutsch. Malakozool. Gesellsch., 1905, p. 81, pl. 2, fig. 5.

Taken in different localities between Koh Chang and Koh Kut, 6—20 fathoms, mud and clay (5).

Long. 21—41 mm.

Distribution: — Mozambique (v. MARTENS). — Philippines (CUMING, HIDALGO), China (J. REEVES), north and east coasts of Australia (ANGAS, "Challenger"-Exped., "Alert"-Exped.).

Cardium (Bucardium) Sinense, Sow.

- Cardium Sinense*, G. B. SOWERBY, Proc. Zool. Soc. London, 1840, p. 105.
 — — — Conchol. Illustrations, fig. 35.
 — — — REEVE, Conchol. icon., II, *Cardium*, Sp. 3.
 — — — RÖMER in MARTINI u. CHEMNITZ, Conchyl. Cabin., X Bd., 2 Abth., p. 73, pl. 12, figs. 11—12.
 — — — P. FISCHER, Catalogue d. Mollusques de l'Indo-Chine, p. 229.
 — — — DAUTZENBERG et FISCHER, Journ. de Conchyl., vol. 54, 1906, p. 214.

Commonly distributed from Koh Chuen to Koh Kong in 3—30 fathoms, mud, clay and shells.

Long. 1—40 mm.

Distribution: — Annam (CROSSE et FISCHER, BOUTAN), Hong Kong, China (SOWERBY), Philippines (SOWERBY, HIDALGO), Java (REEVE).

The number of the ribs varies greatly; G. B. SOWERBY states 23, RÖMER 21—23, and REEVE 24. In my collection there are three specimens from "China" with 25 ribs, but all the specimens from the Gulf of Siam have 21—22 ribs.

Cardium (Trachycardium) flavum L.

- Cardium flavum*, LINNÉ, Systema Naturae, ed. X, p. 680, No. 71. — ed. XII, p. 1123, No. 87.
 — — — MARTINI u. CHEMNITZ, Conchyl. Cabin., X, 2 Abth., p. 56, pl. 7, figs. 7—8; pl. 5, fig. 10.
 — *magnum*, CHEMNITZ, Conchyl. Cabin., VI, p. 196, pl. 19, fig. 191.
 — *pectiniforme*, BORN, Test. Mus. Caesar. Vindob., 1780, p. 49, pl. III, fig. 10.
 — — — P. FISCHER, Catalogue d. Moll. de l'Indo Chine, 1891, p. 230.
 — *rugosum*, LAMARCK, Hist. nat. d. anim. s. vert., VI, p. 400, No. 23.
 — — — REEVE, Conchol. icon., II, *Cardium*, pl. XIV, No. 68.
 — *Dupuchense*, (REEVE), MORLET, Journ. de Conchyl., vol. 37, 1889, p. 168.
 — — — P. FISCHER, Catalogue d. Moll. de l'Indo Chine, 1891, p. 229.

Koh Mak, dead specimens on the coast. Koh Kahdat, 1—5 fathoms, sand, stones (1). North end of Koh Chang, 1—2 fathoms, old coral blocks, several dead specimens. Coast of Koh Kahdat (⁸/₂).

Long. 8–35 mm.

PAVIE in 1884 took it at the islands in the Gulf of Siam (MORLET, Journ. de Conchyl., vol. 37, p. 168).

Distribution: — “Bangkok” (DAUTZENBERG),¹ Bay of Bengal, Ceylon, Arabian Sea, Persian Gulf, Gulf of Aden, Red Sea, Suez Canal, Madagascar and Rodriguez, Mozambique and Zanzibar, Natal (SOWERBY), Malay Archip. (the most commonly occurring species, v. MARTENS), Philippines, north and east coasts of Australia.

Card. Dupuchense, Reeve, is recorded to have been taken at the “Island of Dupuch, Torres Straits (found on the reefs at low water); Dring, H. M. S. Beagle.” MELVILL & STANDEN² do not record it from Torres Strait, but *C. rugosum*, Lam. is recorded from “Boydong Cays.” ED. RÖMER³ regards, and undoubtedly correctly, *C. Dupuchense*, Reeve, as a variety of *C. flavum*.

Cardium (Trachycardium) impolitum, Sow.

Cardium impolitum, G. B. SOWERBY, Proc. Zool. Soc. London, 1840, p. 107.

— — — Conchol. Illustr., Sp. 49, figs. 6 and 66.

— — — REEVE, Conchol. icon., II, *Cardium*, Sp. 80.

— — — MARTINI u. CHEMNITZ, Conchyl. Cabin., X, 2 Abth., p. 62, pl. XI, fig. 12.

Koh Chuen, 30 fathoms (1). Between Koh Kut and Koh Kahdat, 10 fathoms, shells (¹/₂). Between Koh Mesan and Cape Liant, 5–9 fathoms (¹/₂).

Long. 10 mm., alt. 12 mm. (long. 27 mm., alt. 33 mm.).

Distribution: — Karachi (MELVILL & STANDEN). — China (SOWERBY), Tahiti (FRAUENFELD).

Cardium (Trachycardium) arenicola, Reeve.

Cardium arenicolum, REEVE, Conchol. icon., II, 1843, *Cardium*, Sp. 78.

— *arenicola*, — LISCHKE, Japanische Meeres Conchyl., II, p. 125.

— *maculosum*, SOWERBY, Conchol. Illustr., Sp. 48, fig. 63 (non WOOD).

Koh Kram 20–30 fathoms (2 + ¹/₂). Around Koh Mesan and Koh Chuen, 5–38 fathoms, stones and shells (8). Koh Kahdat, 1–2 fathoms (¹/₂).

Long. 3 mm., alt. 3.5 mm. (long. 32 mm., alt. 38 mm.).

Distribution: — Red Sea (STURANY). — Philippines (CUMING), Nagasaki (LISCHKE).

The specimens from the Gulf of Siam have about 52–55 ribs, and as REEVE for his species states only 46 ribs, I thought, at first, that the specimens were perhaps *Card. transcendens*, Melvill & Standen,⁴ in which species there are 58 ribs. But J. COSMO MELVILL, to whom I sent a few specimens, kindly tells me that they

¹ According to a written communication from PH. DAUTZENBERG these specimens must most properly be referred to *C. Dupuchense* = *pectiniforme*, Born. The locality “Bangkok” is certainly due to a mistake.

² Journ. Linnean Soc. Zool., vol. XXVII, p. 191.

³ MARTINI u. CHEMNITZ, Conchyl. Cabin., *Cardiacea*, p. 58.

⁴ Journal of the Linnean Soc., Zoology, vol. 27, 1899, p. 199, pl. 11, fig. 21.

exactly agree with specimens of *Card. arenicola*, Reeve, from Ticao (Philippines) in his collection. LISCHKE's five specimens from Nagasaki have also only 46—47 ribs.

Cardium (Papyridea) rugatum, Gron.

- Cardium rugatum*, GRONOVIVS, Zoophylacium Gronovianum, 1781, fasc. III, p. 266, No. 1125, pl. 18, fig. 5.
 — — — MARTINI U. CHEMNITZ, Conchyl. Cabin., X Bd., 2 Abth., p. 77, pl. 3, figs. 1—3.
 — — — REEVE, Conchol. icon., II, *Cardium*, Sp. 63.
 — *apertum*, CHEMNITZ, Conchyl. Cabin., 1782, VI, p. 189, pl. 18, figs. 181—83.

North of Koh Kam, 5 fathoms, gravel (2).

Long. 35—40 mm.

Distribution: — Singapore, Mergui Archip. (v. MARTENS), Gulf of Manaar (THURSTON). — Philippines (CUMING, and others), Hong Kong (FRAUENFELD), Gulf of Yedo (LISCHKE), Java and Flores (DUNKER), Amboina (TAPPARONE CANEFRI), New Britain (v. MARTENS).

ED. v. MARTENS¹ thinks that *Solen bullatus* L. is undoubtedly synonymous with the present species.

Cardium (Papyridea) papyraceum, Chemn.

- Cardium papyraceum*, CHEMNITZ, Conchyl. Cabin., VI, 1782, p. 190, pl. 18, fig. 184.
 — — — REEVE, Conchol. icon., II, *Cardium*, Sp. 9.
 — — — MARTINI U. CHEMNITZ, Conchyl. Cabin., X Bd., 2 Abth., p. 78, pl. 3, fig. 4; pl. 12, figs. 19—20.
Papyridea papyracea, — HIDALGO, Obras malacológicas, I, tom. II, 1903, p. 344, No. 444.
Cardium muticum, REEVE, Conchol. icon., II, *Cardium*, Sp. 32.

Koh Kahdat, 1 fathom, sand (¹/₂).

Long. 28 mm.

Distribution: — Singapore (SV. GAD), Ceylon, Gulf of Manaar, Karachi, Mekran Coast, Persian Gulf, Gulf of Tadjourah (GRAVIER), Suez Canal (BAVAY), Mauritius, Natal. — Philippines, Japan (northwards to Hakodate), Blitong (post-tertiary), north and east coasts of Australia.

Cardium (Papyridea) Annae, Pilsbry.

- Cardium annae*, PILSBRY, Proc. Acad. Nat. Sc. Philadelphia, vol. 56, 1904, p. 557, pl. 40, fig. 20.

From Cape Liant to Koh Kut, common, 1—30 fathoms, sand, mud, gravel, and shells.

Long. 3—11 mm.

Distribution: — Japan (PILSBRY).

Among the individuals from the Gulf of Siam there are several in which the valves are almost quite white excepting the umbones which are purple in colour.

¹ Rumphius Gedenkboek, 1902, Mollusken, p. 127 (19).

Cardium (Papyridea) Hungerfordi, Sowb.

- Cardium (Papyridia) hungerfordi*, SOWERBY, Journal of Malacology, vol. VIII, 1901, p. 103, pl. IX, fig. 5.
 — *hungerfordi*, SOWERBY, PILSBRY, Proc. Acad. Nat. Sc. Philadelphia, vol. 56, 1904, p. 555, pl. 41, fig. 17.

Commonly distributed at Koh Chang, Koh Kut, Koh Kahdat and Koh Bidang, 3—30 fathoms, soft clay, sand and mud.

Largest specimen: Long. 9.5 mm.

Distribution:— Japan (SOWERBY, PILSBRY).

This species may easily be confounded with the young of *Card. coronatum*, Spgl., from which it is, however, distinguished by a stronger gloss, the absence of ribs at the middle, and by its often being ornamented with two reddish-brown tints at the middle on each side of the umbones (young specimens of *C. coronatum* have often reddish-brown wavy lines transversely across the valves), the valves are more tumid, and the posterior side somewhat prolonged in a rostrum-like manner. PILSBRY, however (loc. cit. p. 556), describes two varieties of *C. Hungerfordi*, to which some of these characters cannot be applied.

Cardium (Laevicardium) Australe, Sow.

- Cardium Australe*, SOWERBY, Proc. Zool. Soc. London, VIII, 1840, p. 105. — Conchol. Illustr., part 48, *Cardium*, figs. 12—12* (1834).
 — *australe*, — MARTINI u. CHEMNITZ, Conchyl. Cabin., X, 2 Abth., p. 70, pl. 12, figs. 8—9.
 — — — REEVE, Conchol. icon., II, *Cardium*, Sp. 97.
 — (*Bucardium*) *australe*, SOWERBY, EDG. SMITH, Rep. on the Lamellibranchiata of the Challenger Exped., p. 160.
 — (*Laevicardium*) — — — EDG. SMITH, Moll. of the Maldive and Laccadive Archipelagoes, 1903, II, pl. II, p. 625, No. 343.
 — *pulchrum*, REEVE, Conchol. icon., II, 1845, *Cardium*, Sp. 98.
 — (*Papyridea*) *pulchrum*, REEVE, ED. V. MARTENS, Mollusken d. Maskarenen u. Seychellen, 1880, p. 148.
 — — — — — EDG. SMITH, Rep. Zool. Collect. Voyage "Alert," 1884, p. 507, No. 11.

West of Koh Chang, 20 fathoms, mud (2).

Long. 11—12 mm.

Distribution:— Salang, Mergui Isls., Andamans, Ceylon, Gulf of Manaar, Maldive Archip., Gulf of Oman, Aden, Red Sea, Seychelles, Amirantes, Mascarenes, Zanzibar, Cape of Good Hope (JAY). — Poulo Condor, Philippines, China Sea, "Coasts of Australia," Lifu, Viti Isls., Samoa Isls.

As neither SOWERBY nor EDG. SMITH mention *Card. Australe*, Sow., in their lists of the Mollusca of South Africa I think that JAY's record of the occurrence of the species at the "Cape of Good Hope" should be regarded as open to doubt. It is a mistake when EDG. SMITH in his report on the *Lamellibranchiata* of the Challenger Expedition writes regarding this species that "it is not apparently adorned with an epidermis, judging from the series of specimens which I have examined," because already in 1878, in the "Proc. Zool. Soc. London," p. 819, he had written concerning this same species "The Andaman examples are rather young and bear the remains

of their epidermis, which takes the form of very thin, short, irregular yellowish lamellæ arising from the radiating striæ." In the specimens from the Gulf of Siam this epidermis is found especially upon the front and hinder sides of the valves; in addition, there is present especially upon the posterior end, slight remnants of epidermis between the radiating ribs. MELVILL and STANDEN¹ consider *C. tenuicostatum*, Lam. to be a variety of *C. Australe*, Sow.

Cardium (Laevicardium) lobulatum, Desh.

(Pl. V, Figs. 16–19).

Cardium lobulatum, DESHAYES, Proc. Zool. Soc. London, XXII, 1854, p. 332, No. 68.

At Koh Kahdat, 1–10 fathoms, sand and mud (14). South of Koh Mak, 5–6 fathoms (2).

Long. 23 mm., alt. 26 mm.

Distribution:— Maldive Archip. — Philippines.

I owe thanks to Mr. EDG. SMITH for the determination of the present species.

Hemicardium (Lunulicardia) retusum L.

Cardium retusum, LINNÉ, Systema Naturae, ed. XII, 1767, p. 1121, No. 75.

— — MARTINI u. CHEMNITZ, Conchyl. Cabin., X, 2 Abth., p. 118, pl. VI, figs. 1–4.

— — LINNÉ, REEVE, Conchol. icon., II, *Cardium*, Sp. 103.

— *subretusum*, SOWERBY, REEVE, Conchol. icon., II, *Cardium*, Sp. 100.

Several (23) specimens taken between Cape Liant and Koh Kut, 1–15 fathoms, sand, gravel and mud.

The specimens are all small, the largest specimen is 23 mm. broad.

Distribution:— Bay of Bengal, India (Madras), Ceylon, Gulf of Manaar, Red Sea, Suez Canal ("rare" M' ANDREW, COOKE), Seychelles, Réunion, Zanzibar. — Philippines, Torres Strait.

The records of the different authors concerning the distribution of this species to China (v. MARTENS, REEVE, and others) and Japan (DUNKER, and on his authority PILSBRY) are open to doubt, neither LISCHKE (Japan. Meeres Conchylien) nor P. FISCHER (Catalogue d. Moll. de l'Indo Chine) mention this species from these regions.

Hemicardium (Fragum) unedo L.

Cardium unedo, LINNÉ, Syst. Nat., ed. X, 1758, p. 680, No. 68.

— — — Mus. Ludovicæ Ultricæ reg., 1764, p. 488, No. 40.

— — — REEVE, Conchol. icon., II, *Cardium*, Sp. 13.

— — — MARTINI u. CHEMNITZ, Conchyl. Cabin., X, 2 Abth., p. 101, pl. 4, figs. 11–12.

Hemicardia unedo, LINNÉ, L. MORLET, Journ. de Conchyl., vol. 37, 1889, p. 168, No. 58.

At Koh Kahdat, 1–5 fathoms, sand (14).

Islands in the Gulf of Siam (MORLET).

Long. 6–8 mm.

¹ Proc. Zool. Soc. London, 1906, p. 837.

Distribution:— Singapore, Mergui Archip., Nicobars, Madras, Ceylon, Mauritius. — Poulo Condor, Cochin China, Philippines, Moluccas, Java, Malay Archip., New Guinea, Torres Str., Port Molle (Queensland), West Australia, Lifu Isl., Salomon Isls., Viti Isls.

The Danish Expedition obtained only quite small specimens of this species from the Gulf of Siam. Mr. PH. DAUTZENBERG writes to me that his *Hemicard. tegulatum*¹ must be regarded as a variety of *Hemicard. unedo* L.

Hemicardium (Fragum) fragum L.

(Pl. V, Fig. 20).

Cardium fragum, LINNÉ, Syst. Nat., ed. X, 1758, p. 679, No. 67. — ed. XII, p. 1123, No. 83.

— — — Mus. Ludov. Ulricæ reg., p. 488, No. 39.

— — — REEVE, Conchol. icon., II, *Cardium*, Sp. 23.

— — — MARTINI u. CHEMNITZ, Conchyl. Cabin., X, 2 Abth., p. 105, pl. 4, figs. 9—10.

Between Koh Kahdat and Koh Kut, 6 fathoms, clay mixed with sand (¹/₂). Koh Kahdat at the strand, numerous specimens. Koh Mak, sandy coast (⁵/₂).

Long. 4—10 mm.

Distribution:— Andamans, Nicobars, Gulf of Tadjourah, Mauritius, east coast of Africa, Querimba Isls. — China Sea, Philippines, Amboina, Java, Borneo, Sulu Isls., Liukiu Isls., Torres Strait, Port Curtis and Mast Head Reef (Queensland), New Zealand, New Caledonia, Gilbert Isls., Funafuti (Ellice Isls.), Paumotu Isls.

The specimens which have been obtained are all very small. According to O. FINSCH this species is used as food in the Gilbert Islands. Several specimens of a peculiar variety (var. *carinata* m.), with a decidedly prominent keel extending from the umbo down towards the hinder angle of the ventral side, produced by the strong development of the two ribs at that place, have been taken on the strand of Koh Kahdat and at Koh Chang; this variety is figured on Pl. V, Fig. 20.

Hemicardium (Fragum) carditæforme, Reeve.

(Pl. V, Figs. 21—22).

Cardium Carditæforme, REEVE, Conchol. icon., II, *Cardium*, Sp. 127.

Between Koh Mesan and Koh Chuen, 15—38 fathoms, stones with shells (7). Koh Chuen, 10—15 fathoms (1). Between Koh Mesan and Cape Liant, 5—9 fathoms, sand (¹/₂). Strand of Koh Kahdat (¹/₂). West of Koh Kong, 10—15 fathoms (1).

Long. 4—9 mm.

Distribution:— Andamans, Gulf of Suez (“rare” M^{ANDREW}, COOKE).

As the figure by REEVE is not good, I give a new figure of the species.

Hemicardium (Ctenocardium) fornicatum, Sow.

Cardium fornicatum, SOWERBY, Proc. Zool. Soc. London, 1840, p. 110.

— — — Conchol. Illustr., Sp. 84, fig. 50.

— — — REEVE, Conchol. icon., II, *Cardium*, Sp. 110.

¹ Journal de Conchyliologie, vol. 48, 1900, p. 5.

Hemicardium (Ctenocardium) fornicatum, SOWERBY, MELVILL & STANDEN, Proc. Zool. Soc. London, 1906, p. 840.

Cardium Adamsii, REEVE, Voyage of "Samarang," p. 77, pl. 22, fig. 2.

— *virgo*, REEVE, Conchol. icon., 1845, II, *Cardium*, Sp. 120.

Commonly distributed from the Gulf of Rayong and Cape Liant to Koh Kut, 1—15 fathoms, sand, mud, and gravel (26).

Long. 6—26 mm.

Distribution:— Andamans (EDG. SMITH), S. Nilandu and N. Male Atoll (EDG. SMITH), Persian Gulf (MELVILL & STANDEN), Red Sea (STURANY), Providence Isl., Mascarenes ("Alert"). — Borneo ("Samarang"), Tizard Bank, southern China Sea (EDG. SMITH), Tonga Isls. ("Challenger").

The present species is often difficult to distinguish from *Hemicardium imbricatum*, Sow. The number of the ribs is variable; the intercostal sculpture (at any rate in the material before me) is the same in both the species. SOWERBY says regarding *fornicatum* that the ribs are set with "vaulted imbrications," while EDG. SMITH¹ states regarding the same species that they are ornamented with "short hollow spines." In younger and well-preserved specimens these "spines" may be as well-developed as in *imbricatum*. The specimens from the Gulf of Siam are quite white on the outer side of the valves and precisely resemble *Card. virgo*, Reeve, which is synonymous with *C. fornicatum*, Sow.

Hemicardium (Ctenocardium) imbricatum, Sow.

Cardium imbricatum, SOWERBY, Proc. Zool. Soc. London, 1840, p. 110.

— — — Conchol. Illustr., Sp. 85, fig. 48.

— — — REEVE, Conchol. icon., II, *Cardium*, Sp. 28.

Several (22) specimens taken at Koh Chang, Koh Mak, Koh Kahdat, Koh Kut, Koh Samit and several places in 5—30 fathoms, mud, gravel, and clay mixed with sand.

Long. 6—27 mm.

Distribution:— Torres Strait (Murray Isl.), off Cape York (North Australia), West Australia (Swan River).

Card. hystrix, Reeve, from the Philippines and the Andamans, with strongly developed spines, approaches somewhat *Card. imbricatum*, Sow.

Fam. Tridacnidae.

Tridacna squamosa, Lam.

Tridacna squamosa, LAMARCK, Hist. nat. d. anim. s. vert., VI, 1 p. 1819, p. 106. — éd. 2, VII, 1836, p. 10.

— — — QUOY et GAIMARD, Voyage de l'Astrolabe, II, 1833, p. 487, pl. 79, fig. 1.

— — — MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 4 Abth., p. 5, pl. 1, figs. 1—3; pl. 2, figs. 1—2.

¹ Report on the Lamellibranchiata of the Challenger Expedition, p. 164.

- Tridacna squamosa*, LAMARCK, REEVE, Conchol. icon., XIV, *Tridacna*, Sp. 3.
 — — — SOWERBY, Thesaurus Conchyl., V, 1887, p. 180, pl. 485—489*, figs. 2, 7, 15, 17.
 — — — L. MORLET, Journ. de Conchyl., vol. 37, 1889, p. 168.
 — — — P. FISCHER, Catal. de Moll. de l'Indo Chine, p. 228.
 — — — HIDALGO, Obras malacológicas, I, tom. II, 1903, p. 386, No. 489.
 — *gigas* L. var. *squamosa*, LAMARCK, Ch. HEDLEY, Australian Museum, Sydney, Memoir III, 1896—1900, p. 504.

Koh Kahdat, 1—2 fathoms, coral (1).

Islands in the Gulf of Siam (MORLET).

Long. 245 mm.

Distribution:— Singapore, Mergui Isls., Nicobars, Ceylon, Seychelles. — Poulo Condor, Annam, Philippines, Loo Choo Isls., Japan, Moluccas, Sulu Isls., Java, Timor, New Guinea, Torres Strait, North and East Australia, New Caledonia, South Sea Islands (“What information we have, suggests that the range of this species is almost co-extensive with that of the reef-building corals.” CH. HEDLEY loc. cit.).

EDG. SMITH says¹ “I should not be surprised if *Tridacna squamosa* or *Tridacna rudis* should prove to be the early stages of this colossal form (*Tridacna gigas*).” A. H. COOKE² and CH. HEDLEY³ have arrived at a similar conclusion; HEDLEY thinks that “No characters of permanent value separate *T. squamosa* from *T. gigas*.”

Tridacna crocea, Lam.

- Tridacna crocea*, LAMARCK, Hist. nat. d. anim. s. vert., VI, 1 p. 1819, p. 106. — éd. 2, VII, 1836, p. 10.
 — — — QUOY & GAIMARD, Voyage de l'Astrolabe, II, 1833, p. 488, pl. 79, figs. 2—3.
 — — — MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 4 Abth., p. 6, pl. 1, fig. 6.
 — — — REEVE, Conchol. icon., XIV, *Tridacna*, Sp. 9 (incl. varr. Sp. 7 and 8).
 — — — SOWERBY, Thesaurus Conchyl., V, 1887, p. 181, pl. 486—87, figs. 5—6, 8—10.

North end of Koh Chang, 1 fathom, boring in old coral blocks (2). Koh Kahdat, in coral blocks (1).

Long. 115 mm., alt. 84 mm.

Distribution:— Singapore, Mergui Isls., Andamans, Nicobars, Persian Gulf, Aden, Madagascar. — Philippines, Loo Choo Isls., Moluccas, Cape York (N. Australia), Lifu, New Ireland, Rarotonga.

Fam. Chamidae.

Chama multisquamosa, Reeve.

- Chama multisquamosa*, REEVE, Conchol. icon., IV, 1846, *Chama*, Sp. 12.
 — — — MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 5 Abth., p. 33, pl. 14, figs. 1—2.

Many specimens taken in 23 different localities between Koh Rin and Koh Kut, 1—30 fathoms, sand, shells, clay and mud.

¹ Lamellibranchiata of the Challenger Expedition, p. 171.

² Annals & Magaz. Nat. Hist., Ser. 5, vol. 18, p. 97.

³ Australian Museum, Sydney, Memoir III, 1896—1900, pp. 504—5.

Largest specimen: Long. 31 mm., alt. 26 mm.

Distribution: — Singapore (low water, Sv. GAD), Poulo Condor, Philippines.

It is very disheartening to look through the literature of the species of the genus *Chama*, and of their distribution, because of the uncertainty and casuality which prevail in it; this is of course for the greater part due to the bad diagnoses and figures in which the characteristic marks of distinction, e. g. in the sculpture, are disregarded, and instead are given long descriptions of insignificant and usually individual details pertaining to colour and outline; but certainly authors are often too careless in determining solitary specimens without having a large quantity of material at their disposal for comparison — better no determination than an erroneous one. It is very characteristic when ED. V. MARTENS¹ says "Die Arten dieser Gattung sind sehr schwer gegeneinander abzugrenzen, daher ihre Bestimmung und Benennung oft etwas willkürlich," and A. H. COOKE:² "It would be impossible here to enter into a discussion of the facts in the case of a genus notoriously so variable as *Chama*, when REEVE has made fifty-five species out of material probably better represented by ten."

Chama fragum, Reeve.

Chama fragum, REEVE, Conchol. icon., IV, 1847, *Chama*, Sp. 48.

— — — MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 4 Abth., p. 22, pl. 10, figs. 2—3.

— — — CROSSE & FISCHER, Journ. de Conchyl., vol. XL, 1892, p. 76.

Koh Kram, 30 fathoms (²/₂). S. of Koh Chuen, 30 fathoms, shells (2). Koh Chang, at low tide (1). North end of Koh Chang, 1 fathom, old coral blocks (2). The sound between the stations, 3—5 fathoms, soft clay (1). Coast of Lem Ngob (¹/₂).

West coast of Cambodge in the Gulf of Siam (PAVIE).

Long. 27 mm., alt. 31 mm.

Distribution: — Persian Gulf (MELVILL & STANDEN), Aden (SHOPLAND), Red Sea (STURANY). — Philippines, Hong Kong, Spencer's Gulf, South Australia? (ANGAS), Samoa and Cook's Isls.? (Mus. Godeffroy).

Chama granulata, Clessin,³ is probably nothing else but the present species.

Chama cristella, Lam.

Chama cristella, LAMARCK, Hist. nat. d. anim. s. vert., VI, 1819, p. 96. — éd. 2, 1835, VI, p. 585.

— — — REEVE, Conchol. icon., IV, 1847, *Chama*, Sp. 42.

— *Reeveana*, CLESSIN, MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 4 Abth., p. 38, pl. 16, figs. 3—4.

Between Koh Mesan and Koh Chuen, 15 fathoms, stones (2). S. of Koh Chuen, 30 fathoms, shells (1).

Long. 21 mm., alt. 28 mm.

Distribution: — Mergui Archip., Moluccas (CLESSIN). — Java, Celebes, Spencer's Gulf? (South Australia, ANGAS).

¹ Die Mollusken d. Maskarenen u. Seychellen, 1880, p. 147.

² Annals and Magaz. of Nat. Hist., Ser. 5, vol. 18, p. 96.

³ MARTINI u. CHEMNITZ, Conchyl. Cabin., loc. cit., p. 40, pl. 17, fig. 4.

CLESSIN, in his deficient Monograph of the genus *Chama* (in MARTINI u. CHEMNITZ's Conchyl. Cabin.), states that the species, described by REEVE under the name of *Ch. cristella*, differs from LAMARCK's species, as LAMARCK's diagnosis does not at all agree with REEVE's form; therefore CLESSIN gives REEVE's species a new name (*Reeveana*, Clessin) and applies LAMARCK's name to a West Indian species which does not at all agree with LAMARCK's diagnosis. The whole of this change is unnecessary and incorrect; REEVE's and LAMARCK's forms are undoubtedly identical; besides REEVE expressly says: "the example here figured has been satisfactorily identified with LAMARCK's original specimen in the collection of M. DELESSERT."

Chama pulchella, Reeve.

Chama pulchella, REEVE, Conchol. icon., IV, 1846, *Chama*, Sp. 10.

— — — Report Zoolog. Collect. Voyage "Alert," 1884, p. 102, No. 35.

Koh Mak, sandy coast ($1\frac{1}{2}$).

Long. 35 mm., alt. 30 mm.

Distribution:— Torres Strait (MELVILL & STANDEN), Port Molle, Queensland (COPPINGER), Cape Upstart, New Holland (JUKES).

The exterior of the somewhat worn shell collected at Koh Mak is of a pretty pink colour.

Note. A small, solitary valve, which somewhat recalls *Chama cornuta*, Chemnitz, has been taken at Koh Tulu.

Chama cornuta, CHEMNITZ (var.), Conchyl. Cabin., VII, 1784, pp. 150 and 154, pl. 52, fig. 518.

— — — Der Naturforscher, XX, 1784, p. 13, pl. 1, fig. 3.

LAMARCK¹ was correct in doubting whether CHEMNITZ's *Ch. cornuta* was identical with his *Ch. florida* from St. Domingo (therefore in the list of synonyms belonging to that species he has queried the citation). CLESSIN,² however, in his Monograph of *Chama* has, as a matter of course, put CHEMNITZ's species as a synonym of *C. florida*, Lam., which is entirely wrong. CHEMNITZ's original specimen, which has been at my disposal, is from the Nicobars, and is a young individual which, because it has not been attached to any other object, has developed its umbones into a pair of twisted horns; as it is somewhat worn, it is not easy to form any definite opinion regarding this species.

Fam. Myidae.

Corbula (Aloidis) crassa, Hinds.

Corbula crassa, HINDS, Proc. Zool. Soc. London, XI, 1843, p. 55.

— — — Zoology of the voyage of H. M. S. "Sulphur." Mollusca, p. 67, pl. 20, figs. 1—3.

— — — REEVE, Conchol. icon., II, *Corbula*, Sp. 8.

— — — HANLEY, Catal. of recent biv. shells, p. 344, pl. 12, fig. 29.

— — — var., EDG. SMITH, Lamellibranchiata of the Challenger Exped., p. 30.

¹ Hist. nat. d. anim. s. vert., 2 éd., VI, p. 583.

² MARTINI u. CHEMNITZ, Conchyl. Cabin., VIII, 5 Abth., p. 12.

E. of Cape Liant, 9 fathoms, shells (5). Gulf of Rayong, 7—10 fathoms, sand and mud (2). S. of Koh Samit, 14—20 fathoms, mud (6). S. of Koh Tulu, 10 fathoms, mud (2). W. of Koh Chang, 20 fathoms, mud ($1\frac{1}{2}$). N. of Koh Kahdat, 4—5 fathoms, coarse sand (1). Koh Kahdat, 1—5 fathoms, sand (1). Between Koh Kahdat and Koh Kut, 6—10 fathoms, mud mixed with sand ($\frac{5}{2}$). Koh Mak, sandy coast ($\frac{2}{2}$). S. of Koh Mak, 5—6 fathoms (2). W. of Koh Kong, 10—15 fathoms (1).

Long. 8—24 mm.

Distribution:— Singapore, Strait of Malacca, Mergui Archip., Andamans, off Port Blair, Andaman Isls., 100 fathoms (EDG. SMITH), Gulf of Manaar. — Poulo Condor, Philippines, Formosa, Strait of Macassar, New Guinea, Torres Str., Mast Head Reef (Queensland), Port Essington, Dampier's Land (NW. Australia), NE. Australia.

The specimens, for the most part, are thick-valved and vary greatly in form, but quite thin-valved specimens also occur; thus, for example (from Singapore) a left valve of the following dimensions:— long. 19 mm., alt. 7 mm., crass. 4 mm.; it is very thin-valved, and without a trace of the denticulation upon the dorsal and ventral margins characteristic of the species; it greatly resembles EDG. SMITH'S species *C. Macgillivrayi*, and like the latter it has a shallow depression down the middle (which *C. crassa* also very frequently has); the hinge characters are also less pronounced than in the thick-valved specimens of *C. crassa* of the same size, from which it appears to differ greatly, but it is, in reality, only an unthickened individual.

Corbula (Aloidis) tunicata, Hinds.

Corbula tunicata, HINDS, Proc. Zool. Soc. London, 1843, p. 55.

— — — REEVE, Conchol. icon., II, *Corbula*, Sp. 5.

— — — Zoology of the voyage of "Sulphur," Mollusca, p. 68, No. 281, pl. 20, figs. 4—5.

— — — EDG. SMITH, Lamellibranchiata of the Challenger Exped., p. 29.

— — — PRITCHARD and GATLIFF, Proc. Roy. Soc. Victoria, vol. 16, 1903, p. 101.

— *scaphoides*, — Proc. Zool. Soc. London, 1843, p. 56.

— — — REEVE, Conchol. icon., II, *Corbula*, Sp. 24.

— — — EDG. SMITH, Lamellibranchiata of the Challenger Exped., p. 32, pl. 7, fig. 3.

— — — PRITCHARD and GATLIFF, Proc. Roy. Soc. Victoria, vol. 16, 1903, p. 101.

NW. of Koh si Chang, 10 fathoms, mud (1). Gulf of Rayong, 7—10 fathoms, mud ($1\frac{1}{2}$). Sound of Koh Chang, 5 fathoms, soft clay ($1\frac{1}{2}$). West coast of Koh Chang, 10 fathoms, mud ($\frac{2}{2}$). S. of Koh Bidang, 9 fathoms, mud (1). S. of Koh Mak, 5—6 fathoms (4). Between Koh Kahdat and Koh Kut, 6—10 fathoms, mud mixed with sand ($\frac{9}{2}$). N. of Koh Kut, 10 fathoms, mud ($\frac{2}{2}$). W. of Koh Kut, 15 fathoms, mud (3).

Long. 7—25 mm. (long. 25 mm., alt. 17 mm., crass. 14 mm.).

Distribution:— (*t.* = *tunicata*, Hinds; *s.* = *scaphoides*, Hinds). Singapore (*s.*), Mergui Archip. (*t.*), Ceylon (*s.*), Cape of Good Hope (*t.*). — Philippines (*t. s.*), China Sea (*t.*), Hong Kong Harbour (*s.*), Amboina (*t.*), Strait of Macassar (*t.*), Arafura Sea (*t.*), Torres Strait (*t. s.*), Cape York (*s.*), Port Jackson, Sydney (*t. s.*), Mast Head Reef, Queensland (*s.*), Port Molle, Queensland (*t. s.*), Victoria (*t. s.*), Port Darwin, NW. Australia (*t.*), Tasmania (*s.*).

I cannot find sufficient reason for separating the two forms *tunicata* and *scaphoides* as distinct species, the differences are entirely individual. Among the rather large quantity of material which I have at my disposal, are several transitional forms. The vivid coloration which HINDS has given in his figure of *tunicata* in the report of the "Sulphur" Mollusca, was not found by me in any of the individuals I have had for examination.

Corbula (Aloidis) erythrodon, Lam.

Corbula erythrodon, LAMARCK, Hist. nat. d. anim. s. vert., V, 1818, p. 496, No. 3. — éd. 2, VI, p. 138, No. 3.

— — — REEVE, Conchol. icon., II, *Corbula*, Sp. 4.

— — — LISCHKE, Japan. Meeres-Conchyl., I, p. 136.

E. of Cape Liant, 9 fathoms, shells ($1\frac{1}{2}$). N. of Koh Kam, 5 fathoms, gravel (2). Between Koh Riot and Koh Mesan, 3—5 fathoms, sand (1). Between Koh Mesan and Cape Liant, 9 fathoms (1). Koh Kahdat, 1—5 fathoms, sand ($2 + \frac{1}{2}$). Between Koh Kut and Koh Kahdat, 10 fathoms, shells ($1\frac{1}{2}$).

Long. 7—20 mm.

Distribution: — Poulo Condor, China, Japan, New Zealand.

Corbula pallida, Hinds (recorded from Singapore and the Nicobars), is certainly synonymous with the present species.

Corbula lineata n. sp.

(Pl. V, Figs. 23—24).

This species is oblong-triangular in form, somewhat inequivalve (the right valve being somewhat larger than the left), moderately convex, the valves thick and solid, and whitish in colour with slight indication of pale red. The umbo is situated at about the middle, often nearer to the front end. The apices of the umbones are placed close together and they curve over towards the front. From the umbo a sharp keel extends over each valve down towards the posterior extremity, which is prolonged in a rostrum-like manner. The dorsal margin slopes gradually down towards the front end, from whence it is continued in a curve down to the straight ventral margin. Towards the pointed posterior end the dorsal margin slopes in a straight line. In both valves, when the animal has reached a certain size, the ventral margins turn back and grow inwards towards each other. The portion of the posterior end which is bounded by the two keels forms an oval; towards the central line (the opening between the valves) of this oval there occurs on each side a smaller keel, by which another oblong oval is formed. The surface of the valves is covered with close-set, concentric, raised thread-like lines, the interstices between which are finely striped transversely with close-set radiating lines. The interior of the valves is white, the muscle impressions and the pallial line are yellow; a narrow depression extends from the umbonal region down towards the ventral margin. The solitary cardinal tooth in the right valve is large, strong and curved upwards; it fits into a corresponding pit in the left valve, behind which there is a large denticle supporting the ligament.

Long. 8.5 mm., alt. 5 mm., crass. 4.5 mm.

Between Koh Mesan and Cape Liant, 9 fathoms (3).

The present species, which somewhat resembles the West Indian species *Corb. Kjaeriana*, C. B. ADAMS,¹ is very characteristic and can easily be distinguished by its form and beautiful sculpture.

Corbula subquadrata, Melvill.

Corbula subquadrata, MELVILL, Proc. Zool. Soc. London, 1906, p. 843, pl. 56, fig. 7.

Koh Chuen, 30 fathoms (1). Coast of Lem Ngob, low tide, stones (9). Koh Chang, low tide (¹/₂). North of Koh Kut, 10 fathoms, mud (⁷/₂).

Long. 2.5–6 mm. (long. 5 mm., alt. 3.5 mm., crass. 2.5 mm.).

Distribution:—Bombay, Persian Gulf, Gulf of Oman.

This species varies greatly both in regard to outline and convexity; several of the specimens from the Gulf of Siam agree exactly with MELVILL's figure, while others differ in outline and are oblong (long. 6 mm., alt. 4 mm., crass. 3.5 mm.); but the peculiar hanging rostrum and the strong sculpture are found in all the individuals. MELVILL, in his diagnosis, does not mention that the concentric folds upon the whole surface and also the interstices between them, seen under magnification, are transversely closely striped; this ornamentation is very characteristic, and occurs in all my specimens. In full-grown specimens there are usually more than "about 12 concentric ribs" (as stated by MELVILL), and although in the umbonal region their prominence is extremely slight, yet often at least fourteen fully developed folds may be counted.

Corbula arcaeformis n. sp.

(Pl. V, Figs. 25–26).

The shell is oblong, very convex, clear-white, thin and dully pellucid; it is twice as long as it is high, rounded at the anterior end and drawn out into a point at the posterior end. From the beak a keel extends to the point of the posterior end; the space thereby formed between the dorsal side and the keel, is divided into two halves by a groove which originates at the beak. The middle portion of the shell, especially towards the ventral side, is depressed, and this makes the ventral margin concave. The surface is covered with fine, irregular lines of growth, which towards the ventral side are coarser; these are most pronounced upon the space mentioned above limited by the keel. Under magnification may be seen in the shell-substance a great many fine, white lines, which radiate from the umbones down towards the ventral margin; in quite young individuals and in the umbonal region of well-preserved, older specimens, these lines may be seen as small, fine, irregular, slightly raised stripes. The beaks are situated in the front third of the

¹ DALL, Report on the Mollusca coll. by the Steamer "Blake," I, 1886, p. 316, pl. I, fig. 6. The American conchologists erroneously name this species *C. Kjoeriana*.

shell and curve over towards the front. In the right valve there is one cardinal tooth, which fits into a corresponding pit in the left valve, behind which is a stout process or denticle supporting the ligament. The interior of the valves, like the exterior, is clear-white in colour.

Long. 9.5 mm., alt. 5 mm., crass. 5.5 mm.

Between Koh Kut and Koh Kahdat, 10 fathoms, shells ($\frac{2}{2}$). Koh Kahdat ($\frac{1}{2}$). South of Koh Kahdat, 8—10 fathoms, mud ($\frac{4}{2}$).

This small characteristic species, which in form recalls an *Arca* (*Barbatia*), stands nearest *Corbula tenuis*, Sow., from which it differs, however, in many points. The specimens which I have before me are not well-preserved, no trace of epidermis is seen upon any of them; also, I cannot, unfortunately, state anything about the reciprocal size of the two valves. But in all probability, the difference in size is not very great, as both right and left valves are at hand, but of different individuals.

Corbula rugifera, A. Ad. (Smith).

Corbula rugifera, A. ADAMS, MS. in Coll. Cuming. Brit. Mus.

— — — EDG. SMITH, Proc. Malacolog. Soc. London, V, 1903, p. 399, No. 373, pl. 15, figs. 9—10.

— — H. ADAMS, MELVILL and STANDEN, Proc. Zool. Soc. London, 1906, p. 843.

Koh Kram, 20 fathoms ($\frac{2}{2}$).

Long. 3.5—8 mm.

Distribution:— Singapore (Sv. GAD, Zoolog. Mus. Copenhagen). Karachi (Hindustan, MELVILL). Umkomaas (South Africa, BURNUP).

After EDG. SMITH in 1903 had published the description of the present characteristic species from South Africa, MELVILL, in 1906, recorded that it had been taken at Karachi. Its occurrence at Singapore and in the Gulf of Siam, renders it probable that later on it may also be found in the interjacent waters.

Corbula Taheitensis, Lam.

Corbula taïtensis, LAMARCK, Hist. nat. d. anim. s. vert., V, 1818, p. 496, No. 5.

— *Taïtensis*, — — — — — éd. 2, VI, p. 139, No. 5.

— *Taheitensis*, — REEVE, Conchol. icon., II, *Corbula*, Sp. 15.

— *Tahitensis*, — HANLEY, Catal. of rec. biv. shells, p. 46, pl. 12, fig. 30.

— *Taitensis*, — HIDALGO, Fauna malacol. de l. isl. Filip., II, 1903, p. 31, No. 59.

Koh Chuen, 30 fathoms ($\frac{1}{2}$). Between Koh Mesan and Koh Chuen, 25—38 fathoms, stones and shells ($1 + \frac{2}{2}$). North end of Koh Chang, 12 fathoms, old coral blocks ($\frac{1}{2}$).

Long. 6—8 mm.

Distribution— Aden. — Philippines, New Guinea, Torres Str., Tahiti, Funafuti Atoll (HEDLEY).

Corbula sulcata, Lam.

- Corbula sulcata*, LAMARCK, Systême d. anim. s. vert., 1801, p. 137. — Hist. nat. d. anim. s. vert., V, 1818, p. 495, No. 2. — éd. 2, VI, p. 138, No. 2.
 — — — — — Encyclop. méthod. Hist. nat. d. vers, II, 2, 1830, p. 8, No. 1. — Tableau encycl. et méth. Moll. test., pl. 230, fig. 1.
 — — — — — HANLEY, Catal. of rec. bivalve shells, p. 45, pl. 13, fig. 48.
 — — — — — REEVE, Conchol. icon., II, *Corbula*, Sp. 2.

NW. of Koh si Chang, 10 fathoms, mud (1). North of Koh Kut, 10 fathoms, mud ($1^{18/2}$). W. of Koh Kut, 10–15 fathoms, mud ($1 + \frac{22}{2}$). Between Koh Kut and Koh Kahdat, 10 fathoms, shells ($1^{12/2}$). Koh Kahdat ($7/2$).

Long. 5–14 mm. (alt. 12·5 mm., long. 14 mm.).

Distribution: — LAMARCK records: l'Océan indien? HANLEY and REEVE: Senegal. ROCHEBRUNE: Porto-Praya (RANG).

Corbula fortisulcata, Smith, is very closely allied to the present species. In the British Museum there is a specimen labelled "*Corbula fortisulcata*, Smith var." from "Jack's Island, South Sea," which agrees completely with some of the specimens from the Gulf of Siam, and these cannot possibly be separated from *C. sulcata*, as there are evenly transitional forms between them and the typical *C. sulcata*, Lam.

Corbula monilis, Hinds.

(Pl. V, Figs. 27–30).

- Corbula monilis*, HINDS, Proc. Zool. Soc. London, XI, 1843, p. 58.
 — — — — — REEVE, Conchol. icon., II, *Corbula*, Sp. 35.
 — — — — — EDG. SMITH, Lamellibranchiata of the Challenger Expedit., p. 34.
 — — — — — HIDALGO, Fauna malacol. de l. isl. Filipinas, II, p. 33, No. 64.

Many specimens taken in 19 different localities between Koh Kram and Koh Kut, 1–30 fathoms, sand, mud and shells.

Long. 1·5–3 mm.

Distribution: — Singapore (2–3 fathoms, coral reef, Sv. GAD). — Philippines, Torres Strait, Mast Head Reef (Queensland),

Corbula solidula, Hinds.

(Pl. V, Figs. 31–34 and 42–44).

- Corbula solidula*, HINDS, Proc. Zool. Soc. London, XI, 1843, p. 58.
 — — — — — REEVE, Conchol. icon., II, *Corbula*, Sp. 41.
 — — — — — Mollusca of the voyage of H. M. S. "Sulphur," 1845, p. 69, No. 288.
 — — — — — HIDALGO, Fauna malacol. de l. isl. Filipinas, II, 1903, p. 34, No. 66.
 — *eburnea*, — Proc. Zool. Soc. London, XI, 1843, p. 58.
 — — — — — REEVE, Conchol. icon., II, *Corbula*, Sp. 42.
 — — — — — Mollusca of the voyage of H. M. S. "Sulphur," 1845, p. 69, No. 290, pl. 20, fig. 14.
 — — — — — HIDALGO, Fauna malacol. de l. isl. Filipinas, II, 1903, p. 34, No. 67.

Many specimens taken in 26 different localities between Koh si Chang and Koh Kut, 1–30 fathoms, mud, sand, shells and clay.

Long. 2–4·5 mm.

Distribution:— Philippines, Strait of Macassar, New Guinea.

HINDS says regarding *eburnea* "This shell closely approaches *C. solidula*, but is distinguished by its somewhat more triangular shape, polished, ivory-like, flattened valves, and the slightly sulcate sculpture." All these characters are however not constant; among the large quantity of material at my disposal, in which both forms occur, there are evenly transitional forms between the polished, almost smooth *eburnea*, ornamented with only a few slight transverse ribs towards the ventral margin, and the strongly ribbed, thick-valved *solidula*. The outline varies somewhat, the colour is clear-white in almost all the specimens from the Gulf of Siam. CUMING's specimens of *eburnea* from the Philippines are of a yellowish colour, but otherwise agree entirely with my individuals from the Gulf of Siam.

Corbula (?) *mirabilis* n. sp.

(Pl. V, Figs. 35—37).

The shell is squarish-oblong in form, flat, thin-valved and white. The umbones are situated towards the posterior end. The prodissoconch is clear, smooth and glossy. Anteriorly the upper margin is straight and passes by a gentle arch into the front margin, which forms a semi-circle. The ventral margin is straight, and parallel with the upper margin. The posterior margin passes in an almost straight line obliquely down from the umbo; a rugged keel extends right across the posterior part of the shell from the umbo down to the point at which the ventral and the posterior margins meet. The surface is rough and the lines of growth are coarse and irregular. The interior of the valves is somewhat glossy and the roughness of the surface can here be seen owing to the thinness of the valves. In the hinge there is anteriorly a crater-like depression (probably for the reception of a tooth in the left valve). The margins of this depression have, at the back, a small, pointed tooth and at the front a larger tooth which is continued anteriorly into a long lamella immediately under the upper margin of the valve; beside and somewhat in front of the larger tooth mentioned there are, in addition, upon the upper margin, two tooth-like nodules which project beyond the margin and are visible outside of the shell. Behind the circumscribed depression named is a triangular excision almost immediately under the apex; upon the upper edge of the thickened posterior margin there is a shallow groove in which, no doubt, the ligament is placed; this groove is limited above by a tooth-like process upon the upper margin which, upon the surface of the shell, resembles a small ear. The front muscle-impression is distinctly visible, but the pallial line only partially; the pallial sinus appears to be wanting.

Long. 11 mm., alt. 5.5 mm., crass. (test. dextr.) 1 mm.

North of Koh Kut, 10 fathoms, mud ($1\frac{1}{2}$).

The above diagnosis is based upon the solitary (probably right) valve obtained, and I refer the specimen, but with great doubt, to the genus *Corbula*. In spite of

the dental peculiarities, I am of opinion that it ought most properly to be placed under the family *Corbulidae*. It will be of interest, when complete specimens are at hand, to ascertain accurately the systematic place of this characteristic form.

***Sphenia quadrangularis* n. sp.**

(Pl. V, Figs. 38—41).

This shell is squarish-oblong in form, flat, white, very thin, hyaline, and glossy. The umbones, which are not very prominent, are situated at about the middle, slightly towards the posterior end. The protoconch is circumscribed as a small, clear, smooth vesicle. The upper side rounds evenly into the anterior end which is continued in a curve to the ventral side which is quite straight. From the umbo a sharp keel extends over the shell down to the posterior part of the ventral side; the ventral margin meets, almost at a right angle, the posterior margin which ascends steeply towards the upper side into which it passes with rounded outline. The surface is rough and the lines of growth are coarse, especially upon the flat middle part of the shell where the surface towards the ventral side has numerous grooves and stripes. The interior of the valves is glossy, and owing to their thinness the roughness of the surface also occurs on the interior. In the left valve there is a pointed, somewhat triangular cardinal tooth, which is situated in front of and below the apex; this tooth fits into a pit in the hinge-plate of the right valve; this hinge-plate is situated in the front of the apex and there also occurs upon it, in front of the above-mentioned pit, a small nodule, like a rudimentary tooth. The front part of the upper margin in the right valve rises along a short distance, so that it protrudes somewhat above the margin of the left valve. The ligament is internal, the impressions of the adductor muscles, the pallial line, and the pallial sinus cannot be seen.

Long. 10 mm., alt. 5 mm., crass. 3 mm.

The coast of Koh Kahdat (1).

I refer this highly characteristic species with some doubt to the genus *Sphenia*; when a larger quantity of material is at hand (unfortunately only a single dead specimen has been obtained) its place will be ascertained with greater certainty. When EDG. SMITH¹ writes regarding *Sphenia perversa*, Blanford, that:—“Mr. BLANFORD makes a curious mistake with regard to the hinge. He says, “In every respect, except the position of the lamellar tooth in the hinge of the left valve instead of the right, the shell appears to be a true *Sphenia*.” In Mr. BLANFORD’S figure the “lamellar tooth” is properly depicted in the left valve; in specimens of this species in the British Museum it is also in the left, and in every other species and specimen examined by the writer it is in the same valve,” — the reason for this must undoubtedly be sought in the fact that BLANFORD² has seen, in several text-books (e. g. by

¹ Annals and Mag. of Natural History, vol. XII, 6 Ser., 1893, p. 279.

² Journ. of the Asiatic Soc. of Bengal, vol. 36, II, 1867, p. 68.

H. & A. ADAMS,¹ TRYON,² P. FISCHER,³ and others), the erroneous statement that the characteristic cardinal tooth occurs in the right valve, while, in reality (as correctly stated by TURTON,⁴ FORBES & HANLEY,⁵ EDG. SMITH,⁶ and others), it is found in the left valve.

Sphenia perversa, Blanf.

Sphenia perversa, BLANFORD, Journ. of the Asiatic Society of Bengal, vol. 36, p. II, 1867, p. 68, pl. 3, figs. 4—6.

— — — EDG. SMITH, Annals and Magaz. Nat. Hist., vol. 12, 6 Ser., 1893, p. 279, No. 6, pl. 15 A, fig. 6.

Between Koh Mesan and Koh Chuen, 25—38 fathoms, stones and shells (1). Koh Chuen, 10—15 fathoms (1). Between Koh Mesan and Cape Liant, 5—9 fathoms ($1\frac{1}{2}$). Coast of Lem Ngob, low tide (4). Koh Chang, low tide (1). North end of Koh Chang, 1—12 fathoms, old coral blocks (12). Gulf at the south end of Koh Chang (6). North of Koh Kahdat, 4—5 fathoms, coarse sand (1). Koh Kahdat, 1—2 fathoms, corals (1).

Long 2—11 mm.

Distribution: — Delta of the Irawady, Pegu.

Like all Mollusca that live in holes and tunnels, which they themselves have made or which were made in other ways, *S. perversa*, Blanf., varies greatly in form according to the locality which it inhabits; I think it will scarcely be possible to maintain EDG. SMITH's species *S. inaequalis* from Singapore; I have specimens of *S. perversa* Blanf., before me with flat left valves and which otherwise almost completely agree with SMITH's figure and description of *S. inaequalis*, but the flat left valve is certainly an individual character only.

Cryptomya elliptica, A. Ad.

Sphenia elliptica, A. ADAMS, Proc. Zool. Soc. London, XVIII, 1850, p. 88.

Cryptomya — — — Annals & Mag. Nat. Hist., 1868, p. 366.

— — — ANGAS, Proc. Zool. Soc. London, 1871, p. 99.

— — — DUNKER, Index moll. mar. Japonici, 1882, p. 178, pl. 7, figs. 17—19.

— *truncata*, GOULD, Otia Conchol., p. 163.

Koh Kahdat ($1\frac{1}{2}$). S. of Koh Kahdat, 8—10 fathoms, mud ($\frac{4}{2}$). N. of Koh Kut, 10 fathoms, mud ($2 + \frac{4}{2}$). W. of Koh Kut, 15 fathoms, mud ($\frac{6}{2}$).

Long 4—12.5 mm.

Distribution: — Japan, Sydney.

¹ The Genera of recent Mollusca, II, 1858, p. 357.

² Structural and systematic Conchology, III, 1884, p. 140.

³ Manuel de Conchyliologie, 1887, p. 1122.

⁴ Conchylia insul. Britannicarum, 1822, p. 36.

⁵ A history of British Mollusca, I, 1853, p. 192.

⁶ loc. cit. p. 279.

Fam. Solenidae.

Solen grandis, Dunk.

- Solen grandis*, DUNKER, Proc. Zool. Soc. London, 1861, p. 418, No. 1.
 — — — Novitates Conchol., II, Meeres Conchyl., p. 71, No. 77, pl. 24, fig. 5.
 — — — LISCHKE, Japanische Meeres-Conchyl., I, 1869, p. 141.
 — — — SOWERBY in REEVE, Conchol. icon., vol. XIX, *Solen*, Sp. 5.
 — — — CLESSIN in MARTINI u. CHEMNITZ, Conchyl. Cabin., XI Bd., 3 Abth., p. 18, No. 20, pl. 7, fig. 1.
 — — — E. v. MARTENS, Süss- u. Brackwasser-Moll. d. Ind. Archipels, p. 274.

Off Koh Kam, 10 fathoms, gravel ($1\frac{1}{2}$).

Long. 56 mm.

Distribution:— Philippines, China, Japan.

S. Ceylonensis, Leach (= *S. intermedius*, Koch = *S. truncatus*, Wood (Sow.)), *S. curtus*, Desm. (= *S. abbreviatus*, Phil. = *S. brevis*, Reeve), and *S. regularis*, Dunk., come exceedingly near *S. grandis*, Dunk.

Solen corneus, Lam.

- Solen corneus*, LAMARCK, Hist. nat. d. anim. s. vert., V, 1818, p. 451, No. 2. — éd. 2, VI, p. 54, No. 2.
 — — — DELESSERT, Recueil de coquilles décr. p. Lamarck, 1841, pl. 2, fig. 2.
 — — — PHILIPPI, Abbild. neuer od. wen. gek. Conchyl., III, p. 44, No. 3, pl. 2, fig. 2.
 — — — SOWERBY in REEVE, Conchol. icon., XIX, *Solen*, Sp. 19 (non pl. 7, fig. 18 b).
 — — — DUNKER, Index moll. mar. Japon., 1882, p. 173.
 — — — CLESSIN in MARTINI u. CHEMNITZ, Conchyl. Cabin., XI Bd., 3 Abth., p. 9, pl. 2, figs. 8—9.
 — — — E. v. MARTENS, Süss- u. Brackwasser-Moll. d. Ind. Archip., p. 276, No. 5.
 — — — HIDALGO, Fauna mal. de l. isl. Filipinas, II, 1903, p. 16, No. 32.
 — — — EDG. SMITH & BLOOMER, Proc. Zool. Soc. London, 1906, II, p. 856.

The strand off the Mangrove at the station on Koh Chang ($1 + \frac{1}{2}$).

Long. 31—38 mm.

Distribution:— Karachi, Gulf of Manaar, Gulf of Aden, Red Sea, Chuaka Bay (Zanzibar Island), Durban. — Philippines, Tschifu (Gulf of Petschili), Japan, Java, Borneo.

This species is recorded with doubt by K. MARTIN¹ from "the stream-tin-deposits" of Blitong (a post-tertiary formation).

Solen linearis, Spengl.

- Solen linearis*, SPENGLER, Skrivter af Naturhistorie-Selskabet, III, 2 H., 1794, p. 87, No. 3.
 — — — CHEMNITZ, Conchyl. Cabin., XI, 1795, p. 198, pl. 198, figs. 1931—32.
 — — — CHEMNITZ, SOWERBY in REEVE, Conchol. icon., XIX, *Solen*, Sp. 22.
 — — — CLESSIN in MARTINI u. CHEMNITZ, Conchyl. Cabin., XI Bd., 3 Abth., p. 23, No. 29, pl. 9, fig. 4.
 — — — SPENGLER, E. v. MARTENS, Süss- u. Brackwasser-Moll. d. Ind. Archipels, p. 277, No. 6.
 — — — CHEMNITZ, HIDALGO, Fauna malacol. de l. isl. Filipinas, 1903, II, p. 16, No. 31.

¹ Notes from the Leyden Museum, III, 1881, pp. 20 and 22.

Between Koh Rin and Cliff Rock, 15 fathoms ($1 + \frac{1}{2}$). Between Koh Mesan and Cape Liant, 5—9 fathoms ($\frac{2}{2}$). Koh Chuen, 30 fathoms ($\frac{1}{2}$). West of Koh Kut, 15 fathoms, mud (1).

Long. 15—66 mm.

Distribution:— Nicobars, Ceylon. — Philippines, Japan, Borneo, Java.

Solen vaginoides, Lam.

- Solen vaginoides*, LAMARCK, Hist. nat. d. anim. s. vert., V, 1818. p. 451, No. 3. — éd. 2, VI, p. 54, No. 3.
 — — — DELESSERT, Recueil de coquilles décr. p. Lamarck, 1841, pl. 2, fig. 3.
 — — — PHILIPPI, Abbild. u. Beschreib. neuer od. wen. gekannt. Conchylien, I, p. 36, No. 3, *Solen*, pl. 1, fig. 3.
 — — — SOWERBY in REEVE, Conchol. icon., XIX, *Solen*, Sp. 23.
 — — — CLESSIN in MARTINI u. CHEMNITZ, Conchyl. Cabin., XI Bd., 3 Abth., p. 16, No. 17, pl. 7, fig. 2.
 — — — PRITCHARD and GATLIFF, Proc. Roy. Soc. Victoria, vol. 16, 1903, p. 99.

Between Koh Mesan and Cape Liant, 5—9 fathoms ($\frac{1}{2}$). South of Koh Chuen, 30 fathoms, shells ($\frac{1}{2}$). Sound of Koh Chang, 5 fathoms, soft clay ($\frac{2}{2}$). Between Koh Kut and Koh Kahdat, 10 fathoms, shells ($\frac{1}{2}$). West of Koh Kut, 30 fathoms, sand and mud ($\frac{1}{2}$).

Long. 6—38 mm.

Distribution:— Singapore, shallow water (SV. GAD, $\frac{4}{2}$). “Habite au canal d’Entrecastaux, et à toutes les îles de la Nouvelle Hollande” (LAMARCK). South Australia, Tasmania.

The specimens from the Gulf of Siam exactly agree with PHILIPPI’s figure and description.

Cultellus scalprum, Gould.

- Solen scalprum*, GOULD, Proc. Boston Soc. Nat. Hist., III, (1849) 1850, p. 214. — Expedition Shells, p. 74. — Unit. States Explor. Exped., Mollusca, p. 388, pl. 33, fig. 502 (non *Solen scalprum*, King).
Pharus — — — CONRAD, American Journ. of Conchol., III, Append., p. 26.
Cultellus — — — E. v. MARTENS, Süss- u. Brackwasser-Mollusken d. Ind. Archipels, 1897, p. 265, No. 2.
 — *subellipticus*, DUNKER, Proc. Zool. Soc. London, 1861, p. 421, No. 15.
 — — — SOWERBY in REEVE, Conchol. icon., vol. 19, *Cultellus*, Sp. 9 (non fig. 9, pl. III).
 — — — CLESSIN in MARTINI u. CHEMNITZ, Conchyl. Cabin., XI Bd., 3 Abth., p. 43, No. 10, pl. 16, fig. 3.
Siliqua subelliptica, — P. FISCHER, Catalogue d. Moll. de l’Indo Chine, p. 273.

Golfe de Siam (L. MORLET).

The Danish Expedition to Siam collected no specimens of this species.

Distribution:— Singapore, Strait of Malacca, Poulo Penang, Salang, Mergui Archip. — Java.

Note. *Cultellus vitreus*, Dunker, was taken in 2—3 fathoms at Singapore.

Cultellus (Pharella) ovalis, Dunk.

- Pharella ovalis*, DUNKER, Proc. Zool. Soc. London, 1861, p. 423, No. 24.
 — — — Novitates Conchologicae, Moll. mar., p. 118, No. 134, pl. 39, fig. 4.
Cultellus — — SOWERBY in REEVE, Conchol. icon., XIX, *Cultellus*, Sp. 24.
Pharella — — CLESSIN in MARTINI u. CHEMNITZ, Conchyl. Cabin., XI Bd., 3 Abth., p. 56, No. 7, pl. 10, fig. 5.
 — — — P. FISCHER, Catalogue d. Moll. de l'Indo-Chine, p. 273.
Cultellus (Pharella) ovalis, DUNKER, E. v. MARTENS, Süß- u. Brackwasser-Moll. d. Ind. Archipels, p. 269, No. 7.

Sound of Koh Chang, 3—4 fathoms, soft clay ($\frac{4}{2}$). Coast of Lem Ngob ($\frac{1}{2}$).
 Long. 13—68 mm.

“Golfe de Siam” (MORLET).

Distribution: — Singapore.

DUNKER'S and SOWERBY'S figures of this species differ rather considerably; my specimens correspond exactly with SOWERBY'S figure, which also agrees best with the diagnosis.

Cultellus (Ensiculus) cultellus L.

- Solen Cultellus*, LINNÉ, Syst. Nat., ed. X, 1758, p. 673, No. 27. — ed. XII, p. 1114, No. 37. — Mus. Ludov. Ultricæ reg., 1764, p. 474, No. 15.
 — *cultellus*, — CHEMNITZ, Conchyl. Cabin., VI, 1782, p. 52, pl. 5, figs. 36—37.
 — — — LAMARCK, Hist. nat. d. anim. s. vert., V, 1818, p. 453, No. 8. — éd. 2. VI, 1835, p. 56, No. 8.
Ensiculus cultellus, LINNÉ, H. ADAMS, Proc. Zool. Soc. London, XXVIII, 1860, p. 369.
Cultellus — — SOWERBY in REEVE, Conchol. icon., XIX, 1874, *Cultellus*, Sp. 23.
Ensiculus — — DUNKER, Index moll. mar. Japon., 1882, p. 174.
Cultellus — — CLESSIN in MARTINI u. CHEMNITZ, Conchyl. Cabin., XI Bd., 3 Abth., p. 40, No. 6, pl. 3, figs. 7—8, pl. 14, fig. 2.
 — — — E. v. MARTENS, Süß- u. Brackwasser-Moll. d. Ind. Archipels, 1897, p. 270, No. 8.
 — — — HIDALGO, Fauna malacol. de l. isl. Filipinas, II, 1903, p. 23, No. 44.
 — *cumingianus*, DUNKER, Proc. Zool. Soc. London, 1861, p. 422, No. 19.
 — *Cumingianus*, — SOWERBY in REEVE, Conchol. icon., XIX, *Cultellus*, Sp. 7.
 — — — CLESSIN in MARTINI u. CHEMNITZ, Conchyl. Cabin., XI Bd., 3 Abth., p. 39, No. 4, pl. 14, fig. 5.
 — *lividus*, — Proc. Zool. Soc. London, 1861, p. 423, No. 21.
 — — — SOWERBY in REEVE, Conchol. icon., XIX, *Cultellus*, Sp. 1.
 — — — CLESSIN in MARTINI u. CHEMNITZ, Conchyl. Cabin., XI Bd., 3 Abth., p. 40, No. 5, pl. 14, fig. 4.
 — *concinus*, DUNKER, Proc. Zool. Soc. London, 1861, p. 423, No. 23.
 — (*Ensiculus*) *Philippianus*, DUNKER, Malakozool. Blätter, 1877, p. 68, No. 4.
Ensiculus Philippianus, DUNKER, Index moll. mar. Japon., p. 174, pl. 7, fig. 23. (*Ensiculus Philippii*, Dunk.).
Cultellus — — CLESSIN in MARTINI u. CHEMNITZ, Conchyl. Cabin., XI Bd., 3 Abth., p. 36, No. 1, pl. 4, fig. 5.
Ensis asperus, DUNKER in schedis, CLESSIN in MARTINI u. CHEMNITZ, Conchyl. Cabin., XI Bd., 3 Abth., p. 45, No. 13, pl. 14, fig. 3.

Off Koh Kam, 10 fathoms, gravel (1). N. of Koh Kam, 5 fathoms, gravel ($\frac{1}{2}$).
 Between Koh Mesan and Cape Liant, 5—9 fathoms (1). S. of Koh Chuen, 30 fathoms,

shells ($1\frac{1}{2}$). W. of Koh Chang, 20 fathoms, mud (1). S. of Koh Mak, 5–6 fathoms (1). Koh Kahdat, 1 fathom, sand and corals (3).

Long. 22–56 mm.

Distribution:— Singapore (Danish Exped. to Siam, 2–3 fathoms, coral reef, 2 specimens), Andamans, Tranquebar, Ceylon, Mekran Coast, Persian Gulf, Aden, Red Sea, Suez (50 m., STURANY). — Philippines, China, Japan, Amboina, Java, New Guinea, Torres Strait.

Cultellus (Ensiculus) cultellus L. var. marmoratus, Dunk.

Cultellus marmoratus, DUNKER, Proc. Zool. Soc. London, 1861, p. 423, No. 22.

Ensiculus — — Index molluscor. mar. Japon., 1882, p. 174, pl. 7, fig. 24.

Cultellus — — E. v. MARTENS, Süß- u. Brackwasser-Moll. d. Ind. Archipels, 1897, p. 271, No. 9.

— — — HIDALGO, Fauna malacol. de l. isl. Filipinas, II, 1903, p. 23, No. 45.

— (*Ensiculus*) *maculatus*, PRESTON, The Journal of Malacology, vol. XII, 1905, p. 8, pl. 2, fig. 36.

N. of Koh Kahdat, 4–5 fathoms, coarse sand (1). Koh Kahdat, 1 fathom, sand and corals (2).

Long. 45–52 mm.

Distribution:— Ceylon, Red Sea, Suez. — Japan, Philippines (?).

I am convinced that *C. marmoratus*, Dunk., can scarcely be kept distinct from the highly variable *C. cultellus* (even as a variety), but as the three specimens which I have before me from the Gulf of Siam precisely agree with DUNKER'S diagnosis and figure, I have given them as varieties. The specimens from Koh Kahdat were taken under the same conditions and in the same locality as *C. cultellus*; in all the three specimens from the Gulf of Siam, the valves, towards the posterior end, are compressed in the middle, so that when viewed from the gaping, posterior end, the latter has a placentiform outline. The darker colour and the concave dorsal margin are also some of the characteristics of this form.

Siliqua radiata L.

Solen radiatus, LINNÉ, Syst. nat., ed. X, 1758, p. 673, No. 28. — ed. XII, p. 1114, No. 38. — Mus. Ludov. Ulricæ reg., 1764, p. 474, No. 16.

— — — CHEMNITZ, Conchyl. Cabin., VI, p. 54, pl. 5, figs. 38–39.

Cultellus — — SOWERBY in REEVE, Conchol. icon., XIX, *Cultellus*, Sp. 13.

Machaera radiata, LINNÉ, CHENU, Manuel de Conchyl., II, 1862, p. 23, fig. 102.

— — — CLESSIN in MARTINI u. CHEMNITZ, Conchyl. Cabin., XI Bd., 3 Abth., p. 59, No. 3, pl. 5, figs. 9–11.

Siliqua — — MORLET, Journ. de Conchyl., vol. 37, 1889, p. 172, No. 86.

— — — ED. v. MARTENS, Süß- u. Brackwasser-Mollusken d. Ind. Achip., 1897, p. 260.

— — — DAUTZENBERG et FISCHER, Journ. de Conchyl., vol. 54, 1906, p. 220.

Kampot (Golfe de Siam, L. MORLET).

The Danish Expedition to Siam collected no specimens of this species.

Distribution:— Madras, Tranquebar, Ceylon, Gulf of Manaar, Bombay to Ratnagiri, Mekran Coast. — Annam, Sumatra, Java, Flores, Celebes, Moluccas.

Siliqua minima, Gmel.

- Minutissima leguminum*, CHEMNITZ, Conchyl. Cabin., VI, 1782, p. 48, pl. 5, fig. 31.
Solen minimus, GMELIN, Syst. Nat., ed. 13, 1790, p. 3227, No. 14.
Aulus — — DUNKER, Index molluscor. mar. Japon., 1882, p. 175.
Machaera minima, — CLESSIN in MARTINI u. CHEMNITZ, Conchyl. Cabin., XI, 3 Abth., p. 68, pl. 5, figs. 1—2.
Siliqua — — E. v. MARTENS, Süss- u. Brackwasser-Moll. d. Ind. Archip., p. 262, No. 3.
Machaera — — HIDALGO, Fauna malacol. de l. isl. Filipinas, II, p. 25.
Solen pellucidus, SPENGLER, Skrivter af Naturhistor. Selsk., III, 2 H., 1794, p. 97, No. 13.
 — *albida*, ADAMS & REEVE, Zoology of the voyage of H. M. S. "Samarang," 1848, p. 84, pl. 23, fig. 15.
Cultellus albidus, DUNKER, SOWERBY in REEVE, Conchol. icon., XIX, 1874, *Cultellus*, Sp. 16.
Machaera albida, — CLESSIN in MARTINI u. CHEMNITZ, Conchyl. Cabin., XI, 3 Abth., p. 65, No. 13, pl. 18, fig. 3.

The sound of Koh Chang, 3—5 fathoms (fragment).

Distribution:— Malacca, Tranquebar, Bombay. — Philippines, China, Korea, Japan.

Although I am almost convinced of the correctness of the determination, yet, on the basis of the small fragment of a young individual which is at hand, it cannot be settled with complete certainty, if the specimen does not possibly belong to the nearly allied species *Sil. Winteriana*, Dunk.

Novaculina Siamensis, Morl.

- Novaculina Siamensis*, L. MORLET, Journ. de Conchyl., vol. 37, 1889, p. 198, pl. 9, fig. 4.
Solenocurtus (Novaculina) Siamensis, L. MORLET, P. FISCHER, Catalogue d. Mollusques de l'Indo-Chine, p. 242.
Novaculina Siamensis, L. MORLET, Mission Pavie Indo Chine, 1879—1895, III, 1904, p. 385, pl. 22, fig. 7.

“Marais de Chantakam” (Siam, PAVIE).

The Danish Expedition to Siam collected no specimens of this species.

Solecurtus (Macha) rhombus, Spengl.

- Solen strigilatus* var., CHEMNITZ, Conchyl. Cabin., VI, 1782, pp. 60—62, pl. 6, fig. 44.
 — *Rhombus*, SPENGLER, Skrivter af Naturhistorie Selskabet, III Bd., 2 H., 1794, p. 102, Nr. 17.
Solecurtus rhombus, SPENGLER, E. v. MARTENS, Süss- u. Brackwasser-Moll. d. Ind. Archip., p. 257, No. 2.
Macha Quoyi, v. MARTENS, E. v. Martens u. B. Langkavel, Donum Bismarckianum, 1871, p. 61, pl. 4, fig. 6 (non *S. Quoyi*, Deshayes = *S. albus*, Quoy & Gaim.).

North of Koh Kahdat, 4—5 fathoms, coarse sand ($1\frac{1}{2}$).

Long. 35 mm., alt. 18 mm.

Distribution:— Nicobars, Moluccas, Viti Isls., Kingsmill Isls.

The figure in “Donum Bismarckianum” is not quite good; the outline both in SPENGLER’s original specimen and in the specimen from Koh Kahdat is more squarish-oval, the anterior and posterior margins being almost rectilinear, obtusely truncated, and forming rounded angles with the dorsal and ventral margins.

Solecortus (*Macha*) Philippinarum, Dunk.

- Macha Philippinarum*, DUNKER, Proc. Zool. Soc. London, 1861, p. 424, No. 26.
Solecortus — — SOWERBY in REEVE, Conchol. icon., XIX, *Solecortus*, Sp. 12.
 — — — CLESSIN in MARTINI u. CHEMNITZ, Conchyl. Cabin., XI, 3 Abth., p. 90, No. 7,
 pl. 21, fig. 8.
Solenocortus (Macha) Philippinarum, DUNKER, H. CROSSE et P. FISCHER, Journ. de Conchyl., vol. 40, 1892,
 p. 76, No. 25.
Solecortus Philippinarum, DUNKER, E. v. MARTENS, Süß- u. Brackwasser-Moll. d. Ind. Archip., 1897, p. 256.
 — — — HIDALGO, Fauna mal. de l. isl. Filipinas, II, 1903, p. 26, No. 50.
Macha — — DUNKER, EDG. SMITH & BLOOMER, Proc. Zool. Soc. London, 1906, II, p. 855.

Golfe de Siam ("sur le littoral occidental du Cambodge," PAVIE).

The Danish Expedition to Siam collected no specimens of this species.

Distribution:— Andamans, Wasin Isl. (East Africa). — Java, Philippines.

In mentioning the genus *Macha* EDG. SMITH (loc. cit.) says "HERMANNSEN (Indicis Gen. Malac. Vol. II p. 1) quotes *Macha* as described by OKEN in 1815; but I have searched in vain in the "Lehrbuch" (Lehrbuch d. Naturg. Vol. III) for any mention of this genus, which should therefore date from 1835." HERRMANNSEN himself had already in the Supplement to "Indic. gen. Malacozoor." 1852, p. 78, corrected the date, in his statement concerning OKEN's description of *Macha*, from 1815 to 1835.

Solecortus (*Azor*) emarginatus, Spengl.

- Solen angustior constrictus* etc., CHEMNITZ, Conchyl. Cabin., VI, 1782, p. 62, pl. 6, fig. 45.
 — *coarctatus*, GMELIN, Syst. Nat., ed. 13, 1790, p. 3227, No. 16 (partim).
Solecortus (Azor) coarctatus (GMELIN), EDG. SMITH, Report on the Lamellibranchiata of the Challenger Exped., 1885, p. 79.
Solen emarginatus, SPENGLER, Skrivter af Naturhist. Selskabet, III, 2 H., 1794, p. 105, No. 21 (non Synon. Pennant, Brit. Zool., IV, pl. 46, fig. 25 = *S. antiquatus*, Pult.).
Macha Scheepmakeri, DUNKER, Zeitschr. f. Malakozool., 1852, p. 56, No. 11.
Azor (Macha) Scheepmakeri, DUNKER, Novitates conchol., II, 1869, p. 121, No. 137, pl. 39, figs. 10—11.
Solecortus Scheepmakeri, — SOWERBY in REEVE, Conchol. icon., XIX, *Solecortus*, Sp. 14.
 — *Scheepmakeri*, — E. v. MARTENS, Süß- u. Brackwasser-Moll. d. Ind. Archip., p. 259, No. 3.
Azor — — — HIDALGO, Fauna malacol. de l. isl. Filipinas, 1903, II, p. 28, No. 53.
Solecortus abbreviatus, GOULD, Proc. Boston Soc. Nat. Hist., VIII, 1861, p. 26.
 — — — SOWERBY in REEVE, Conchol. icon., XIX, *Solecortus*, Sp. 6.
 — — — J. DE MORGAN, Bull. de la Soc. de France, X, 1885, p. 366, No. 24.
Azor oblongus, DUNKER, Proc. Zool. Soc. London, 1861, p. 425, No. 30.
Solecortus oblongus, "Dorhn," SOWERBY in REEVE, Conchol. icon., XIX, *Solecortus*, Sp. 2.
Azor — — — DUNKER, HIDALGO, Fauna malacol. de l. isl. Filipinas, II, p. 27, No. 52.
 — *solidus*, DUNKER, Proc. Zool. Soc. London, 1861, p. 425, No. 31.
Solecortus solidus (non GRAY), SOWERBY in REEVE, Conchol. icon., XIX, *Solecortus*, Sp. 3.

W. of Koh Chuen, soft clay and mud ($\frac{2}{2}$). Sound of Koh Chang, 3—5 fathoms, soft clay ($\frac{3}{2}$). W. of Koh Chang, 20—30 fathoms, mud and clay ($5 + \frac{1}{2}$). E. of Koh Mak ($\frac{2}{2}$). S. of Koh Kahdat ($\frac{1}{2}$). Between Koh Kahdat and Koh Kut, 6—10 fathoms, clay mixed with sand ($1 + \frac{1}{2}$). North, west and south of Koh Kut, 10—30 fathoms, mud ($\frac{9}{2}$).

Long. 6—36 mm.

Siam (J. DE MORGAN).

Distribution: — Malacca, Poulo Penang, Andamans, Nicobars, Birma, Karikal (COROMANDEL, DAUTZENBERG), Mekran Coast, Gulf of Oman, (Gulf of Suez, MAC ANDREW?) — Hong Kong, Philippines, Moluccas, New Guinea, Torres Strait.

S. coarctatus, Gmelin, which in the course of time has indicated various species, viz. both the European *S. antiquatus*, Pult., and the East Indian form, and has therefore caused some confusion, ought, in my opinion, to give place to SPENGLER's name *emarginatus*. GMELIN was evidently not clear with regard to his species, both his diagnosis (true, he says "medio coarctata," but does not mention more closely the characteristic depressed rays upon the middle of the valves), and his statement that "*Solen anatinus*, Linné" (non *S. anatinus* L. = *Anatina subrostrata*, Lam.), in SCHRÖTER's "Flussconchylien"¹ was synonymous with his species, show his uncertainty and that he has confused several species with the species in question, which he evidently did not know by personal observation. SPENGLER, in whose collection the specimen was contained which CHEMNITZ² in 1782 described and figured, gave in 1794 an exhaustive and accurate diagnosis of it under the name of *S. emarginatus*, and I think that this should be preferred to GMELIN's name. I rely upon EDG. SMITH's authority in giving *S. Scheepmakeri*, Dunk., as a synonym of the species under consideration, though it attains a size that is probably not attained by *S. emarginatus*, Spengl. typ. As far as I can judge from the figure and the brief diagnosis *Novaculina andamanensis*, Preston,³ is nothing else but the present species.

Fam. Gastrochaenidae.

Gastrochaena gigantea, Desh.

- Fistulana gigantea*, DESHAYES, Encyclop. méth. Hist. nat. d. vers., II, 1830, p. 142.
Gastrochaena — — — — — Traité élém. de Conchyl. (1834), pl. 2, figs. 6—8. Explic. d. planches, p. 2. Tome I, 2 part., p. 34.
 — — — — — SOWERBY in REEVE, Conchol. icon., XX, 1878, *Gastrochaena*, Sp. 15.
 — — — — — — — — — Thesaur. Conchyl., V, 1887, p. 128, No. 4, pl. 470, fig. 12.
 — — — — — CLESSIN in MARTINI u. CHEMNITZ, Conchyl. Cabin., XI, 4 Abth. a, p. 13, No. 22, pl. 4, figs. 8—9.
Rocellaria — — — — — EDG. SMITH in The Fauna and Geography of the Maldive and Laccadive Archipelagoes, ed. by Stanley Gardiner, II, p. 626, No. 362.
Gastrochaena — — — — — LAMY, Bull. du Mus. d'Hist. Nat. Paris, 1906, p. 207.
Gastrochaena lamellosa, EDG. SMITH (non DESHAYES), Report on the Lamellibranchiata of the Challenger Expedition, p. 28, pl. 7, fig. 2.

Koh si Chang (1). Koh Chang, low tide (1). North end of Koh Chang, old coral blocks, 1—12 fathoms (13). South end of Koh Chang, 1 fathom, corals (1). Koh Kahdat, 1 fathom (¹/₂).

¹ SCHRÖTER, Geschichte d. Flussconchylien. Halle 1779, p. 185, pl. 9, fig. 17.

² MÖRCH, both in Malakozool. Blätter, 1870, p. 110, No. 21, and upon the label attached to SPENGLER's original specimen, has given the name *Solen constrictus*, Chemn.

³ Records of the Indian Museum, II, Calcutta 1908, p. 209, pl. 16, fig. 40.

Long. 5—36 mm.

Distribution:— Singapore, low water, boring in corals (SV. GAD), Nancowry (Nicobars, Mus. Zool. Havn.), Maldive Archipelago (EDG. SMITH). — Sorong (TAPPARONE CANEFRI), Cape York (CHALLENGER). Funafuti Atoll (HEDLEY as *G. lamellosa*, Desh., and with a reference to EDG. SMITH, Challenger Lamellibr. loc. cit. HEDLEY adds that the Museum in Sydney has this species from Viti Isls., New Caledonia, Moreton Bay (Queensland) and St. Vincent's Gulf, Lord Hood's Isl. and Mangareva (LAMY).

The specimens from Singapore were found in coral, in which they had made a bottle-shaped hole which was smooth interiorly, and only the narrow part of it which leads to the exterior is partially lined with a thin layer of chalk.¹ The form which EDG. SMITH figures in Rep. Challenger Lamellibr. (loc. cit.) under the name of *lamellosa*, Desh., does not correspond with DESHAYES'S diagnosis of *lamellosa*; some confusion must certainly, somehow or other, have taken place, I scarcely think I am wrong in putting SMITH'S form as a synonym of *G. gigantea*, Desh. EDG. SMITH says, in his list of the Mollusca from Aden,² regarding *Gastrochaena dubia*, Penn., "This species undoubtedly occurs in the Red Sea (*ruppellii*)³ at Singapore (*indistincta*, Desh.) and the Philippines (*lamellosa*, Desh.).⁴ On comparing the types of the three Deshayesian species with specimens of *G. dubia*, I fail to discover any essential differences." I do not quite agree with EDG. SMITH in this; *G. gigantea* from the Gulf of Siam and from Singapore differs from *G. dubia*, Penn., in the stronger and more prominent longitudinal striation over its whole surface, and *gigantea* attains a larger size than *G. dubia*, which has been recorded to reach only about 20 mm.

Gastrochaena cymbium, Spengl.

- Gastrochaena cymbium*, SPENGLER, Nye Saml. af d. kgl. danske Vidensk. Selsk. Skrifter, II, 1783, pp. 180—82, figs. 12—17. — Beschäftigt. d. Berlin. Gesellsch. Naturf. Freunde, II, 1776, p. 569, pl. IX A, figs. 3—5.
- Chæna Cymbium*, — RETZIUS, Diss. sist. nova testaceor. genera, 1788, p. 20.
- — — — — Skrivter af Naturhist.-Selskabet, III, 1 H., 1793, p. 24, No. 4, pl. 2, fig. 4.
- Lagenula* — — — — — BECK, MS. Mus. Univ. Hafn.
- Cucurbitula cymbia*, — TRYON, Proc. Acad. Nat. Sc. Philadelphia, 1861, p. 54.
- Fistulana lagenula*, LAMARCK, Hist. nat. d. anim. s. vert., V, 1818, p. 436, No. 4. — éd. 2, VI, 1835, p. 31, No. 4.
- — — — — HANLEY, Catal. of rec. biv. shells, p. 3, pl. 13, fig. 59.
- Chæna (Cucurbitula) lagenula*, LAMARCK, GOULD, Proc. Boston Soc. Nat. Hist., vol. 8, 1861, p. 22.
- Gastrochaena lagenula*, LAMARCK, SOWERBY, Thesaur. Conchyl., V, 1887, p. 130, No. 24, pl. 470, fig. 18.

¹ The cave which *G. dubia*, Penn., forms is described and figured in: Magazin de Zoologie p. GUÉRIN-MÉNEVILLE, 1843 (par F. CAILLAUD), pl. 69—71, and in: BUCQUOY, DAUTZENBERG et DOLLFUS, Moll. mar. du Roussillon, II, 1896, p. 607.

² Proc. Zool. Soc. London, 1891, p. 395.

³ Comp.: STURANY, Lamellibranchiaten d. Rothen Meeres, 1899, p. 21.

⁴ As EDG. SMITH apprehends this species in the Challenger-Exped. Lamellibr.

- Gastrochaena lagenula*, LAMARCK, SOWERBY in REEVE, Conchol. icon., vol. 20, *Gastrochaena*, Sp. 18, pl. 3, fig. 16 (not fig. 18 = *G. ovata*, Sow.).¹
 — *pupina*, DESHAYES, Proc. Zool. Soc. London, XXII, 1854, p. 326, No. 39.
 — — — SOWERBY, Thesaur. Conchyl., V, 1887, p. 130, No. 25, pl. 470, fig. 16.
 — — — — in REEVE, Conchol. icon., vol. 20, *Gastrochaena*, Sp. 17.
Gastrochaena deshayesi, STURANY, Lamellibranchiaten d. Rothen Meeres, 1899, p. 19, pl. 5, figs. 1—7.

NW. of Koh si Chang, 10 fathoms, mud (4). Between Koh Mesan and Cape Liant, 5—9 fathoms (6). Between Koh Mesan and Koh Chuen, 25—38 fathoms (4). S. of Koh Chuen, 30 fathoms, shells (1). W. of Koh Chang, 20 fathoms, mud (1). E. of Koh Mak, 20 fathoms, mud (3). W. of Koh Kut, 15 fathoms, mud (3). Coast of Koh Kut (1).

Long. 12 mm.

Distribution:— Coromandel Coast, Ceylon, Red Sea, Suez. — Hong Kong, Moreton Bay.

Gastrochaena aequabilis, Sluiter,² from Krakatau is closely allied to the present species. As SPENGLER's original specimens of *G. cymbium* have been at my disposal I am certain of the correctness of the determination.

Fam. Pholadidae.

Pholas (Monothyra) orientalis, Gm.

- Pholas orientalis*, GMELIN, Systema Naturae, ed. XIII, 1790, p. 3216, No. 7.
 — — — LAMARCK, Hist. nat. d. anim. s. vert., V, 1818, p. 444, No. 2. — éd. 2, VI, p. 44, No. 2.
Dactylina — — GRAY, Ann. & Mag. of Nat. Hist., 2 ser., VIII, 1851, p. 382.
Pholas orientalis, — SOWERBY, Thesaur. Conchyl., II, p. 486, No. 4, pl. 102, figs. 3—4.
Monothyra orientalis, GMELIN, TRYON, Proc. Acad. Nat. Sc. Philadelphia, 1862, p. 205. — Catalogue of rec. Moll. *Pholadacea*, p. 3.
Pholas — — REEVE, Conchol. icon., XVIII, *Pholas*, Sp. 5.
Phragmopholas orientalis, GMELIN, MORLET, Journ. de Conchyl., vol. 37, 1889, p. 173, No. 91.
Pholas (Dactylina) — — CLESSIN in MARTINI u. CHEMNITZ, Conchyl. Cabin., XI Bd., 4 Abth., p. 12, No. 6, pl. 2, figs. 3—4.
 — *Indiae Orientalis*, CHEMNITZ, Conchyl. Cabin., VIII, 1785, p. 356, pl. 101, fig. 860.

¹ On Pl. 3 in "Conchologia iconica" the numbers of No. 16 (*G. ovata* from Panama) and No. 18 (*G. lagenula* from Ceylon), have been interchanged by a misprint; this has misled STURANY (who did not discover the error), so that he (loc. cit.) has established his species *G. Deshayesi* upon typical specimens of *G. cymbium*, Sp. (*lagenula*, Lam.). It is not surprising that CLESSIN should copy this error in his Monograph, without comparing the diagnoses with the figures, when we recall the uncritical character of his Monographs of Bivalves in: MARTINI u. CHEMNITZ, Conchyl. Cabinet. HEDLEY (Australian Museum, Sydney, Memoirs III, 1896—1900, p. 508) characterizes CLESSIN's Monograph of "The *Teredinidae*" as follows: "Even worse is an alleged Monograph by CLESSIN in the Conchylien Cabinet, of which the text and illustrations disgrace that serial. The latter memoir is absolutely the worst zoological monograph I have read."

² C. P. SLUITER, Ueber d. Bildung d. Kalkröhren von *Gastrochaena*. Natuurk. Tijdschrift v. Nederl. Indië, 50 Bd., 1890, pp. 45—60, pl. 1.

Pholas Siamensis, SPENGLER, Nye Saml. af Danske Vidensk. Selsk. Skrifter, III, 1788 (1784), pp. 128—38 with pl. (without Latin name). — Skrifter af Naturhistorie-Selskabet, II, 1 H., 1792, p. 88, No. 3.

“Den Siamske Havbugt, for Udløbet af Strømmen Queda, hvor den gaar op til Alastav” (SPENGLER). Islands in the Gulf of Siam (MORLET).

The Danish Expedition to Siam brought home no specimens of this species.

Distribution: — Tranquebar, Gulf of Manaar, Mouths of the Indus (Karachee, Scinde), Oman. — China Sea.

MÖRCH¹ has shown that *Scutus* (?) *abnormis*, G. and H. Nevill,² from Penang and Chandpur (Bay of Bengal) is nothing else but the accessory dorsal plate (“Protoplax”) of *P. orientalis*, Gm.

Pholas (Barnea) Australasiae, Gray.

Barnea Australasiae, GRAY, Annals and Mag. Nat. Hist., 2 Ser., VIII, 1851, p. 381.

Pholas — — SOWERBY, Thesaur. Conchyl., II, p. 488, No. 11, pl. 107, fig. 73.

Barnea — — TRYON, Proc. Acad. Nat. Sc. Philadelphia, 1862, p. 207.

Pholas — — REEVE, Conchol. icon., XVIII, *Pholas*, Sp. 11.

— — — MORLET, Journ. de Conchyl., vol. 37, 1889, p. 173, No. 89.

— (*Barnea*) *Australiasae*, SOWERBY, CLESSIN in MARTINI u. CHEMNITZ, Conchyl. Cabin., XI Bd., 4 Abth., p. 21, No. 18, pl. 6, fig. 2.

Barnea australasiae, SOWERBY, PRITCHARD and GATLIFF, Proc. Roy. Soc. Victoria, vol. 16, p. 98.

Between Bangkok and Kampot (Gulf of Siam), MORLET.

The Danish Expedition to Siam brought home no specimens of this species.

Distribution: — “Abundant in Australia” (SOWERBY), Victoria (PRITCHARD and GATLIFF), Spencer’s Gulf (South Australia, ANGAS), Tasmania (TATE and MAY).

A nearly allied species from Mergui has been described by PHILIPPI under the name of *Ph. birmanica*.³ On considering the distribution of *P. Australasiae*, a doubt arises as to the correctness of MORLET’s determination.

Pholas (Barnea) sp.?

The shell of a small *Barnea* (long. 5 mm.) has been obtained at Koh Kahdat which in form and sculpture somewhat resembles *B. parva*, Penn. On account of its small size and bad state of preservation I cannot determine it with any certainty.

Pholas (Martesia) striata (L.), Sow.

Pholas striatus, LINNÉ, Syst. Nat., ed. X, 1758, p. 669, No. 12. — ed. XII, 1767, p. 1111, No. 22.

— *striata*, — SOWERBY, Genera of rec. and foss. shells, No. XXIII, *Pholas*, fig. 2. — Thesaur. Conchyl., II, 1855, p. 494, No. 29, pl. 104, figs. 40—42; pl. 105, figs. 43—44.

— — — FORBES & HANLEY, British Mollusca, I, p. 120.

¹ Journal de Conchyliologie, vol. 24, 1876, p. 367.

² Journal of the Asiatic Soc. Bengal, vol. 43, pt. II, 1874, p. 28, pl. 1, fig. 12.

³ Abbild. u. Beschreib. neuer od. wen. gekannt. Conchylien, III, p. 51, pl. 1, fig. 1.

- Martesia striata*, LINNÉ, H. & A. ADAMS, Genera of rec. Moll., II, p. 330, pl. 90, fig. 5.
Pholas — — — P. FISCHER, Journ. de Conchyl., VIII, 1860, p. 337.
Martesia — — — TRYON, Proc. Acad. Nat. Sc. Philadelphia, 1862, p. 220. — Catal. of rec. Moll. Ord. *Pholadacea*, p. 10, No. 13.
 — — — CLESSIN in MARTINI u. CHEMNITZ, Conchyl. Cabin., XI Bd., 4 Abth., p. 45, No. 13, pl. 10, figs. 2—3 and 7—8.
Pholas (Martesia) striata L., E. v. MARTENS, Süss- u. Brackwasser-Moll. d. Ind. Archip., 1897, p. 281.
Martesia striata, LINNÉ, HEDLEY, Australasian Assoc. Adv. Science, VIII, 1901, p. 249, pl. 10, figs. 10—11.
Pholas pusillus, — Syst. Nat., ed. X, 1758, p. 670, No. 14.
 — *Lignorum*, SPENGLER, Beschäft. d. Berl. Gesellsch. Naturf. Freunde, IV, 1779, p. 167, pl. 5, figs. 1—5.
 — — — Skrivter af Naturh. Selsk., II, 1 H., 1792, p. 95, No. 9 (*Pholas pusillus*).
 — *nana*, PULTENEY, Catal. of the Birds, Shells, etc. of Dorsetshire, 1799, p. 27.
 — *clavata*, LAMARCK, Hist. nat. d. anim. s. vert., V, 1818, p. 446, No. 9. — éd. 2, VI, p. 46, No. 9.
 — *conoides*, FLEMING, History of Brit. animals, 1828, p. 457.
 — *falcata*, WOOD, Gener. Conchology, 1835, p. 84, pl. 16, figs. 5—7 (fide TRYON).
 — *semicostata*, LEA, Proc. Boston Soc. Nat. Hist., I, 1844, p. 204 (pl. 24, fig. 1).
 — *terediniformis*, SOWERBY, Proc. Zool. Soc. London, XVII, 1849, p. 161, No. 5. — Thesaur. Conchyl., II, p. 490, No. 18, pl. 108, figs. 97—98, *P. Teredinæformis* (fide TRYON).

Near Koh Samit and Koh Tulu (boring in the swampy layer of cocoanuts which float upon the surface of the water). West of Koh Chang (boring in the fruits of *Terminalia Catappa* L., which float upon the surface).

Only small specimens as much as 5 mm. in length.

Between Bangkok and Kampot in the Gulf of Siam (MORLET).

Distribution:— Singapore, Pulo Penang, Mergui Archip., Burma (in the trunks of the teak-tree), Madras, Tranquebar, Gulf of Manaar, Bombay, Aden, Ins. Zanzibar, Mozambique. — Annam, southern China Sea, Japan, Philippines, Borneo, Batavia and Molluccas (in piles), Arafura Sea, Cape York, Cooktown (Queensland), Sydney, New Caledonia. — East coast of America: South Carolina, Florida, Bermuda Isl., Texas, Greater and Lesser Antilles (GUPPY and GABB record it from pliocene formations on Trinidad and in Costa Rica), South America as far as Rio de Janeiro. — The coasts of Europe, e. g. along England and France and in the Mediterranean it has been taken in floating timber and boring in ships.

SPENGLER's original specimens¹ of *P. lignorum* from Tranquebar agree precisely with the specimens of *P. striata* L. from St. Thomas. Several other boring forms such as *Narario lapicida*, Chemn., *Coralliophaga coralliophaga*, Chemn., *Modiolaria coralliophaga* (Chemn.) Gmel., *Lithodomus cinnamomea*, Chemn., and others have almost the same wide and peculiar geographical distribution as the present species. In the above-mentioned cocoanut from Koh Samit many quite young, living specimens, 3—5 mm. in length, were found, without Callum, and of the accessory plates only a "Protoplaxe" is found, which in form differs from those of the full-grown individuals.²

¹ In the Zoological Museum of the University of Copenhagen.

² See P. FISCHER: "Études sur l. Pholades," Journ. de Conchyliologie, VIII, 1860, p. 340.

Pholas (Martesia) multistriata, Sow.

- Pholas multistriata*, SOWERBY, Thesaurus Conchyl., II, 1849 (1855), p. 494, No. 28, pl. 104, figs. 35—36. —
 Proc. Zool. Soc. London, 1849, p. 162, No. 8.
Martesia — — TRYON, Proc. Acad. Nat. Sc. Philadelphia, 1862, p. 218.
Pholas — — REEVE, Conchol. icon., XVIII, *Pholas*, Sp. 37.
Martesia — — MORLET, Journ. de Conchyl., vol. 37, 1889, p. 173, No. 92.
 — — — P. FISCHER, Catalogue d. Moll. de l'Indo-Chine, p. 244.
 — — — CLESSIN in MARTINI u. CHEMNITZ, Conchyl. Cabin., XI Bd., 4 Abth., p. 42,
 No. 8, pl. 7, figs. 6—7.

Mékong, Gulf of Siam (MORLET).

The Danish Expedition to Siam did not collect any specimens of this species.

Distribution:— Cua-Quen, Annam (CROSSE & FISCHER), Turtle's Island, N. coast of Australia (SOWERBY).

Pholas (Martesia) Grayana, Leach.

- Pholas Grayana*, LEACH, MS. Brit. Mus.
 — — — REEVE, Conchol. icon., XVIII, *Pholas*, 1872, Sp. 46.
Martesia — — CLESSIN in MARTINI u. CHEMNITZ, Conchyl. Cabin., XI Bd., 4 Abth., p. 45, pl. 11,
 fig. 2.

North end of Koh Chang, old coral blocks, 1—12 fathoms ($4\frac{1}{2}$).

Long. 5—10 mm.

Distribution unknown.

My specimens, which are all small and were taken dead, are without "Callum" upon the anterior end. The striped sculpture upon the front end is very regular, close-set and fine; it is slightly wavy, owing to several grooves which radiate from the umbones.

Pholas (Martesia) rivicola, Sow.

- Pholas rivicola*, SOWERBY, Thesaurus Conchyl., II, 1848 (1855), p. 496, No. 33, pl. 108, figs. 90—91.
 — — — A. ADAMS and REEVE, Mollusca of the voyage of H. M. S. "Samarang," 1848, p. 84,
 No. 98, pl. 23, fig. 5.
Martesia — — TRYON, Proc. Acad. Nat. Sc. Philadelphia, 1862, p. 219.
Pholas — — REEVE, Conchol. icon., XVIII, *Pholas*, Sp. 22.
Martesia — — CLESSIN in MARTINI u. CHEMNITZ, Conchyl. Cabin., XI Bd., 4 Abth., p. 44, No.
 11, pl. 11, figs. 5—6.
Pholas — — MORLET, Journ. de Conchyl., vol. 37, 1889, p. 173, No. 90.
 — (*Martesia rivicola*), SOWERBY, E. v. MARTENS, Süss- u. Brackwasser-Moll. d. Indischen Archipels,
 1897, p. 282.
Martesia fluminalis, BLANFORD, Journ. Asiat. Soc. Bengal, 1867, vol. 36, p. 67, pl. 3, figs. 1—3 (fide E. v.
 MARTENS).
Parapholas — — STOLICZKA, Palæontologia Indica. Cretaceous Fauna of South-India, III,
Pelecypoda, 1871, pp. 20 and 24.
 —? — — CLESSIN in MARTINI u. CHEMNITZ, Conchyl. Cabin., XI Bd., 4 Abth., p. 50,
 No. 2, pl. 13, figs. 4—5.

Between Bangkok and Kampot (Gulf of Siam, MORLET), Petshaburi in the Gulf of Siam (v. MARTENS).

The Danish Expedition to Siam brought home no specimens of this species.

Distribution:— Mouths of the Irawadi (BLANFORD), Port Canning (Delta of the Ganges, STOLICZKA), Orissa coast, Ceylon (STOLICZKA). — Southern China Sea (8° N. lat., v. MARTENS), BORNEO (A. ADAMS), Port Cuming (Australia, Collect. ROLLE).

Pholas (Parapholas) quadrizonatus, Spengl.

- Pholas quadrizonatus*, SPENGLER, Skriver af Naturhistorie-Selskabet, II, 1 H., 1792, p. 93, No. 8, pl. 1, figs. 1—3.
 — *quadrizonalis*, — SOWERBY, Thesaurus Conchyl., II, 1855, p. 492, No. 23, pl. 108, figs. 88—89.
Parapholas — — H. & A. ADAMS, Genera of rec. Moll., II, p. 330, pl. 90, fig. 4.
 — — — TRYON, Proc. Acad. Nat. Sc. Philadelphia, 1862, p. 215.
Pholas quadrizonatus, — MÖRCH, Malakozoolog. Blätter, XVII, p. 104.¹
 — *quadrizonalis*, — REEVE, Conchol. icon., XVIII, *Pholas*, Sp. 38.
Parapholas — — CLESSIN in MARTINI u. CHEMNITZ, Conchyl. Cabin., XI Bd., 4 Abth., p. 55, No. 7, pl. 14, fig. 1.
Pholas Incii, SOWERBY, Proc. Zool. Soc. London, XVII, 1849, p. 161, No. 7.
 — — — Thesaurus Conchyl., II, 1855, p. 491, pl. 105, figs. 45—46.
 — *Incei*, — REEVE, Conchol. icon., XVIII, *Pholas*, Sp. 30.
Parapholas Incei, — CLESSIN in MARTINI u. CHEMNITZ, Conchyl. Cabin., XI Bd., 4 Abth., p. 52, No. 4, pl. 12, figs. 9—10.
Pholas striatus, CHEMNITZ (non LINNÉ), Conchyl. Cabin., VIII, 1785, p. 364, pl. 102, figs. 864—66 (*Pholas clavata*, Lam. c.).

South-west end of Koh Chang, 1 fathom, coral (1). North end of Koh Chang, old coral blocks, 1 fathom (1).

Long. 13 mm.

Distribution:— Mergui Archip. (v. MARTENS), Aden (SHOPLAND). — Torres Strait (SOWERBY).

One of the specimens from Koh Chang is a young individual; it is entirely without "Callum" and resembles therefore most nearly a *Zirphaea*.²

Fam. Teredinidae.

Teredo Manni, Wright.

- Kuphus (?) manni*, WRIGHT, Transact. Linn. Soc., vol. 25, 1866, p. 565, pl. 65, figs. 1—8.
Nausitoria manni, — HEDLEY, Australasian Assoc. Advancem. Science, VIII, 1901, p. 248.

Sound of Koh Chang, 5 fathoms. Several very small specimens (about 0.7 mm.) boring in a piece of wood.

Distribution:— Singapore, Cooktown (Queensland).

¹ It is due to a mistake that MÖRCH (loc. cit.) says "SPENGLER citirt mit Unrecht Chemn. f. 864—66, die eine Martesia ist," as it is the same specimens from the collection of Spengler, which CHEMNITZ 1785 describes and figures (under the name of *P. striatus* L.?) and SPENGLER afterwards (1792) describes as *P. quadrizonatus*. These specimens are still in existence in the Museum of the University of Copenhagen.

² vide: P. FISCHER, Études sur l. Pholades, Journ. de Conchyliologie, VII, pp. 173—74.

On account of the small size of the specimens the determination is somewhat uncertain. The "palettes" bear a great resemblance to the figures by WRIGHT (loc. cit.).

Note. At Singapore in shallow water a solitary valve of a *Nausitora* has been taken (by Sv. GAD), probably *N. edax*, Hedley (Proc. Linn. Soc. New South Wales, IX, 1894, p. 501, pl. 32, figs. 1—5), but as its palettes were not found, the determination is uncertain.

Fam. Pandoridae.

Coelodon elongatus, Carp.

Coelodon elongatus, CARPENTER, Proc. Zool. Soc. London, 1864, p. 600, No. 3.

— — — EDG. SMITH, Rep. Lamellibranchiata of the "Challenger" Exped., p. 62.

Pandora elongata, — G. B. SOWERBY in REEVE, Conchol. icon., vol. 19, 1874, *Pandora*, Sp. 4.

Sound of Koh Chang, 5 fathoms, soft clay (1 + ²/₂).

Long. 11—16 mm.

Distribution: — China, Borneo, Flinders Passage (North Australia).

The present species is very characteristic on account of its flatness, but like all the species belonging to the genus *Pandora* it varies considerably in form. HEDLEY evidently does not know SOWERBY'S figure in REEVE'S Conchol. icon. as he calls it (Proc. Linn. Soc. New South Wales, vol. 31, 1906, p. 473) an "unfigured species" and (loc. cit. pl. 37, fig. 16) gives a figure of a form from Mast Head Reef, Queensland, under the name of *C. elongatus*, Carp., which, however, scarcely is CARPENTER'S species.

Note. *Myodora trigona*, Reeve, has been taken (by Sv. GAD) at Singapore in shallow water.

Fam. Anatinidae.

Anatina anatina L.

Solen anatinus, LINNÉ, Syst. Nat., ed. X, 1758, p. 673, No. 30. — ed. XII, 1766, p. 1115, No. 40. — ed. XIII, p. 3225, No. 8. — Museum Ludov. Ulricæ reg., 1764, p. 475, No. 18.

— — — CHEMNITZ, Conchyl. Cabin., VI, 1782, p. 62, pl. 6, figs. 46—48.

Anatina subrostrata, LAMARCK, Hist. nat. d. anim. s. vert., V, 1818, p. 463. — éd. 2, 1835, VI, p. 78.

— — — REEVE, Conchol. icon., XIV, *Anatina*, Sp. 6.

— — — SAVIGNY, Descript. de l'Égypte. Mollusques, pl. 7, fig. 8.

— *siphonata*, REEVE, Conchol. icon., XIV, *Anatina*, Sp. 2.

— — — EDG. SMITH, Lamellibranchiata of the "Challenger" Exped., p. 76.

— *flexuosa*, REEVE, loc. cit., Sp. 5.

— *amphora*, REEVE, loc. cit., Sp. 23.

— *eximia*, REEVE, loc. cit., Sp. 30.

N. of Koh Kam, 5 fathoms, gravel (1). Koh Chuen, 30 fathoms (2). Between Koh Mesan and Cape Liant, 9 fathoms (2). S. of Koh Tulu, 10 fathoms, mud mixed with sand (1). Off Tung Kaben, 6 fathoms, mud mixed with sand (2). Sound of Koh Chang, 3—5 fathoms, soft clay (many fragments). Between Koh Kahdat

and Koh Kut, 6 fathoms, clay mixed with sand (1). W. of Koh Kut, 15 fathoms, mud (2). Off Koh Kut, 5 fathoms (fragments).

Long. 26 mm. (several of the fragments have belonged to larger specimens).

Distribution:— Singapore (Danish Exp. to Siam, 2 specimens), Nicobars, Ceylon, Mekran Coast, Aden, Red Sea, Suez, Suez Canal. — Philippines, Japan (*A. flexuosa*), Borneo, Flores.

The species here under consideration varies considerably, especially with regard to the form and the development of the rostrum; and many species of the gen. *Anatina* will certainly in the course of time be withdrawn owing to their having been based upon entirely individual characters. The greater part of the specimens from the Gulf of Siam resemble most nearly REEVE's figure of *A. eximia*.

Fam. Clavagellidae.

Brechites dichotomus, Chenu.

- Aspergillum dichotomum*, CHENU, Illustrations conchyliologiques (1843—45), *Aspergillum*, p. 3, pl. 2, fig. 6.
Brechites dichotomus, — H. & A. ADAMS, Genera of rec. Moll., II, 1858, p. 339.
Aspergillum dichotomum, — REEVE, Conchol. icon., XII, 1860, *Aspergillum*, Sp. 9.
Penicillus dichotoma, — TRYON, Proc. Acad. Nat. Sc. Philadelphia, 1861, p. 59, No. 2.
Aspergillum dichotomum, — CLESSIN in MARTINI u. CHEMNITZ, Conchyl. Cabin., XI Bd., 4 Abth. A, p. 30, No. 9, pl. 12, fig. 2.

Koh Lan, 30 fathoms, mud (1). Koh Chuen, 30 fathoms (3). N. of Koh Kahdat, 4—5 fathoms, coarse sand (1). Koh Kahdat, 1 fathom, sand (1). S. of Koh Mak, 5—6 fathoms (2).

All the specimens collected were fragmentary.

Distribution:— Singapore (CUMING), Gulf of Manaar (THURSTON).

TRYON (loc. cit.), undoubtedly correctly, considers *B. disjunctus*, Desh., to be synonymous with *B. dichotomus*, but several other of those species which have been established ought probably also to be abolished; thus GRAY¹ has united under the name of *Penicillus aquaria*, Burr.:— *Aspergillum dichotomum*, Chenu, *semifimbriatum*, Chenu, *sparsum*, Sow., *javanum*, Gray (non LAM.).

Order Septibranchiata.

Fam. Cuspidariidae.

Neaera Singaporensis, Hinds.

Neaera Singaporensis, HINDS, Proc. Zool. Soc. London, XI, 1843, p. 77.

W. of Koh Chuen, soft clay and mud (⁷/₂). W. of Koh Chang, 30 fathoms (¹/₂). Koh Kahdat (⁹/₂). N. of Koh Kut, 10 fathoms, mud (²/₂). Between Koh Kahdat

¹ Proc. Zool. Soc. London, 1858, p. 312.

and Koh Kut, 6—10 fathoms, clay mixed with sand and shells (²/₂). W. of Koh Kut, 15 fathoms, mud (1).

Long. 4—9 mm.

Distribution: — Singapore.

Neæra (*Cardiomya*) *pulchella*, H. Ad.,¹ and *N. Gouldiana*, Hinds,² are closely allied to the present species.



Neæra Singaporensis, Hinds.

Neæra rosea, Hinds.

Neæra rosea, HINDS, Proc. Zool. Soc. London, XI. 1843, p. 78.

— — — Mollusca of the Voyage of H. M. S. "Sulphur," 1845, p. 70, No. 296, pl. 20, fig. 20.

— — — HIDALGO, Fauna malacol. de I. isl. Filipinas, 1903, p. 43, No. 88.

West of Koh Kut, 30 fathoms, sand and mud (¹/₂).

Long. 5 mm., alt. 3 mm.

Distribution: — Philippines, New Guinea.

I do not doubt that the small left valve which I have before me should be referred to *N. rosea*, Hinds, in spite of the fact that the beak is not of a rose-colour.

¹ Proc. Zool. Soc. London, 1870, p. 789, pl. 48, fig. 4.

² Proc. Zool. Soc. London, 1843, p. 77.

ERRATA

Page 45, line 6, for Busch	read Bush.
- 128, - 42, - Lamellibranchiata	- Lamellibranchiaten.
- 134, - 9, - peronata	- personata.
- 144, - 34, - T. variegatus, Sow.	- T. variegatus, Hanl.

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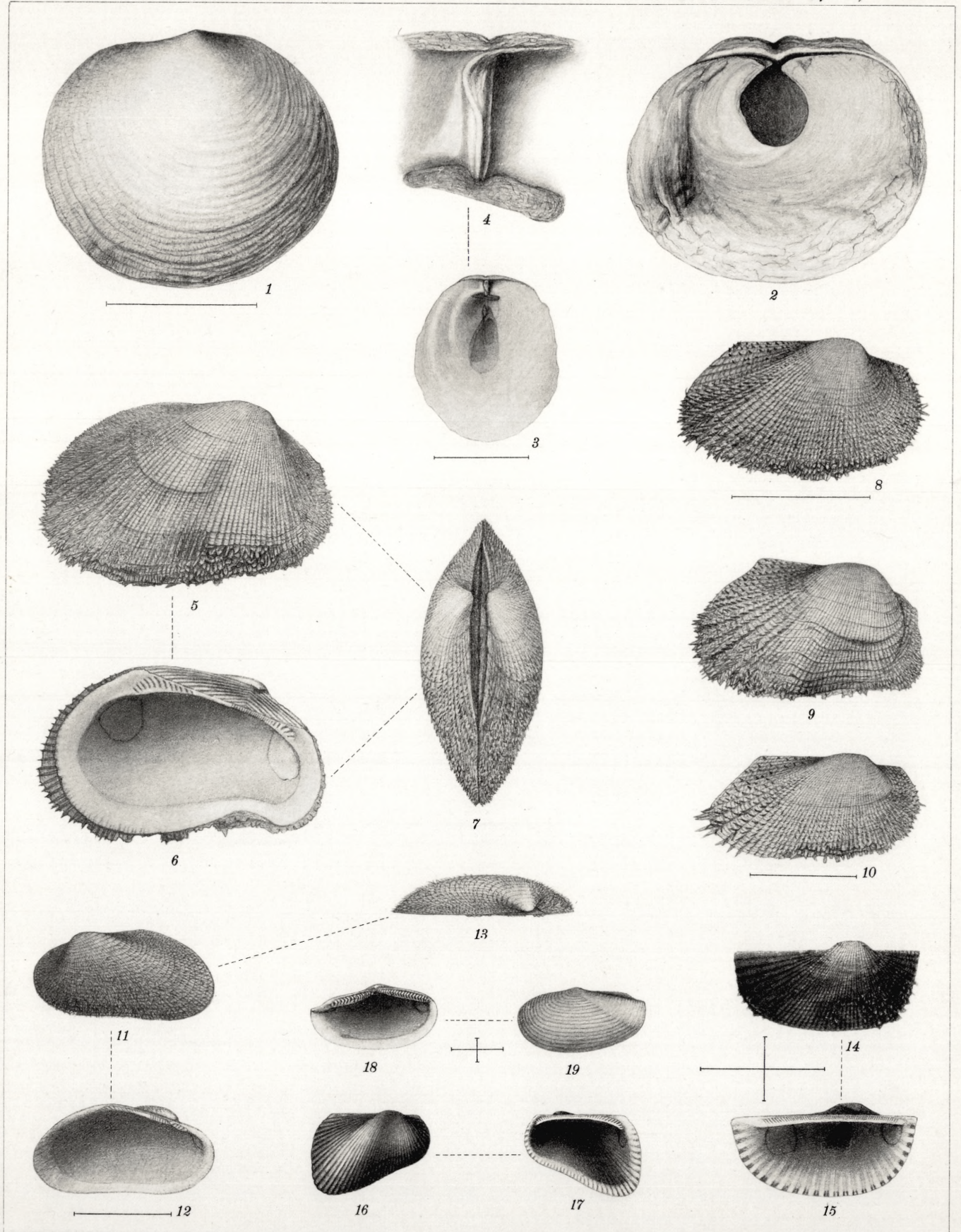


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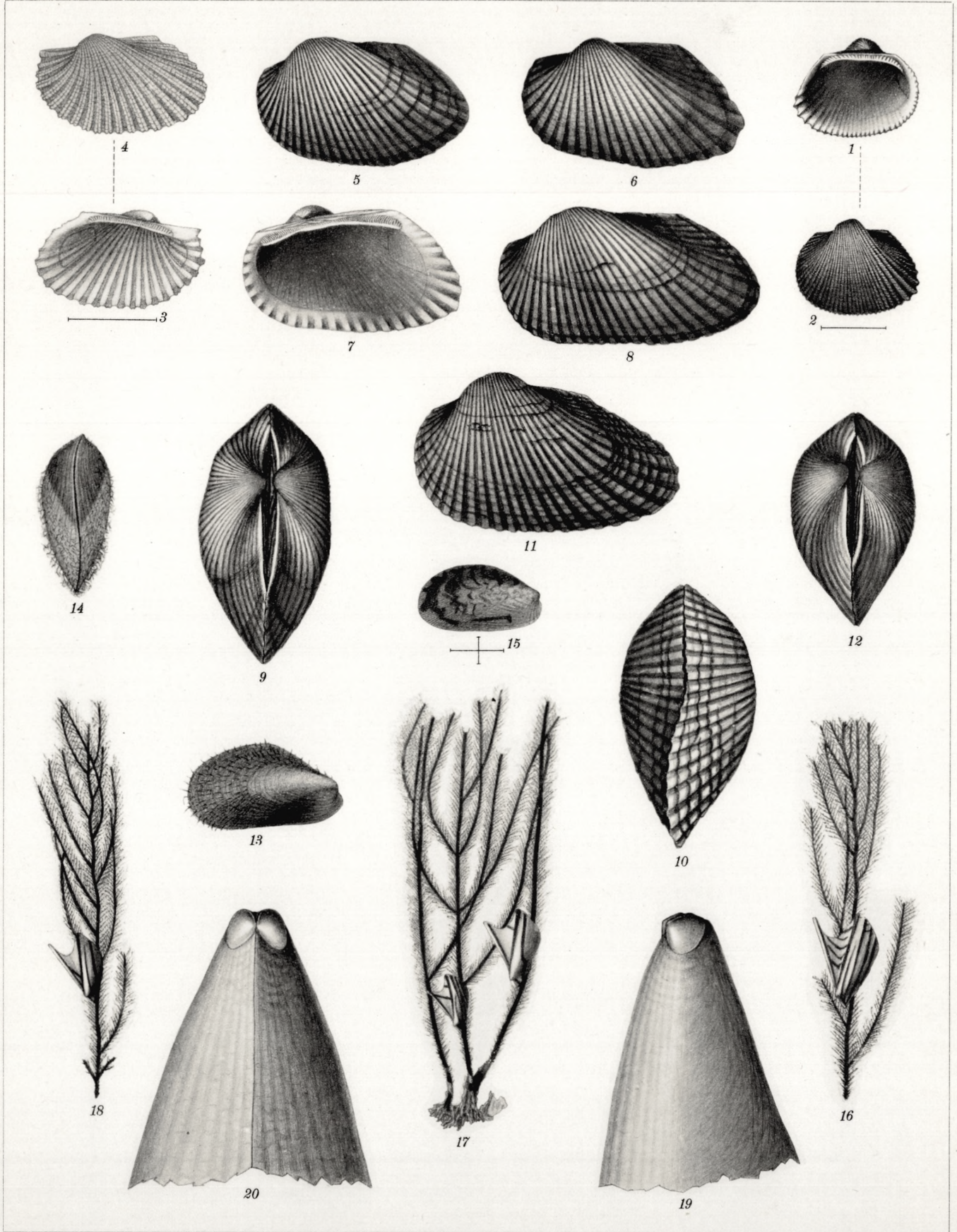


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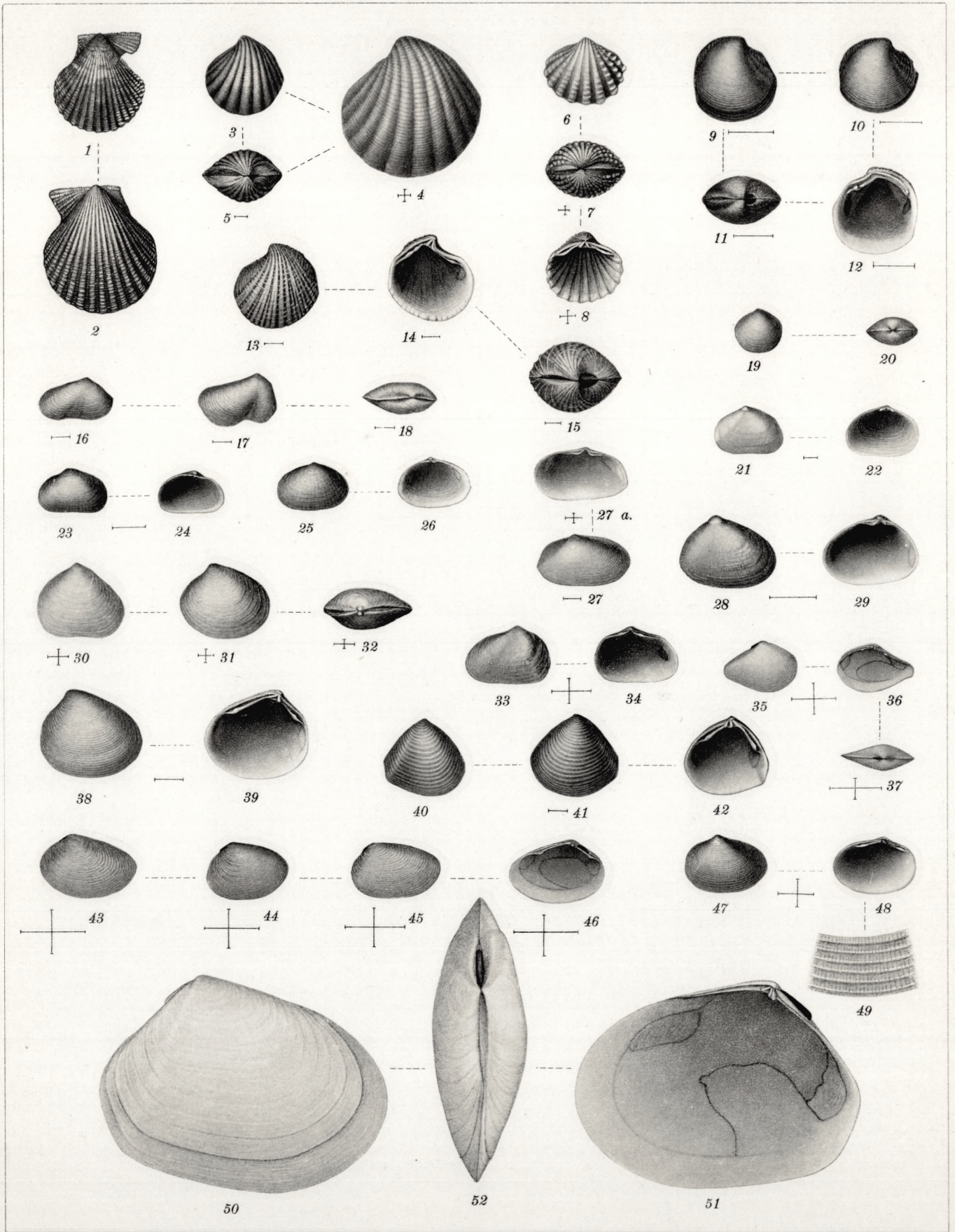


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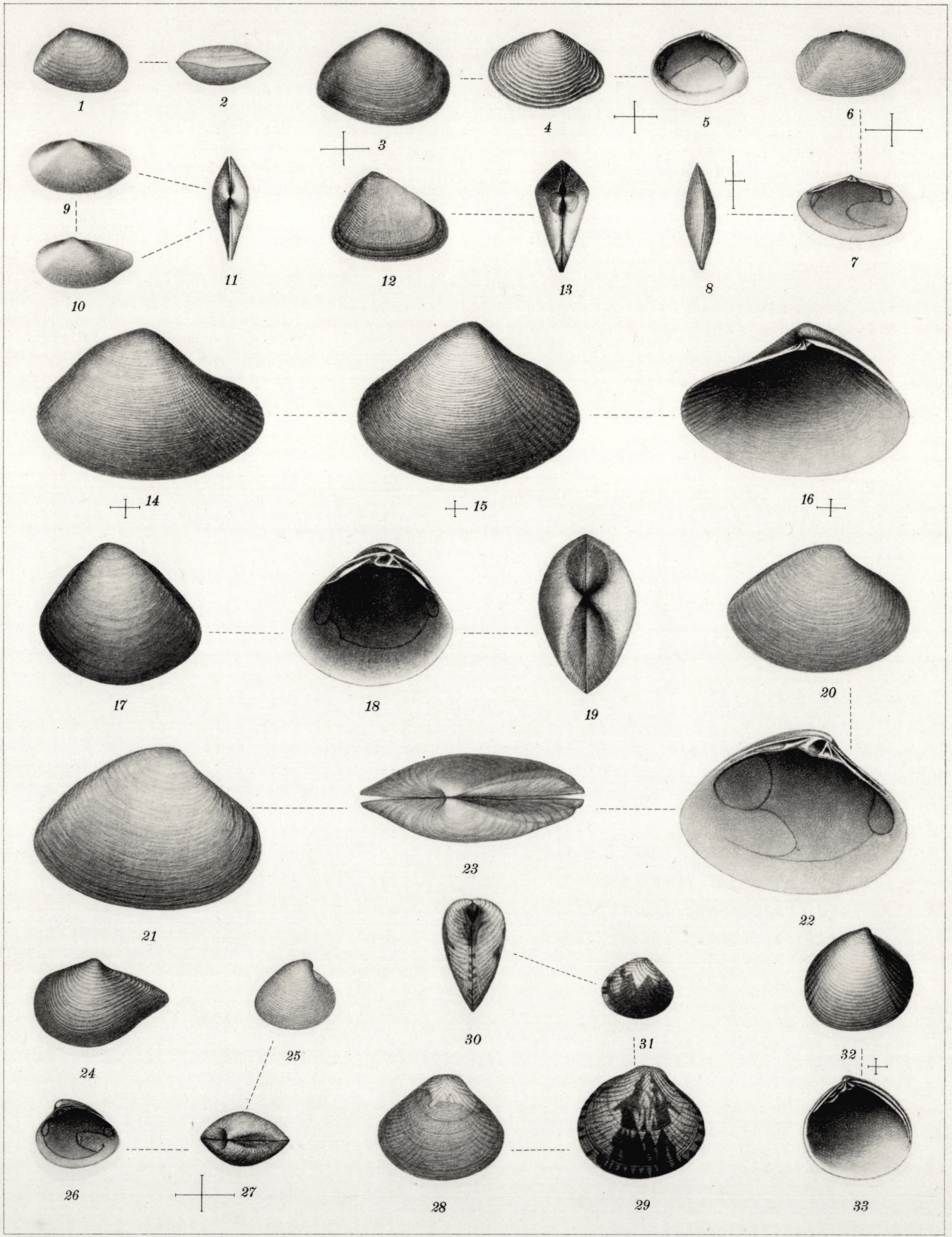
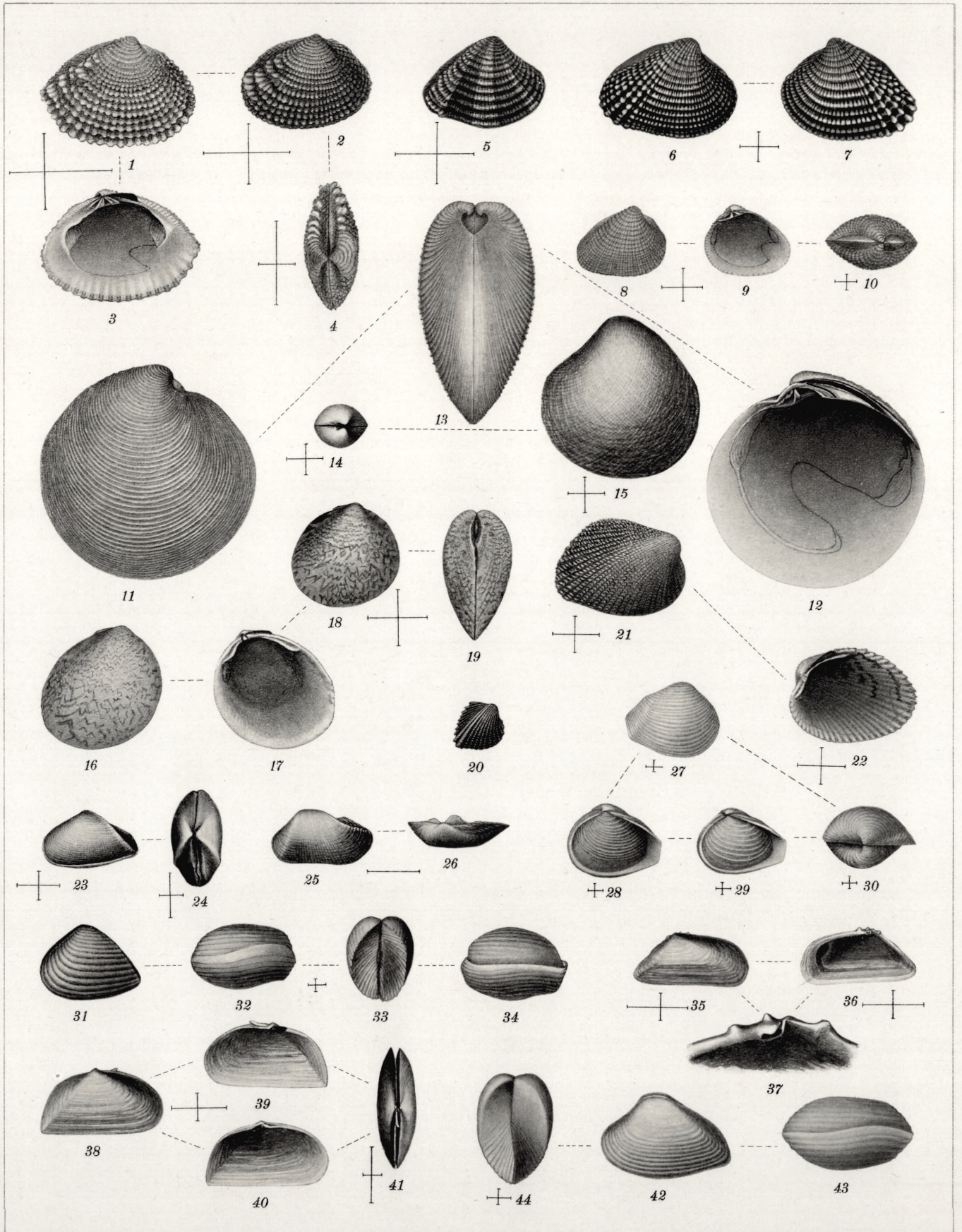


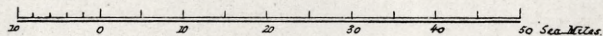
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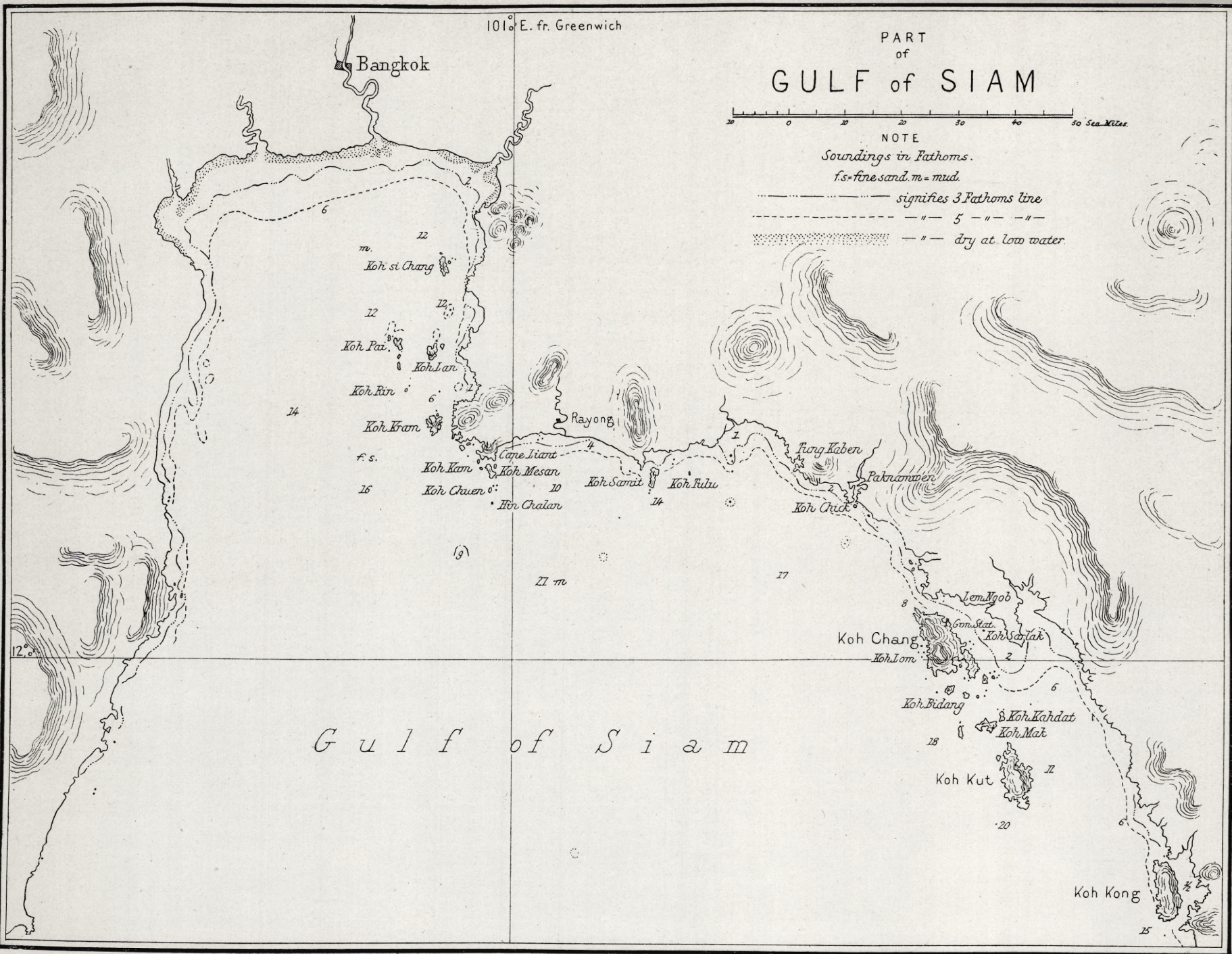


NOTE

Soundings in Fathoms.

f. s. = fine sand. m. = mud.

— — — — — signifies 3 Fathoms line
- - - - - " 5 " " "
..... " " dry at low water



G u l f o f S i a m

Koh Kong

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— Kjømpedovendyr-Slægten Coelodon, m. 5 Tavler. Résumé en franç. 78	5.	•
— Beskrivelse af Hovedskallen af et Kjømpedovendyr, Grypotherium darwinii, fra La Plata-Landenes plejstocene Dannelser, m. 2 Tavler. Résumé en franç. 79	1.	75.
Reinhardt & Prosch. Om Scidaephorus Mülleri, m. 5 Tavler. 46	2.	25.
Schjødte, J. C. Corotoca og Spirachtha, m. 2 Tavler. 54	1.	35.
Steenstrup, Jap. Rhizochilus antipathum, m. 1 Tavle. 53	1.	•
— Hectocotyldannelsen hos Octopodslægterne Argonauta og Tremoctopus, m. 2 Tavler. 56	1.	35.
— Hemisepius, en ny Slægt af Sepia-Blæksprutternes Familie, med Bemærkninger om Sepia-Formerne i Almindelighed, m. 2 Tavler. Résumé en franç. 75	1.	25.
— Spolia atlantica. Kolossale Blæksprutter fra det nordtlge Atlanterhav, m. 4 Tavler. 98	2.	75.
Steenstrup & Lütken. Bidrag til Kundskab om det aabne Havs Snyltekrebs og Lernæer, m. 15 Tavler. 61	5.	•

THE DANISH EXPEDITION TO SIAM 1899-1900

V. Brachyura

by

Mary J. Rathbun
(Washington D. C.)

With 2 plates and a map

D. KGL. DANSKE VIDENSK. SELSK. SKRIFTER, 7. RÆKKE, NATURVIDENSK. OG MATHEM. AFD. V. 4

KØBENHAVN

HOVEDKOMMISSIONÆR: ANDR. FRED. HØST & SØN, KGL. HOF-BOGHANDEL

BIANCO LUNOS BOGTRYKKERI

1910

Det Kgl. Danske Videnskabernes Selskabs Skrifter, 6^{te} Række.

Naturvidenskabelig og matematisk Afdeling.

	Kr.	Øre
I, med 42 Tavler, 1880—85		
1. Prytz, K. Undersøgelser over Lysets Brydning i Dampe og tilsvarende Vædsker. 1880	29.	50.
2. Boas, J. E. V. Studier over Decapodernes Slægtskabsforhold. Med 7 Tavler. Résumé en français. 1880	8.	50.
3. Steenstrup, Jap. Sepiadarium og Idiosepius, to nye Slægter af Sepiernes Familie. Med Bemærkninger om to beslægtede Former Sepioloidea D'Orb. og Spirula Lmk. Med 1 Tavle. Résumé en français. 1881	1.	35.
4. Colding, A. Nogle Undersøgelser over Stormen over Nord- og Mellem-Europa af 12 ^{te} —14 ^{de} Novb. 1872 og over den derved fremkaldte Vandflod i Østersøen. Med 23 Planer og Kort. Résumé en français. 1881	10.	"
5. Boas, J. E. V. Om en fossil Zebra-Form fra Brasiliens Campos. Med et Tillæg om to Arter af Slægten Hippidion. Med 2 Tavler. 1881	2.	"
6. Steen, A. Integration af en lineær Differentialligning af anden Orden. 1882	"	50.
7. Krabbe, H. Nye Bidrag til Kundskab om Fuglenes Bændelorme. Med 2 Tavler. 1882	1.	35.
8. Hannover, A. Den menneskelige Hjernes kals Bygning ved Anencephalia og Misdannelsens Forhold til Hjernes kalls Primordialbrusk. Med 2 Tavler. Extrait et explication des planches en français. 1882	1.	60.
9. — Den menneskelige Hjernes kals Bygning ved Cyclopia og Misdannelsens Forhold til Hjernes kalls Primordialbrusk. Med 3 Tavler. Extrait et explic. des planches en français. 1884	4.	35.
10. — Den menneskelige Hjernes kals Bygning ved Synotia og Misdannelsens Forhold til Hjernes kalls Primordialbrusk. Med 1 Tavle. Extrait et explic. des planches en français. 1884	1.	30.
11. Lehmann, A. Forsøg paa en Forklaring af Synsvinklens Indflydelse paa Opfattelsen af Lys og Farve ved direkte Syn. Med 1 Tavle. Résumé en français. 1885	1.	85.
II, med 20 Tavler, 1881—86		
1. Warning, Eug. Familien Podostemaceae. 1 ^{ste} Afhandling. Med 6 Tavler. Résumé et explic. des planches en français. 1881	3.	15.
2. Lorenz, L. Om Metallernes Ledningsevne for Varme og Elektricitet. 1881	1.	30.
3. Warning, Eug. Familien Podostemaceae. 2 ^{den} Afhandling. Med 9 Tavler. Résumé et explic. des planches en français. 1882	5.	30.
4. Christensen, Odn. Bidrag til Kundskab om Manganets Iiter. 1883	1.	10.
5. Lorenz, L. Farvespredningens Theori. 1883	"	60.
6. Gram, J. P. Undersøgelser ang. Mængden af Primitiv under en given Grænse. Résumé en français. 1884	4.	"
7. Lorenz, L. Bestemmelse af Kviksølvøjlers elektriske Ledningsmodstande i absolut elektromagnetisk Maal. 1885	"	80.
8. Traustedt, M. P. A. Spolia Atlantica. Bidrag til Kundskab om Salperne. Med 2 Tavler. Explic. des planches en français. 1885	3.	"
9. Bohr, Chr. Om Iltens Afvigelse fra den Boyle-Mariotteske Lov ved lave Tryk. Med 1 Tavle. 1885	1.	"
10. — Undersøgelser over den af Blodfarvestoffet optagne Iltmængde udførte ved Hjælp af et nyt Absorptionsmeter. Med 2 Tavler. 1886	1.	70.
11. Thiele, T. N. Om Definitionerne for Tallet, Talarterne og de tallignende Bestemmelser. 1886	2.	"
III, med 6 Tavler, 1885—86		
1. Zeuthen, H. G. Keglesnitlæren i Oldtiden. 1885	16.	"
2. Levinsen, G. M. R. Spolia Atlantica. Om nogle pelagiske Annulata. Med 1 Tavle. 1885	10.	"
3. Rung, G. Selvregistrerende meteorologiske Instrumenter. Med 1 Tavle. 1885	1.	10.
4. Melkert, Fr. De eucephale Myggelarver. Med 4 dobb. Tavler. Résumé et explic. des planches en français. 1886	6.	75.
IV, med 25 Tavler. 1886—88		
1. Boas, J. E. V. Spolia Atlantica. Bidrag til Pteropodernes Morfologi og Systematik samt til Kundskaben om deres geografiske Udbredelse. Med 8 Tavler. Résumé en français. 1886	10.	50.
2. Lehmann, A. Om Anvendelsen af Middelgradationernes Metode paa Lyssansen. Med 1 Tavle. 1886	1.	50.
3. Hannover, A. Primordialbrusken og dens Forbening i Truncus og Extremiteter hos Mennesket før Fødselen. Extrait en français. 1887	1.	60.
4. Lütken, Chr. Tillæg til Bidrag til Kundskab om Arterne af Slægten <i>Cyamus</i> Latr. eller Hvallusene. Med 1 Tavle. Résumé en français. 1887	"	60.
5. — Fortsatte Bidrag til Kundskab om de arktiske Dybhavs-Tudsefiske, særligt Slægten <i>Himantolophus</i> . Med 1 Tavle. Résumé en français. 1887	"	75.
6. — Kritiske Studier over nogle Tandhvaler af Slægterne <i>Tursiops</i> , <i>Orca</i> og <i>Lagenorhynchus</i> . Med 2 Tavler. Résumé en français. 1887	4.	75.
7. Koefoed, E. Studier i Platosoforbindelser. 1888	1.	30.
8. Warning, Eug. Familien Podostemaceae. 3 ^{die} Afhandling. Med 12 Tavler. Résumé et explic. des planches en français. 1888	6.	45.
V, med 11 Tavler og 1 Kort. 1889—91		
1. Lütken, Chr. Spolia Atlantica. Bidrag til Kundskab om de tre pelagiske Tandhval-Slægter <i>Steno</i> , <i>Delphinus</i> og <i>Prodelphinus</i> . Med 1 Tavle og 1 Kort. Résumé en français. 1889	2.	75.
2. Valentiner, H. De endelige Transformations-Grupper Theori. Résumé en français. 1889	5.	50.
3. Hansen, H. J. Cirolanidæ et familiæ nonnullæ propinquæ Musei Hauniensis. Et Bidrag til Kundskaben om nogle Familier af isopode Krebsdyr. Med 10 Kobbertavler. Résumé en français. 1890	9.	50.
4. Lorenz, L. Analytiske Undersøgelser over Primitivmængderne. 1891	"	75.

THE DANISH EXPEDITION TO SIAM 1899-1900

D. Kgl. Danske Vidensk. Selsk. Skrifter. 7. Række, naturvidensk. og mathem. Afd. V. 4

V. Brachyura

by

Mary J. Rathbun

(Washington D. C.)

With 2 plates and a map



København

Bianco Lunos Bogtrykkeri

1910

The crabs here described are the result of the exploration by Dr. TH. MORTENSEN of the eastern coast of the Gulf of Siam from Koh si Chang, near the head of the gulf, to Koh Kong at the south, in about 11° north latitude. The passages formed by the numerous islands fringing the mainland proved to be an excellent collecting ground. Operations were continued for a period of about four months (from December, 1899, to March, 1900) and from the shore line to a depth of 30 fathoms. The collection obtained is a large one, comprising 204 species, and probably represents a large proportion of the fauna actually existing there. A few specimens are from Singapore.

The Gulf of Siam occupies a somewhat central position in the marine Asiatic fauna, being midway between the Chinese and Japanese seas on the one hand and the Indian Ocean on the other, while in an intermediate direction radiates the Malayan Archipelago. While the Brachyura are in general Indo-Pacific in character, 72 per cent of the previously known species being enumerated by ALCOCK in his "Materials for a Carcinological Fauna of India," yet there are certain features which seem to be peculiar to the Gulf of Siam. Of the twenty-seven new species, three represent as many new genera, and one makes necessary a new subfamily. Several of these forms are catometopous crabs with a semicircular carapace, that is, with a squarish posterior, and an arcuate anterior outline, the antero-lateral angles being rounded off. The collection is noticeably rich in species of this build, belonging to the families *Gonoplacidae* (subfamilies *Rhizopinae* and *Hexapodinae*) and *Pinnotheridae*. Next in importance are the *Leucosiidae* which number 31 species.

One is struck with the many minute specimens in the collection; their presence may be attributed either to the zeal of the collector or to their relative abundance in this sheltered arm of the sea.

The classification used in this paper is that of BORRADAILE (cf. Ann. Mag. Nat. Hist. (7), XIX, June, 1907, 457—486). In the case of species included in ALCOCK's memoir above mentioned,¹ synonymical references are restricted to that work, which contains full synonymy and descriptions.

The types of new species are in the Copenhagen Museum and a set of cotypes is in the United States National Museum.

¹ Journ. Asiat. Soc. Bengal, LXIV, 1895; LXV, 1896; LXVII, 1898; LXVIII, 1899; LXIX, 1900.

The new forms described are as follows:—

- Heteronucia mesanensis*, sp. nov.
Cryptocnemus mortenseni, sp. nov.
Philyra olivacea, sp. nov.
Arcania siamensis, sp. nov.
Rhynchoplax coralicola, sp. nov.
Cleistostoma lingulatum, sp. nov.
Camptandrium paludicola, sp. nov.
Acmæopleura rotunda, sp. nov.
Sesarma (Chiromantes) siamense, sp. nov.
Pinnotheres bürgeri, sp. nov.
 — *lanensis*, sp. nov.
 — *quadratus*, sp. nov.
 — *nigrans*, sp. nov.
 — *kamensis*, sp. nov.
 — *kutensis*, sp. nov.
 — *siamensis*, sp. nov.
Mortensenella forceps, gen. et sp. nov.
Asthenognathus hexagonum, sp. nov.
Litocheira cristata, sp. nov.
Megæsthesius sagedæ, gen. et sp. nov.
Typhlocarcinopsinæ, subfam. nov.
Typhlocarcinops canaliculata, gen. et sp. nov.
Thaumastoplax orientalis, sp. nov.
 — *chuenensis*, sp. nov.
Lambdophallus anfractus, sp. nov.
Pilumnus borradailei, sp. nov.
Actumnus changensis, sp. nov.
Heteropanope sexangula, sp. nov.

In order to secure these new forms for this collection a preliminary description of them was published in the Proceedings of the Biological Society of Washington, Vol. XXII, June 25, 1909, pp. 107—114, in a paper entitled "New Crabs from the Gulf of Siam."

The following new names are given to previously known species:—

- Uca manii*.
Pinnotheres alcocki.
Hypocolpus haanii.
Portunus (Lupocycloporus) innominatus.

These names likewise were first published in the paper quoted. The drawings were made by Miss VIOLET DANDRIDGE.

Tribe **Brachyura.**
Subtribe **Oxystomata.**
Family **Dorippidæ.**

Dorippe dorsipes (Linnæus).

Dorippe dorsipes ALCOCK, LXV, 277, 1896.

Between Koh Mesan and Cap Liant, 9 fath.; II. 4; 1 juv. Koh Kam, 5 fath., gravel; II. 6; 1 juv. Koh Kahdat, 5—8 fath., sandy mud; II. 16 and III. 4; 1 juv. North side of Koh Mesan, 10—15 fath., stones, shells; II; 1 juv. Tung Kaben, 6 fath., sand, mud, phanerogams; II. 22; 1 ♀. Koh Lan, 30 fath., mud; III. 2; 1 juv. Koh Kram, 30 fath.; III. 2 and 21; 1 juv.

In the adults that I have examined, the carapace of both sexes is broader than long. In young specimens the eyes project laterally beyond the external spine of the orbit.

Dorippe facchino (Herbst).

Dorippe facchino ALCOCK, LXV, 278, 1896.

Coast of Lem Ngob, 0—1 fath., stones and sand; XII; 1 ♀. Koh Kahdat, 8—10 fath., mud; I. 27; 1 ♀. Koh Kahdat, 5—8 fath., sandy mud; II. 16 and III. 4; 3 ♀ ovigerous. Sound at Koh Chang, 3—5 fath., soft clay; 1900; 1 juv., soft shell.

Dorippe astuta Fabricius.

Dorippe astuta ALCOCK, LXV, 280, 1896.

Mouth of the river, Paknam-wen, in Chinamen's tow-nets; I. 30; 1 ♂. Koh Chik; II. 2; 1 ♀ ovigerous. Koh Chang, near the Station, low water; III. 10; 1 juv.; crept about with a large leaf over it.

The third segment of the male abdomen has a blunt transverse ridge which is bilobed.

Family **Leucosiidæ.**

Subfamily **Leucosiinæ.**

Oreophorus rugosus Stimpson.

Oreophorus rugosus STIMPSON, Smithson. Misc. Coll., XLIX, 159, pl. XIX, fig. 6, 6 a, 1907.

Koh Kam, 5 fath., gravel; II. 6; 1 ♀ immature.

Tlos muriger Adams and White.

Tlos muriger ADAMS and WHITE, Zool. Samarang, Crust., 58, pl. XIII, fig. 2, 1848.

N. of Koh Kut, 10 fath.; I. 23; 1 ♂. Koh Chuen, 30 fath., shell bottom; II; 1 ♀ juv. 6 miles East of Cap Liant, 9 fath., shell bottom; II. 1; 1 ♀.

Nursia lar (Fabricius).

Parthenope lar FABRICIUS, Entom. Syst., Suppl., 354, 1798.

Nursia hardwickii LEACH, ALCOCK, LXV, 181, 1896.

Singapore, 2—3 fath.; XII. 4; 1 ♂ 1 ♀. Between Koh Kut and Koh Kahdat, 10 fath., shell bottom; I. 10; 2 ♂ 3 ♀. North of Koh Kut, 10 fath.; I. 23; 1 ♀. North of Koh Chuen, 15 fath., mud, shells; II. 5; 1 ♀ juv. The Gulf at Rayong, 7—10 fath., sand, mud, shells; II. 8; 1 ♂ 1 ♀. North of Koh Kut, 15 fath.; III. 4; 1 ♀ ovigerous. Koh Lan, 30 fath., mud; III. 2; 1 ♀ juv. Between Koh Chuen and Koh Chang, 15 fath., mud; III. 3; 1 ♀ immature.

The species "*Parthenope Lar* Fabricius" has remained till now neglected, its author having classified it according to its general appearance without reference to the mouth parts. The original description is as follows:—

"P. thorace inaequali quadridentato: margine spinoso, chelis laeubus.

"Habitat in India Dom. Daldorff.

"Corpus paruum obouatum. Rostrum truncatum, vix exsertum. Thorax inaequalis dentibus duobus in medio duobusque in linea dorsali postice eleuatis, acutis. Spinae marginalis utrinquetris planae, acutae: intermedia longiore. Chelae longissimae at omnino laeues."

The type specimen is in the Museum at Copenhagen.

MILNE EDWARDS had doubts as to the assignment of the species, for he says:—¹

"Si le **Lambre lar.** (*Parthenope lar.* Fabr. Supp. p. 354) appartient réellement à la tribu des Parthénopiens, il paraît devoir se ranger parmi les Lambres, et il se distinguerait facilement de toutes les autres espèces par ses pinces qui sont tout-à-fait lisses."

Heteronucia mesanensis Rathbun.

Heteronucia mesanensis RATHBUN, Proc. Biol. Soc. Washington, XXII, 107, 1909.

As in the typical species of the genus, *H. vesiculosa* Alcock (LXV, 177, pl. VIII, fig. 1), the surface is closely set with vesiculous granules. The carapace is one-fourth broader than long, subglobular, very uneven; a narrow triangular area in the middle is bordered by a deep groove and embraces the cardiac and mesogastric regions, the cardiac region being also separately convex; branchial region nodulous and tuberculous, the larger protuberances in the anterior half; an inconspicuous tubercle on the hepatic region. The lateral margin begins with a tubercle at the angle of the buccal cavity, on the pterygostomian region there is a large

¹ Hist. Nat. Crust., I, 358, 1834.

obtuse-angled prominence, the anterior margin of which is nearly transverse and in line with the eye when viewed from above; behind it a smaller prominence, from which a row of tubercles curves backward and strongly upward to a point opposite the middle of the cardiac region. Posterior margin slightly convex. Front and orbits together nearly one-half as wide as the carapace; front with a median furrow, edge subtruncate, faintly bidentate, outer angles rounded. Orbit small, orbicular.

Outer maxilliped strongly bent near its middle so that the merus of the endognath is nearly at a right angle to the ischium. Abdomen of female with third to sixth segments fused.

Chelipeds knobby like the carapace; arm widening a little distally, palm extremely thick near its proximal end, fingers no longer than palm, opening vertically, curving inward, grooved, ridges finely granulate, prehensile edges evenly denticulate and overlapping, the dactylus lying within the pollex, and nearly as wide as the pollex.

This species differs from those hitherto described, in lacking conical tubercles on the carapace, and in the palm being as long as the fingers.

Dimensions. — Female, length 3.7 mm., width 4.5 mm.

Localities. — Between Koh Mesan and Koh Chuen, 15 fath.; II. 6; one ♀ ovigerous, type. Between the same islands, 30 fath., stones; II. 5; one ♀ adult.

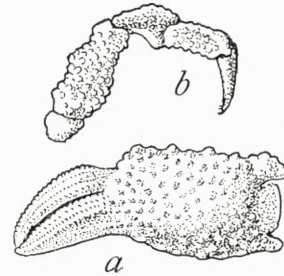


Fig. 1.
Heteronucia mesanensis,
type ♀, 4.5 mm. wide:
a, chela; b, leg.

***Ebalia woodmasoni* Alcock.**

Plate I, fig. 17.

Ebalia woodmasoni ALCOCK, LXV, 188, pl. VII, fig. 3, 1896.

Koh Kahdat, 1 fath., sandy bottom, sponges, dead corals; I. 11; 2 ♀ ovig.
Koh Kahdat, 4—5 fath., sand, stones, coral; II. 15—18; 1 ♀ ovig.

These specimens agree well with Alcock's description, but not so well with his figure, which represents the front considerably wider. The largest female is 6.7 mm. long, 6.7 mm. wide.

***Nucia tuberculosa* A. Milne Edwards.**

Nucia tuberculosa A. MILNE EDWARDS, Nouv. Arch. Mus. Hist. Nat., X, 44, pl. II, fig. 5, 5a, 1874.

Between Koh Mesan and Koh Chuen, 30 fath., stones; II. 5; 1 ♂ 1 ♀ immature.

Surface of body and limbs closely covered with acute granules or tubercles. Carapace subglobular, slightly hexagonal; a little broader than long, with the front set off by a furrow. Regions faintly indicated. Front more than one-third width of carapace. Merus of maxillipeds sharply acuminate. Chelipeds not much longer

than the carapace; palm so swollen as to be subglobular; fingers almost as long as palm, their opposed edges meeting.

Dimensions. — Length of ♂, 2 mm., width 2.2 mm.

Persephona fugax (Fabricius).

Myra fugax ALCOCK, LXV, 202, 1896.

South of Koh Bidang, 9 fath., mud, shells; I. 18; 1 ♀. North of Koh Kut, 10 fath.; I. 23; 1 ♂. 4—6 miles S. of Koh Samit, 14—18 fath.; II. 1; 1 ♀. Koh Kahdat, 5—8 fath., sandy mud; II. 16 and III. 4; 2 ♂. Between Koh Chuen and Koh Chang, 15 fath., mud; III. 3; 1 ♀ with Rhizocephalid parasite in abdomen.

Persephona pentacantha (Alcock).

Myra pentacantha ALCOCK, LXV, 204, 1896.

Singapore, 2—3 fath.; XII. 4; 1 ♀ juv. Koh Kahdat, 5—8 fath., sandy mud; II. 16 and III, 4; 1 ♀ mature. Tung Kaben, 6 fath., sand, mud, phanerogams; II. 22; 1 ♀ immature.

The measurements of these 3 females are as follows:— Singapore, length 9.8 mm., without spine 8 mm., width 7.8 mm. Koh Kahdat, length 17.1 mm., without spine 14.9 mm., width 13.7 mm. Tung Kaben, length 21.9 mm., without spine 19 mm., width 17.1 mm.

The series indicates that the species is distinct from *P. fugax*. The two smaller females have the characters given by ALCOCK. The largest one, not adult, differs from the smaller ones in being less rough, in having the spinule of the postero-lateral margin and those of the antero-lateral margin reduced to large granules as in adult *fugax*. This species differs from *P. fugax* in lacking the fringe of hair along the inner part of the apposed edges of the external maxillipeds.

Persephona affinis (Bell).

Myra affinis ALCOCK, LXV, 205, 1896.

Koh Kam, 5 fath., gravel; II. 6; 1 ♀ juv. Between Koh Mesan and Koh Chuen, 15 fath., stones; II. 6; 1 ♂. Between Koh Riat and Koh Mesan, 3—5 fath., sand, algæ; II. 7; 1 ♀ juv. Gulf of Rayong, 7—10 fath., sand, mud, shells; II. 8; 1 ♂ 2 ♀ juv. Koh Chuen, 30 fath., shell bottom; II; 2 ♂ 1 ♀ juv., 1 ♀ ovig. Koh Kram, 30 fath.; III. 2 and 21; 1 ♂.

The only adult ♂ is that from Koh Kram, the only adult ♀ comes from Koh Chuen. The ♀ differs much from the ♂, as the surface is very much smoother, the granules are smaller and further apart, so that while the carapace appears rough to the naked eye, the granules do not stand out sharply as in the ♂.

Persephona elegans (Bell).

Plate I, fig. 12.

Myra elegans ALCOCK, LXV, 208, 1896.

Twenty-one specimens of this rare species were taken at nine stations:—

West of Koh Kong, 10—15 fath.; I. 24; 3 ♂. South of Koh Kut, 17—20 fath., mud; I. 28; 2 ♂. 10—12 miles west of Koh Chang, 20 fath., mud; I. 29; 4 ♂ 2 ♀ ovig. 20 miles south of Koh Samit, 20 fath.; I. 31; 3 ♂ 1 ♀ ovig. 4—6 miles south of Koh Samit, 14—18 fath.; II. 1; 1 ♀ ovig. Koh Kahdat, 5—8 fath., sandy mud; II. 16 and III. 4; 1 ♀ ovig. 7 miles NW. to W. of Koh si Chang, 10 fath., mud; II. 24; 1 ♂. Between Koh Chuen and Koh Chang, 15 fath., mud; III. 3; 1 ♂ 1 ♀ ovig. Sound at Koh Chang, 3—5 fath., soft clay; 1900; 1 ♀ juv.

Dimensions. — Length of largest ♂ (Koh Kong), 19·5 mm., width 10·5 mm. Length of largest ♀ (between Koh Chuen and Koh Chang), 18·3 mm., width 10·4 mm.

Leucosides longifrons (de Haan).*Leucosia longifrons* ALCOCK, LXV, 217, 1896.

Koh Kahdat, 4—5 fath., sand, stones, coral; II. 15—18; 1 ♀ juv. South of Koh Mak, 5—6 fath.; II. 17; 1 ♀ juv.

The largest of these specimens is 10·8 mm. long. The front is shorter and more distinctly tridentate than in adults with which they have been compared. The color markings (now very faint) consist of numerous fine brownish wavy lines running inward and backward from the antero-lateral margins, and a few small spots along the lateral margins.

Leucosides longifrons pulcherrima (Miers).

Plate I, fig. 14.

Leucosia longifrons var. *pulcherrima* ALCOCK, LXV, 219, 1896.

Koh Kahdat, 4—5 fath., sand, stones, coral; II. 15—18; 1 ♂ 1 ♀ immature.

Both have the same color pattern:— two red rings on the posterior half of the carapace, and two larger trefoils of the same color on the anterior half, each enclosing three white spots, two large and one small.

Leucosides urania (Herbst).

Plate I, fig. 1.

Leucosia urania ALCOCK, LXV, 220, 1896.

West coast of Koh Chang, a little north of the small islands, 10 fath., mud bottom, dead shells; I. 16; 1 ♂. Koh Lan, 30 fath., mud; II. 3; 1 ♂ 1 ♀. Koh Kahdat, 5—8 fath., sandy mud; II. 16 and III. 4; 2 ♂ 1 ♀.

Largest specimen, a male (Koh Kahdat), 30·3 mm. long, 24·9 mm. broad.

These specimens differ from ALCOCK's description as follows:— The hand is not as broad as long, the dactyli of the legs are a little longer than their propodi;

the color is different:— Specimens that have been in alcohol 6¹/₂ years have the carapace and chelipeds above smoky, with the carapace light yellowish behind and with a longitudinal row of faint light spots either side of the middle; legs banded with deep yellowish.

Leucosides haswelli (Miers).

Plate I, fig. 16.

Leucosia haswelli ALCOCK, LXV, 222, 1896.

Koh Chuen, 30 fath., shell bottom; II. 1900; 1 ♂.

In this specimen there are 19 or 20 lateral tubercles, beginning at the anterior end of the hepatic region and extending to the level of the base of the first ambulatory leg; tubercles mostly large; on the antero-lateral margin there are one or two small tubercles or granules just behind the front, followed by 7 or 8 large, spaced tubercles; on the postero-lateral margin the tubercles are smaller than those immediately preceding, diminish regularly backward, and are crowded close together. These tubercles, as well as those on the upper surface of the arm and inner margin of wrist and hand are bright red. The hand has, below the inner edge, a row of faint granules extending its whole length; outer margin of hand rather sharp.

Leucosides whitei (Bell).

Leucosia whitei ALCOCK, LXV, 225, 1896.

Koh Chuen, 30 fath., shell bottom; II. 1900; 1 ♀.

Leucosides hæmatosticta (Adams and White).

Leucosia hæmatosticta ALCOCK, LXV, 229, 1896.

4 miles S. of Koh Sakait, 9 fath., shell bottom; II. 3; 1 ♀ juv. Koh Kam, 5 fath., gravel; II. 6; 1 ♂ juv. Between Koh Chuen and Koh Chang, 15 fath., mud; III. 3; 1 ♂.

Leucosides margaritata (A. Milne Edwards).

Leucosia margaritata ALCOCK, LXV, 230, 1896.

Between Koh Kahdat and Koh Kut, 6 fath., sandy clay; I. 9; 1 ♀. North of Koh Kut, 10 fath.; I. 23; 1 ♂. 15 miles west of Koh Kut, 30 fath. (s. m.); I. 28; 1 ♂. Between Koh Chuen and Koh Chang, 15 fath., mud; III. 3; 1 ♀.

Leucosides craniolaris (Linnæus).

Leucosia craniolaris ALCOCK, LXV, 231, 1896.

Singapore, 2—3 fath.; XII. 4; 2 ♀ (1 ovig.). 10—12 miles west of Koh Chang, 20 fath., mud; I. 29; 1 ♂ 1 ♀ ovig. 20 miles south of Koh Samit, 20 fath., mud; I. 31; 1 ♀. Koh Kahdat, 5—8 fath., sandy mud; II. 16 and III. 4; 2 ♂ 2 ♀ (1 ovig.). Tung Kaben, 6 fath., sand, mud, phanerogams; II. 22; 3 ♂. Between Koh Chuen and Koh Chang, 15 fath., mud; III. 3; 1 ♂. North of Koh Kut, 15 fath., mud; III. 4; 1 ♀ ovig.

Leucosides vittata (Stimpson).

Leucosia vittata ALCOCK, LXV, 232, 1896; STIMPSON, Smithson. Misc. Coll., XLIX, 149, pl. XVIII, fig. 3, 3a, 1907.

Sound at Koh Chang, 3—5 fath., soft clay; 1900; 2 juv.

Onychomorpha lamelligera Stimpson.

Onychomorpha lamelligera ALCOCK, LXV, 236, 1896; STIMPSON, Smithson. Misc. Coll., XLIX, 164, pl. XIX, figs. 8, 8a, 1907.

North of Koh Kam, 10 fath., shell bottom; II. 6; 1 ♂. Koh Lan, 30 fath., mud; III. 2; 1 ♀ ovig.

The abdomen of the male has only three segments, the second to sixth inclusive being fused and bilobed in its widest part.

Cryptocnemus mortenseni Rathbun.

Cryptocnemus mortenseni RATHBUN, Proc. Biol. Soc. Washington. XXII, 107, 1909.

Nearly related to *C. pentagonus* Stimpson. Carapace equally broad, but with the margin of the posterior half regularly arched, without postero-lateral angles;

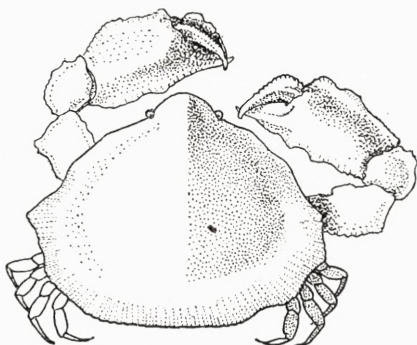


Fig. 2. *Cryptocnemus mortenseni*, type ♂, 3.8 mm. wide.

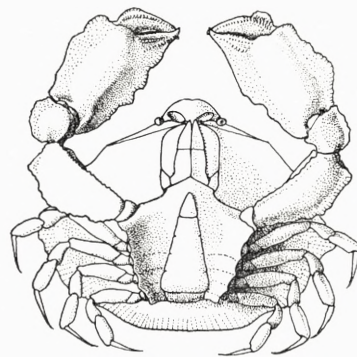


Fig. 3. *Cryptocnemus mortenseni*, type ♂, 3.8 mm. wide, ventral view.

margin of anterior half slightly angled at the hepatic region; front ascending, its edge arcuate, not acute as in *C. pentagonus*, forming a very shallow reentering angle with the hepatic margin. Carapace smoothly rounded in the middle and surrounded by a thin striated rim as in *Onychomorpha lamelligera*; rim widest in the postero-lateral portion; from the hepatic angle its sharp edge is continued downward to the anterior margin of the buccal cavity, and forms the lower edge of a narrow facet, of which the upper margin, or true margin of the carapace, is bluntly edged and in its outer portion not well defined.

Merus of outer maxilliped as long as the ischium.

Chelipeds about $1\frac{1}{4}$ times as long as the carapace, nearly naked. Inner and outer margins of arm and propodus and outer margin of wrist and dactylus with

a striated crest like that on the carapace. The palm measured along its outer edge is about $1\frac{1}{4}$ times its greatest width; immovable finger broadly triangular, sharp-pointed; dactylus strongly bent down.

The legs may be entirely concealed beneath the carapace; they have thin cristiform edges and very slender dactyli.

Dimensions. — Male type, length 3 mm., width 3.8 mm.

Localities. — Koh Chuen, 30 fath., shell bottom; I. 2; 1 ♂, type, immature. North of Koh Mesan, 15 fath., stones, shells; II. 5; 1 ♀ immature.

Philyra anatum (Herbst).

Cancer anatum HERBST, Naturg. Krabben u. Krebse, I, 93, pl. II, fig. 19, 1783.

Philyra globulosa MILNE EDWARDS, ALCOCK, LXV, 245, 1896.

East of Koh Chang, 6 fath., seine; I. 25; 1 ♂. Off Koh Kut, 6 fath.; I. 26; 1 ♀ juv. Among the small islands west of Koh Chang, 4–5 fath., mud; III. 9; 1 ♂. Sound at Koh Chang, 3–5 fath., soft clay bottom; 1 ♂ 3 juv.

Philyra olivacea Rathbun.

Plate II, fig. 17.

Philyra olivacea RATHBUN, Proc. Biol. Soc. Washington. XXII, 108, 1909.

Carapace convex, elongate oval, with a well defined hepatic facet; a depression either side of the cardiac and intestinal regions. Surface coarsely punctate, and, on the more elevated portions, granulate. From the postero-lateral margin two oblique lines run inward and converge, forming a small triangular area.

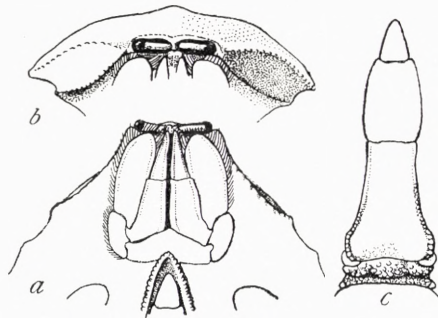


Fig. 4. *Philyra olivacea*, type ♂, 7.8 mm. wide: a, lower view of anterior half; b, front view; c, abdomen.

Front subtruncate, with a median furrow, and a slight point at the middle of the margin; the ends of the maxillipeds are visible in a dorsal view. Eyes long and slender. The lower margin of the hepatic facet has a strong tooth at its posterior third. The lateral margin of the carapace is angled at the posterior end of the facet, and again a short distance behind that point, at the widest part of the carapace; edge between these angles straight. Posterior margin narrow, prominent and trilobate; in the ♂ the outer lobes or teeth are much more prominent than in the ♀.

Sternum granulate; in the male there is a strong line of granules bordering the anterior half of the abdominal cavity. External maxillipeds with the edges granulate, the exognath broadly oval at the extremity, the merus of the endognath narrow, its outer edge straight. In the ♀ there is a fringe of hair near inner edge of endognath.

The chelipeds in the adult male are $1\frac{1}{2}$ times, in the adult female $1\frac{1}{4}$ times, the length of the carapace; surface granulous, the granules coarser along the inner

and outer margins, and on the lower surface of the arm; hand partly smooth, $\frac{2}{3}$ as wide as its outer length; outer edge straight, inner convex; dactylus $\frac{1}{4}$ longer than outer edge of palm; opposed edges of fingers denticulate throughout. Legs slender, the first pair reaching past the wrist by half the length of their dactyli; last two joints hairy.

The ♂ abdomen consists of 5 pieces, the third, fourth and fifth segments being fused; first and second and outer edge of third granulous; third bilobed; penultimate segment unarmed and wider than the terminal half of the preceding segment. The basal half of the ♀ abdomen, as well as the margins of the long segment, are coarsely granulous.

The color of the carapace in alcohol is olive green, chelipeds yellowish-brown, legs mostly dark reddish-brown.

Length of type ♂, 9 mm., width 7.8 mm.

Locality. — Coast of Lem Ngob (seine); XII. 26; 1 ♂ (type) 1 ♀.

Near *P. fuliginosa* Tozzetti (Zool. Magenta, Crost., p. 201, pl. XII, fig. 3a—g, 1877), from Java, but differs in wanting a postero-lateral angulation, and in the form of the ♂ abdomen and chela.

Pseudophilypira tridentata Miers.

Plate I, fig. 2.

Pseudophilypira tridentata ALCOCK, LXV, 250, 1896.

Between Koh Mesan and Koh Chuen, 38 fath., stones; II. 7; 1 ♂. Koh Kahdat, 4—5 fath., sand, stones, coral; II. 15—18; 1 ♀ ovig.

Pseudophilypira melita de Man.

Plate I, fig. 13.

Pseudophilypira melita ALCOCK, LXV, 253, 1896.

Between Koh Mesan and Cap Liant, 9 fath.; II. 4; 4 ♂ 2 ♀. Koh Kam, 5 fath., gravel; II. 6; 1 ♀ ovig. Between Koh Riat and Koh Mesan, 3—5 fath., sand, algæ; II. 7; 2 ♂ 1 ♀ ovig.

Subfamily Iliinæ.

Myrodes eudactylus Bell.

Myrodes eudactylus ALCOCK, LXV, 255, 1896.

Lem Ngob, mangrove swamp; XII. 23, 24 or 27; one cheliped only. 4 miles south of Koh Sakait, 9 fath., shell bottom; II. 3; 1 ♀ immature. North of Koh Chuen, 15 fath., mud, shells; II. 5; 1 ♀. Koh Chuen, 30 fath., shell bottom; II; 3 ♂ 5 ♀. Koh Kahdat, 4—5 fath., sand, stones, coral; II. 15—18; 2 ♂ 2 ♀ 4 juv. Koh Kahdat, 5—8 fath., sandy mud; II. 16 and III. 4; 1 ♂ 1 ♀ juv. South of Koh Mak, 5—6 fath.; II. 17; 1 ♂ 5 juv. Between Koh Rin and Cliff Rock (north of Koh Kram), 15 fath.; III. 2; 1 ♀ immature. Koh Kram, 30 fath.; III. 2 and 21; 1 ♀ juv.

Iphiculus spongiosus Adams and White.*Iphiculus spongiosus* ALCOCK, LXV, 256, 1896.

Singapore, 2—3 fath.: XII. 4; 1 ♂. Koh Kahdat, 8—10 fath., mud; I. 27; 1 ♀ juv. 12 miles east of Koh Mak, 20 fath., large seine; I. 28; 1 ♂. South of Koh Kut, 17—20 fath., mud; I. 28; 1 ♂. 15 miles west of Koh Kut, 30 fath. (s. m.); I. 28; 1 ♂. 10—12 miles west of Koh Chang, 20 fath., mud; I. 29; 2 ♂ 2 ♀. 20 miles south of Koh Samit, 20 fath., mud; I. 31; 1 ♂. 4—6 miles south of Koh Samit, 14—18 fath.; II. 1; 1 ♀ ovig. North of Koh Kut, 15 fath., mud; III. 4; 1 ♂ 2 ♀.

Arcania septemspinosa (Fabricius).*Arcania septemspinosa* ALCOCK, LXV, 265, 1896.

South of Koh Kut, 17—20 fath., mud; I. 28; 4 ♀ (2 ovig.). 15 miles west of Koh Kut, 30 fath. (s. m.); I. 28; 1 ♀ juv. 10—12 miles west of Koh Chang, 20 fath., mud; I. 29; 1 ♀ juv. 20 miles south of Koh Samit, 20 fath., mud; I. 31; 2 ♂ 2 ♀ (1 ovig.). Between Koh Chuen and Koh Chang, 15 fath., mud; III. 3; 1 ♂. North of Koh Kut, 15 fath., mud; III. 4; 1 ♂.

Arcania siamensis Rathbun.

Plate I, fig. 11.

Arcania siamensis RATHBUN, Proc. Biol. Soc. Washington, XXII, 108, 1909.

Near *A. septemspinosa* (Fabricius), from which it differs in few particulars: Carapace more subglobular, the branchial regions being more swollen. Surface densely covered with granules visible to the naked eye. The seven marginal spines shorter than in *A. septemspinosa*; the long lateral spine is less than one-third as wide as the carapace; the five posterior spines are short, subequal, the median one very slightly longer than the others.

Locality. — Sound at Koh Chang, 3—5 fath., soft clay bottom; 1900; 1 ♀ immature (type), 1 small ♂. A ♂ from Singapore, collected by E. DESCHAMPS, is in the U. S. National Museum.

Length of type ♀, with spine, 17.5 mm.; without spine 15.7 mm.; width, with spines, 24.5 mm.; without spines 15.5 mm.

Arcania undecimspinosa de Haan.*Arcania undecimspinosa* ALCOCK, LXV, 266, 1896.

Koh Kam, 5 fath., gravel; II. 6; 1 ♂ incomplete.

Ixa cylindrus (Fabricius).*Ixa cylindrus* ALCOCK, LXV, 271, 1896.

4 miles south of Koh Sakait, 9 fath., shell bottom; II. 3; 1 ♂. Koh Kahdat, 5—8 fath., sandy mud; II. 16 and III. 4; 1 ♀ ovig. Tung Kaben, 6 fath., sand, mud, phanerogams; II. 22; 1 ♂.

Family Calappidæ.

Subfamily Calappinæ.

Calappa lophos (Herbst).

? *Calappa lophos* ALCOCK, LXV, 144, 1896 (not *C. guerini* Capello).

20 miles south of Koh Samit, 20 fath., mud; I. 31; 1 ♂. 4 miles south of Koh Sakait, 9 fath., shell bottom; II. 3; 1 ♀. Koh Kam, 5 fath., gravel; II. 6; 1 ♂ 1 ♀ 3 juv. Between Koh Mesan and Cap Liant, 5—8 fath., sand, stones; II. 7; 3 juv. Gulf of Rayong, 7—10 fath., sand, mud, shells; II. 8; 2 juv. Tung Kaben, 6 fath., sand, mud, phanerogams; II. 22; 1 juv. Koh Chuen, 30 fath., shell bottom; II; 1 juv.

The specimens are all small, the largest being 48.5 mm. wide. I have for comparison an adult ♀ 76 mm. wide from Japan, which has the characteristics of DE HAAN's fig. 1, pl. XX (Fauna Japonica, Crustacea), and differs from ALCOCK's description (loc. cit.) in having its extreme length (54.7 mm.) more than $\frac{2}{3}$ of its extreme breadth; in the front projecting forward beyond the level of the orbits; in having the anterior border of the endostomial septum convex and not incised. In the series of 14 Siamese specimens the width increases with age; a specimen 6 mm. long is only 6.5 wide, while one 2.5 mm. long is a little longer than wide.

Perhaps ALCOCK had a species other than *C. lophos* and conspecific with *C. guerini* Capello.

Subfamily Matutinæ.

Matuta banksii Leach.

Matuta banksii ALCOCK, LXV, 158, 1896.

Between Koh Mesan and Cap Liant, 9 fath.; II. 4; 2 juv. Between Koh Mesan and Cap Liant, 5—8 fath., sand, stones; II. 7; 1 juv. Koh Kam, 5 fath., gravel; II. 6; 2 juv. Between Koh Riat and Koh Mesan, 3—5 fath., sand, algæ; II. 7; 1 ♂ 1 ♀ 4 juv. Koh Kahdat, 4—5 fath., sand, stones; II. 15—18; 1 ♂ 1 ♀ 2 juv.

Matuta lunaris (Forskål).

Matuta victor ALCOCK, LXV, 160, 1896.

Southwest coast of Koh Chang, sand, in shrimp net; I. 18; 2 juv. Coast of Koh Kong; I. 23; 13 ♂ 7 ♀. Koh Chik; II. 2; 1 ♂. Shore outside the mangrove at the Station on Koh Chang; III. 11; 1 ♀.

Subtribe **Brachygnatha.**
Superfamily **Oxyrhyncha** or **Inachidea.**

Family **Hymenosomidæ.**

Rhynchoplax coralicola Rathbun.

Rhynchoplax coralicola, RATHBUN, Proc. Biol. Soc. Washington, XXII, 108, 1909.

Closely allied to *R. setirostris* Stimpson¹ (which I have not seen) and distinguished chiefly by having only one lateral spine instead of two.

Adult female. — Shell very thin and soft, spotted with fine black dots, and sparingly hairy, some of the hairs long and hooked. Carapace ovate, with a reentering angle above the base of the last leg, and a rostrum consisting of a long median spine and two very short lateral spines; regions indicated by fine impressed lines. Carapace bordered by a raised rim, passing behind the rostrum and above the well-marked and almost forward-pointing antero-lateral spine. A small post-ocular tooth. Eyes large, reaching forward as far as the lateral spines of the rostrum.

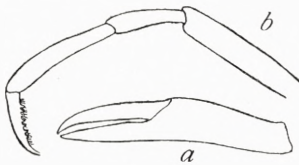


Fig. 5. *Rhynchoplax coralicola*, type ♀, 1·7 mm. wide: *a*, chela; *b*, leg.

Epistome deep. Merus and ischium of endognath subequal in length; merus obliquely cut on the antero-internal border; exognath posteriorly exposed. Chelipeds feeble, unarmed; fingers as long as palm. Legs longer than chelipeds, unarmed except the dactyli which are spinulose.

Dimensions. — Length, including rostrum, 2·2 mm.; excluding rostrum 1·8 mm.; width 1·7 mm.

Type locality. — Singapore, on coral reef; XII. 5; one adult ♀.

Family **Inachidæ.**

Subfamily **Inachinæ.**

Achæus lacertosus Stimpson.

Achæus lacertosus ALCOCK, LXIV, 172, 1895; STIMPSON, Smithson. Misc. Coll., XLIX, 20, pl. III, fig. 7, 1907.

Koh Chuen, 30 fath., shell bottom; I. 2; 1 ♀ ovig. Between Koh Riat and Koh Mesan, 3—5 fath., sand, algæ; II. 7; 1 ♀ ovig. Tung Kaben, 6 fath., sand, mud, phanerogams; II. 22; 1 ♀ ovig. Koh Kram, 30 fath., III. 2 and 21; 1 ♀.

Achæus affinis Miers.

Achæus affinis MIERS, ALCOCK, LXIV, 172, 1895.

Koh Kam, 5 fath., gravel; II. 6; 1 ♀. Between Koh Rin and Cliff Rock (N. of Koh Kram), 15 fath.; III. 2; 1 ♂. Koh Kram, 30 fath.; III. 2 and 21; 3 ♂ 4 ♀ 1 ovig.

¹ Smithson. Misc. Coll., XLIX, 148, 1907.

Paratymolus pubescens Miers.

Paratymolus pubescens MIERS, Proc. Zool. Soc. London, 1879, 45, pl. II, fig. 6.

Singapore, 2—3 fath.; XII. 4; 2 ♀ ovig. Koh Kahdat, 4—5 fath., sand, stones, coral; II. 15—18; 1 ♀. Koh Kahdat, 4—5 fath., sand, stones; II. 6; 1 ♀ ovig. Tung Kaben, 6 fath., sand, mud, phanerogams; II. 22; 1 ♂ juv., soft shell.

I think that this is MIERS'S species, although all the Siamese specimens have a posterior gastric tubercle, smaller than the two anterior tubercles. As in his figure, there is a single large tubercle on the postero-lateral margin. The larger of the antero-lateral tubercles is further back than shown in the figure. There are four tubercles in the oblique line on the dorsal surface of the branchial region; the two anterior tubercles are the larger.

Subfamily **Acanthonychinæ**.

Menæthius monoceros (Latreille).

Menæthius monoceros ALCOCK, LXIV, 197, 1895.

Koh Kahdat, among algæ; II. 19; 5 ♂ 4 ♀ ovig. 2 juv. Koh Kahdat, 1 fath., sandy bottom, sponges, dead corals; I. 11; 2 ♂ 2 ♀ ovig. Koh Chik; "animal green, covered with green algæ and among green algæ;" II. 11; 1 ♂. Koh Chang, 1 fath., coral; I—III; 1 juv.

Subfamily **Pisinæ**.

Halimus hilgendorfi (de Man).

Hyastenus hilgendorfi ALCOCK, LXIV, 209, 1895.

Between Koh Mesan and Cap Liant, 9 fath.; II. 4; 1 ♀ ovig. Between Koh Mesan and Cap Liant, 5—8 fath., sand, stones; II. 7; 1 ♀ ovig. Koh Kram, 30 fath.; III. 2 and 21; 1 ♂, with the right rostral horn bifurcate, almost from the base.

Halimus diacanthus (de Haan).

Hyastenus diacanthus ALCOCK, LXIV, 210, 1895.

Between Koh Kut and Koh Kahdat, 10 fath., shell bottom; I. 10; 1 juv. Koh Kam, 5 fath., gravel; II. 6; 1 ♂ 2 ♀ (1 ovig.). Between Koh Mesan and Koh Chuen, 15 fath., stones; II. 6; 1 ♀ ovig. Between Koh Riat and Koh Mesan, 3—5 fath., sand, algæ; II. 7; 1 ♀ ovig. Koh Chuen, 30 fath., shell bottom; 3 ♂ 4 ♀ 2 juv. Between Koh Rin and Cliff Rock (N. of Koh Kram), 15 fath.; III. 2; 1 ♀ juv. Koh Kram, 30 fath.; III. 2 and 21; 1 ♂ 1 ♀ 2 juv.

Halimus spinosus (A. Milne Edwards).

Hyastenus spinosus ALCOCK, LXIV, 211, 1895.

Koh Chuen, 30 fath., shell bottom; II; 1 ♂. Koh Kahdat, 5—8 fath., sandy mud; II. 6 and III. 4; 1 ♂ 1 ♀. Koh Kram, 30 fath.; III. 2 and 21; 3 ♂ 6 ♀. Between Koh Chuen and Koh Chang, 15 fath., mud; III. 3; 1 ♂ 1 ♀.

Halimus planasius (Adams and White).*Hgastenus planasius* ALCOCK, LXIV, 212, 1895.

Koh Kam, 5 fath., gravel; II. 6; 1 juv. North side of Koh Mesan, 10—15 fath., stones, shells; II; 1 juv. Koh Chuen, 30 fath., shell bottom; II; 6 juv. Between Koh Rin and Cliff Rock (N. of Koh Kram), 15 fath.; III. 2; 1 juv. Koh Kram, 30 fath.; III. 2 and 21; 9 juv.

Halimus oryx (A. Milne Edwards).*Hgastenus oryx* ALCOCK, LXIV, 214, 1895.

Singapore, 2—3 fath.; XII. 4; 2 juv. Singapore, coral reef; XII. 5; 1 ♀ juv. South of Koh Mak, 5—6 fath.; II. 17; 1 ♂ juv. In this specimen there is a short spine at the postero-lateral angle, as in de Man's figure (Arch. f. Naturg., LIII, pt. 1, pl. VII, fig. 2, 1887).

Phalangipus longipes (Linnæus).*Egeria arachnoides* ALCOCK, LXIV, 223, 1895.

Singapore, 2—3 fath.; XII. 4; 2 legs only. Koh Kam, 5 fath., gravel; II. 6; 1 ♂ 1 ♀. Koh Chuen, 30 fath., shell bottom; II; 2 ♂ 1 ♀ 4 juv. Koh Kram, 30 fath.; III. 2 and 21; 1 ♂ 1 ♀.

Doclea canalifera Stimpson.*Doclea canalifera* ALCOCK, LXIV, 228, 1895; STIMPSON, Smithson. Misc. Coll., XLIX, 7, pl. I, fig. 4, 1907.

Koh Kahdat, 5—8 fath., sandy mud; II. 16 and III. 4; 1 ♀ immature and soft shell. Koh Kram, 30 fath.; III. 2 and 21; 1 juv.

Doclea tetraptera Walker.*Doclea tetraptera* ALCOCK, LXIV, 231, 1895.

4 to 6 miles south of Koh Samit, 14—18 fath.; II. 1; 1 ♂ juv. 3 ♀ (2 ovig.). Koh Kahdat, 5—8 fath., sandy mud; II. 16 and III. 4; 1 ♂. Between Koh Chuen and Koh Chang, 15 fath., mud; III. 3; 2 ♂ juv. 1 ♀ juv. North of Koh Kut, 15 fath., mud; III. 4; fragment of carapace.

Subfamily **Schizophrysinæ**.**Chlorinoides aculeatus** (Milne Edwards).*Chlorinoides aculeatus* ALCOCK, LXIV, p. 241, 1895.

Between Koh Mesan and Koh Chuen, 30 fath., stones; II. 5; 1 ♀. Koh Kam, 5 fath., gravel; II. 6; 1 ♀ juv. Koh Chuen, 30 fath., shell bottom; II; 1 ♂ juv. North side of Koh Mesan, 10—15 fath., stones, shells; II; 1 ♀ juv., 1 juv. Between Koh Rin and Cliff Rock (N. of Koh Kram), 15 fath.; III. 2; 1 ♂ 3 ♀. Koh Kram, 30 fath.; III. 2 and 21; 2 ♂ 2 ♀.

Micippa philyra (Herbst).

Micippa philyra ALCOCK, LXIV, 249, 1895.

Koh Kahdat, 1 fath., sandy bottom, sponges, dead corals; I. 11; 1 ♀. Between Koh Mesan and Koh Chuen, 15 fath., stones; II. 6; 1 ♀ ovig. Koh Kahdat, 4—5 fath., sand, stones, coral; II. 15—18; 1 ♂ 2 ♀ (1 ovig.). South of Koh Mak, 5—6 fath.; II. 17; 3 ♂.

Micippa thalia (Herbst).

Micippa thalia ALCOCK, LXIV, 251, 1895.

Between Koh Kut and Koh Kahdat, 10 fath., shell bottom; I. 10; 1 juv. Koh Kam, 5 fath., gravel; II. 6; 1 ♂ 1 juv. Off Koh Sakait, sand; II. 23; 1 ♂. Koh Kram, 30 fath.; III. 2 and 21; 1 ♂.

Family Parthenopidæ.**Subfamily Parthenopinæ.****Parthenope (Parthenope) longimanus** (Linnæus).

Lambrus longimanus ALCOCK, LXIV, 260, 1895, and synonymy.¹

Singapore, 2—3 fath.; XII. 4; 1 juv. West of north end of Koh Kut, 11 fath.; I. 27; 1 ♂. 20 miles E. S. E. of Koh Samit, 13—14 fath., sandy mud, shells; II. 2; 1 ♀. N. of Koh Chuen, 15 fath., mud, shells; II. 5; 1 ♂ juv. Koh Kam, 5 fath., gravel; II. 6; 1 ♂ adult, 1 ♀ juv. Between Koh Mesan and Cap Liant, 5—8 fath., sand, stones; II. 7; 1 ♂ 3 juv. Koh Chuen, 30 fath., shell bottom; II. 1 ♂ 6 juv. Between Koh Rin and Cliff Rock (N. of Koh Kram), 15 fath.; III. 2; 1 ♂ juv. Koh Kram, 30 fath.; III. 2 and 21; 1 ♂ juv. N. of Koh Kut, 15 fath., mud; III. 4; 1 ♀.

Parthenope (Platylambrus) echinata (Herbst).

Lambrus (Platylambrus) echinatus ALCOCK, LXIV, 264, 1895.

Parthenope (Platylambrus) echinata RATHBUN, Bull. U. S. Fish Comm. for 1903, pt. III, 883, pl. XV, fig. 8, 1906.

Gulf of Rayong, 7—10 fath., sand, mud, shells; II. 8; 1 juv. Koh Lan, 30 fath., mud; III. 2; 1 ♀. Between Koh Rin and Cliff Rock (N. of Koh Kram), 15 fath.; III. 2; 2 juv. Koh Kram, 30 fath.; III. 2 and 21; 2 juv.

Parthenope (Rhinolambrus) longispinis (Miers).

Lambrus (Rhinolambrus) longispinis ALCOCK, LXIV, 266, 1895,

Between Koh Kut and Koh Kahdat, 10 fath., shell bottom; I. 10; 1 juv. 4 miles south of Koh Sakait, 9 fath., shell bottom; II. 3; 1 juv. Koh Kam, 5 fath., gravel; II. 6; 3 ♀ 1 juv. Between Koh Riat and Koh Mesan, 3—5 fath., sand, algæ; II. 7; 1 juv. Between Koh Mesan and Cap Liant, 5—8 fath., sand, stones; II. 7; 1 juv. 2 miles south of Koh Tulu, 10 fath., sandy mud, shells; II. 9; 1 juv. Koh

¹ The mark of interrogation should be omitted before "*Parthenope longimanus* Fabr."

Chuen, 30 fath., shell bottom; II; 1 juv. Koh Kahdat, 5—8 fath., sandy mud; II. 16 and III. 4; 2 juv. North of Koh Kut, 15 fath., mud; III. 4; 1 ♀.

Parthenope (Rhinolambrus) pelagica (Rüppell).

Lambrus (Rhinolambrus) pelagicus ALCOCK, LXIV, 267, 1895.

Koh Kahdat, 4—5 fath., sand, stones, coral; II. 15—18; 3 ♂ 1 ♀ 1 juv.

Parthenope (Aulacolambrus) hoplonotus (Adams and White).

Lambrus (Aulacolambrus) hoplonotus ALCOCK, LXIV, 273, 1895.

Singapore, 2—3 fath.; XII. 4; 2 chelipeds only. Between Koh Kut and Koh Kahdat, 10 fath., shell bottom; I. 10; 1 ♂. South of Koh Mak, 5—6 fath.; II. 17; 1 ♂.

Parthenope (Pseudolambrus) calappoides (Adams and White).

Lambrus (Parthenolambrus) calappoides ALCOCK, LXIV, 275, 1895.

Between Koh Mesan and Koh Chuen, 15 fath., stones; II. 6; 2 ♀ juv. Between Koh Riat and Koh Mesan, 3—5 fath., sand, algæ; II. 7; 1 ♀ juv. North side of Koh Mesan, 10—15 fath., stones, shells; II; 1 ♀ ovig.

Parthenope (Pseudolambrus) harpax (Adams and White).

Plate I, fig. 7.

Lambrus (Parthenope) Sandroekii HASWELL, Proc. Linn. Soc. N. S. W., IV, 452, pl. XXVII, fig. 2. 1879.

Lambrus (Parthenolambrus) harpax ALCOCK, LXIV, 278, 1895.

Between Koh Mesan and Cap Liant, 9 fath.; II. 4; 1 juv. North side of Koh Mesan, 10—15 fath., stones, shells; II; 1 ♂ juv. Koh Chuen, 30 fath., shell bottom; II; 2 ♀. Koh Kram, 30 fath.; III. 2 and 21; 1 ♀.

Cryptopodia fornicata (Fabricius).

Cryptopodia fornicata ALCOCK, LXIV, 282, 1895.

Between Koh Kut and Koh Kahdat, 10 fath., shell bottom; I. 10; 1 ♀ 2 juv. Tung Kaben, 6 fath., sand, mud, phanerogams; II. 22; 2 ♂. Koh Kahdat, 5—8 fath., sandy mud; II. 16 and III. 4; 1 ♂. North of Koh Kut, 15 fath., mud; III. 4; 1 ♀ immature.

Cryptopodia lævimana Miers.

Plate I, fig. 5.

Cryptopodia spatulifrons var. *lævimana* MIERS, Ann. Mag. Nat. Hist. (5) IV, 27, 1879.

Between Koh Mesan and Koh Chuen, 15 fath., stones; II. 6; 1 ♀ immature.

Compared with *C. fornicata* of equal size, the carapace is longer and narrower, about 1½ times as broad as long; the triangular median depression is nearer the posterior margin than the tip of the front, while the reverse is true in *fornicata*. Surface tubercular along the ridges and along the posterior and postero-lateral margins. The hands are broader and lower, a line of granules runs lengthwise along the middle of the under surface. Crests on the legs entire.

Gonatonotus pentagonus White.

Gonatonotus pentagonus WHITE, Proc. Zool. Soc. London, XV, 58, 1847; ADAMS and WHITE, Zool. Samarang, Crust., 33, pl. VI, fig. 7, 1848.

Between Koh Kut and Koh Kahdat, 10 fath., shell bottom; I. 10; 1 ♀ 1 juv. Koh Chuen, 30 fath., shell bottom; H; 5 ♂ 3 ♀ (2 ovig.) 5 juv. Koh Kahdat, 5—8 fath., sandy mud; II. 16 and III. 4; 1 ♀ ovig. Between Koh Rin and Cliff Rock (N. of Koh Kram), 15 fath.; III. 2; 1 ♂ 1 ♀ 1 juv. Koh Kram, 30 fath.; III. 2 and 21; 2 ♂ 3 ♀ (2 ovig.) 5 juv. On *Plococidaris bispinosa* (Lamk.), off Koh Kram, 30 fath., stones, shells; II. 23; 1 ♂ 1 ♀ ovig. 2 juv. Koh Kahdat, 8—10 fath., mud; I. 27; 1 juv. Koh Chuen, 30 fath., shell bottom; I. 2; 5 juv.

Subfamily Eumedoninæ.

Zebrida adamsii White.

Zebrida adamsii WHITE, Proc. Zool. Soc. London, XV, 121, 1847; ADAMS and WHITE, Crust. Zool. Samarang, 24, pl. VII, fig. 1, 1848.

On *Salmacis bicolor* Ag., off Koh Kram, 30 fath., stones, shells; II. 23; 1 ♀. Between Koh Mesan and Cap Liant, 5—9 fath.; II. 4—7; 1 ♀ ovig. On *Toxopneustes pileolus* (Lamk.), north side of Koh Mesan, 10—15 fath.; II. 5; 2 ♂. Koh Chuen, 30 fath., shell bottom; I. 2; 1 ♀ juv. Koh Kram, 30 fath.; III. 2 and 21; 1 ♂ juv. 1 juv.

The young specimens have the legs proportionally longer and narrower, and the projections small and inconspicuous. The smallest individual, 2 mm. long, has short blunt frontal lobes, the tip only of the lateral lobe is directed forward, the chelipeds and legs are unarmed, the latter slender, the propodus of the last pair only having a feeble projecting point on its posterior edge.

This is the crab mentioned by Dr. MORTENSEN in his work on the Siam-Echinoidea I. (Zool. Res. Danish Exped. to Siam 1899—1900. II. Mém. Acad. R. d. Sci. Copenhagen. 7. sér. I. 1904 p. 66 and 120) which was found on *Salmacis bicolor*, var. *rarispinus* Ag. and *Toxopneustes pileolus* (Lamk.), devouring “the spines (probably the muscles only), pedicellariæ and tube feet, quite cleaning the test; it mostly follows one area from the top downwards.”

Superfamily Brachyrhyncha or Cancridea.

Family Ocypodidæ.

Subfamily Ocypodinæ.

Ocypode ceratophthalma (Pallas).

Ocypoda ceratophthalma ALCOCK, LXIX, 345, 1900.

Coast of Koh Mak, sandy shore; I. 9; 4 juv. Coast at north point of Koh Chang; I. 15; 1 juv. West coast of Koh Chang; I. 16; 2 juv. Coast of Koh Mesan; II. 4—5; 1 juv. Koh Pløt; II. 10; 3 juv. Koh Kahdat; II. 18; 1 ♂.

Ocypode macrocera Milne Edwards.

Ocypoda macrocera ALCOCK, LXIX, 347, 1900.

Koh Kong, sandy beach; I. 24; 1 ♀ 1 juv.

Uca annulipes (Milne Edwards).

Gelasimus annulipes ALCOCK, LXIX, 353, 1900.

Mangrove swamp, Lem Ngob; XII. 23, 24 and 27; 8 ♂ 1 ♀. River on the west coast of Koh Chang (not above the limit to which the salt water enters at high water); I. 16; 1 juv. Koh Chang, stony coast at low water; I; 1 ♂.

Uca manii Rathbun.

Gelasimus acutus DE MAN, ALCOCK, LXIX, 360, 1900. Not *G. acutus* STIMPSON, which is synonymous with *U. dussumieri* (MILNE EDWARDS).

Uca manii RATHBUN, Proc. Biol. Soc. Washington, XXII, 114. 1909.

Mangrove swamp, Lem Ngob; XII. 23, 24 and 27; 11 ♂ 3 ♀ (2 ovig.).

Subfamily **Macrophthalminae**.**Macrophthalmus verreauxi** Milne Edwards.

Macrophthalmus verreauxi ALCOCK, LXIX, 377, 1900.

Between Koh Mesan and Cap Liant, 5—8 fath., sand, stones; II. 7; 1 ♂ 1 juv. Koh Kahdat, 4—5 fath., sand, stones, coral; II. 15—18; 4 ♂ 1 ♀ ovig. Koh Kahdat, 5—8 fath., sandy mud; II. 16 and III. 4; 1 ♀ ovig. South of Koh Mak, 5—6 fath.; II. 17; 2 ♂.

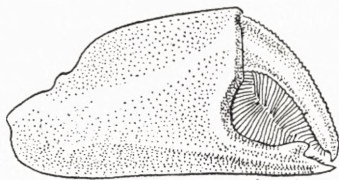


Fig. 6. Chela of *Macrophthalmus verreauxi*, Koh Mak, ♂, 8.5 mm. wide.

In these specimens, the longest of which, a male, is 5.9 mm. long by 8.8 mm. wide, the tips of the three lateral teeth are equidistant from the median line, but the first sinus is deeper than the second, so that the teeth are successively smaller.

The chela figured by MILNE EDWARDS (Ann. Sci. Nat. (3) Zool., XVIII, pl. IV, fig. 25c, 1852) must represent that of a female, as the immovable finger in the male is armed with a strong spine on its distal half (fig. 6).

Macrophthalmus dentatus Stimpson.

Macrophthalmus dentatus STIMPSON, Smithsonian. Misc. Coll., XLIX, 96, pl. XIII, fig. 1, 1907.

Between Koh Kahdat and Koh Kut, 6 fath., sandy clay; I. 9; 7 ♂ 7 ♀ (3 ovig.). North of Koh Kut, 10 fath.; I. 23; 1 ♂. Two miles south of Koh Tulu, 10 fath., sandy mud, shells; II. 9; 1 ♀ ovig. Sound at Koh Chang, 3—5 fath., soft clay; 1900; 2 ♂ 2 ♀ 1 ovig. Gulf of Siam (without further locality); 2 ♂ 2 ♀ ovig. 1 juv.

Macrophthalmus crassipes Milne Edwards.

Macrophthalmus crassipes ORTMANN, Zool. Jahrb., Syst., X, 345, 1897.

Shore outside the mangrove at the Station on Koh Chang; III. 11; 2 ♂.

Macrophthalmus convexus Stimpson.

Plate II, fig. 3.

Macrophthalmus convexus ALCOCK, LXIX, 378, 1900; STIMPSON, Smithson. Misc. Coll., XLIX, 97, pl. XIII, fig. 2, 1907.

Shore outside the mangrove at the Station on Koh Chang; III. 11; 1 ♂.

Macrophthalmus serratus White (?), Stimpson.

Macrophthalmus serratus WHITE (?) in ADAMS and WHITE, Zool. Samarang, Crust., 51, 1848; STIMPSON, Smithson. Misc. Coll., XLIX, 96, pl. XIII, fig. 3, 1907.

North of Koh Kong, 8 fath., mud bottom; I. 23; 1 ♂ 1 juv. Off Koh Kut, 6 fath.; I. 26; 2 ♀. North of Koh Kut, 15 fath., mud; III. 4; 1 ♂. Sound at Koh Chang, 3–5 fath., soft clay bottom; 1900; 20 juv.

Macrophthalmus erato de Man.

Macrophthalmus erato ALCOCK, LXIX, 381, 1900.

Koh Chang, stony coast at low water; I; 2 juv. Koh Kahdat, among algæ; II. 19; 1 juv.

Cleistostoma lingulatum Rathbun.

Cleistostoma lingulatum RATHBUN, Proc. Biol. Soc. Washington, XXII, 108, 1909.

Surface somewhat setose, setæ retaining mud. Carapace convex, finely sculptured, regions slightly indicated, fine frost-like granulation scattered over the surface, the granules forming clumps and thickened lines on the elevated parts; lateral borders sinuous, forming an obtuse angle at the anterior third where the carapace is widest, and a minute tooth at the anterior angle. Below the postero-lateral margin there is a subtriangular and nearly vertical facet, not visible in a dorsal view. Front between one-third and one-fourth the greatest width of the carapace, almost vertically deflexed, the vertical portion comprising two transverse, oval, concave surfaces separated on the median line. Upper border of orbit more oblique than in *C. dotilliforme* Alcock,¹ lower border spinulose. Above and parallel to the posterior margin, a line of granules; intervening area smooth.

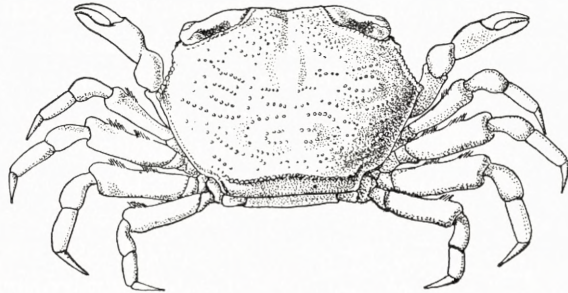


Fig. 7. *Cleistostoma lingulatum*, type ♀, 4.5 mm. wide.

¹ Jour. Asiat. Soc. Bengal, LXIX, 373, 1900; Illus. Investigator, X, pl. LXIV, fig. 1.

The epistome is narrower than in related species and its median tooth is long and lingulate. The exognath of the outer maxillipeds is entirely concealed;

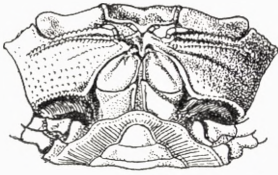


Fig. 8.
Cleistostoma lingulatum,
antero-ventral view of type ♀,
4.5 mm. wide.

the merus of the endognath is longer than the ischium, has a deep sulcus near and parallel to its outer margin and is much narrowed anteriorly; the carpal segment is correspondingly small; the ischium has its distal inner corner produced beyond the otherwise transverse suture; an oblique line of hair is continued backward from this inner angle. Lower surface of carapace regularly granulous and setose.

Legs rather narrow and subcylindrical; the second and third pairs have each two tubercles, the first and fourth pairs each one tubercle, on their anterior margin, the tubercles fringed with hair; dactyli slender and sharp.

Dimensions. — Immature female, length 3.1 mm., width 4.5 mm., width of front 1.3 mm.

Type locality. — Mangrove swamp, Lem Ngob; XII, 23; 1 ♀ juv.

This species seems to lean towards the genus *Ilyoplax* Stimpson,¹ in having the exognath concealed; but in *Ilyoplax*, the carapace is soft, the legs have tympana, and the second pair is conspicuously the longest. Our species differs from *C. dilatata* de Haan² and *C. dotilliforme* Alcock in having the merognath narrower anteriorly, the epistome narrower (approaching the Mictyrinæ), and the non-flattened merus joints of the legs.

Subfamily Mictyrinæ.

Dotilla wichmanni de Man.

Dotilla wichmanni DE MAN, in Weber's Zool. Ergeb. einer Reise in Niederl. Ost-Indien, II, 308, pl. XVIII, fig. 8, 1892; Zool. Jahrb., Syst., VIII, 577, 1895.

Coast of Koh Kong; I. 23; 2 ♀ 1 juv. Koh Kong, sandy beach; I. 24; 9 ♂ 9 ♀ (1 ovig.). "These small crabs make small balls of sand, thrown out from their holes."

Family Gecarcinidæ.

Cardisoma carnifex (Herbst).

Cardisoma carnifex ALCOCK, LXIX, 445, 1900.

Koh Kahdat; II. 18; 3 specimens. Lem Ngob; 1 specimen.

Family Grapsidæ.

Subfamily Grapsinæ.

Grapsus grapsus tenuicrustatus (Herbst).

Grapsus grapsus tenuicrustatus RATHBUN, Bull. U. S. Fish Comm. for 1903, pt. III, 838, 1906.

Koh Kahdat; I. 11; 1 ♂.

¹ Smithson. Misc. Coll., XLIX, 100, 1907.

² Fauna Japon., Crust., 55, pl. VII, fig. 3, 1835.

Metopograpsus messor (Forskål).

Metopograpsus messor ALCOCK, LXIX, 397, 1900.

Coast of Lem Ngob, 0—1 fath., stones, sand; XII; 1 ♂. Koh Chang, 1 fath., coral; I—III; 1 juv.

Metopograpsus latifrons (White).

Metopograpsus latifrons KINGSLEY, Proc. Acad. Nat. Sci. Phila., 1880, 191.

Metopograpsus maculatus ALCOCK, LXIX, 398, 1900.

Mangrove swamp, Lem Ngob; XII. 23, 24 or 27; 1 juv. Coast of Koh Kong; I. 23; 1 ♂. North of Koh Chang, under leaves, seaweed, &c.; II. 10; 2 juv.

Metopograpsus quadridentatus Stimpson.

Metopograpsus quadridentatus STIMPSON, Smithson. Misc. Coll., XLIX, 115, pl. XVI, fig. 2, 1907.

Coast of Lem Ngob, 0—1 fath., stones and sand; XII; 1 ♂ 1 ♀ ovig. Koh Chang, stony coast at low water; I; 1 ♂ 3 ♀ ovig.

Subfamily **Varuninæ**.**Varuna litterata** (Fabricius).

Varuna litterata ALCOCK, LXIX, 401, 1900.

Mangrove swamp, Lem Ngob; XII. 23, 24 or 27; 1 ♀. Between Koh Mesan and Koh Chuen, on and under plants, surface; II. 5; 1 juv.

Camptandrium Stimpson.

Camptandrium STIMPSON, Proc. Acad. Nat. Sci. Phila., X, 106 [52], 1858; Smithson. Misc. Coll., XLIX, 137, 1907.

Carapace hexagonal, with the antero-lateral margins oblique and dentate. Fronto-orbital distance two-thirds, and front between one-third and one-fourth, the greatest width of the carapace. Front steeply inclined. Orbits large, shallow; inferior margin and infra-orbital crest approximated. Antennules oblique, in deep fossæ; septum broad. Antennæ with the basal joint small, rounded; flagellum standing in the orbital hiatus.

Epistome of moderate length (fore and aft). Buccal cavity large, much broader than long. Maxillipeds slightly or not at all gaping; endognath wide, the ischium not much longer than wide, merus wider than ischium and wider than long, outer margin convex, overlapping the exognath, outer angle strongly produced forward, palpus articulating at the middle of the anterior margin. Exognath narrow.

Chelipeds small and weak, much shorter, and in the male no more massive than the legs and resembling those of the female of *Uca* (= *Gelasimus*). Fingers hollowed at tip. Legs compressed, third pair longest; dactyli slender.

Resembles *Cyrtograpsus* Dana¹ in its general aspect but differs in the more deflexed front, slender chelipeds and large maxillipeds.

¹ Proc. Acad. Nat. Sci. Phila., V, pp. 247 and 250, 1851.

Camptandrium paludicola Rathbun.

Camptandrium paludicola RATHBUN, Proc. Biol. Soc. Washington, XXII, 109, 1909.

Immature female. Surface uneven, regions well marked, and ornamented with a few tubercles regularly placed: two transversely on the cardiac region, one on the intestinal region, four small in a square on the mesogastric region, one on each proto-gastric region, two diagonally at the inner part of the branchial region. Width of front one-third the greatest breadth of the carapace; lower edge visible from above, faintly bilobed; the two superior lobes are separated from each other and from the margin of the orbit by a deep furrow. The inner margin of the orbit is

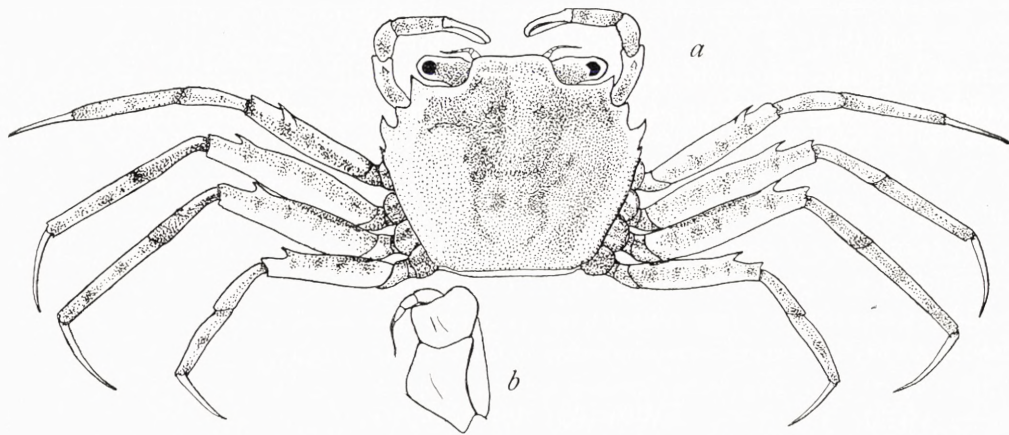


Fig. 9. *Camptandrium paludicola*, type ♀, 5.3 mm. wide: a, dorsal view; b, maxilliped.

oblique, the posterior margin nearly transverse, the outer angle an acutely pointed tooth which forms one of three large antero-lateral teeth. The first interval is wider than the second; the carapace is widest between the tips of the teeth of the third pair; behind, and at the base of, the third tooth, a much smaller tooth. Postero-lateral margin longer than antero-lateral.

Chelipeds feeble, about as long as carapace, subcylindrical. Subterminal spine on outer margin of arm. Wrist elongate. Palms over twice as long as wide. Fingers as long as palm, narrowly gaping, broadly hollowed at tips. Legs with the merus joints a little dilated, and bearing a triangular spine on the distal third of the anterior border. Third pair two and a half times as long as carapace; second pair not much shorter than the third; first and fourth pairs of subequal length. Dactyli about three-fourths as long as their respective propodi, slightly curved. Legs crossed by broken dark-colored bands.

Length of immature female 4.3 mm., width 5.3 mm.

Type locality. -- Mangrove swamp, Lem Ngob; XII. 23, 24 or 27; one immature female (soft shell), and one young, only 1.5 mm. long.

This species is distinguished from the type species, *C. sexdentatum* (Smithson.

Misc. Coll., XLIX, 138, pl. XVII, fig. 4), by the wider front, narrower posterior margin, and by the spine on the merus joints of the legs.

Acmæopleura rotunda Rathbun.

Acmæopleura rotunda RATHBUN, Proc. Biol. Soc. Washington, XXII, p. 109, 1909.

Carapace about as long as broad, subcircular, a little convex, widest at the middle; fronto-orbital distance not much less than width of carapace; front about one-third width of carapace, bilobed with a shallow sinus and separated from the inconspicuous orbital angle by a slight furrow. Eyes stout, filling the orbits. Outer angle of orbit not advanced. Lateral margin acute. Surface of carapace and chelipeds rough with granulations.

Antennules obliquely folded. Antennæ very slender, as long as the major diameter of the orbit. Epistome short, well defined. Buccal cavity widening a little anteriorly, with the anterior angles rounded off. Outer maxillipeds not gaping, the endognath very wide, merus and ischium subequal in length and width, but much wider than long; the inner half of the anterior margin is occupied by a notch, and the palpus articulates at the middle of the margin. Exognath narrow.

Chelipeds of moderate size, inner margin of wrist rounded, fingers meeting, tips crossing and curved inward. The right cheliped in the single specimen is much reduced, probably abnormally so. Legs narrow, unarmed; first three pairs subequal, fourth pair much smaller; last three joints subcylindrical, dactyli very slender and moderately curved.

Length of male 2 mm., width 1.75 mm., fronto-orbital width 1.7 mm., width of front 0.7 mm.

Type locality. — South of Koh Kut, 17—20 fath., mud; I. 28; 1 ♂ juv.

I am not sure that this species should be included in *Acmæopleura*, not having seen a specimen of *A. parvula* Stimpson (Smithson. Misc. Coll., XLIX, 130, pl. XI, fig. 4), or a figure of its maxillipeds. The carapace of *A. parvula*, according to STIMPSON'S figure, is widest in the anterior half, and the legs are not so slender as in our species.

Subfamily Sesarminæ.

Sesarma (*Sesarma*) *tæniolatum* White.

Sesarma tæniolatum ALCOCK, LXIX, 419, 1900.

Mangrove swamp, Lem Ngob; XII. 23, 24 & 27; 2 ♂ juv. 1 ♀ juv. Coast of Lem Ngob, 0—1 fath., stones and sand; XII; 1 ♂ juv.

Sesarma (*Sesarma*) *minutum* de Man.

Sesarma minuta DE MAN, Arch. f. Naturg., LIII, pt. 1, 377, pl. XVI, fig. 4, 1887.

Fishing-weir at Koh Kong; I. 21; 1 ♂. Koh Chang, 1 fath., coral; I—III; 4 ♂ 4 ♀ (2 ovig.).

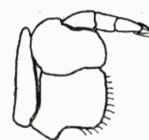


Fig. 10. Maxilliped of *Acmæopleura rotunda*, type ♂ juv., 1.75 mm. wide.

The largest specimen is the male from Koh Kong, which is 5.2 mm. long and 6.4 mm. wide. There is a faint second tooth on the lateral margin behind the large tooth. The chelæ are unequal, but the right or smaller one is abnormal in shape and perhaps in size also. The prehensile teeth are uneven; in the larger chela, the largest tooth is at the middle of the pollex; a smaller, but enlarged tooth is on each finger next to the terminal spoon, much as in de Man's fig. 4 *b*; in the smaller chela, which is a little constricted at the base of the pollex, there is an additional large tooth at the middle of the dactylus.

Sesarma (Sesarma) smithi Milne Edwards.

Sesarma smithi MILNE EDWARDS, Arch. Mus. Hist. Nat., Paris, VII, 149, pl. IX, figs. 2, 2 *a*, 2 *b*, 2 *c*, 1854.

Sesarma smithii A. MILNE EDWARDS, Nouv. Arch. Mus. Hist. Nat., Paris, IX, 305, 1873.

Mangrove swamp, Lem Ngob; XII. 23, 24 or 27; 1 ♂.

Compared with a specimen collected by M. BALANSA at New Caledonia and determined by A. MILNE EDWARDS.

Sesarma (Chiromantes) siamense Rathbun.

Sesarma (Chiromantes) siamense RATHBUN, Proc. Biol. Soc. Washington, XXII, 109, 1909.

Carapace distinctly broader than long, widening a little posteriorly; lateral tooth slight, obtuse-angled; surface glabrous and coarsely punctate. Front half as wide as carapace; middle pair of upper lobes distinctly wider than outer pair; lower margin arcuate in front view, very faintly bilobed in dorsal view.

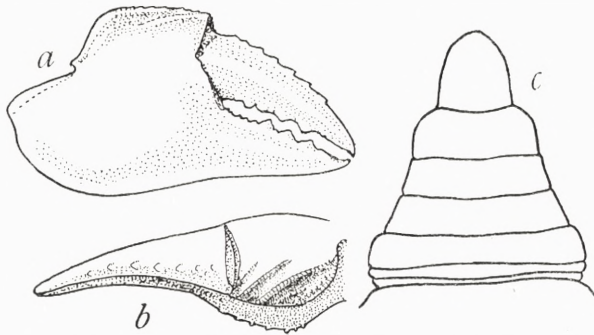


Fig. 11. *Sesarma (Chiromantes) siamense*, Koh Kong, ♂, 8.7 mm. wide: *a*, chela; *b*, top of chela; *c*, abdomen.

Anterior margin of arm with a slight obtusangular expansion; inner angle of wrist blunt. Palm higher than long, upper surface marked by oblique striæ, two of which are sharply marked, crenulate, while there are a few broken striæ near the upper angle; 6 or 7 spinules on the upper edge of the dactylus on its proximal two-thirds; a few granules on inner surface of palm; otherwise the chelæ are smooth and punctate. When the

chelipeds are folded naturally against the body, the oblique striæ of the palm are parallel to the front.

The merus joints of the legs are armed anteriorly with a sharp, subdistal spine, last three joints sparsely furnished with long fine hairs. The legs of the third pair are little more than twice as long as carapace, their merus is about two and a half times as long as wide.

Terminal segment of male abdomen very large, longer than, and more than half as wide as, the sixth segment.

A small species, the adult female measuring 8.5 mm. long, 9.5 wide in front, 9.7 wide behind, front 5.1 mm. wide.

Koh Kong, on the coast, above the water; XII. 21; 1 ♀ juv. At Government Station, right opposite Koh Kong; XII. 21; 1 ♂. Koh Kut, stony coast; I. 10; 1 ♂ 1 ♀ (type). Koh Chick, rocky coast; I. 30; 1 ♀ juv.

The shape of the carapace and the ornamentation of the movable finger are different from any other species of this group.

Sesarma (Chiromantes) haswelli de Man.

Sesarma Haswelli DE MAN, Jour. Linn. Soc. London, Zool., XXII, 175, 1888.

Mangrove swamp, Lem Ngob; XII. 23, 24 and 27; 3 ♂ 2 ♀ (1 ovig.) 2 juv.

Sesarma (Chiromantes) lividum A. Milne Edwards.

Sesarma lividum A. MILNE EDWARDS, Nouv. Arch. Mus. Hist. Nat., V, 25, 1869; IX, 303, pl. XVI, fig. 2, 1873.

River on the west coast of Koh Chang (not above the limit to which the salt water enters at high water); I. 16; 1 ♂. Klong Salakpet (River on Koh Chang); III. 15; 1 ♀.

Compared with specimens collected by M. BALANSA at New Caledonia and determined by A. MILNE EDWARDS.

In this species the pectinated ridges on the upper surface are very ill-defined.

Sesarma (Holometopus) aubryi A. Milne Edwards.

Sesarma Aubryi DE MAN, Journ. Linn. Soc. London, Zool., XXII, 168, 1888.

Koh Kut, stony coast; I. 10; 1 ♀.

Sesarma (Parasesarma) plicatum (Latreille).

Cancer quadratus FABRICIUS, Entom. Syst., Suppl., 341, 1798. Not *C. quadratus* FABRICIUS, Mant. Ins., I, 315, 1787, nor *C. quadrata* MEUSCHEN, 1781.

Sesarma quadratum ALCOCK, LXIX, 413, 1900.

Koh Kut, stony coast; I. 10; 1 ♀ juv.

River on the west coast of Koh Chang (not above the limit to which the salt water enters at high water); I. 16; 1 ♂.

Fences between rice-fields at Klong Salakpet (River on Koh Chang); 2 ♀ 2 juv.

Metaplax dentipes (Heller).

Metaplax dentipes ALCOCK, LXIX, 433, 1900.

Mangrove swamp, Lem Ngob; XII. 23, 24 or 27; 1 ♂.

Metaplax elegans de Man.

Metaplax elegans ALCOCK, LXIX, 434, 1900.

Mangrove swamp, Lem Ngob; XII. 23, 24 or 27; 3 ♂.

Subfamily Plagusiinæ.

Plagusia depressa tuberculata Lamarck.

Plagusia depressa var. *squamosa* ALCOCK, LXIX, 437, 1900.

Koh Kahdat, from driftwood; I. 11; 1 ♂.

Family Pinnotheridae.

Subfamily Pinnotherinæ.

Pinnotheres affinis Bürger.

Pinnotheres affinis BÜRGER, Zool. Jahrb., Syst., VIII, 365, pl. IX, fig. 2, pl. X, figs. 2 and 34, 1895.

18 miles west of Koh Chang, about 20 fathoms, mud; I. 31; one immature male. I have compared this specimen with one of BÜRGER's adult female cotypes from Bohol; the male is very small, only 1.7 mm. long and 1.8 mm. wide, width of front .6 mm. The front is considerably wider in males than in females, as shown by BÜRGER.

Pinnotheres glaberrimus Bürger.

Pinnotheres glaberrimus BÜRGER, Zool. Jahrb., Syst., VIII, 366, pl. IX, fig. 3, pl. X, fig. 3, 1895.

Koh Kam, 5 fath., gravel; II. 6; one male very small, only 1.3 mm. in each dimension.

Pinnotheres cardii Bürger.

Plate II, fig. 8.

Pinnotheres cardii BÜRGER, Zool. Jahrb., Syst., VIII, 367, pl. IX, figs. 4 and 5, pl. X, fig. 4, 1895.

Between Koh Chuen and Koh Chang, 15 fath., mud; III. 3; 1 ♀ ovigerous. In this specimen, 5.8 mm. wide, the palms are a little longer and narrower than represented in BÜRGER's figure, increasing slightly but regularly in width to the distal end. The legs on the left side are normal, but on the right side the second leg is abnormally developed, half again as long as on the left side.

Pinnotheres gracilis Bürger.

Pinnotheres gracilis BÜRGER, Zool. Jahrb., Syst., VIII, 368, pl. IX, fig. 6, pl. X, fig. 6, 1895.

Koh Kahdat, 5–8 fath., sandy mud, II. 16 and III. 4; 1 ♀ ovig.

This specimen is smaller than BÜRGER's type and larger specimen; it measures 2.7 mm. long, and 3.5 mm. wide. The carapace is very thin and transparent so that the eggs are easily seen through it. The orbits are wholly ventral in position, their anterior margin a little in advance of the antennular cavities; the eyes have a small black pigment spot on the inner side. The chela increases in width from the wrist to the base of the immovable finger. Fingers very thick, each having a low white tooth at the base, that on the dactylus shutting within that on the pollex; when closed there is a very narrow slit between fingers, tips crossing. The relative lengths of the legs are as described by Bürger, but the dactyli appear a little longer in proportion to their propodi than represented in his figure; neither do I detect any lines on the anterior half of the carapace.

***Pinnotheres bürgeri* Rathbun.**

Pinnotheres bürgeri. RATHBUN. Proc. Biol. Soc. Washington XXII, 109, 1909.

Near *P. gracilis*, having similar maxillipeds and legs, but differing in the carapace, eyes and chelipeds. Carapace of female nearly as long as wide (about 2 mm. in each dimension), nearly circular, the front a little advanced, the orbits cut out of the margin and the eyes, therefore, visible from above; eyes unpigmented.

The chelipeds differ from those of *P. gracilis*, in having the lower margin of the propodus concave below the distal end of the palm and the fingers tapering more regularly to the strongly curved tips; a slight basal prominence is present on each finger.

South of Koh Kut, 17—20 fath., mud; I. 28; 1 ♀ juv. Koh Kram, 30 fath.; III. 2 or 21; 1 ♀ juv. type.

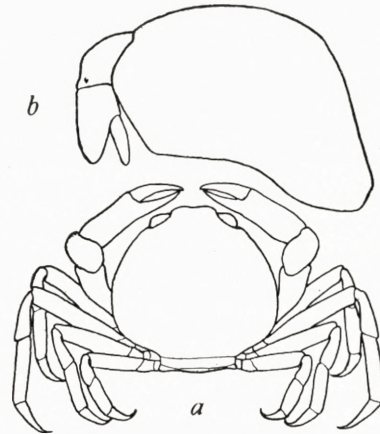


Fig. 12. *Pinnotheres bürgeri*, type ♀, 2 mm. wide: a, dorsal view; b, maxilliped.

***Pinnotheres parvulus* Stimpson.**

Plate II, fig. 9.

Pinnotheres parvulus Ortmann, Zool. Jahrb., Syst., VII, 699, pl. XXIII, fig. 12, 1894; Stimpson, Smithsonian Misc. Coll., XLIX, 142, 1907. Not *P. parvulus* de Man, Jour. Linn. Soc. London, XXII, 105, 1887, and Arch. f. Naturg., LIII, pt. 1, 383, 1887; Bürger, Zool. Jahrb., Syst., VIII, 376, pl. IX, fig. 18, pl. X, fig. 17, 1895; and Alcock, Jour. Asiat. Soc. Bengal, LXIX, 339, 1900, which may be known as *Pinnotheres alcocki*, Rathbun (Proc. Biol. Soc. Washington, XXII, 114, 1909).

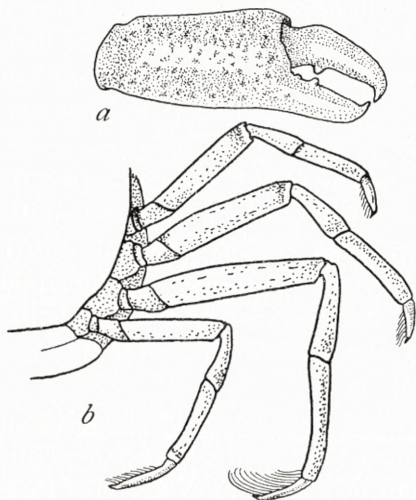


Fig. 13. *Pinnotheres parvulus*, Lem Ngob, ♀, 8.5 mm. wide: a, chela; b, legs.

Allowing for the variations probable in a species of *Pinnotheres*, it is very unlikely that the dactylus of the endognath of *P. parvulus* presents the different aspects ascribed to it. It is defined by STIMPSON as "slender, reaching to the end of the penult joint"; and it is so represented by ORTMANN; but DE MAN, BÜRGER and ALCOCK describe the dactylus as distinctly falling short of the end of the propodus.

The single specimen which I refer to *P. parvulus* agrees with STIMPSON'S all too brief description, excepting as regards size and locality. The length of the type female is. 14 inch or 3.5 mm., while the Siamese specimen is 7.5 mm. long and 8.5 mm. wide. The type locality is a sandy bottom in 26 fathoms, in the China Sea, while the example in hand is from a mangrove swamp at Lem Ngob.

There must, therefore, remain some doubt as to the identity of the two forms until the Pinnotherids of eastern Asia are better known.

Our specimen, a female, has a thin and yielding skin, which is speckled with fine black dots. Posterior margin a little concave. Orbits subcircular, invisible in a strictly dorsal view; eyes black. Width of front and orbits nearly one-third width of carapace.

Chelipeds stout, about as long as carapace; palms increasing in width distally, about one and a half times as long as fingers; the latter are stout, the dactylus bears an oblique tooth on its basal half, which fits in closing between two smaller teeth on the pollex.

Legs slender, especially the last pair, third pair longest, second and fourth pairs subequal, first pair shortest; merus of third pair longest, second next, first and fourth subequal; carpus of third pair longest, second pair next, others subequal; third propodus longest, second and fourth subequal, first a little shorter; dactylus of fourth pair distinctly longest, third pair next, first and second subequal.

Mangrove swamp, Lem Ngob; XII. 23, 24, 27; 1 ♀ ovig.

Besides the character of the endognath *P. alcocki* differs in having the fourth pair of legs decidedly longer than first or second pairs.

***Pinnotheres lanensis* Rathbun.**

Pinnotheres lanensis RATHBUN, Proc. Biol. Soc. Washington, XXII, 109, 1909.

Allied to *P. parvulus* Stimpson, but differs from it chiefly by the shorter dactylus of the endognath.

A very small species, the single specimen taken (an egg-bearing female) measuring approximately 2.4 mm. long and 2.7 mm. wide. The skin is very soft and thin so that the shape as well as the size is difficult to determine with accuracy. There is however, an antero-lateral angle or shoulder, and the anterior margin between these angles is not strongly arcuate. The front is so much deflexed and incurved that the orbits are far from visible in dorsal view. The eyes are distinctly pigmented.



Fig. 14. *Pinnotheres lanensis*, type ♀, 2.7 mm. wide: a, maxilliped; b, chela.

Last two segments of endognath mitten-shaped, the dactylus small and attached about half way back on the propodus and reaching about to its terminal fourth. Chelipeds considerably stouter than legs. Palm about one and a third times as long as fingers, widening distally. Fingers stout, tips incurved, pollex wider at base than dactylus.

Of the legs, the second pair is a little longer than the first, its last three articles each very slightly longer than in the first pair. Third pair longest, last three articles each much longer than in second pair, dactylus twice as long as in second pair. Fourth pair subequal to first, its dactylus equal to that of third, propodus equal to that of second pair, carpus shorter than in any other pair.

Type locality. — Koh Lan, 30 fathoms, mud; III. 2; one ovigerous female.

In *P. alcocki* the fourth leg is decidedly longer than the first and second and its dactylus is the longest of all.

Pinnotheres quadratus Rathbun.

Pinnotheres quadratus RATHBUN, Proc. Biol. Soc. Washington, XXII, 110, 1909.

Belongs to BÜRGER'S section I¹, in which the dactylus of the outer maxilliped is styliform, inserted on the inner margin of the propodus, and to section *d*, in which the third and fourth ambulatories are longer than the first and second; the carapace, however, is scarcely broader than long. The dactylus of the maxilliped does not nearly reach the end of the propodus; the third pair of legs is the longest, and the dactyli of the third and fourth pairs are subequal. This brings the species near *P. palaensis* Bürger² which, however, is hexagonal in form, and noticeably broader than long.

Carapace subquadrate, with rounded corners, its length and breadth about equal (length 5.2 mm., breadth 5.3 mm.); convex in all directions, thin. Orbits ventral, transversely oblique, eyes pigmented on the ventral side near the tip; orbits and antennæ occupying one-third width of carapace.

The propodus of the maxilliped is large and spatulate and overreaches the inner angle of the merus; the dactylus is very small, linear, reaches exactly to the inner angle of the merus and is scarcely visible when the maxillipeds are folded in place, being hidden beneath the merus.

The single cheliped (on the left side) is stoutish; the palm widens distally, is slightly more than twice as long as high, and nearly twice as long as the stout fingers, which meet along their apposed edges, the tips curved inward, the dactylus overreaching the pollex; a large tooth near the base of the dactylus fits between two smaller teeth on the pollex.

Legs slender; the third leg (the longest) is 1.25 times as long as the carapace; on the right side of the unique type this leg is abnormally shortened. Fourth leg slightly longer than second, second slightly longer than first. Third merus longest, first, second and fourth subequal; carpus of all the legs subequal; third propodus longest, first, second and fourth subequal; third and fourth dactyli longest, subequal, first and second dactyli subequal.

Type locality. — Koh Chang, 1 fath., coral; I—III; 1 ♀ ovig.

¹ Zool. Jahrb., Syst., VIII, 362, 1895.

² Zool. Jahrb., Syst., VIII, 372, pl. IX, fig. 12, pl. X, fig. 12.

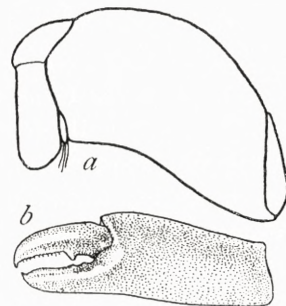


Fig. 15.
Pinnotheres quadratus,
type ♀, 5.3 mm. wide:
a, maxilliped; *b*, chela.

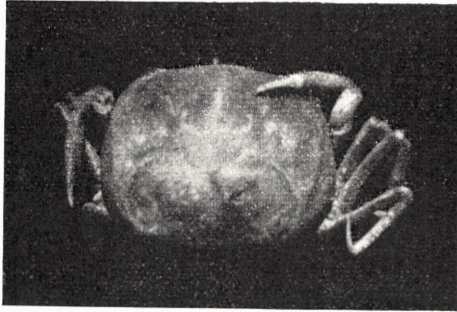
Pinnotheres nigrans* Rathbun.Pinnotheres nigrans* RATHBUN, Proc. Biol. Soc. Washington, XXII, 110, 1909.

Fig. 16. *Pinnotheres nigrans*, type ♀,
8.3 mm. wide.

A species allied to *P. latus* Bürger¹, in which the dactylus of the endognath is styli-form, inserted on the inner margin of the propodus, the dactyli of the third and fourth legs are longer than those of the first and second legs, the third leg not much longer than the others, and the carapace considerably broader than long and somewhat six-sided. Our species differs from *P. latus* chiefly in the form of the maxilliped, the dactylus not reaching the end of the propodus, and the latter tapering toward the end.

Female. — Carapace about one-fifth broader than long, very high in the middle and sloping down on all sides, regions partially indicated by pits and grooves, anterior margin advanced at the middle. Orbits not visible in dorsal view, and with the antennæ occupying about two-sevenths of the width of the carapace; orbits small, transversely oblong, corneæ black, subterminal.

Cheliped (the right only is present) not much stouter than the legs, wrist elongate, palm widest at distal end, margins almost straight, 1.5 times as long as the fingers, but not so high as the length of the fingers, which cross at the tips and do not gape.

Legs not varying much in length, third longest, second and fourth subequal, first shortest; dactyli of third and fourth pairs longest, equal, twice as long as those of the first and second pairs.

Dimensions. — Female, length 6.8 mm., width 8.3 mm.

Color. — Dark in alcohol, caused by numerous minute dots which in some places are densely crowded, especially toward the antero-lateral angles.

Type locality. — Koh Lan (west of Koh Chang); III. 9; 1 ♀ ovig.

Among the male Pinnotherids are three different forms which I am not able to refer to the foregoing species. All are of minute size and have the front well advanced and the eyes very large (for the genus). As, in some species where both sexes are known, the fronto-orbital region is of much more importance in the male than in the female, and the size of the crab is less in the male, it seems probable that the males under discussion belong to the genus *Pinnotheres*, and it is possible that examination of more material would indicate that one or more of these male



Fig. 17. Maxilliped of
Pinnotheres nigrans,
type ♀, 8.3 mm. wide.

¹ Zool. Jahrb., Syst., VIII, p. 363, 374, pl. IX, fig. 16, pl. X, fig. 15, 1895.

forms are conspecific with species of which the female only has been described. For example, the differences in the maxillipeds of *P. bürgeri*, female, and of *P. kutensis*, male (compare figures 12 *b* and 19 *c*) may be either sexual, or referable to their position while being drawn. Descriptions of the males follow.

Pinnotheres kamensis Rathbun.

Pinnotheres kamensis. RATHBUN, Proc. Biol. Soc. Washington, XXII, 110, 1909.

Male. — Carapace broad-ovate, with an obscure antero-lateral angle, surface coarsely punctate. Front strongly advanced beyond the orbits, slightly bilobed. Eyes large, visible from above; orbits in the lateral margin of the carapace; corneæ small, black.

Inner margin of merus of maxilliped strongly angled; propodus long and narrow; dactylus inserted behind the middle of the propodus and not nearly reaching end of same.

Chelipeds stout; palms swollen, not much longer than wide and not much longer than the fingers, which gape widely; a small tooth at base of dactyl.

Legs broad, first three pairs subequal, last pair very much smaller; dactyli of all legs strongly curved, in first three pairs subequal, in fourth pair smaller.

Dimensions. — Male, length 1.4 mm., width 1.5 mm.

Type locality. — West of Koh Kam, 5 fathoms, gravel; type ♂, 1.5 mm. wide. H. 6; 1 ♂.



Fig. 18. Maxilliped of *Pinnotheres kamensis*,

Pinnotheres kutensis Rathbun.

Pinnotheres kutensis RATHBUN, Proc. Biol. Soc. Washington, XXII, 110, 1909.

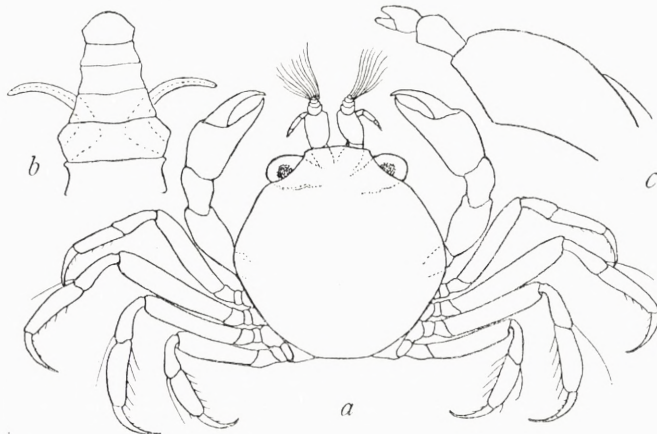


Fig. 19.

Pinnotheres kutensis, type ♂, 1.02 mm. wide: *a*, dorsal view; *b*, abdomen and appendages; *c*, maxilliped.

Male. — Carapace oblong-hexagonal, thin, transparent, margin not defined. Front advanced, subtruncate. Eyes large, projecting well beyond outline of carapace. The antennules are in an unnatural position in figure 19 *a*. The specimen was so disguised with mud and debris clinging to the hairs that it was soaked in a dilute solution of chloride of soda, which probably extended the antennules and the maxillipeds.

Sternum rough. The palpus of the maxilliped when

folded against the merus, reaches a little beyond the inner angle of the latter; the propodus is short and broad; the dactylus articulates near the middle of the propodus, which it overreaches a little, and the terminal half of which it resembles.

Hands inflated, fingers slender, gaping. Length of legs, 2 (longest) 3·1·4; dactyli similar, strongly curved, terminal half very slender, fourth a little shorter than the others, which are subequal; fourth merus much shorter than the others.

Length of type male 1·1 mm., width 1·02 mm.

Type locality. — South of Koh Kut, 17–20 fath., mud; I. 28; 1 ♂.

***Pinnotheres siamensis* Rathbun.**

Pinnotheres siamensis RATHBUN, Proc. Biol. Soc. Washington, XXII, 111, 1909.

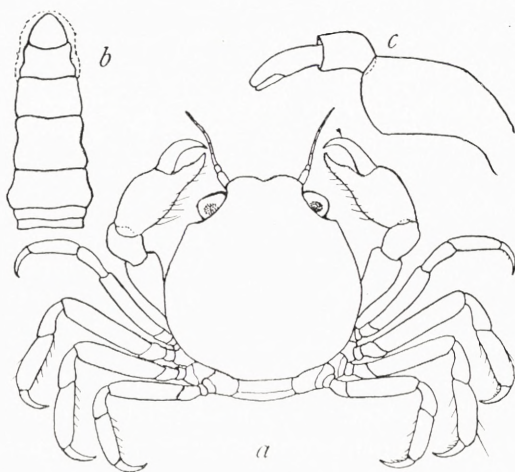


Fig. 20. *Pinnotheres siamensis*, type ♂, 1·05 mm. wide; a, dorsal view; b, abdomen; c, maxilliped.

Male. — Similar to *P. kutensis*; differs as follows: The carapace is more strongly angled behind the orbit; its surface is deeply punctate. The front is plainly bilobed. The antennæ are as long as the width of the front; in *P. kutensis*, they are not discernible, perhaps broken off. The palpus of the maxilliped is considerably longer than in the related species, the propodus especially elongate, the dactylus attached on the distal half of the propodus, not far from the middle, very narrow and reaching just as far as does the propodus. The palms of the chelipeds are much swollen, their upper and lower margins very convex. The carpal and propodal segments of the legs are wider in the

distal half than in the preceding species; dactyli of all the legs subequal. The sternum is hollowed out in a circular depression which receives the extremity of the abdomen.

Length of type male 1·1 mm., width 1·05 mm.

Localities. — South of Koh Kut, 17–20 fath., mud; I. 28; 1 ♂ (type). North of Koh Chuen, 15 fath., mud, shells; II. 5; 1 ♂.

In the specimen from Koh Chuen, the abdomen projects behind the carapace and sternum in a hemispherical protuberance visible in a dorsal view; in the type specimen the abdomen is a good deal rumped, so that one cannot be sure that its normal arrangement was as in the cotype.

Subfamily Pinnotherelinae.

***Mortensenella* Rathbun.**

Mortensenella RATHBUN, Proc. Biol. Soc. Washington, XXII, 111, 1909.

Dorsal aspect of *Pinnixa*, the carapace being very broad, subpentagonal, and the last leg reduced in size. Maxillipeds not gaping, filling the buccal cavity, with

the ischium-merus broad, oblong, longitudinal in position, the two segments subequal and subquadrate, fused, but with a faint suture line visible; palpus small, articulated on the anterior margin and near the outer angle of the merus, the three segments end to end; exognath exposed.

Differs from other genera of *Pinnotheridae* in the longitudinal direction of the maxillipeds, combined with the small palpus. The exognath is of important size as in the subfamily *Asthenognathinae*.

Type and only species:

Mortensenella forceps Rathbun.

Plate I, fig. 18.

Mortensenella forceps RATHBUN, Proc. Biol. Soc. Washington, XXII, 111. 1909.

Carapace 1.5 times as wide as long, lateral angles rounded; surface punctate and pubescent, a transverse groove through the middle. Fronto-orbital distance 4 as great as width of carapace, edge of front straight in dorsal view, sides oblique, a median furrow. Upper margin of orbit rounding into the side margin of the carapace, which margin is emphasized by a sharp raised line cut into crenulations by closed fissures. Posterior margin straight, equalling the length of the carapace; a fine sharp ridge just above and parallel to the margin. Orbits oblong, lower margin ill-defined. Epistome deep in the middle, bilobing the anterior margin of the buccal cavity. Both the anterior angles of the merus of the maxillipeds are rounded off; exognath about one-third as wide as endognath, provided with a slender palpus.

Chelipeds of male equal, smooth and punctate. Inner margin of wrist rounded. Palm well-developed, suboblong; fingers strongly curved away from each other, making a wide gape into which a large truncate tooth projects from the dactylus; extremities of fingers horizontal, very slender, sharp, tips horny. In the single female collected, only one cheliped is present; it is much smaller than in the male but similar, the horizontal extremities being proportionally longer.

First three legs similar, first and third of subequal length, second longer, about 2.5 times length of carapace. Fourth leg much reduced in length and width, reaching little beyond the merus of the third. Legs and also the arm, with granulated margins; dactyli elongate.

Sternum of male coarsely punctate; margin of abdominal cavity finely beaded. Abdomen of male narrow-triangular, with a constriction at middle of fifth segment, terminal segment oblong; the appendages of the first segment would exceed the abdomen if extended, but they are bent sharply backward opposite the posterior

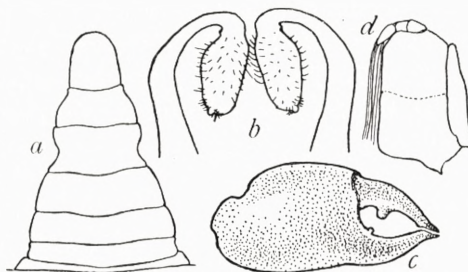


Fig. 21. *Mortensenella forceps*, ♂ cotype, 7 mm. wide: a, abdomen; b, abdominal appendages; c, chela; d, maxilliped.

margin of the first sternal segment; extremity of each appendage broadly oval. The abdomen of the mature female almost covers the sternum except at the posterior angles; margin of terminal segment trilobate.

Length of type ♂ 4.2 mm., width 6.8 mm., fronto-orbital width 2.8 mm., edge of front 1.3 mm., posterior margin 4.6 mm.

Type locality. — Outside mangroves at Koh Chang, very shallow water; III. 18; 3 ♂ (1 is type), 1 ♀ ovig.

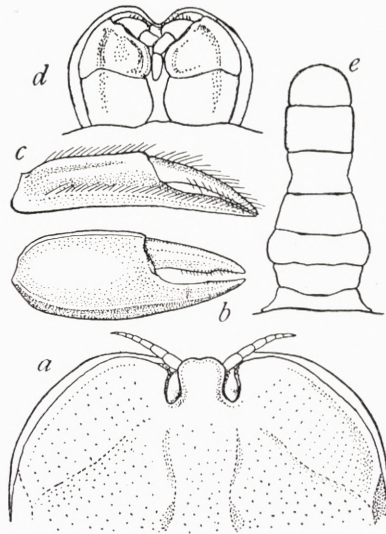


Fig. 22. *Xenophthalmus pinnotheroides*, Koh Kut: a, anterior half of ♂, 6.6 mm. wide; b, chela of same; c, chela of ♀, 7.1 mm. wide; d, maxillipeds; e, abdomen of ♂.

Subfamily Xenophthalminae.

Xenophthalmus pinnotheroides White.

Xenophthalmus pinnotheroides ALCOCK, LXIX, 332, 1900.

Between Koh Kahdat and Koh Kut, 6 fath., sandy clay; I. 9; 1 ♀. North of Koh Kut, 10 fath.; I. 23; 1 ♂ 1 ♀ 1 juv.

These specimens are all smaller than that figured by WHITE (Ann. Mag. Nat. Hist., XVIII, pl. II, fig. 2, 1846, and Zool. Samarang, Crust., pl. XII, fig. 3, 1848), the largest, a female from Koh Kut, measuring 7.5 mm. wide. The legs are slenderer than represented by WHITE, but probably as in the species below, *X. obscurus*, the legs are stouter in the adult than in the young.

Carapace and legs pubescent. Chelipeds of male, while not much longer than in the female are considerably more enlarged, the chelæ suboval, margined above and below. The propodus of the first leg is as broad as long.

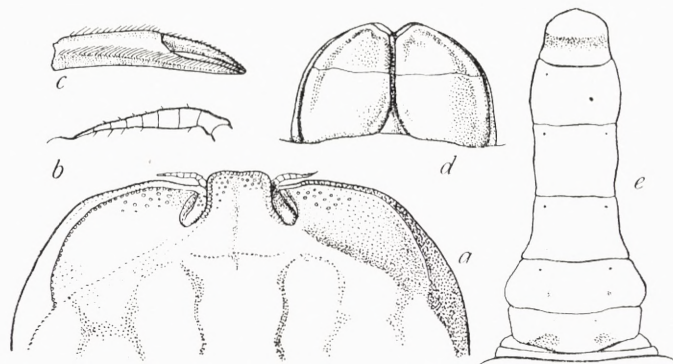


Fig. 23. *Xenophthalmus obscurus*, Koh Kut, ♂, 9.1 mm. wide: a, anterior half; b, antenna; c, chela; d, maxillipeds; e, abdomen.

Xenophthalmus obscurus Henderson.

Plate II, fig. 13.

Xenophthalmus obscurus ALCOCK,
LXIX, 333, 1900.

The Sound at Koh Chang, 3—5 fath., soft clay bottom; XII. 24 to I. 6; 13 ♂ 20 ♀ (2 ovig.) 4 juv. West coast of Koh Chang, a little north of the small islands, 10 fath., mud bottom, dead shells; I.

16; 1 ♂ 2 ♀. West coast of Koh Kong, 10–15 fath.; I. 24; 1 ♂. Off Koh Kut, 6 fath.; I. 26; 2 ♂ 1 ♀.

In these specimens the ischium and merus of the outer maxillipeds are grooved near the outer border, which is contrary to ALCOCK'S description. I should be disposed to consider the Siamese specimens a separate species, did not the shading of the maxillipeds in HENDERSON'S figure (pl. XXXVI, fig. 19, Trans. Linn. Soc. London, Zool. (2), V, 1893) suggest a groove along the outer edge. In our specimens also, the low branchial ridges are connected by a ridge across the cardiac region. In this species the propodus of the first leg is distinctly longer than broad.

Subfamily Asthenognathinæ.

Asthenognathus hexagonum Rathbun.

Plate II, fig. 14.

Asthenognathus hexagonum RATHBUN, Proc. Biol. Soc. Washington, XXII, 111, 1909.

Carapace $1\frac{1}{3}$ times as wide as long, strongly hexagonal; the posterior margin very little longer than the anterior, or fronto-orbital; antero-lateral and postero-lateral margins subequal. Surface little convex, pubescent and finely punctate, medial furrows deep. Front about $\frac{1}{5}$ as wide as carapace, advanced beyond the orbits, sides oblique, lower edge straight. Orbits transverse, eyestalks tapering to the black corneæ. The granulate anterior and antero-lateral margin is continued part way on the postero-lateral margin. A small part of the carapace behind the lateral angle is strongly deflexed, the true angle being just above the base of the second leg. Posterior margin strongly rimmed.

The antennules are folded in deep fossettes. The infra-orbital ridge is strong and sharp. Buccal cavity arcuate in front, not nearly filled by the narrow outer maxillipeds. Ischium and merus of endognath subequal in length, ischium a little wider; segments of palpus end to end. Chelipeds of female feeble, little longer than carapace, almost smooth, fingers longer than palm, acute, dactylus with a sharp upper edge, pollex with a smooth ridge outside. Second leg longest, about twice as long as carapace, stout; third subequal to it; first much smaller; fourth most feeble, reaching little beyond merus of preceding pair. Male unknown.

Length of ovigerous female 5.6 mm., width 7.8 mm., fronto-orbital width 4.3 mm., width of front along lower edge 1.7 mm.

Type locality — North of Koh Kong, 8 fath., mud bottom; I. 23; 2 ♂ (1 ovig., type).

This species is very closely related to the type species, *A. inaequipes* Stimpson (Smithson. Misc. Coll., XLIX, 140, pl. XIV, fig. 1, 1907). Chelipeds and legs similar

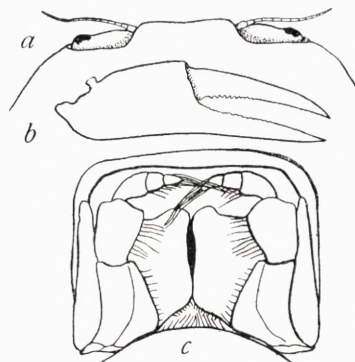


Fig. 24. *Asthenognathus hexagonum*, type ♀, 7.8 mm. wide: a, anterior border; b, chela; c, buccal cavity.

in the two species, but the carapace in *A. inæquipes* is much broader behind, so that it appears less hexagonal; the posterior margin is 1.5 times as great as the distance across front and orbits in *inæquipes*; it is just equal to that distance in *hexagonum*. In *A. japonica* (Ortmann) (= *Tritodynamia japonica* Ortmann, Zool. Jahrb., Syst., VII, 693, pl. XXIII, fig. 5, 1894), the front is arcuate, and the second leg is much longer than the third.

Chasmocarcinops gelasimoides Alcock.

Plate I, fig. 10; Plate II, fig. 12.

Chasmocarcinops gelasimoides Alcock, LXIX, 334, 1900; illus. Zool. Investigator, Crust., pt. X, pl. LXII, figs. 2 and 3, 1902.

Between Koh Kahdat and Koh Kut, 6 fath., sandy clay; I. 9; 1 ♂ 3 ♀ (1 ovig.). South of Koh Bidang, 9 fath., mud, shells; I. 18; 1 ♀. North of Koh Kut, 10 fath.; I. 23; 1 ♂. 15 miles west of Koh Kut, 30 fath. (s. m.); I. 28; 1 ♂. South of Koh Kut, 17–20 fath., mud (large seine); I. 28; 8 ♂ 6 ♀ 1 juv.; one male was in shell of living *Amussium pleuronectes* Linnæus. 12 miles east of Koh Mak, 20 fath., large seine; I. 28; 2 ♂ 1 ♀. 10–12 miles west of Koh Chang, 20 fath., mud; I. 29; 7 ♂ 2 ♀. 20 miles south of Koh Samit, 20 fath., mud; I. 31; 1 ♂. 35 miles west of Koh Chang, 30 fath., clay; I. 31; 1 ♀ ovig. 4–6 miles south of Koh Samit, 14–18 fath.; II. 1; 3 ♂ 3 ♀. 2 miles south of Koh Tulu, 10 fath., sandy mud, shells; II. 9; 1 ♂.

Family Gonoplacidæ.

Subfamily Carcinoplacinæ.

Eucrate crenata de Haan.

Eucrate crenata ALCOCK, LXIX, 300, 1900.

15 miles E. of Koh Chuen, 10 fath., shell bottom; II. 2; 1 ♀ juv. Koh Chuen, 30 fath., shell bottom; II; 1 ♂ juv. 2 ♀ juv.

Litocheira setosa (A. Milne Edwards).

Litocheira setosa ALCOCK, LXIX, 315, 1900.

15 miles E. of Koh Chuen, 10 fath., shell bottom; II. 2; 1 juv.

A small specimen 2.6 mm. long and 3.7 mm. wide, in which the second lateral tooth is acutely pointed.

Litocheira cristata Rathbun.

Litocheira cristata RATHBUN, Proc. Biol. Soc. Washington, XXII, 111, 1909.

Carapace flat except anteriorly where it is moderately deflexed. Regions delineated, cardiac region almost quadrilateral. Antero-lateral region granulate. Surface pubescent, and *anterior border of carapace and of chelipeds and legs fringed*

with long hair. Front deflexed below the fringe, its lobes oblique and sinuous, a V-shaped median notch. The orbits have a notch above and below the outer angle, and a smaller notch near the middle of the upper margin. Of the 4 lateral teeth,

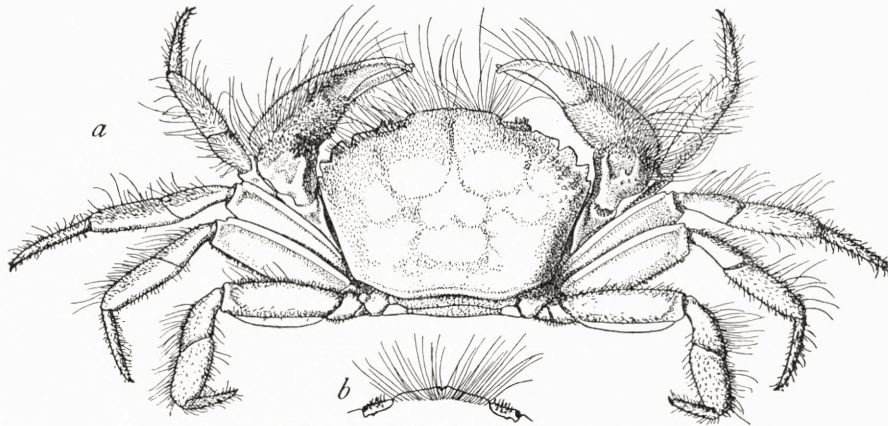


Fig. 25. *Litocheira cristata*, type ♀, 7.7 mm. wide: a, dorsal view; b, deflexed margin of front.

the first is truncate and fused with the orbital angle, the second is subacute with its outer margin truncate, the third prominent, triangular, the fourth small, acute.

Chelipeds of ♀ equal. The arm has a thin crest above, forming a tooth near the end of the segment, and a transverse subdistal ridge on the outer surface. Wrist eroded, a blunt ridge along the inner edge, and on a higher plane than the inner tooth. The chelæ are granulate, fingers long and cylindrical, brown in the terminal $\frac{2}{5}$.

Second pair of legs longest, about twice as long as the carapace. The merus of the first three pairs has a thin smooth crest on its anterior margin, of the fourth pair on its posterior margin.

Length of ♀ 5.5 mm., width 7.7 mm., fronto-orbital width 5 mm., frontal width 2.8 mm.

15 miles E. of Koh Chuen, 10 fath., shell bottom; II. 2; 1 ♀. 6 miles E. of Cap Liant, 9 fath., shell bottom; II. 7; 1 ♀. 2 miles S. of Koh Tulu, 10 fath., sandy mud, shells; II. 9; 1 ♀ type.

This species is near *Pilumnoplax ciliata* Stimpson (Proc. Acad. Nat. Sci. Phila., X, p. 94 [40], 1858), of which neither a figure nor type specimen exists, but differs in its narrower carapace, triangular third tooth of the side margin, the nondentate upper border of the arm, and in the existence of a crest on the posterior instead of the anterior border of the merus of the last leg.

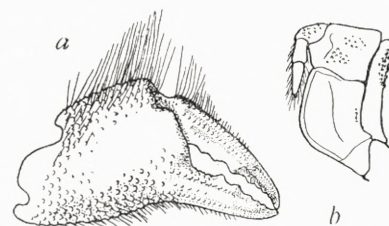


Fig. 26. *Litocheira cristata*, type ♀, 7.7 mm. wide; a, chela; b, maxilliped.

Heteroplax dentata Stimpson.

Heteroplax dentata STIMPSON, *Smithson. Misc. Coll.*, XLIX, 94, 1907.

Koh Kahdat, 5—8 fath., sandy mud; II. 16 and III. 4; 1 ♂ 1 ♀. 2 miles S. of Koh Tulu, 10 fath., sandy mud, shells; II. 9; 3 ♀.

Heteroplax transversa Stimpson.

Heteroplax transversa STIMPSON, *Smithson. Misc. Coll.*, XLIX, 95, 1907.

Between Koh Kahdat and Koh Kut, 6 fath., sandy clay; I. 9; 1 ♂ 1 ♀. Gulf of Rayong, 7—10 fath., sand, mud, shells; II. 8; 1 ♂. 2 miles S. of Koh Tulu, 10 fath., sandy mud; II. 9; 1 ♀ juv.

Subfamily **Rhizopinæ**.**Ceratoplax ciliata** Stimpson.

Ceratoplax ciliata ALCOCK, LXIX, 320, 1900.

Gulf of Rayong, 7—10 fath., sand, mud, shells; II. 8; 1 ♂. Koh Kahdat, 4—5 fath., sand, stones, coral; II. 15—18; 1 ♂.

Ceratoplax hispida Alcock.

Ceratoplax hispida ALCOCK, LXIX, 321, 1900. *Illus. Zool. Investigator, Crust.*, pt. X, pl. LXI, fig. 4, 1902.

Gulf of Rayong, 7—10 fath., sand, mud, shells; II. 8; 1 ♀. 2 miles south of Koh Tulu, 10 fath., sandy mud, shells; II. 9; 2 ♀ (1 ovig.).

The specimens are all small, about 2·9 mm. long \times 3·9 mm. wide.

Mertonia lanka Laurie.

Plate II, fig. 4.

Mertonia lanka LAURIE, *Report Ceylon Pearl Oyster Fisheries*, pt. V, *Suppl. Rept. No. XL.*, p. 424, pl. I, fig. 11, 11 a—c, 1906.

Between Koh Mesan and Cap Liant, 9 fath.; II. 4; 1 ♀ ovigerous. Length 3·9 mm.; width 5·3 mm.

Second leg similar to the third, but slightly longer, the additional length being in the dactyl. The fourth leg is broader than the second and third, its merus and dactyl shorter, but its coxa and ischium longer than in those legs.

The markings on the wrist and hand resemble large flat squamæ.

Rhizopa gracilipes Stimpson.

Rhizopa gracilipes STIMPSON, *Proc. Acad. Nat. Sci. Phila.*, X. 95 [41], 1858. *cf.* Alcock, LXIX. 322, 1900.

Sound at Koh Chang, 3—5 fath., soft clay bottom; XII. 24—I. 6; 23 ♂ 30 ♀ (1 ovig., 3 with Rhizocephalids). S. of Koh Bidang, 9 fath., mud, shells; I. 18; 1 ♀. S. of Koh Mak, 5—6 fath.; II. 17; 3 juv. Off Koh Kut, 6 fath.; I. 26; 1 ♂.

Carapace about $\frac{3}{4}$ as long as broad, postero-lateral borders slightly convergent posteriorly. Regions fairly well marked, cervical suture deep, cardiac region swollen. Surface obscurely granulate, especially toward the lateral margins. Carapace and legs covered with a very short pubescence, with marginal fringes of hair. Antero-lateral margin granulate and acute as far as the widest portion of the carapace and marked by two obscure notches.

Fronto-orbital distance over $\frac{1}{2}$ width of carapace, front $\frac{1}{4}$ width of carapace, grooved in the middle line, faintly bilobed. Orbits piriform; eyes small, black.

Buccal cavern increasing in breadth from behind forwards; merus of maxillipeds with antero-lateral angle produced and rounded; exognath of moderate width.

Chelipeds heavy, especially the chelæ, and nearly smooth, except for marginal hairs. Arm projecting little beyond the carapace, with a subterminal tooth above. Wrist granulous at the inner angle, armed with a sharp tooth. Chelæ smooth and shining, with a granulate marginal line above and below; larger palm as high as its superior length, and with a prominent tooth on the outer side projecting over the dactylus, which has a basal tooth larger than the others.

Third pair of legs over $2\frac{1}{2} \times$ length of carapace.

Dimensions. — ♂, length 7 mm., width 9.7 mm.

The merus of the outer maxillipeds is much more produced at the antero-external angle than in *Typhlocarcinus* Stimpson.

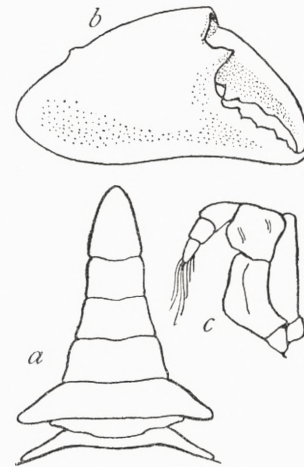


Fig. 27. *Rhizopa gracilipes*, Koh Chang, ♂, 9.7 mm. wide: a, abdomen; b, chela; c, maxilliped.



Fig. 28. Maxilliped of *Typhlocarcinus villosus*, Koh Chuen, ♀, 8.9 mm. wide.

Typhlocarcinus villosus Stimpson.

Typhlocarcinus villosus ALCOCK, LXIX, 322, 1900.

20 miles ESE. of Koh Samit, 13–14 fath., sandy mud, shells; II. 2; 2 ♀. 15 miles E. of Koh Chuen, 10 fath., shell bottom; II. 2; 2 ♀ (1 ovig.). Gulf of Rayong, 7–10 fath., sand, mud, shells; II. 8; 1 ♂ 1 ♀. 2 miles S. of Koh Tulu, 10 fath., sandy mud, shells; II. 9, 2 ♂ 5 ♀. N. of Koh Kut, 10 fath.; I. 23; 1 ♂.

Typhlocarcinus nudus Stimpson.

Plate I, fig. 6.

Typhlocarcinus nudus ALCOCK, LXIX, 322, 1900.

Singapore, 2–3 fath.; XII. 4; 1 ♂ 2 ♀. Between Koh Kahdat and Koh Kut, 6 fath., sandy clay; I. 9; 3 ♂ 1 ♀. S. of Koh Bidang, 9 fath., mud, shells; I. 18; 1 ♂ 1 ♀. W. of Koh Kong, 10–15 fath.; I. 24; 1 ♂ 1 ♀. 12 miles E. of Koh Mak, 20 fath. (large seine); I. 28; 1 ♂. 7 miles NW. to W. from Koh si Chang, 10 fath., mud; II. 24; 1 ♀. N. of Koh Kut, 10 fath.; I. 23; 1 juv.



Fig. 29. Maxilliped of *Typhlocarcinus nudus*, Singapore, ♀, 6.5 mm. wide.

Scalopidia spinosipes Stimpson.

Plate II, fig. 2.

Scalopidia spinosipes ALCOCK, LXIX, 325, 1900.

Off Koh Kut, 6 fath.: I. 26; 1 ♀ juv. S. of Koh Kut, 17—20 fath., mud (large seine); I. 28; 2 ♂ 2 ♀. 20 miles S. of Koh Samit, 20 fath., mud; I. 31; 3 ♂ 6 ♀ (1 ovig.). 35 miles W. of Koh Chang, 30 fath., clay; I. 31; 1 ♀ juv.

The largest ♂ (Koh Samit) is 14 mm. long, 19.5 mm. wide. The third, fourth and fifth segments of the ♂ abdomen are incompletely fused.

Camatopsis rubida Alcock and Anderson.

Camatopsis rubida ALCOCK, LXIX, 329, 1900.

12 miles E. of Koh Mak, 20 fath., large seine; I. 28; 1 ♂.

Megæsthesius Rathbun.

Megæsthesius RATHBUN, Proc. Biol. Soc. Washington, XXII, 112, 1909.

Allied to *Camatopsis* Alcock (Investigator Deep-Sea Brachyura, p. 75, 1899) but differs in having the eyes unpigmented, the movable part of the antennules not only excluded from the fossettes, but immensely stout, the buccal cavern anteriorly narrowed and arcuate, the outer maxillipeds touching each other, the ischium as broad as long and broader than the merus, which is subtriangular and bears the palp at its summit, exognath short and narrow.

Megæsthesius sagedæ Rathbun.

Plate II, fig. 5.

Megæsthesius sagedæ RATHBUN, Proc. Biol. Soc. Washington, XXII, 112, 1909.

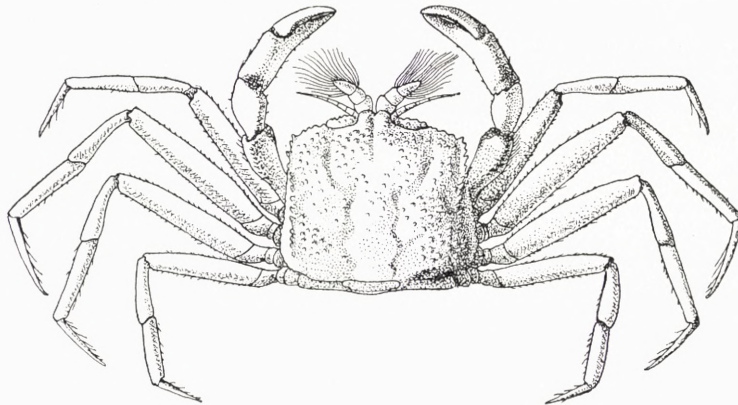


Fig. 30. *Megæsthesius sagedæ*, type ♂, 2.7 mm. wide.

Carapace pentagonal, the long postero-lateral borders parallel, forming distinct angles with the short antero-lateral borders which are in line with the orbits. Surface nearly naked, rough with sharp granules, which on the borders become spinules; very convex fore and aft, level from side to side. Front about one-fifth as wide as carapace,

bilobed by a deep groove, lobes arcuate. Eyestalks rough like the carapace, not pigmented. Epistome small. Pterygostomial region swollen.

Antennules immensely stout, the last two segments of the peduncle wider than the lobes of the front, the flagellum fringed with long hair which reaches to the sternum when the antennules are applied to the ventral surface. Antennæ slender, crowded by the antennules away from the front.

Chelipeds of the ♂ shorter and not much stouter than the legs, pubescent, rough; wrist suboval, bearing a spinule at the inner angle, fingers cylindrical, longer than the palm, the lower margin of which is spinulose.

Legs long and narrow, margins spinulose.

Abdomen of ♂ widest at the third segment; third to fifth segments fused. Length of ♂ 2.7 mm., width 2.7 mm., fronto-orbital width 1.8 mm., width of front 0.6 mm.

Singapore, 2–3 fath.; XII. 4; 1 ♂ type.

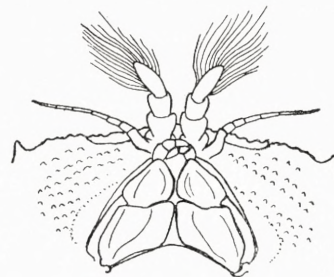


Fig. 31. *Megæsthesius sagedæ*, type ♂, 2.7 mm. wide, antero-ventral view.

Subfamily Typhlocarcinopsinæ Rathbun.

The first segment of the male abdomen covers the whole space between the last pair of legs. Otherwise, as in the Rhizopinæ, to which it bears the same relation that the Carcinoplacinae does to the Prionoplacinae. The type of the subfamily is

Typhlocarcinops Rathbun.

Typhlocarcinops RATHBUN, Proc. Biol. Soc. Washington, XXII, 112, 1909.

Differs from *Typhlocarcinus* Stimpson (*cf.* Alcock, LXIX. 321, 1900), chiefly in having the first segment of the ♂ abdomen very broad, covering the whole width of the sternum, and transversely grooved. Remainder of abdomen narrow.

Type and only species:

Typhlocarcinops canaliculata Rathbun.

Plate II, fig. 16.

Typhlocarcinops canaliculata RATHBUN, Proc. Biol. Soc. Washington, XXII, 112, 1909.

Carapace, chelipeds and legs sparingly hairy on the margins. Carapace three-fourths as long as wide, widest posteriorly, mesogastric region faintly marked. Lateral margins granulate, entire.

Fronto-orbital width about three-fifths of the total width of the carapace; nearly half of the distance is occupied by the front. The latter widens anteriorly, is strongly

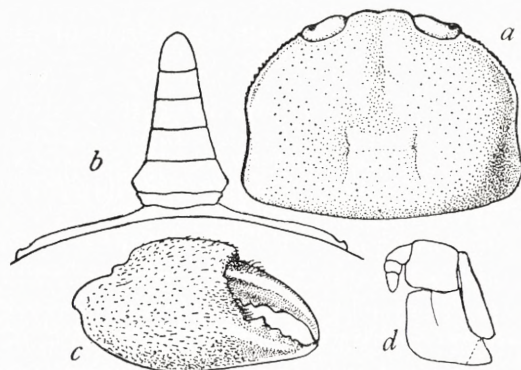


Fig. 32. *Typhlocarcinops canaliculata*, Koh Mak, ♂, 3.4 mm. wide: a, carapace; b, abdomen; c, chela; d, maxilliped.

deflexed, medially sulcate, lower margin arcuate, faintly emarginate in the middle. Orbits almost circular; eyes faintly pigmented.

Buccal cavity with sides parallel. Antero-external angle of merus of outer maxillipeds well marked but not produced.

Chelipeds about one and one-half times as long as carapace. Inner angle of wrist not prominent. Palm pubescent and on the lower half finely granulous.

Second and third legs subequal. Second pair longest, about twice as long as carapace.

Neither of the two specimens is adult, and the segments of the abdomen are not clearly marked; save for the broad first segment, the abdomen is very narrow, being at the third segment less than one-third the width of the sternum.

Length of type ♂ 2.7 mm., width 3.6 mm., fronto-orbital width 2 mm., frontal width 0.9 mm.

Between Koh Mesan and Cap Liant, 5–8 fath., sand, stones; II. 7; 1 ♂ type. S. of Koh Mak, 5–6 fath.; II. 17; 1 ♂.

Subfamily Hexapodinæ.

Thaumastoplax orientalis Rathbun.

Plate II, fig. 1.

Thaumastoplax orientalis RATHBUN, Proc. Biol. Soc. Washington, XXII, 113, 1909.

Carapace one and two-fifths times as broad as long; longitudinally very convex, transversely nearly level; naked and coarsely punctate, a faint H-shaped depression at the middle. Lateral borders marked by a raised line. The fronto-orbital distance, while about two-fifths as great as the extreme width of the carapace,

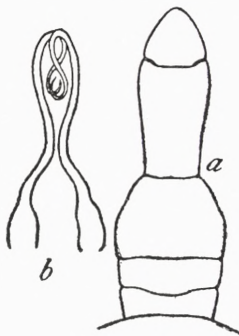


Fig. 33. *Thaumastoplax orientalis*, type ♂, 12.6 mm. wide: *a*, abdomen; *b*, abdominal appendages.

occupies only a little more than half of the anterior margin, the so-called antero-lateral margin being angularly arcuate, its anterior portion transverse, a slight notch on the outer portion, postero-lateral margins sub-parallel; posterior margin convex, postero-lateral angle obliquely cut off above the insertion of the third leg.

Front one-fourth the width of the carapace, posteriorly constricted, anterior margin concave, except for a broad shallow median tooth. Orbits transversely oval, appearing marginal in a dorsal view. Antennæ in the orbital hiatus; flagella three times as long as the major diameter of the orbit.

Epistome obsolete in the middle, narrow at the sides. Buccal cavity much broader than long, anteriorly arcuate, sides anteriorly divergent. Outer maxillipeds large, especially the palpus, which occupies the length of the cavity; a hiatus exists between the palpus and the ischium; there is a transverse fringe of hair across the middle of the maxillipeds, as well as a marginal fringe on the last two joints. Anterior half of

the maxillipeds nearly vertical. The maxilliped is shaped much as in the type species *T. anomalipes* Miers (Ann. Mag. Nat. Hist. (5), VIII, pl. XIV, fig. 2 b, 1881), but the propodus is as wide as long.

Chelipeds short, equal; merus with a superior subterminal spine; wrist smooth and bare except near the inner angle, where it is sharply granulate and hairy. Palms higher than long, granulate, granules arranged only partly in rows, lower edge bordered by a row of prominent sharp tubercles continued half way on the thumb. Dactylus spinulose above. Fingers narrowly gaping.

Second leg much larger than the first and third, which are subequal; upper margin of merus of second leg spinulose.

Margins of chelipeds and legs and also the pterygostomial regions long-hairy. Margins of sternal segments and of abdomen furry.

Third and fourth segments of ♂ abdomen fused, and also the fifth and sixth. The terminal segment projects between the tips of the dactyli of the two outer maxillipeds. The appendages of the first segment are much longer than the abdomen but do not project beyond it; their extremities being doubly recurved, forming together a figure 8.

Length of ♂ 9 mm., width 12.6 mm., width across front and orbits 5 mm., greatest width of front 2.8 mm.

Type locality. — N. of Koh Kut, 10 fath.; I. 23; 1 ♂.

This species differs from *T. anomalipes* Miers (Op. cit., p. 261, pl. XIV, fig. 2) in its narrower carapace, shorter, stouter claws and smaller third leg.

Thaumastoplax chuenensis Rathbun.

Thaumastoplax chuenensis RATHBUN, Proc. Biol. Soc. Washington, XXII, 113, 1909.

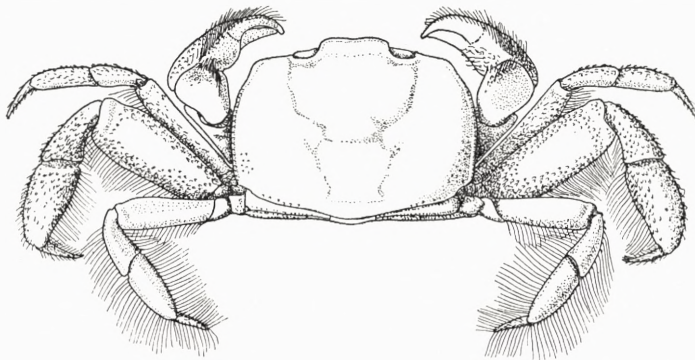


Fig. 34. *Thaumastoplax chuenensis*, type ♂, 4.8 mm. wide.

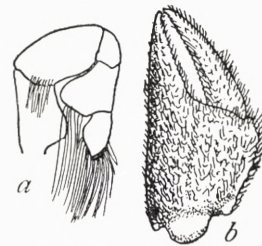


Fig. 35.
Thaumastoplax chuenensis,
type ♂, 4.8 mm. wide:
a, maxilliped; b, chela.

Differs from *T. orientalis* in a little narrower carapace, about one and one-third times as broad as long, with the gastric region sharply outlined, the cardiac region less distinctly so, the branchio-hepatic groove faint; antero-lateral margin less angled; fronto-orbital distance greater, one-half width of carapace; front widest at its lower

margin where it is nearly one-third as wide as carapace; epistome complete though narrow; legs narrower than in *T. orientalis*.

Founded on a young male, in which only the last segment of the ♂ abdomen is distinctly separated.

Length 3.5 mm., width 4.8 mm., width across front and orbits 2.5 mm., greatest width of front 1.5 mm.

Type locality. — Koh Chuen, 30 fathoms, shell bottom; II; 1 ♂.

Lambdophallus anfractus Rathbun.

Lambdophallus anfractus RATHBUN, Proc. Biol. Soc. Washington, XXII, 113, 1909.

Carapace subquadrilateral with the anterior angles rounded, one-half broader than long, convex fore and aft, anteriorly deflexed, slightly convex from side to side, gastric and cardiac regions well defined, surface short-pubescent and finely granulate and punctate. At the posterolateral corners there is a small but very well marked lobe.

Front nearly vertically deflexed, about one-fifth as broad as the greatest breadth of the carapace, subtruncate with the outer angles rounded, and with a median groove which bilobes the front in a dorsal view.

Orbit oblong-oval, about as wide as each lobe of the front and inclined downward and outward in a front view. Eyes almost immovable, pigmented.

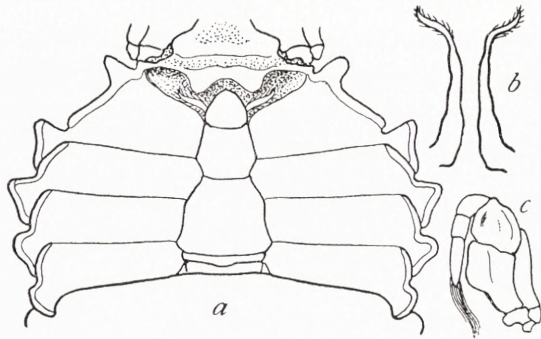


Fig. 36. *Lambdophallus anfractus*, type ♂, 7.2 mm. wide: a, sternum and abdomen; b, abdominal appendages; c, maxilliped.

Antennules transverse, septum narrow. Antennæ more than twice as long as the major diameter of the orbit.

Epistome well defined. The buccal cavity narrows anteriorly. The inner margin of the ischium-merus is very convex, so that the space between the ischium joints is very nearly filled by the palpi, the propodal joint of which is less enlarged than in the type species *L. seipes* (cf. pl. LXII, fig. 1 a, Illus. Zool. Investigator, Crust., pt. X). There are several fine oblique raised lines near the buccal cavity.

Chelipeds unequal in the ♂, equal in the ♀, the larger one in the ♂ one and one-half times as long as the carapace, finely granulate, fingers meeting only at tip, a low molariform tooth at base of dactyl.

Legs tomentose and granulate, third pair longest, a little more than twice as long as carapace, first pair shortest and narrowest, merus joints longitudinally furrowed.

Sternum finely granular; in the first segment is a transverse sinuous trench, to hold the curved and projecting extremities of the abdominal appendages.

The narrow ♂ abdomen has the first two segments short, no suture lines visible between the third, fourth and fifth segments, sixth segment nearly as long

as wide and widest near the middle, seventh segment subtriangular with convex sides. ♀ abdomen subovate, widest at the sinus between third and fourth segments, all segments distinct.

Length of type ♂ 4·7 mm., width 7·3 mm.

Record of specimens. — W. coast of Koh Chang, a little N. of the small islands, 10 fath., mud bottom, dead shells; I. 16; 1 ♀ ovig. Koh Chang, about 1 fath., coral; I. 17; 1 ♀. N. of Koh Kong, 8 fath., mud; I. 23; 2 ♀. Off Koh Kut, 6 fath.; I. 26; 2 ♂ (1 type) 5 ♀ (2 ovig.). 15 miles W. of Koh Kut, 30 fath., on *Chaetodiadema granulatum* Mortensen; 1 ♂. The Sound at Koh Chang, 3—5 fath., soft clay bottom; 1 ♂, 1 ♀.

Differs from the type species, *L. seaxes* Alcock (Jour. Asiat. Soc. Bengal, LXIX, p. 330, 1900) in its narrower carapace, and the different shape of the maxillipeds, abdomen and sternal trench.

This species has a suspicious resemblance to *Hexapus seaxes* de Man (Arch. f. Naturg., LIII, 1, p. 322, pl. XIII, fig. 3, 1887), but the author does not mention a sternal trench. I doubt if the species represented by him is the same as *H. seaxes* de Haan or *H. seaxes* A. Milne Edwards which appear also to be distinct from each other. The type of *Cancer seaxes* Fabricius (Entomol. Syst., Suppl. p. 344, 1798) is not extant, so that the specific name can perhaps not well be retained for de Haan's species.

(?) *Hexaplax*, sp.

Tung Kaben, 6 fath., sand, mud, phanerogams; II. 22; 1 ♂, young and soft shell, about 1·8 mm. wide.

This specimen has the form of carapace and front of *H. megalops* Doflein¹, also large reniform black eyes set in orbits similar to those of that species. The specimen is devoid of chelipeds and legs and is in too bad shape to be described with accuracy.

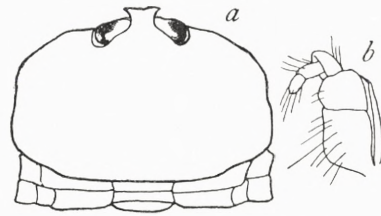


Fig. 37. *Hexaplax*, sp., ♂, 1·8 mm. wide: *a*, body, showing front flattened out, instead of curving downward in its natural position; *b*, maxilliped.

Family Xanthidæ.

Subfamily Xanthinæ.

Cymo melanodactylus de Haan.

Cymo melanodactylus ALCOCK, LXVII, 174, 1898.

Koh Kahdat, coral and coral blocks, 1 fath.; I—II; 2 ♂, 1 ♀.

¹ *Brachyura* "Valdivia", p. 122, pl. XXXI. fig. 3—4, pl. I, fig. 7, 1904.

Xantho scaberrimus Walker.

Xantho (Lophoxanthus) scaberrimus ALCOCK, LXVII, 116, 1898.

Koh Chuen, 30 fath., shell bottom; II; 1 juv., 7.3 mm. in width. Unlike the adult, the fronto-orbital distance is more than half as great as the width of the carapace; the legs are longer and narrower than in the adult.

Leptodius exaratus (Milne Edwards).

Xantho (Leptodius) exaratus ALCOCK, LXVII, 118, 1898.

Coast of Lem Ngob, 0—1 fath., stones and sand; XII; 1 ♂. Koh Chik, rocky coast; I. 30; 1 ♂ 2 ♀ (1 ovig.). Koh Chang, 1 fath., coral; I—III; 1 ♂.

Leptodius sanguineus (Milne Edwards).

Xantho (Leptodius) sanguineus ALCOCK, LXVII, 119, 1898.

Koh Kahdat, 1 fath., coral and coral blocks; I—II; 1 ♀. Koh Chang, 1 fath., coral; I—III; 1 ♀.

These specimens are the *nodosus* form, figured by Dana (pl. XI, figs. 14a—g, Crust. U. S. Expl. Exped.) in which the tips of the lateral teeth are much thickened and strongly produced.

Cycloxanthops lineatus (A. Milne Edwards).

Plate II, fig. 15.

Cycloxanthus lineatus ALCOCK, LXVII, 124, 1898.

Koh Chuen, 30 fath., shell bottom; I. 2; 1 ♀ juv. Between Koh Kut and Koh Kahdat, 10 fath., shell bottom; I. 10; 1 ♀. Between Koh Mesan and Cap Liant, 9 fath.; II. 4; 1 ♂. N. of Koh Chuen, 15 fath., mud, shells; II. 5; 3 ♂ 5 ♀. Koh Kam, 5 fath., gravel; II. 6; 1 ♂ 1 ♀ ovig. Gulf of Rayong, 7—10 fath., sand, mud, shells; II. 8; 2 ♂. Koh Chuen, 30 fath., shell bottom; II; 1 ♂ 1 ♀. Koh Lan, 30 fath., mud; III. 2; 2 juv.

The specimens are all smaller than the type, the largest one (♂, Koh Kam) measuring 5.5 mm. long and 7.3 mm. wide; the outer angle of the orbit is more prominent than in larger specimens, forming a little blunt tooth similar to the next tooth on the antero-lateral margin.

Actæa nodulosa White.

Actæa nodulosa ALCOCK, LXVII, 148, 1898.

Koh Chuen, 30 fath., shell bottom, II; 1 ♀. Koh Kram, 30 fath.; III. 2 and 21; 2 ♂ juv.

Actæa savignyi (Milne Edwards).

Actæa granulata ALCOCK, LXVII, 151, 1898. Not *Cancer granulatus* LINNÆUS, 1758.

Between Koh Kut and Koh Kahdat, 10 fath., shell bottom; I. 10; 1 ♀ juv. 15 miles E. of Koh Chuen, 10 fath., shell bottom; II. 2; 1 ♀ ovig. Koh Kam, 5 fath.,

gravel; II. 6; 1 ♂ juv. 1 ♀ juv. Koh Chuen, 30 fath., shell bottom; II; 2 ♀ juv. Koh Kram, 30 fath.; III. 2 and 21; 1 ♀ juv.

Actæa calculosa (Milne Edwards).

Actæa calculosa ALCOCK, LXVII, 152, 1898.

Between Koh Mesan and Cap Liant, 9 fath.; II. 4; 1 ♂ 2 ♀ juv. Between Koh Mesan and Koh Chuen, 30 fath., stones; II. 5; 1 ♂. Between Koh Mesan and Koh Chuen, 38 fath., stones; II. 7; 1 ♂. Between Koh Mesan and Cap Liant, 5—8 fath., sand, stones; II. 7; 1 ♂ 1 juv. Koh Kram, 30 fath.; III. 2 and 21; 1 ♀ juv.

Platypodia granulosa (Rüppell).

Lophactæa granulosa ALCOCK, LXVII, 101, 1898.

Singapore, coral reef; XII. 5; 1 ♂.

Atergatis ocyroe (Herbst).

Atergatis floridus ALCOCK, LXVII, 98, 1898.

Koh Kahdat, among corals; II. 13; 2 ♂. Koh Chang, 1 fath., corals; I—III; 1 ♀ ovig. 4 juv.

Atergatis dilatatus de Haan.

Atergatis dilatatus ALCOCK, LXVII, 96, 1898.

Koh Chang, 1 fath., corals; I—III; 1 ♂ 1 juv.

Subfamily **Carpiliinæ**.

Chlorodiella niger (Forskål).

Chlorodius niger ALCOCK, LXVII, 160, 1898.

Koh Kahdat, coral and coral blocks, 1 fath.; I—II; 5 ♂ 5 ♀ (2 ovig.) 4 juv. Koh Chang, coral, 1 fath.; I—III; 2 ♂ 1 ♀.

Carpilodes rugipes (Heller).

Actæodes rugipes HELLER, S. B. K. Akad. Wiss. Wien, Math.-Naturw. Cl., XLIII, 1. Abth., 330, pl. II, fig. 20, 1861.

Carpiloxanthus rugipes HELLER, Reise Novara, Crust., 17, 1865.

Carpilodes rugipes A. MILNE EDWARDS, Nouv. Arch. Mus. Hist. Nat., Paris, I, 229, pl. XII, fig. 4, 4 a, 4 b, 1866.

Koh Chang, coral, 1 fath.; I—III; 2 ♀.

Carpilodes lophopus Alcock.

Plate II, fig. 18.

Carpilodes lophopus ALCOCK, LXVII, 84, 1898; Illus. Zool. Investigator, part VII, pl. XXXVI, fig. 2, 1899.

15 miles E. of Koh Chuen, 10 fath., shell bottom; II. 2; 1 ♀. Between Koh Mesan and Koh Chuen, 30 fath., stones; II. 5; 1 ♀. North side of Koh Mesan, 10—15 fath., stones, shells; II; 1 ♂ 1 ♀. Koh Chuen, 30 fath., shell bottom; II; 3 ♀.

The largest specimen (♀ between Mesan and Chuen) is 6.5 mm. long and 10.5 mm. wide. All are more distinctly areolated than the one figured by Alcock. The areola 1 M (of Dana) is distinct; 2 M is longitudinally divided, and there is a triangular areolet in front of the outer half; a square supra-orbital areolet; D and E are fused; 1 L, 2 L and 3 L are fused and eroded; 1 R and 2 R are fused with S; 4 L is fused with T; 5 L and 6 L are each distinct; the transverse groove across the posterior part of the carapace is deep.

Hypocolpus haanii Rathbun.

Cancer (Xantho) granulatus DE HAAN, Fauna Japon., Crust., p. 65, pl. XVIII, fig. 3, 1837. Not *Cancer granulatus* LINNÆUS, 1758.

Hypocœlus granulatus A. MILNE EDWARDS, Nouv. Arch. Mus. Hist. Nat., Paris, I, 296, pl. XVI, fig. 6, 6 a, 1866. HENDERSON, Trans. Linn. Soc. London, (2), Zool., V., p. 358, pl. XXXVI, fig. 12, 1893.

Hypocolpus haanii RATHBUN, Proc. Biol. Soc. Washington, XXII, p. 114, 1909.

Koh Kram, 30 fath.; III. 2 and 21; 1 ♂ 1 juv.

Subfamily Etisinæ.

Chlorodopsis melanochira A. Milne Edwards.

Chlorodopsis melanochira ALCOCK, LXVII, 168, 1898.

Singapore, coral reef; XII. 5; 1 ♂ 1 juv. Koh Kahdat, 1 fath., sandy bottom, sponges, dead corals; I. 11; 3 ♂ 1 ♀ ovig. 3 juv. Koh Kahdat, among algæ; II. 19; 1 ♂. Koh Kahdat, 1 fath., coral and coral blocks; I—II; 4 ♂ 6 ♀ 2 juv. Koh Chang, 1 fath., coral; I—III; 7 ♂ 10 ♀ (3 ovig.) 18 juv.

Halimede de Haan.

Halimede DE HAAN, Fauna Japon., 35, 1835 (*fragifer*).

Andromeda GISTEL, Natur. Thierreichs, p. IX, 1848.

Polycremnus GERSTÄCKER, Arch. f. Natur., XXII, pt. 1, 120, 1856 (*ochtodes*).

Three species of this genus form a regular series according to the amount of ornamentation. They are as follows:

Halimede tyche (Herbst).

Cancer tyche Herbst, Naturg. d. Krabben u. Krebse, III, Heft 2, p. 35, pl. LII, fig. 3, 1801, Ostindien.

Cancer (Halimede) fragifer de Haan, Fauna Japon., Crust., p. 47, pl. XIII, fig. 4, 1835, Japan.

Halimede thurstoni Henderson, Trans. Linn. Soc. London (2), V, p. 360, pl. XXXVI, figs. 13, 14, 1893, Tuticorin.

Halimede ochtodes (Herbst).

Cancer ochtodes Herbst, Naturg. d. Krabben u. Krebse, I, p. 158, pl. VIII, fig. 54, 1783.

Polycremnus ochtodes Alcock, Jour. Asiat. Soc. Bengal, LXVII, p. 135, 1898 and synonymy.

Polypremnus verrucifer Stimpson, Smithson. Misc. Coll., XLIX, p. 49, pl. VI, fig. 1, 1907 and synonymy.

H. tyche has the carapace, wrist and palm covered with raised, flattened and distinctly separated prominences, as shown in de Haan's figures (of *fragifer*). These prominences are pitted or irregularly grooved. The type of *C. tyche* is in the Berlin Museum; it is a small specimen 9.5 mm. long by 11.4 mm. wide, and is undoubtedly the same as *H. fragifer*.

H. thurstoni has similar flattened prominences, but fewer of them; they are restricted to the antero-lateral and suborbital regions of the carapace, the surface of the wrist, and the upper and proximal half of the palm.

H. ochtodes is without flattened prominences, but the antero-lateral protuberances of the carapace are low and rounded, the wrist and supero-proximal surface of the palm are covered with rounded tubercles. *P. verrucifer* corresponds to the young of *H. ochtodes*.

As these three species present no other differences, it is quite probable that they were derived one from another in the order named, and it would not be surprising if intermediate forms existed. The young (at least of *H. thurstoni* and *H. ochtodes*) present greater inequalities of the surface than the old.

H. tyche is not represented in the Siam collection, but the other species were taken as follows:

Halimede thurstoni Henderson.

Plate I, fig. 19. Plate II, fig. 7.

Between Koh Kut and Koh Kahdat, 10 fath., shell bottom; I. 10; 1 ♂ juv. 1 juv. Koh Kam, 5 fath., gravel; II. 6; 1 ♀ juv. 2 juv. Between Koh Mesan and Cap Liant, 5—8 fath., sand, stones; II. 7; 1 ♂ juv. Koh Chuen, 30 fath., shell bottom; II; 1 ♂ juv. 1 ♀ juv. with Rhizocephalid. Between Koh Rin and Cliff Rock (N. of Koh Kram), 15 fath.; III. 2; 2 juv. N. of Koh Chuen, 15 fath., mud, shells; II. 5; 1 juv.

Halimede ochtodes (Herbst).

Plate I, fig. 4.

The gulf at Rayong, 7—10 fath., sand, mud, shells; II. 8; 1 ♀ ovig. Koh Kahdat, 4—5 fath., sand, stones, coral; II. 15—18; 1 ♀ juv. Koh Chuen, 30 fath., shell bottom; II; 1 ♂ with large Rhizocephalid. Koh Lan, 30 fath., mud; III. 2; 1 ♀ juv.

In young specimens the lateral projections are more acute than in the adult. Length of ovigerous ♀ 31 mm., width 42.6 mm.

This species has been recorded at Hong Kong (STIMPSON), Singapore (WALKER), Penang (ALCOCK), Madras Coast (ALCOCK), East India (HERBST), Indian Ocean (ADAMS and WHITE).

Subfamily Menippinæ.

Menippe convexa Rathbun.

Menippe convexa RATHBUN, Bull. U. S. Fish Comm. for 1903, pt. III, 861, pl. XI, fig. 4, 1906.

Fishing-weir at Koh Kong; I. 21; 1 ♂.

Length 9.7 mm., width 12.9 mm. Carapace a little narrower than the type ♀, regions slightly better marked, surface showing a close flat granulation, especially in the anterior half, lateral teeth stronger, more acute. Chelipeds more unequal than in the ♀. Fine dots of a dark color on the posterior part of the carapace, legs transversely banded.

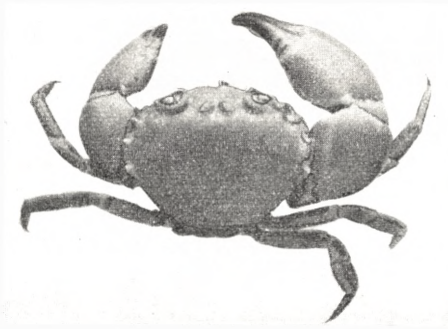


Fig. 38. *Menippe convexa*, Koh Kong, ♂, 12.7 mm. wide.

Myomenippe granulosa (A. Milne Edwards).

Menippe (*Myomenippe*) *granulosa* ALCOCK, LXVII, 179, 1898.

Coast of Lem Ngob, 0—1 fath., stones and mud; XII; 2 ♂ 5 ♀ 10 juv. Mangrove swamp, Lem Ngob; XII, 23, 24 and 27; 2 ♂ 2 ♀. Koh Chang, stony coast at low water; I; 1 ♂ 1 juv.

Eurycarcinus orientalis

A. Milne Edwards.

Eurycarcinus orientalis ALCOCK, LXVII, 210, 1898.

Mangrove swamp, Lem Ngob; XII, 23, 24 and 27; 1 ♀. Coast of Lem Ngob, 0—1 fath., stones, sand; XII; 4 ♂ 1 ♀ 5 juv. Koh Chang, stony coast at low water; I; 1 ♂ 1 ♀. Coast of Lem Ngob, above low water mark; XII, 28; 2 ♀ 8 juv. Gulf of Siam, without special locality; 1 ♂ 1 ♀. Koh Chang, coral, 1 fath.; I—III; 1 ♂ 4 ♀ (1 ovig.) 5 juv. Koh Chang, under stones on coast, extreme low water; I. 12; 1 ♂ juv.



Fig. 39. *Eurycarcinus orientalis*, Lem Ngob, ♀, 13.5 mm. wide.

Pilumnus vespertilio (Fabricius).

Pilumnus vespertilio ALCOCK, LXVII, 192, 1898.

Singapore, coral reef; XII, 5; 6 ♂ 2 ♀. Between Koh Mesan and Cap Liant, 5—8 fath., sand, stones; II. 7; 1 juv. Koh Chang, 1 fath., coral; I—III; 1 juv.

Pilumnus longicornis Hilgendorf.

Pilumnus longicornis ALCOCK, LXVII, 193, 1898.

Koh Kram, 30 fath.; III. 2 and 21; 1 ♀ juv. Koh Kahdat, 5—8 fath., sandy mud, II. 16 and III. 4; 1 ♀ ovig. Gulf at Rayong, 7—10 fath., sand, mud, shells; II. 8; 1 ♀. Between Koh Mesan and Koh Chuen, 15 fath., stones; II. 6; 1 juv. Between Koh Mesan and Cap Liant, 5—8 fath., sand, stones; II. 7; 1 juv.

These specimens differ from the type in having the greater part of the outer surface of the large hand, granulous and hairy; this may be due to the smaller size of the specimens.

Pilumnus andersoni de Man.

Pilumnus andersoni ALCOCK, LXVII, 194, 1898.

15 miles east of Koh Chuen, 10 fath., shell bottom; II. 2; 1 ♀. Koh Chuen, 30 fath., shell bottom; I. 2; 2 ♀ 2 juv. Koh Chuen, 30 fath., shell bottom; II; 1 ♂ 5 ♀ (1 ovig.). Koh Kram, 30 fath.; III. 2 and 21; 6 ♂ 7 ♀ (2 ovig.) 12 juv. Koh Kahdat, 1 fath., coral, coral blocks; I—II; 2 ♂ 1 ♀ ovig. Koh Chang, 1 fath., coral; I—III; 2 ♂ 7 ♀ (1 ovig.) 12 juv.

The specimens are all small, the largest measuring 4 mm. long, 6 wide. The outer angle of the orbit is inclined to be spiniform, but the spine is very short, not approaching in size the other spines.

Pilumnus edamensis de Man.

Pilumnus edamensis DE MAN, Arch. f. Naturg., LIII, 1, p. 302, pl. XI, fig. 5, 1887.

Koh Kahdat, 1 fath., coral and coral blocks; I—II; 1 ♂. Koh Chang, 1 fath., coral; I—III; 3 ♀. Bay at south end of Koh Chang, among large oysters; III. 14; 1 ♂.

Pilumnus cærulescens A. Milne Edwards, var.

Plate I, fig. 15.

Pilumnus cærulescens ALCOCK, LXVII, 196, 1898.

Koh Kahdat, 1 fath., sandy bottom, sponges, dead coral; I. 11; 1 ♂ 2 ♀ (1 ovig.). Koh Kahdat, among algæ; II. 19; 1 ♂ juv. 1 ♀.

Corresponds well to ALCOCK's description except that the hands are not closely granulate.

Pilumnus hirsutus Stimpson.

Pilumnus hirsutus STIMPSON, Smithson. Misc. Coll., XLIX, 69, pl. IX, fig. 1, 1907. Cf. RATHBUN, Bull. Mus. Comp. Zool., XXXIX, 129, 1902.

Koh Kahdat, 1 fath., sandy bottom, sponges, dead corals; I. 11; 1 ♀ 3 juv. Between Koh Mesan and Koh Chuen, 25 fath., shells, II. 5; 1 juv. Koh Kam, 5 fath., gravel; II. 6; 3 ♂ 3 ♀ (1 ovig.). Between Koh Riat and Koh Mesan, 3—5 fath., algæ; II. 7; 1 ♀. Between Koh Mesan and Cap Liant, 5—8 fath., sand, stones; II. 7; 2 ♂ 1 ♀. Koh Kram, 30 fath.; III. 2 and 21; 2 ♂. Twelve miles east of Koh Mak, 20 fath., large seine; I. 28; 1 ♂.

A ♂ from Koh Kram is about the size of Stimpson's type and resembles his figure. The lobes of the front are more rounded and less oblique than in smaller specimens, edge minutely crenulate, and the median emargination shallower. Carapace very convex both ways. The projections of the chelipeds are sharp, spinulous. Besides the short pubescence of the surface there are numerous long hairs.

Length of carapace of ♂, 8.5, width 11.5 mm.

Pilumnus dorsipes Stimpson.

Plate I, figs. 3 and 9.

Pilumnus dorsipes STIMPSON, Smithsonian Misc. Coll., XLIX, 70, pl. IX, fig. 3, 3a, 1907.

Koh Kram, 30 fath.; III. 2 and 21; 1 ♀ juv.

Length 7.9 mm., width 10.4 mm. Corresponds to ALCOCK's description fairly well. There is a bunch of subhepatic granules. The surface of the wrist and chela is covered with blunt curved spines. STIMPSON's figure shows the legs somewhat shorter, and those of the last two pairs broader.

Pilumnus borradailei Rathbun.

Plate I, fig. 8.

Pilumnus borradailei RATHBUN, Proc. Biol. Soc. Washington, XXII, p. 113, 1909.

Carapace very flat except anteriorly, about $\frac{3}{4}$ as long as broad, covered with a dense short pubescence, and long hairs, forming a fringe on the anterior border of the carapace and abundant on the chelipeds even to the finger tips and on the legs. When denuded, the regions of the carapace are fairly well marked, the surface is finely punctate, and towards the antero-lateral regions a little granular.



Fig. 40. Chela (denuded) of *Pilumnus borradailei*, Koh Chang, ♂, 9.4 mm. wide.

Fronto-orbital border $\frac{7}{10}$ of width of carapace, $\frac{1}{2}$ of this is occupied by the front, the two lobes of which are very oblique, convex, with a shallow median emargination, outer angles rectangular, rounded off and scarcely separated from the inner angle of the orbit. The outer of the two superior fissures of the orbit is small, the inner scarcely discernible; notch below the outer angle broad.

Antero-lateral margin crossed by three grooves which form four shallow lobes with granulated edges, which diminish in size from the first to the fourth. Postero-lateral margins slightly converging.

Chelipeds stout; merus broader than long; carpus almost smooth except for fine granules along the distal margin; palms wider than their superior length, surface covered with numerous but not contiguous small pearly granules, which are continued half way along the fingers; only the distal half or less of the fingers is dark-colored. Third pair of legs twice as long as carapace. Legs unarmed.

Length of type ♂ 7.4 mm., width 10 mm., fronto-orbital width 7.1 mm., width of front 3.5 mm.

Koh Kahdat, 1 fath., coral and coral blocks; I—II; 1 ♂ 1 ♀. Koh Chang, 1 fath., coral; I—III; 2 ♂ (1 is type).

Nearest to *P. pilosus* Fulton and Grant¹, from which it differs in lacking the naked triangular area on the palms, in having the fingers meeting when closed, and in its greater hairiness (judging from the figures of *P. pilosus*).

***Actumnus setifer* (de Haan).**

Actumnus setifer ALCOCK, LXVII, 202, 1898.

Between Koh Mesan and Cap Liant, 5—8 fath., sand, stones; II. 7; 1 ♀. Koh Kahdat, 4—5 fath., sand, stones, coral; II. 15—18; 2 ♂ 2 ♀. North side of Koh Mesan, 10—15 fath., stones, shells; II; 1 ♂ 1 ♀. 15 miles east of Koh Chuen, 10 fath., shell bottom; II. 2; 2 ♀ (1 ovig.).

***Actumnus changensis* Rathbun.**

Actumnus changensis RATHBUN, Proc. Biol. Soc. Washington, XXII, p. 114, 1909.

Surface almost bare, only occasional hairs, both long and short, which in no way disguise the markings.

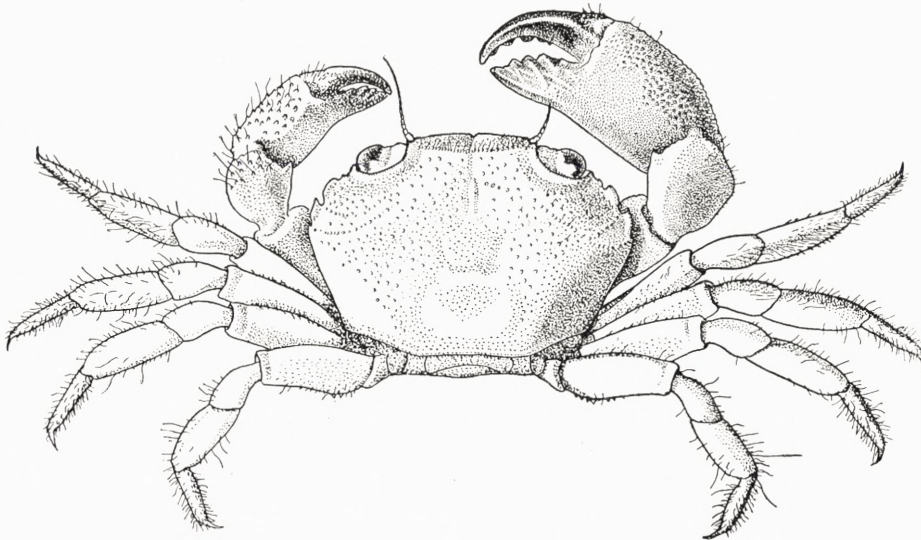


Fig. 41. *Actumnus changensis*, Koh Chang, ♂, 5.7 mm. wide.

Carapace $\frac{2}{3}$ as long as broad, regions very slightly indicated, viz., the mesogastric and cardiac; epigastric lobes slightly elevated. Frontal and antero-lateral regions dotted with separated granules; an indistinct line of granules curves inward and forward from the last lateral tooth.

Front $\frac{1}{3}$ as wide as carapace, bilobed, with a median notch, each lobe slightly convex and separated from the orbital angle by a rectangular notch.

¹ Proc. Roy. Soc. Victoria, XIX (n. s.), p. 7, pl. IV, fig. 1—4, 1906.

Orbital margin not fissured above, a triangular notch below the outer angle. The antennary flagellum arises in the orbital hiatus.

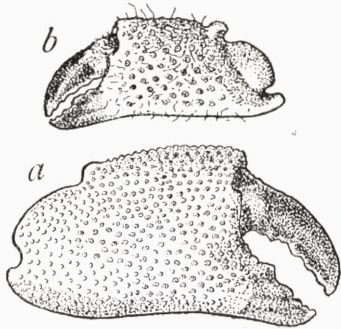


Fig. 42. *Actumnus changensis*, Koh Chang, ♂, 5.7 mm. wide: a, right chela; b, left chela.

There are three antero-lateral teeth, the first subtruncate, the second and third acutely pointed. Between the first tooth and the orbital angle there is a spinule. Postero-lateral margins considerably longer than the antero-lateral, straight.

Chelipeds very unequal, granulous, granules small, beadlike, and dense on the palms. Pollex of larger hand short, with four principal teeth. The dark color does not quite cover the surface of either thumb.

Dimensions. — ♀, length 3.8 mm., width 5.7 mm.

Koh Chang, 1 fath., coral; I—III; 3 ♂ 2 ♀ (1 ♀ type).

In shape resembles *A. tomentosus* Dana (pl. XIV, figs. 2a—c, Crust. U. S. Expl. Exped.) which has the carapace without granules and covered with a tomentum.

Actumnus squamosus (de Haan).

Cancer (Pilumnus) squamosus DE HAAN, Fauna Japon., Crust., p. 50, 1835.

Actumnus squamosus A. MILNE EDWARDS, Nouv. Arch. Mus. Hist. Nat., Paris, I, p. 286, pl. XVIII, fig. 6, 6a, 6b, 6c, 1866.

20 miles E. S. E. of Koh Samit, 13—14 fath., sandy mud, shells; II. 2; 1 ♂. Between Koh Mesan and Cap Liant, 9 fath.; II. 4; 1 ♂. Off Koh Sakait, 5—6 fath., sand; II. 23; 1 ♀ ovig. Koh Chuen, 30 fath., shell bottom; II; 1 ♂ 1 ♀. Between Koh Rin and Cliff Rock, (N. of Koh Kram), 15 fath.; III. 2; 1 ♀. Koh Kam, 5 fath., gravel; II. 6; 3 ♂ 3 ♀ (1 ovig.) 2 juv.

Parapleurophrycoides roseus Nobili.

Parapleurophrycoides roseus NOBILI, Bull. Mus. Hist. Nat., Paris, 1906, No. 5, p. 9.

About 15 miles W. of Koh Kut, about 30 fath. (s. m.); I. 28; 1 juv., 1.25 mm. long, 1.4 mm. wide, front 0.6 mm.

This corresponds very well with NOBILI'S preliminary description. The eyes are of huge size, projecting sideways beyond the orbits. Outer angle of orbit spiniform, as is also the lower inner angle; lower margin serrulate. Antenna standing loosely in the orbit, the joint following the basal joint barely reaching the front.

Heteropanope sexangula Rathbun.

Plate II, fig. 6.

Heteropanope sexangula RATHBUN, Proc. Biol. Soc. Washington, XXII, p. 114, 1909.

Carapace narrow, hexagonal, little convex, surface tomentose, uneven, a blunt transverse ridge on each frontal lobe, and on each protogastric lobe, and a few irregular nodules on the branchial region.

Front strongly deflexed, its lower edge bearing four small well separated lobes, the inner pair more produced (or lower down), the outer pair distinctly separated from the orbital angles.

The upper margin of the orbit has two very small notches; below the outer angle is a very large notch.

The short antero-lateral margin is cut into four teeth, first three blunt, fourth largest, acute; first fused with orbital angle, third minute.

Chelipeds and legs tomentose; chelipeds unequal in the ♀, stout, $1\frac{1}{2}$ times as long as carapace. Merus with a superior, subterminal spine; wrist nodular, with a sharp inner spine; palms granulose except on the distal portion of the larger one. Legs slender.

Length of ovigerous ♀ 5.2 mm., width 7 mm.

Gulf of Siam (special locality not given), 1 ♀.

This species in form resembles *H. eucratoides* Stimpson (Smithson. Misc. Coll., XLIX, 64, pl. VIII, fig. 2, 2a, 1907) which is a much smoother species, the hand being quite smooth.



Fig. 43. Chela of *Heteropanope sexangula*, type ♀, 7 mm. wide.

Subfamily Oziinæ.

Epixanthus frontalis (Milne Edwards).

Epixanthus frontalis ALCOCK, LXVII, 185, 1898.

Koh Chik, rocky coast; I. 30; 3 ♂ 2 ♀.

Subfamily Eriphiinæ.

Eriphia sebana smithii Mac Leay.

Eriphia lœvimana var. *Smithii* ALCOCK, LXVII, 216, 1898.

South coast of Koh Chang, sand (shrimp-net); I. 18; 1 ♀.

Subfamily Trapeziinæ.

Trapezia cymodoce (Herbst).

Trapezia cymodoce ALCOCK, LXVII, 219, 1898.

Koh Kahdat, coral and coral blocks, 1 fath.; I—II; 1 ♀.

Tetralia glaberrima (Herbst).

Tetralia glaberrima ALCOCK, LXVII, 223, 1898.

Koh Kahdat, coral and coral blocks, 1 fath.; I—II; 7 ♂ 9 ♀ ovig. 2 juv.

Family Potamonidæ.

Subfamily Potamoninæ.

Potamon (Potamon) brousmichei Rathbun.

Potamon (Potamon) brousmichei RATHBUN, Nouv. Arch. Mus. Hist. Nat. (4), VI, 272, fig. 12 in text, pl. X, fig. 6, 1904.

River on Koh Chang; I. 5; 4 ♂ 2 ♀ 4 juv. Koh Kut, in little mountain river; 1 juv. Bay at Klong Salakpet (River on Koh Chang); III. 14; 1 ♂. Klong Salakpet (River on Koh Chang); III. 15; 2 juv.

Family Portunidæ.

Subfamily Carupinæ.

Carupa læviuscula Heller.

Carupa læviuscula ALCOCK, LXVIII, 26, 1899.

Koh Chang, among corals, 1 fath.; III; 1 ♀.

Subfamily Portuninæ.

Scylla serrata (Forskål).

Scylla serrata ALCOCK, LXVIII, 27, 1899.

Coast at Lem Ngob, 6 specimens.

“Caught in great numbers in the mangrove. It is eaten by the natives; its flavor I found quite excellent”.

Portunus sanguinolentus (Linnæus).

Neptunus sanguinolentus ALCOCK, LXVIII, 32, 1899.

At South point of Koh Chang in Sargassum; I. 8; 2 juv. (1 minute). Koh Kahdat, 1 fath., sandy bottom, sponges, dead corals; I. 11; 1 juv. (minute). 18 miles West of Koh Chang, surface; I. 31; 12 juv. (mostly minute). North of Koh Samit, surface; II. 3; 1 juv. (minute). Between Koh Mesan and Koh Chuen, on and under plants, surface; II. 5; 2 juv. North of Koh Chang, under leaves, seaweed, etc.; II. 10; 17 juv. N. side of Koh Chang, under leaves, surface; III. 8; 3 juv. (minute). South of Koh Chang, under floating Sargassum, “rain, not sun”; III. 13; 4 juv. (minute). South of Koh Chang, under floating Sargassum; III. 16; 2 juv. (minute).

Portunus pelagicus (Linnæus).

Neptunus pelagicus ALCOCK, LXVIII, 34, 1899.

Coast at Lem Ngob; XII. 30. 99; 3 specimens. Coast at Lem Ngob (seine); XII. 26; 5 ♂ 1 ♀ (all young). Coast at Lem Ngob, 0—1 fath., stones, mud; XII;

2 ♂ 2 ♀ 5 juv. Coast of Koh Kong; I. 23; 4 ♀ juv. Fishing-weir at Koh Kong; I. 21; 1 ♂. The shore outside the Mangrove at the Station on Koh Chang; III. 11; 2 juv. Outside mangroves on Koh Chang, very shallow water; III. 18; 1 juv.

Portunus (Achelous) gladiator (Fabricius).

Neptunus (Amphitrite) gladiator ALCOCK, LXVIII, 35, 1899 (Not *Amphitrite media* STIMPSON).

Between Koh Mesan and Cap Liant, 9 fath.; II. 4; 2 juv. Koh Kam, 5 fath., gravel; II. 6; 1 ♂. Between Koh Riat and Koh Mesan, 3—5 fath., sand, algæ; II. 7; 1 juv. Gulf of Rayong, 7—10 fath., sand, mud, shells; II. 8; 1 juv.

Portunus (Achelous) hastatoides (Fabricius).

Neptunus (Hellenus) hastatoides ALCOCK, LXVIII, 38, 1899.

Singapore, 2—3 fath.; XII. 4; 3 ♂ 4 ♀ (1 with Rhizocephalid). Between Koh Kut and Koh Kahdat, 10 fath., shell bottom; I. 10; 2 ♀. S. of Koh Bidang, 9 fath., mud, shells; I. 18; 1 ♀. N. of Koh Kong, 8 fath., mud bottom; I. 23; 1 ♂ 2 ♀. N. of Koh Kut, 10 fath.; I. 23; 1 ♂ juv. 1 ♀ juv. West of Koh Kong, 10—15 fath.; I. 24; 1 ♂. East of Koh Chang, 6 fath., seine; I. 25; 2 ♂ 4 ♀ (1 with Rhizocephalid). Koh Kahdat, 8—10 fath., mud; I. 27; 5 ♂ 8 ♀ (4 ovigerous). Off North point of Koh Kut, 10 fath. (large seine); I. 27; 3 ♂ 1 ♀. West of North end of Koh Kut, 11 fath.; I. 27; 2 ♀ (1 ovigerous). South of Koh Kut, 17—20 fath., mud (large seine); I. 28; 2 ♀ (1 ovig.). 15 miles west of Koh Kut, 30 fath., (s. m.); I. 28; 1 ♀, 1 juv. 10—12 miles west of Koh Chang, 20 fath., mud; I. 29; 1 ♂ 3 ♀. Sound at Koh Chang, 3—5 fath., soft clay bottom; 11 ♂ j., 17 ♀ j. 20 miles south of Koh Samit, 20 fath., mud; I. 31; 2 ♂ 4 ♀. 4—6 miles south of Koh Samit, 14—18 fath.; II. 1; 1 ♀ with Rhizocephalid, 1 juv. Koh Kam, 10 fath., gravel; II. 6; 1 ♀. Between Koh Mesan and Cap Liant, 5—8 fath., sand, stones; II. 7; 1 ♂. Gulf of Rayong, 7—10 fath., sand, mud, shells; II. 8; 1 ♂. Koh Kahdat, 5—8 fath., sandy mud; II. 16 and III. 4; 1 ♀. Tung Kaben, 6 fath., sand, mud, phanerogams; II. 22; 1 ♀.

Portunus (Achelous) spinipes (Miers).

Neptunus (Hellenus) spinipes ALCOCK, LXVIII, 39, 1899.

S. of Koh Kut, 17—20 fath., mud (large seine); I. 28; 2 ♂ 1 ♀. 10—12 miles west of Koh Chang, 20 fath., mud; I. 29; 5 ♂. 20 miles south of Koh Samit, 20 fath., mud; I. 31; 2 ♂.

Portunus (Achelous) tenuipes (de Haan).

Neptunus (Hellenus) tenuipes ALCOCK, LXVIII, 42, 1899.

4 miles S. of Koh Sakait, 9 fath., shell bottom; II. 3; 1 ♀ ovig. Gulf of Rayong, 7—10 fath., sand, mud, shells; II. 8; 1 ♂. Koh Kam, 5 fath., gravel; II. 6; 1 ♂ juv. Between Koh Riat and Koh Mesan, 3—5 fath., sand, algæ; II. 7; 1 juv. 6 miles east of Cap Liant, 9 fath., shell bottom; II. 7; 2 ♀. Koh Kahdat, 4—5 fath.,

sand, stones, coral; II. 15—18; 7 ♂. Koh Kahdat, 5—8 fath., sand, mud; II. 16 and III. 4; 2 juv.

Portunus (Achelous) tuberculatus (A. Milne Edwards).

Neptunus (Hellenus) tuberculatus ALCOCK, LXVIII, 42, 1899.

Between Koh Kut and Koh Kahdat, 10 fath., shell bottom; I. 10; 1 ♂. Between Koh Mesan and Cap Liant, 5—8 fath., sand, stones; II. 7; 1 juv. S. of Koh Mak, 5—6 fath.; II. 7; 1 juv. Koh Kahdat, 4—5 fath., sand, stones, coral; II. 15—18; 1 ♀. Koh Kahdat, 5—8 fath., sandy mud; II. 16 and III. 4; 1 ♂. Koh Kram, 30 fath.; III. 2 and 21; 2 ♀ (1 ovig.).

Portunus (Achelous) brockii (de Man).

Neptunus (Hellenus) brockii ALCOCK, LXVIII, 43, 1899.

Koh Kahdat, 4—5 fath., sand, stones, coral; II. 15—18; 1 juv. S. of Koh Mak, 5—6 fath.; II. 17; 2 ♂. Sound at Koh Chang, 3—5 fath., soft clay bottom; 1900; 1 ♂.

Portunus (Achelous) granulatus (Milne Edwards).

Neptunus (Achelous) granulatus ALCOCK, LXVIII, 45, 1899.

Koh Kahdat, 4—5 fath., sand, stones, coral; II. 15—18; 6 ♂ 2 ♀.

Portunus (Lupocycloporus) gracilimanus (Stimpson).

Neptunus (Lupocycloporus) whitei ALCOCK, LXVIII, 44, 1899.

Amphirrite gracilimanus STIMPSON, Smithsonian Misc. Coll., XLIX, 77, pl. X, fig. 3, 1907.

Singapore, 2—3 fath.; XII. 4; 1 ♂. Between Koh Kut and Koh Kahdat, 10 fath., shell bottom; I. 10; 1 ♂ 1 ♀. Between Koh Mesan and Cap Liant, 9 fath.; II. 4; 3 juv. Koh Kram, 5 fath., gravel; II. 6; 1 juv. Gulf of Rayong, 7—10 fath., sand, mud, shells; II. 8; 2 juv. Tung Kaben, 6 fath., sand, mud, phanerogams; II. 22; 2 juv. Koh Chuen, 30 fath., shell bottom; II; 5 ♀. Koh Lan, 30 fath., mud; 1 ♂ 1 juv. Between Koh Rin and Cliff Rock (N. of Koh Kram), 15 fath.; III. 2; 1 ♀.

Portunus (Lupocycloporus) innominatus Rathbun.

Neptunus (Lupocycloporus) gracilimanus ALCOCK (not STIMPSON) LXVIII, 45, 1899.

Portunus (Lupocycloporus) innominatus RATHBUN, Proc. Biol. Soc. Washington, XXII, p. 114, 1909.

Koh Kahdat, 8—10 fath., mud; I. 27; 1 ♀ ovig. 10 miles E. of Koh Mak, 20 fath., large seine; I. 28; 1 ♂.

Besides the distinguishing characters given by Alcock, the antero-lateral teeth are irregular, the 2nd, 3rd, 4th and 6th being smaller than the others.

Portunus (Xiphonectes) longispinosus (Dana).

Neptunus (Hellenus) longispinosus ALCOCK, LXVIII, 40, 1899.

Koh Kahdat, 1 fath., sandy bottom, sponges, dead corals; I. 11; 1 ♂. S. of Koh Mak, 5–6 fath., II. 7; 2 juv. Koh Kahdat, 4–5 fath., sand, stones, coral; II. 15–18; 25 ♂ 25 ♀ (13 ovig.).

Subfamily **Thalamitinæ.**

Lissocarcinus boholensis Semper.

Lissocarcinus boholensis SEMPER, in Nauck, Zeits. Wiss. Zool., XXXIV, pp. 60 and 67, 1880.

15 miles West of Koh Kut, in Salpæ, 1 ♀ immature.

This small specimen is very little broader than long (3.7 mm. long, 3.8 mm. broad)¹. The anterior two-thirds of the carapace approaches a circular form, the postero-lateral margins are concave, and meet the broad and lightly concave posterior margin (which is half as wide as the carapace) at a blunt obtuse angle. Dorsal surface nearly flat and crossed by fine transverse lines, which are very apparent and fairly continuous on the anterior half but posteriorly become fainter and more broken.

Fronto-orbital distance very little less than extreme width. Front strongly projecting and (exclusive of orbital angles) about one-third width of carapace, bilobed, with a distinct median emargination and a short median furrow, each lobe sloping backward and outward and with nearly straight margin. Inner orbital angle subacute. Orbit large, its upper border entire. Eye very large.

Antero-lateral border thin, cut into five (including the orbital) short blunt teeth, scarcely projecting, and indicated more by the furrows between them.

Basal joint of antenna narrow, its outer angle produced. The exclusion of the flagellum from the orbit is very slight. Antennules very large, obliquely folded.

Chelipeds stout, but little longer than carapace; surface finely roughened. Inner angle of wrist dentiform. Hands full, wider than their superior length, two granular ridges above and one or more obscure ridges on outer surface. Fingers deeply grooved, not gaping, and crossing some distance behind the tips. Legs narrow, first three pairs as long as chelipeds; merus of last pair one and one-half times as long as wide, its posterior border, as well as that of the merus, smooth.

Shape of carapace and front something as in *L. polybioides* Adams & White (cf. Alcock, LXVIII, p. 19, 1899), but anterior and posterior margins wider, orbits much larger, side teeth more as in *L. orbicularis* Dana (cf. Alcock, op cit., p. 20).

Charybdis cruciata (Herbst).

Charybdis (Goniosoma) crucifera ALCOCK, LXVIII, 51, 1899.

Fishing-weir at Koh Kong; I. 21; 2 ♀. S. of Koh Kut, 17–20 fath., mud (large seine); I. 28; 1 ♀ 2 juv. Paknam-wen; II. 11; 1 ♀. 18 miles W. of Koh

¹ NAUCK says, on page 67, "länger als breit", but on page 60 the dimensions are given as 14 mm. long, 17 broad. Cf. footnote on page 18.

Chang, surface; I. 31; 6 juv. S. of Koh Chang, under floating sargassum, "rain, no sun"; III. 13; 1 juv. 35 miles W. of Koh Chang, 30 fath., clay; I. 31; 1 juv.

Charybdis lucifera (Fabricius).

Plate II, fig. 10.

Charybdis (Goniosoma) quadrimaculata ALCOCK, LXVIII, 54, 1899.

Coast of Lem Ngob, 0—1 fath., stones and mud; XII; 1 ♀. Fishing-weir at Koh Kong; I. 21; 1 ♂ 1 ♀ ovig.

In one of the cotypes before me of *Goniosoma quadrimaculatum* A. Milne Edwards from Batavia (pl. II, fig. 10) the first antero-lateral tooth is bluntly angled on its outer margin, but this is not the case in the three smaller specimens from the Gulf of Siam. In the two largest individuals examined the orbit is one-third as wide as the front, and in the smallest individual the orbit is somewhat wider.

Charybdis annulata (Fabricius).

Charybdis (Goniosoma) annulata ALCOCK, LXVIII, 54, 1899.

Coast of Koh Kam; II. 5; 1 ♀.

Charybdis affinis Dana.

Plate II, fig. 11.

Charybdis (Goniosoma) affinis ALCOCK, LXVIII, 56, 1899.

Coast of Lem Ngob (seine); XII. 26; 1 ♂.

Charybdis anisodon (de Haan).

Portunus anisodon DE HAAN, Fauna Japon., Crust., p. 42, 1835.

Mouth of the river Paknam-wen, in Chinamen's tow-nets; I. 30; 1 ♀. Sound at Koh Chang, 3—5 fath., soft clay bottom; 1900; 2 juv.

Charybdis callianassa (Herbst).

Charybdis (Goniosoma) callianassa ALCOCK, LXVIII, 57, 1899.

Fishing-weir at Koh Kong; I. 21; 1 ♂. Off Koh Kut, 6 fath.; I. 26; 1 ♀. Mouth of Paknam-wen (in Chinamen's tow-nets); I. 30; 3 ♂ 1 ♀.

Charybdis variegata (Fabricius).

Charybdis (Goniosoma) variegata ALCOCK, LXVIII, 60, 1899.

Koh Kam, 5 fath., gravel; II. 6; 1 ♀ ovig. Koh Kahdat, 4—5 fath., sand, stones, coral; II. 15—18; 1 juv.

Charybdis natator (Herbst).

Charybdis (Goniosoma) natator ALCOCK, LXVIII, 61, 1899.

Between Koh Mesan and Cap Liant, 9 fath., II. 4; 1 ♂ juv.

Charybdis ornata (A. Milne Edwards).

Charybdis (*Goniohellenus*) *ornata* ALCOCK, LXVIII, 64, 1899.

Between Koh Kahdat and Koh Kut, 6 fath., sandy clay; I. 9; 2 juv. 20 miles south of Koh Samit, 20 fath., mud; I. 31; 1 ♂ juv. Koh Kahdat, 5–8 fath., sandy mud; II. 16. and III. 4; 1 ♂.

Thalamita crenata (Latreille).

Thalamita crenata ALCOCK, LXVIII, 76, 1899.

Koh Chang, stony coast at low water; I; 1 ♂. Koh Chang; II. 12; 1 ♂.

Thalamita prymna (Herbst).

Thalamita prymna ALCOCK, LXVIII, 78, 1899.

Singapore, coral reef; XII. 5; 1 ♀ with Rhizocephalid. Koh Lom (West of Koh Chang); III. 9; 1 ♀.

Thalamita chaptali Audouin.

Thalamita chaptali ALCOCK, LXVIII, 80, 1899.

Koh Kahdat, 4–5 fath., sand, stones, coral; II. 15–18; 1 ♂, 6 mm. wide, with narrow hands, rather faintly marked, 2 spines (1 acute) on arm; penult segment of abdomen twice as wide as long. 1 ♀ ovigerous, 10.7 mm. wide, with stoutish hands, more strongly marked; 3 acute spines on arm. 1 ♀ ovigerous, 22.2 mm. wide by 16.1 long, is narrower than typical *chaptali* or *sima*, has the side teeth of *chaptali*, the frontal lobes inclining to *sima*, the hand stout, with strong markings, only the anterior one of the outer row being obsolete, 3 acute spines on arm. 35 miles West of Koh Chang, 30 fath., clay; I. 31; 1 ♂, 4 mm. wide. N. of Koh Chang, under leaves, seaweed, etc.; II. 10; 1 ♂ with lateral teeth acute, resembling those of *T. poissonii*; chelipeds narrow, hands feebly ridged. Cf. Borradaile, Fauna Maldives Ids., I, pp. 201–202, 1902, for the variations in this species and its allies.

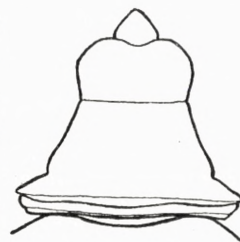


Fig. 44. Abdomen of *Thalamita chaptali*, Koh Chang, ♂, 6.3 mm. wide.

Thalamita sima Milne Edwards.

Thalamita sima ALCOCK, LXVIII, 81, 1899.

Koh Chuen, 30 fath., shell bottom; I. 2; 2 juv. 15 miles E. of Koh Chuen, 10 fath., shell bottom; II. 2; 1 ♀, 1 juv. Between Koh Mesan and Cap Liant, 9 fath.; II. 4; 1 ♀ with Rhizocephalid. Between Koh Mesan and Koh Chuen, on and under plants, surface; II. 5; 1 juv. Koh Kam, 5 fath., gravel; II. 6; 4 ♂ 6 ♀ 17 juv. Between Koh Riat and Koh Mesan, 3–5 fath., sand, algæ; II. 7; 2 juv. Between Koh Mesan and Cap Liant, 5–8 fath., sand, stones; II. 7; 2 juv. Koh Kahdat, 4–5 fath., sand, stones, coral; II. 15–18; 1 juv. Koh Kahdat, 4–5 fath., sand,

stones, coral; II. 16; 1 juv. Tung Kaben, 6 fath., sand, mud, phanerogams; II. 22; 1 ♀ ovig. Koh Chuen, 30 fath., shell bottom; II; 1 juv. Koh Chang, 1 fath., coral; I—III; 1 juv. (both 3rd and 4th side teeth rudimentary).

Thalamita imparimanus Alcock.

Thalamita imparimanus ALCOCK, LXVIII, 87, 1899; Illus. Zool. Investigator, Crust., VIII, pl. XLVII, figs. 3, 3a, 1900.

North of Koh Chang, under leaves, seaweed, etc.; II. 10; 1 ♂. Differs from the original description in having three spinules present on the outer surface of the wrist; no denticle at base of first side tooth. Between Koh Mesan and Cap Liant, 5—8 fath., sand, stones; II. 7; 1 juv., with a strong denticle at base of first side tooth; also spinules on wrist.

Subfamily Podophthalminæ.

Podophthalmus vigil (Fabricius).

Podophthalmus vigil (FABRICIUS) MIERS, Challenger Rept., Zool., XVII, 207, 1886.

Sound at Koh Chang, surface; I. 15; 1 ♀. (The legs thrown off after it was put in spirit). Fishing-weir at Koh Kong; I. 21; 4 ♂ 2 ♀.

Family Atelecyclidæ.

Subfamily Thiinæ.

Kraussia nitida Stimpson.

Kraussia nitida RATHBUN, Bull. Mus. Comp. Zool., XXXIX, 132, plate, fig. 13, 1902; STIMPSON, Smithsonian Misc. Coll., XLIX, 87, pl. X, fig. 4, 1907.

North side of Koh Mesan, 10—15 fath., stones, shells; II; 1 juv.

Subtribe Dromiacea.

Superfamily Dromiidea.

Family Dromiidæ.

Dromidia cranioides de Man.

Dromidia cranioides ALCOCK, LXVII, 138, 1899.

Between Koh Mesan and Cap Liant, 5—8 fath., sand, stones; II. 7; 1 ♀. Koh Chuen, 30 fath., shell bottom; II; 1 ♂, concealed under large sponge. N. of Koh Samit, surface; II. 3; was taken a specimen, one of the later larval stages of a Dromiid, perhaps this species, the last legs strongly resembling those of the adults examined.

Dromidia unidentata (Rüppell).

Dromidia unidentata ALCOCK, LXVII, 139, 1899.

Koh Chuen, 30 fath.; II; 1 ♀ with Rhizocephalid attached to, and concealed by, the abdomen. Koh Kram, 30 fath.; III. 2 and 21; 1 ♂. Koh Kahdat, 5–8 fath., sandy mud; II. 16, III. 4; 1 juv.

Cryptodromia canaliculata Stimpson.

Cryptodromia canaliculata ALCOCK, LXVII, 142, 1899; STIMPSON, Smithson. Misc. Coll., XLIX, 176, 1907.

Between Koh Mesan and Koh Chuen, 30 fath., stones; II. 5; 1 ♂ juv.

A small specimen, only 4.1 mm. long. The nodules of the wrist and hand are very strong; on the wrist are four large, and two or three small nodules; and on the upper surface of the palm five large nodules.

Conchæcetes artificiosus (Fabricius).

Conchæcetes artificiosus ALCOCK, LXVIII, 151, 1899.

20 miles E. S. E. of Koh Samit, 13–14 fath., sandy mud, shells; II. 2; 1 ♂ 1 ♀. Koh Chuen, 30 fath., shell bottom; II; 1 ♂.

The ♂ from Koh Chuen is half grown and seems intermediate between *C. andamanicus* Alcock (op. cit., p. 152) and typical *artificiosus*; the front is cut into two triangular teeth, with the inferior denticle slightly visible in dorsal view; there is a rudimentary tooth on the upper border of the orbit; no traces of lateral teeth, the sides being arcuate; subhepatic region not bounded by distinct rows of tubercles or granules.

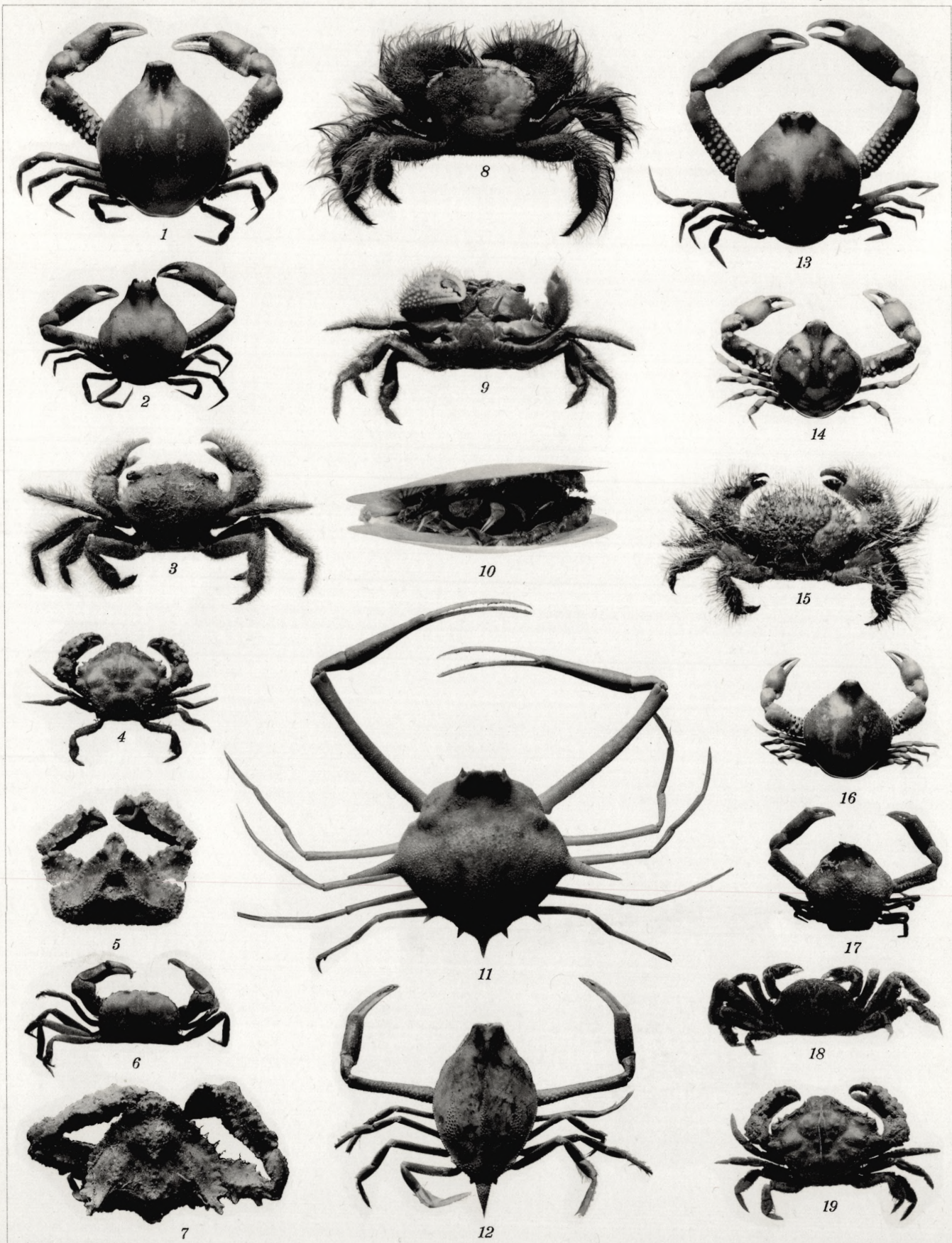
EXPLANATION OF PLATES.

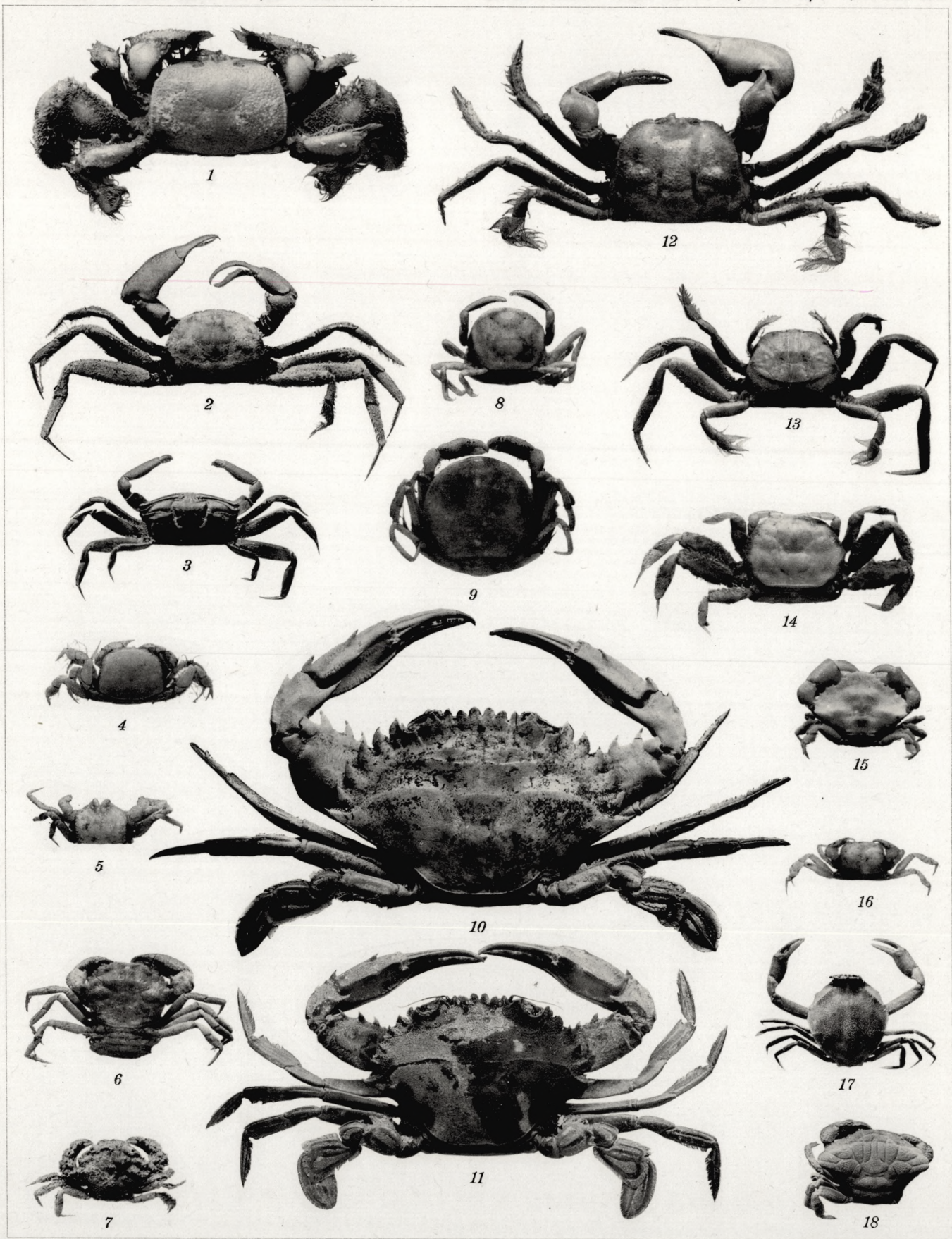
Plate I.

- Fig. 1. *Leucosides urania*, Koh Kahdat, ♂, 24.9 mm. wide.
— 2. *Pseudophilyra tridentata*, between Koh Mesan and Koh Chuen, ♂, 6.9 mm. wide.
— 3. *Pilumnus dorsipes*, Koh Kram, ♀ juv., 10.4 mm. wide, dorsal view. Same specimen as fig. 9.
— 4. *Halimede ochtodes*, Koh Kahdat, immature ♀, 17.5 mm. wide.
— 5. *Cryptopodia laevimana*, between Koh Mesan and Koh Chuen, ♀, 26.1 mm. wide.
— 6. *Typhlocarcinus nudus*, between Koh Kahdat and Koh Kut, ♂, 6.2 mm. wide.
— 7. *Parthenope (Pseudolambrus) harpax*, Koh Chuen, ♀, 27.7 mm. wide.
— 8. *Pilumnus borradailei*, type ♂, 10 mm. wide.
— 9. — *dorsipes*, ventral view. Same specimen as fig. 3.
— 10. *Chasmocarcinops gelasimoides*, ♂, in *Amussium pleuronectes*. ¹/₁.
— 11. *Arcania siamensis*, type ♀, 24.5 mm. wide.
— 12. *Persephona elegans*, Koh Chang, ♂, 9.4 mm. wide.
— 13. *Pseudophilyra melita*, between Koh Riat and Koh Mesan, ♀, 11.3 mm. wide.
— 14. *Leucosides longifrons pulcherrima*, Koh Kahdat, ♂, 18 mm. wide.
— 15. *Pilumnus carulescens*, Koh Kahdat, ♂, 10.4 mm. wide.
— 16. *Leucosides haswelli*, Koh Chuen, ♂, 17.2 mm. wide.
— 17. *Ebalia woodmasoni*, Koh Kahdat, ♀, 6.7 mm. wide.
— 18. *Mortensenella forceps*, Koh Chang, ♂, 6.8 mm. wide.
— 19. *Halimede thurstoni*, Koh Kam, ♀, 20.8 mm. wide.

Plate II.

- Fig. 1. *Thaumastoplax orientalis*, type ♂, 12.6 mm. wide.
— 2. *Scalopidia spinosipes*, Koh Samit, ♂, 19.5 mm. wide.
— 3. *Macrophthalmus convexus*, Koh Chang, ♂, 19.5 mm. wide.
— 4. *Mertonia lanka*, between Koh Mesan and Cap Liant, ♀, 5.3 mm. wide.
— 5. *Megasthesius sagedæ*, type ♂, 2.7 mm. wide.
— 6. *Heteropanope sexangula*, type ♀, 7 mm. wide.
— 7. *Halimede thurstoni*, Koh Kam, juv., 6.8 mm. wide.
— 8. *Pinnotheres cardii*, between Koh Chuen and Koh Chang, ♀, 5.8 mm. wide.
— 9. — *parvulus*, Lem Ngob, ♀, 8.5 mm. wide.
— 10. *Charybdis lucifera* (Fabricius). Cotype of *Goniosoma quadrimaculatum* A. Milne Edwards, ♂, 58.1 mm. wide.
— 11. *Charybdis affinis*, Lem Ngob, ♂, 43.6 mm. wide.
— 12. *Chasmocarcinops gelasimoides*, Koh Chang, ♂, 13.1 mm. wide.
— 13. *Xenophthalmus obscurus*, Koh Kut, ♂, 9.1 mm. wide.
— 14. *Asthenognathus hexagonum*, type ♀, 7.8 mm. wide.
— 15. *Cycloxanthops lineatus*, north of Koh Chuen, ♂, 7.2 mm. wide.
— 16. *Typhlocarcinops canaliculata*, type ♂, 3.6 mm. wide.
— 17. *Philyra olivacea*, type ♂, 7.8 mm. wide.
— 18. *Carpilodes lophopus*, between Koh Mesan and Koh Chuen, ♀, 10.5 mm. wide.

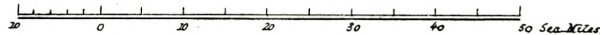




101° E. fr. Greenwich

PART
of

GULF of SIAM



NOTE

Soundings in Fathoms.

f.s. = fine sand. m. = mud.

- — — — — signifies 3 Fathoms line
- - - - - " 5 " " "
- " " dry at low water

Bangkok

24

m.
Koh si Chang

12
Koh Pai
Koh Lan

Koh Rin
Koh Kwan

f. s.
Koh Kam
Koh Chuen
Cape Siwat
Koh Mesan
Hin Chalar

Rayong

Koh Samut
Koh Bulu

Tung Kaban
Paknampan
Koh Chik

21 m

27

Lem Ngob
Koh Chang
Koh Lon

Koh Bidang
Koh Kahdat
Koh Mat

Koh Kut

Koh Kong

G u l f o f S i a m

12°

25

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6. Nielsen, N. Undersøgelser over reciproke Potenssummer og deres Anvendelse paa Rækker og Integraler. 1898.	1.	60.
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1. Steenstrup, Japetus, og Lütken, Chr. Spolia Atlantica. Bidrag til Kundskab om Klump- eller Maaneffskene (<i>Molidae</i>). Med 4 Tavler og en Del Xylografer og Fotogravurer. 1898	4.	75.
2. Warming, Eug. Familien Podostemaceae. 5 ^{te} Afhandling. Med 42 Figurgrupper. Résumé en français. 1899	1.	60.
3. Meyer, Kirstine. Om overensstemmende Tilstande hos Stofferne. En med Videnskabernes Selskabs Guldmedaille belønnet Prisaafhandling. Med en Tavle. 1899	2.	60.
4. Jørgensen, S. M. Om Zeise's Platosemiæthylen- og Cossa's Platosemiamminsalte. Med 1 Tavle. 1900	"	75.
5. Christensen, A. Om Overbromider af Chinaalkaloider. 1900	1.	"
6. Steenstrup, Japetus. Heteroteuthis Gray, med Bemærkninger om Rossia-Sepiola-Familien i Almindelighed. Med en Tavle. 1900	"	90.
Gram, Bille. Om Proteinkornene hos oliegivende Frø. Med 4 Tavler. Résumé en français. 1901	2.	50.
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1. Juul, C. Indledning i Læren om de grafiske Kurver. Résumé en français. 1899	2.	80.
2. Billmann, Einar. Bidrag til de organiske Kvægsølvforbindelsers Kemi. 1901	1.	80.
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2. Ravn, J. P. J. Molluskerne i Danmarks Kridtaflejringer. I. Lamellibranchiater. Med 1 Kort og 4 Tavler. 1902.	4.	"
3. Winther, Chr. Rotationsdispersionen hos de spontant aktive Stoffer. 1902	2.	"
4. Ravn, J. P. J. Molluskerne i Danmarks Kridtaflejringer. II. Scaphopoder, Gastropoder og Cephalopoder. Med 5 Tavler. 1902	3.	40.
5. Winther, Chr. Polarimetriske Undersøgelser II: Rotationsdispersionen i Opløsninger	1.	60.
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— Anatomiske Bidrag til Kundskab om Æolidierne, m. 9 Tavler. 64	5. "
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— Undersøgelser over Hvaldyrene. Afhandling 1—6, m. 16 Tavler. 44—48	13. "
— Om Gangesdelphinen, m. 3 Tavler. 51	2. "
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— — Ni Tavler til Oplysning om Hvaldyrenes Bygning m. Forklaring. 69	2. 65.
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