

**THE MARINE MOLLUSCA OF THE KENDENG  
BEDS (E A S T J A V A)  
GASTROPODA, PART III <sup>1)</sup>  
(Families Eratoidae Cypraeidae, and Amphiperatidae)**

BY

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The Cypraeacea of the COSIJN collection and from the localities M 1—M 262 of the Mijnwezen collection were already discussed by me in a previous paper <sup>3)</sup>. Recently some new material was sent to me by Dr. C. O. VAN REGTEREN ALTENA; these new shells partly derive from the localities M 263—M 347 of the Mijnwezen collection <sup>4)</sup>, partly they belong to the DUBOIS collection of the Rijksmuseum van Natuurlijke Historie at Leiden. I thought it useful to include in the present study all the Cypraeacea of the COSIJN and Mijnwezen collections, whether already dealt with before or not, as well as the shells from Sonde in the collection K. MARTIN (R. G. M. L.) <sup>5)</sup>, the Cypraeacea of the DUBOIS collection, and some other specimens examined in Dutch collections. Thus the total number of examined Cypraeacea from Pliocene and Pleistocene beds of the Kendeng Mountains rose to 145 specimens belonging to 29 species or races.

The formulae added to the descriptions of specimens have been explained in the same paper <sup>6)</sup>; the seven figures indicate: 1. the length of the shell in mm.; 2. and 3. (both in brackets) the relative breadth and height (*i. e.* the dorso-ventral diameter) of the shell, both in per cent of the length (the figure indicating the relative height often has been omitted); 4. and 5. the absolute number of labial and columellar teeth, the left anterior terminal ridge excluded; 6. and 7. (both in brackets) the relative number of these teeth reduced to hypothetical shells of 10 mm. (in Eratoidae) or 25 mm. (in Cypraeidae and

<sup>1)</sup> Part II see: *Leidsche Geol. Meded.*, 12, pp. 1—86, 1941.

<sup>2)</sup> Manuscript received IV 1940, corrections and additions received VI 1941.

<sup>3)</sup> *De Ingenieur in Nederl.-Indië*, ser. 4 (*Mijnbouw en Geologie*), 4, pp. 195—210, 1937.

<sup>4)</sup> For the localities of the Mijnwezen and Cosijn collections see: part I of this monograph, *Leidsche Geol. Meded.*, 10, pp. 248—262, 1938.

<sup>5)</sup> Abbreviations see: part I of this monograph, *l. c.*, p. 273.

<sup>6)</sup> *De Ingenieur in Nederl.-Indië*, ser. 4 (*Mijnbouw en Geologie*), 4, pp. 195—196, 1937.

Amphiperatidae). The species have been arranged according to my last systema<sup>1)</sup>.

The titles of the following special papers on Cypraeacea have been abbreviated:.

- 1907 HIDALGO, J., Monogr. *Cypraea* = Mem. Ac. Cienc. Madrid, 25.  
 1932 SCHILDER, F. A., Foss. Cat. = in QUENSTEDT, Fossilium Catalogus, 1/55.  
 1937 SCHILDER, F. A., Neog. Cypr. Ost-Java = Ingen. in Ned. Indië, ser. 4 (Mijnb.), 4.  
 1938-39 SCHILDER, F. A., & SCHILDER, M., Prodrome = Proc. Malac. Soc. London, 23.  
 1933 SCHILDER, M., & SCHILDER, F. A., Cypr. Ost-Indien = Zool. Meded. Leiden, 16.

The present knowledge of bathymetrical distribution of Cypraeacea is quite insufficient, so that I have omitted such indications on purpose.

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The figures 1a—d have been drawn by Mr. L. P. POUDEROYEN.

#### Familia Eratoidae.

##### Subfamilia Triviinae.

Genus *Trivirostra* JOUSSEAUME 1884.

##### 123. TRIVIROSTRA ORYZA ORYZA (LAMARCK).

- + 1810 *Cypraea oryza*. — LAMARCK, Ann. Mus. Hist. Nat. Paris, 16, p. 104.  
 1827 *Cypraea oryza*. — J. E. GRAY, Zool. Journ., 3, p. 369.  
 1843 *Cypraea oryza* LAM. — KIENER, Coqu. viv., *Cypraea*, pl. 52, fig. 2.  
 1907 *Cypraea oryza* LAM. — SCHEPMAN, Posttert. Celebes, p. 185.  
 1907 *Cypraea oryza* LAMARCK. — HIDALGO, Monogr. *Cypraea*, p. 434 [partim].  
 1927 *Cypraea (Trivia) oryza* LAM. — J. FISCHER, Seran u. Obi, p. 59.  
 1932 *Trivirostra oryza oryza* (LAM.). — SCHILDER, Foss. Cat., p. 101.  
 1933 *Trivirostra oryza oryza* LAMARCK. — SCHILDER, Zoolog. Anzeiger, 102, pp. 290, 291.  
 1937 *Trivirostra oryza*. — SCHILDER, Neog. Cypr. Ost-Java, p. 200.  
 1939 *Trivirostra oryza* LAMARCK. — SCHILDER, Neues Jahrb. Min., Beil. 81, B, p. 495, pl. 19, fig. 1.

No new material; material previously examined:

Upper Kalibèng layers: Sheet 93B, M 252: 1 ex.; M 257: 1 ex.

The few shells collected in Pliocene beds of Java and Ceram do not show any character distinctly separating them from the living *oryza*. Two Pleistocene shells from Kajoe Ragi (preserved in R. G. M. L.)<sup>2)</sup> also seem to agree with the recent specimens from Malaysia.

Fossil distribution:

Mal: pliocene [= upper Kalibèng layers]: Padasmalang and Sonde

<sup>1)</sup> Archiv f. Molluskenkunde, 71, pp. 165—201, 1939. During correction of the present paper, a complete list of fossil and recent Cypraeacea has been published in Archiv f. Molluskenk., 73, pp. 57—120, 1941.

<sup>2)</sup> The formulae of these pleistocene shells are: 9.2 (71.61) 24: 20 (25: 21) with 64 RS and 35 RR; 10.4 (72.62) 28: 21 (28: 21) with 73 RS and 36 RR.

(Madioen, Java); pliocene: Fufa (Ceram); pleistocene: Kajoe Ragi (N. Celebes).

Recent distribution:

Chiefly Mal and Mel, possibly spread to Ind and Syd, but the exact limits of distribution have not yet been ascertained.

Genus *Pusula* JOUSSEAUME 1884.

Subgenus *Dolichupis* IREDALE 1930.

124. **PUSULA (DOLICHUPIS) SOLOENSIS** (SCHILDER).

+ 1937 *Dolichupis soloënsis* nov. spec. — SCHILDER, Neog. Cypr. Ost-Java, p. 200, fig. 18.

Material examined:

Upper Kalibèng layers: Sheet 93B, „Sonde—Padasmalang (1932), coll. DUBOIS 722.”: 1 ex.

Material previously examined:

Upper Kalibèng layers: Sheet 93B, M 260: 2 ex.

The formula of the third specimen is 13.1(73.63)24:19(22:17) with 55 RS and 18 RR (rr = 16); therefore its teeth and dorsal ribs are less numerous than in the shells described before, but the other specific characters seem to be identical.

Fossil distribution:

no other records.

This pliocene species evidently is the antecessor of *P. (D.) producta* GASKOIN (see SCHILDER, 1932, Foss. Cat., p. 100), living from Mal to Que and in Syd, where another geographical race (*excelsa* IREDALE) lives; the characters of *soloënsis*, however, prove it to be a different species.

Familia Cypraeidae.

Subfamilia Cypraeorbinae.

Genus and subgenus *Zoila* JOUSSEAUME 1884.

125. **ZOILA (ZOILA) GENDINGANENSIS GENDINGANENSIS** (K. MARTIN).

+ 1899 *Cypraea (Aricia) gendinganensis* spec. nov. — K. MARTIN, Foss. Java, p. 167, pl. 26, fig. 385.

1932 *Zoila (Zoila) gendinganensis gendinganensis* (MARTIN). — SCHILDER, Foss. Cat., p. 120.

1937 *Zoila gendinganensis*. — SCHILDER, Neog. Cypr. Ost-Java, p. 203.

Material examined:

Probably upper Kalibèng layers: „C. 147, probably Tegoean, coll. DUBOIS 9807.”: 1 fr. of an adult shell; „C. 147, coll. DUBOIS 9786”’: 1 fr. of a young specimen (depressed by fossilization).

## Material previously examined:

Pliocene [= upper Kalibèng layers]: Sonde: 1 ex. (= MARTIN's holotype, R. G. M. L.); upper Kalibèng layers: Sheet 93B, M 252: 2 fr.

The two fragments seem to agree with the three specimens of *gendinganensis* collected near the Solo River before, though both shells evidently were smaller with the columellar teeth less numerous; for the total length of the adult shell was about 37 mm., that of the young shell about 34 mm., the number of columellar teeth 16 and 11 (*i. e.* their reduced number: 14 and 10 instead of 15—16 in the other *gendinganensis*); the relative height is about 49 in the adult shell and hardly exceeding 50 in the young specimen. In the latter the spire is still well visible, projecting, the hind top of the inner lip is still less protruding, though acuminate, and the posterior columellar teeth are obsolete; the posterior outlet, however, is developed like in adult shells, as is the fossula showing a shallow notch on its slightly thickened inner margin.

## Fossil distribution:

no other records.

The upper miocene antecessor of *gendinganensis*, found in Southern India, must be separated as a subspecies at least (see SCHILDER, 1937, Neog. Cypr. Ost-Java, p. 203); it has been called *schilderi* by DEY (see Archiv f. Molluskenk., 73, p. 114, pl. 8, fig. 9, 1941).

## 126. ZOILA (ZOILA) KENDGENSIS spec. nov. \*)

Figures 1a—d.

## Material examined:

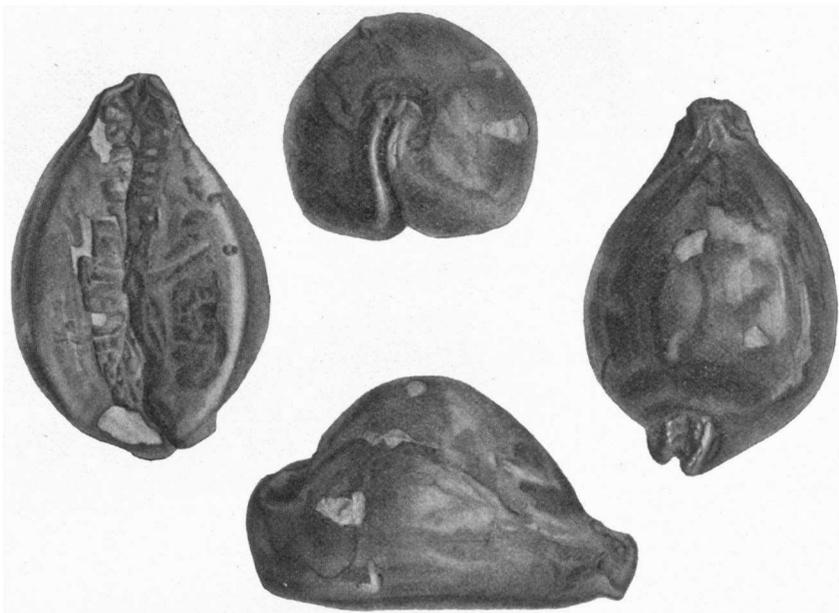
Poetjangan layers (volcanic facies), layer I: Sheet 110A, M 291: 1 ex. (holotype).

The unique shell, which is completely preserved in a rather good way, evidently approaches *Z. (Z.) gendinganensis gendinganensis* (MARTIN) by the posterior extremity, which is projecting, recurved, and sharply edged round the deeply notched outlet, and by the base, which is absolutely flat, with acute angles on both margins, and concave and carinate in front. It differs, however, 1) by the humped dorsum, the top of which is relatively higher and placed farther behind, recalling the living *Zoila (Zoila) decipiens* (SMITH) (see ROBERTS, 1885, in TRYON, Man. Conch., 7, pl. 10, fig. 39); 2) by the anterior extremity being produced and carinate like in *gendinganensis*, but less high (lateral view!) because the anterior outlet is less deep; 3) by the aperture, which is much narrower and more curved behind; and 4) by the terminal ridge, which consists in one short, oblique, and hardly sunken rib. The formula of the holotype of *kendgensis* is .52 (66.59)?: about 15 (? : about 13);

\*) A note on this species with a figure and a short description is found in: Arch. f. Molluskenk., 73, pp. 81, 117, text table 8, fig. 10, 1941.

its aperture is filled with hard matrix so that the terminal ridge and the columellar teeth are hardly recognizable<sup>10)</sup>, and the fossula and the labial teeth are entirely hidden. The original colour, however, is partially still well preserved: the dorsum shows large, irregularly confluent chestnut blotches comparable with those of *decipiens*, and the margins and base are plain chestnut.

*Z. (Z.) kendengensis* evidently is the antecessor of the still larger *Z. (Z.) friendii* (GRAY, s. lat.) living in the rather cold waters of Southern Australia. It seems to combine characters of the two chief races of *friendii*: the produced extremities and the entirely brown base of



Figs. 1a—d. *Zoila (Zoila) kendengensis* spec. nov., holotype  $\times 1$ , from Sheet 110A, M 291, Poetjangan layers (volcanic facies), layer I.

*kendengensis* agree with *friendii friendii* (GRAY) from S.W. Australia, which is, however, more elongate and less humped; the general shape of *kendengensis* agrees more with *friendii thersites* (GASKOIN) from South Australia (Eucla to Adelaide), in which the characters of the aperture and of the terminal ridge agree with those of the pleistocene species even more than in *friendii friendii*, but in which the extremities are less produced and the base is not entirely brown.

In the N.W. Australian *Z. (Z.) decipiens* (SMITH), however, which agrees with *kendengensis* in size, shape, and colouring, the extremities

<sup>10)</sup> One can see about 8 anterior columellar teeth only, the posterior teeth are covered by the hard matrix, but I doubt whether they are developed at all; if they were developed, the total number of columellar teeth would be about 15.

are less recurved, less sharply edged, and less margined than in the other living *Zoila*, the aperture is rather wide and rather straight, and the terminal ridge is sunken and rather obsolete, so that *decipiens* seems to approach *gendinganensis* far more than *kendengensis*. In no living species the base is so flattened and so sharply margined as in *kendengensis*<sup>11</sup>).

Subfamilia Cypraeinae.

Genus and subgenus *Talparia* TROSCHEL 1863.

127. TALPARIA (TALPARIA) cf. TALPA TALPA (LINNÉ).

- + 1758 *Cypraea talpa*. — LINNÉ, Syst. Nat., ed. 10, p. 720.
- 1824 *Cypraea talpa*. — J. E. GRAY, Zool. Journ., 1, p. 142.
- 1843 *Cypraea talpa* LIN. — KIENER, Coqu. viv., *Cypraea*, pl. 12, fig. 2.
- 1907 *Cypraea talpa* LINNÉ. — HIDALGO, Monogr. *Cypraea*, p. 532 [partim].
- 1932 *Talparia (Talparia) talpa* (LINN.): — SCHILDER, Foss. Cat., p. 140 [partim].
- 1937 *Talparia (Talparia) talpa* ?? LINNAEUS. — SCHILDER, Neog. Cypr. Ost-Java, p. 203.
- 1938 *Talparia (Talparia) talpa talpa* LINN. — SCHILDER & SCHILDER, Prodrome, p. 180.

No new material; material previously examined:

Upper Kalibèng layers: Sheet 93B, M 245: 1 cast.

The identity of the unique cast remains doubtful.

Fossil distribution:

no other record of the Malayan race; other geographical races have been found in pleistocene beds of Hawaii and of the Red Sea.

Recent distribution:

Mal, Chi, Ind; other races occur as far as Ery, Cap, Tua, and Haw.

Genus *Cypraea* LINNÉ 1758.

Subgenus *Lyncina* TROSCHEL 1863.

128a. CYPRAEA (LYNCINA) CARNEOLA WANNERI SCHILDER.

- 1920 *Cypraea (Luponia) lynx* [non] LINNÉ. — TESCH, Timor, 2, p. 46, pl. 129, fig. 161.
- 1931 *Cypraea* aff. *carneola* LINNÉ. — KOPERBERG, Jungtert. Moll. Timor, p. 124.
- 1937 *Cypraea (Lyncina) carneola*. — SCHILDER, Neog. Cypr. Ost-Java, p. 203.
- + 1939 *Cypraea (Lyncina) carneola wanneri* nov. subsp. — SCHILDER, Neues Jahrb. Min., Beil. 81, B, p. 499, pl. 19, fig. 7.

No new material; material previously examined:

Upper Kalibèng layers: Sheet 93B, M 260: 1 rather young ex.

The only known pliocene *carneola* from Java is not full-grown, so that the racial characters of the fossil race *wanneri* are not yet developed; therefore its identification must remain doubtful.

<sup>11</sup>) In the unique *Z. (Z.) marginata* (GASKOEN) the acute periphery of the expanded margins is undulate, while the margins of *kendengensis* are nearly vertical.

Some more *carneola*, however, recently examined from pliocene beds of Timor, all show the typical features of the holotype of *wanneri* developed more or less distinctly, viz. the outer lip more concavely declivous in front, the central and posterior labial teeth produced so that they cross  $\frac{1}{3}$  to  $\frac{1}{2}$  of the lip, and the inner lip often adorned with 1—2 feeble tubercles or even with traces of a longitudinal carina; the hind top of the inner lip, however, mostly approaches the living *carneola carneola* LINNÉ. Besides the holotype I have examined four specimens from Timor: 3 shells from Noil Lakoe, 1 km. S.E. of Pene<sup>12)</sup> (leg. D. DE BRUYNE, G. I. A.<sup>13)</sup>): 31 (60) 2 + 22:1 + 19 + 2 (21:18) without columellar tubercles, but with the labial characters accentuated, 32 (56) ca. 20:19 (ca. 19:18) with 2 tubercles, and 36 (58) 2 + 25:21 + 3 (22:19) with 1 tubercle, and one fragment from „Fatoekan bij Lahoeroes”<sup>14)</sup> (Geol. Inst. Delft) belonging to a shell of about 30 mm. with about 21 columellar teeth. Seven casts from Nikiniki (Timor), mentioned by KOPERBERG, also may belong to *wanneri*, the probable length of the shells was about 32, 35, 38, and 50 mm. (all in R. G. M. L.), and 34, 39, and 45 mm. (Geol. Inst. Delft).

Fossil distribution:

Pliocene<sup>15)</sup> of Timor and Java<sup>16)</sup>.

Recent distribution of its descendant *carneola carneola*: see below.

128b. CYPRAEA (LYNCINA) CARNEOLA CARNEOLA LINNÉ.

- 1705 *Carneola*. — RUMPHIUS, Amboin. Rariteitk., p. 115, pl. 38, fig. K.  
 + 1758 *Cypraea carneola*. — LINNÉ, Syst. Nat., ed. 10, p. 719.  
 1824 *Cypraea carneola*. — J. E. GRAY, Zool. Journ., 1, p. 147.  
 1907 *Cypraea carneola* LINN. — SCHEPMAN, Posttert. Celebes, p. 185.  
 1907 *Cypraea carneola* LINNÉ. — HIDALGO, Monogr. *Cypraea*, p. 293 [partim].  
 1932 *Cypraea (Lyncina) carneola carneola* LINN. — SCHILDER, Foss. Cat., p. 143 [partim].  
 1933 *Cypraea (Lyncina) carneola* LINN. — SCHILDER & SCHILDER, Cypr. Ost-Indien, p. 191.  
 1939 *Cypraea (Lyncina) carneola carneola* LINN. — SCHILDER & SCHILDER, Prodrome, p. 188.

<sup>12)</sup> TESCH's locality M IV is 1 km. N.W. of Pene.

<sup>13)</sup> I had an opportunity to study these specimens during a visit to Amsterdam in February 1939. They were collected by De Bruyne during his stay in Timor as a member of professor. BROUWER's Expedition to the Lesser Sunda Islands in 1937.

<sup>14)</sup> i. e. TESCH's locality M VI.

<sup>15)</sup> The miocene „*Cypraea (Lyncina) cf. carneola* L.” from Sedan (coll. HULSHOFF, G. I. A.), mentioned by PANNEKOEK, 1936, Altmioz. Moll. Rembang, p. 47, most probably is a small specimen of *Chelycypraea (Miolyncina) simplicissima* (MARTIN): its formula is 36 (65.59) †: 23 (†: 21), the spire is very small like in young *Cypraea (Lyncina) lynx* LINNÉ, the terminal ridge seems to be sunken like in the genus *Jousseaumea*.

<sup>16)</sup> The giant inflated „*Cypraea carneola*” figured by YOKOYAMA, 1924, Moll. Coral bed Awa, p. 18, pl. 1, fig. 11 from the pliocene of Japan and by YOKOYAMA, 1928, Moll. Oilfield Taiwan, p. 48, pl. 4, fig. 4 from the pliocene (Upper Byoritz beds) of Formosa seem to exhibit a columellar carina similar to that of the holotype of *wanneri*, and they are therefore supposed to connect the living species *carneola*

## Material examined:

Poetjangan layers (volcanic facies), layer II: Sheet 110B, M 278: 4 ex. (two of which are rather young shells) and fr. of 3 other specimens; M 280: 1 doubtful fr. (central part of the outer lip). — Besides there are 2 doubtful casts labelled „E. 21, Goenoeng Djoerit<sup>17)</sup>, West of Goenoeng Pandan, coll. DUBOIS, 9762”.

The length of the 8 complete and restored specimens (the poor fragment from M 280 excepted) varies from 23 to 32 mm., the mean formula is 28 (59.50) 23—24:20 (22—23:19); the dentition agrees with the pliocene *carneola wanneri* (see above), the formula of which is 32 (58.48) 24:21 (22:19), while in the living *carneola* the teeth are slightly more numerous: 34 (60.50) 27:22 (24:20); but as all other characters of the pleistocene shells seem to agree with the latter, they should be united with the living Malayan race *carneola carneola*.

## Fossil distribution:

Mal: pleistocene: Kajoe Ragi (N. Celebes)<sup>18)</sup>; other living geographical races of *carneola* have been found in pleistocene beds of Hawaii, Mombasa, and Port Sudan.

## Recent distribution:

Mal, Bro, Chi, Jap; other races occur as far as Ery, Cap, Syd, Tua, and Haw.

## Subfamilia Nariinae.

Genus *Erosaria* TROSCHEL 1863.

Subgenus *Ravitrona* IREDALE 1930.

129. **EROSARIA (RAVITRONA) LABROLINEATA LABROLINEATA** (GASKOIN).

1825 *Cypraea flaveola*. — J. E. GRAY, Zool. Journ., 1, p. 502 [non LINNÉ].

1846 *Cypraea flaveola*. — REEVE, Conch. Icon., 3, *Cypraea*, pl. 18, fig. 95.

+ 1848 *Cypraea flaveolae* varietas *labro-lineata*. — GASKOIN, Proc. Zool. Soc., 1848, p. 97.

1932 *Erosaria (Erosaria) labrolineata labrolineata* (GASK.). — SCHILDER, Foss. Cat., p. 162 [partim].

1933 *Erosaria (Erosaria) labrolineata labrolineata* (GASK.). — SCHILDER & SCHILDER, Cypr. Ost-Indien, p. 192.

1937 *Erosaria (Ravitrona) labrolineata*. — SCHILDER, Neog. Cypr. Ost-Java, p. 201.

1938 *Erosaria (Ravitrona) labrolineata labrolineata* GASKOIN. — SCHILDER & SCHILDER, Prodrome, p. 131.

No new material; material previously examined:

Upper Kalibèng layers: Sheet 93B, M 260: 1 ex.

LINNÉ and *lynx* LINNÉ (see SCHILDER & SCHILDER, 1939, Prodrome, p. 188); but as their size and shape seem to differ in a constant way, and as the labial teeth evidently are short, they should be separated from *wanneri*: I proposed to call them *carneola yokoyamai* nov. subsp., with the pliocene shell from Awa as type (see Arch. f. Molluskenk., 73, p. 87, 1941).

<sup>17)</sup> This locality is probably identical with or situated near M 13 or/and M 14.

<sup>18)</sup> The shells from Kajoe Ragi (R. G. M. L. and Z. M. A.) seem to approach the Pacific race *propinqua* GARRETT with regard to the acuminate extremities.

The only known pliocene shell seems to agree with the living Malayan *labrolineata*.

Fossil distribution:  
no other record<sup>19)</sup>.

Recent distribution:  
Mal, Chi, Jap, Mic; other geographical races occur as far as Loy (Suvorov I.) and Syd.

130. *EROSARIA (RAVITRONA) MADIUNENSIS* SCHILDER.

+ 1937 *Erosaria (Ravitrona?) madiunensis* nov. spec. — SCHILDER, Neog. Cypr. Ost-Java, p. 202, fig. 22.

No new material; material previously examined:  
Upper Kalibèng layers: Sheet 93B, M 251: 1 ex. (holotype).

The only known specimen seems to be allied to *E. (R.) labrolineata* (GASKOIN) and *E. (E.) erosa* (LINNÉ).

Fossil distribution:  
no other record.

131. *EROSARIA (RAVITRONA) HELVOLA HELVOLA* (LINNÉ).

- + 1758 *Cypraea helvola*. — LINNÉ, Syst. Nat., ed. 10, p. 724.
- 1825 *Cypraea helvola*. — J. E. GRAY, Zool. Journ., 1, p. 508.
- 1870 *Cypraea helvola* LINN. — G. B. SOWERBY II, Thes. Conch., 4, *Cypraea*, pl. 25, figs. 214—216.
- 1907 *Cypraea helvola* LINNÉ. — HIDALGO, Monogr. *Cypraea*, p. 376 [partim].
- 1932 *Erosaria (Erosaria) helvola helvola* (LINNÉ). — SCHILDER, Foss. Cat., p. 163 [partim].
- 1933 *Erosaria (Erosaria) helvola helvola* (LINNÉ). — SCHILDER & SCHILDER, Cypr. Ost-Indien, p. 192.
- 1937 *Erosaria (Ravitrona) helvola*. — SCHILDER, Neog. Cypr. Ost-Java, p. 201.
- 1938 *Erosaria (Ravitrona) helvola helvola* LINN. — SCHILDER & SCHILDER, Prodrome, p. 134.

No new material; material previously examined:  
Upper Kalibèng layers: Sheet 93B, M 260: 1 ex.

The only known pliocene specimen seems to agree with the living Malayan *helvola*, though several characters point to some affinity with *E. (R.) labrolineata* (GASKOIN).

Fossil distribution:  
no other record.

<sup>19)</sup> The specimens mentioned by SCHEPMAN, 1907, Posttert. Celebes, p. 185 as „*Cypraea gangrenosa* var. *flaveola* REEVE (fig. 95)“ from the pleistocene beds of Kajoe Ragi belong to *E. (R.) gangrenosa gangrenosa* (DILLWYN); four specimens, varying from 13 to 18 mm., are preserved in SCHEPMAN's collection (Z. M. A.).

## Recent distribution:

Mal, Chi, Jap, Mic, and the North-western part of Mel; other geographical races occur as far as Ery, Cap, Fre, Syd, Tua, and Haw.

Subgenus *Erosaria* TROSCHEL 1863.132. *EROSARIA (EROSARIA) EROSA DUYFJESI* SCHILDER.

- † 1907 *Cypraea erosa* LINN. — SCHEPMAN, Posttert. Celebes, p. 185.  
 1920 *Cypraea (Ocellaria) erosa* LENNÉ. — TESCH, Timor, 2, p. 47, pl. 129, fig. 163.  
 1932 *Erosaria (Erosaria) erosa erosa* (LINNÉ). — SCHILDER, Foss. Cat., p. 166 [partim].  
 + 1937 *Erosaria (Erosaria) erosa duyffjesi* nov. subsp. — SCHILDER, Neog. Cypr. Ost-Java, p. 205, figs. 23—24.  
 1938 *Erosaria (Erosaria) erosa duyffjesi* SCHILDER. — SCHILDER & SCHILDER, Pro-drome, p. 137.

No new material; material previously examined:

Poetjangan layers (volcanic facies), layer II: Sheet 116A, M 216: 1 ex. (paratype, now in the writer's coll.); layer III: Sheet 110A, M 139: 1 ex. (holotype).

The chief character of the fossil race seems to consist in the left margin, which is more sharply edged and more bent up than in the living Malayan *erosa phagedaina* (MELVILL). For this character can also be observed in the two pliocene shells from Fatoekan near Lahoeroes (Timor) mentioned by TESCH and now preserved in the Geol. Inst. Delft<sup>20)</sup>, as well as in two shells from 1 km. S.E. of Pene, Noil Lakoe (Timor), collected by DE BRUYNE (G. I. A., see note 13, p. 177)<sup>21)</sup>. In the pleistocene shells from Kajoe Ragi mentioned by SCHEPMAN<sup>22)</sup> the extremities are more produced and acuminate than in living Malayan *erosa phagedaina*, so that they probably should be classified as *erosa duyffjesi* too, while the „miocene" shell from Sumatra figured by WOODWARD<sup>23)</sup> probably is not a fossil specimen at all<sup>24)</sup>.

## Fossil distribution:

Mal: pliocene: Timor; pleistocene: Java and Northern Celebes.

<sup>20)</sup> There is a fragment of a shell of about 23 mm., besides the larger shell figured by TESCH (32 mm. with 15 columellar teeth and a distinct left lateral blotch).

<sup>21)</sup> 31 (67) 17: 11 (16: 11) and 35 (68) 18: 17 (16: 16), both with the right margin swollen and the labial teeth crossing the lip to the margin; the smaller shell has the last but one posterior columellar tooth tuberculate, the larger shell exhibits the two lateral blotches dorsally of the marginal rim.

<sup>22)</sup> The mean formula of 3 shells (two in R. G. M. L., one in Z. M. A.) is 39 (61.45): 21: 14 (18: 13), the right margin is narrow to swollen, as the shells belong to the three varieties described in Proc. Malac. Soc. London, 21, p. 211, 1934.

<sup>23)</sup> Geol. Mag. ser. 2, 6, p. 498, pl. 13, fig. 10, 1879.

<sup>24)</sup> TESCH (1920, Timor, 2, p. 46, pl. 129, fig. 162) has described and figured „*Cypraea (Aricia) annula* LINNÉ." from the „Lower Pliocene or Upper Miocene" of Noil Noni (Timor); in the 5 *Monetaria (Ornamentaria) annulus annulus* (LINNÉ) preserved in the Geol. Inst. Delft the dorsum has been carefully rubbed off, so that these „fossil" shells undoubtedly have been used as ornaments by the natives before.

## Recent distribution:

In the holocene, *erosa duyffjesi* has been replaced by *erosa phagedaina* (MELVILL) living in Mal, Chi, and Jap; other geographical races occur as far as Ery, Cap, Syd, Tua, and Haw.

133. *EROSARIA (EROSARIA) PLIOSTAPHYLAEA* SCHILDER.

- 1899 *Cypraea (Ocellaria) erosa* LINN. — K. MARTIN, Foss. Java, p. 174, pl. 28, fig. 406.  
 + 1927 *Erosaria (Staphylaea) pliostaphylaea* nov. — SCHILDER, Arch. Naturgesch., 91, A 10, p. 106 and p. 148, note 291.  
 1932 *Erosaria (Erosaria) pliostaphylaea* SCHIL. — SCHILDER, Foss. Cat., p. 162.  
 1937 *Erosaria (Erosaria) pliostaphylaea*. — SCHILDER, Neog. Cypr. Ost-Java, p. 202, fig. 28.

No new material; material previously examined:

Pliocene [= upper Kalibèng layers]: Sonde: 1 ex. (holotype, R. G. M. L.); upper Kalibèng layers: Sheet 93B, M 252: 1 ex. (now in the writer's coll.); M 260: 1 ex.

This species evidently is the antecessor of *E. (E.) miliaris* (GMELIN); a repeated examination of the holotype proved the outer lip to be malformed and the terminal ridge to be narrow, not slit, so that there is some affinity with *E. (Ravitrona) gangranosa* (DILLWYN); nevertheless the two other specimens seem to belong to *pliostaphylaea* too.

## Fossil distribution:

no other record.

134. *EROSARIA (EROSARIA) MILIARIS EFFOSSA* SCHILDER.

- † 1870 *Cypraea miliaris* [non] GMEL. — G. B. SOWERBY II, Thes. Conch., 4, *Cypraea*, pl. 17, fig. 109.  
 † 1907 *Cypraea miliaris* GMELIN. — HIDALGO, Monogr. *Cypraea*, p. 428 [partim].  
 † 1913 *Cypraea miliaris* var. *brevis* nov. [name preoccupied] — M. SMITH, Nautilus, 27, p. 69.  
 † 1927 *Erosaria (Erosaria) differens* nov. — SCHILDER, Arch. Naturgesch., 91, A 10, p. 107 and p. 149, note 297.  
 1928 *Cypraea* sp. — YOKOYAMA, Moll. Oilfield Taiwan, p. 49, pl. 4, fig. 8.  
 † 1932 *Erosaria (Erosaria) miliaris differens* SCHIL. — SCHILDER, Foss. Cat., p. 167.  
 † 1933 *Erosaria (Erosaria) miliaris differens* SCHIL. and *miliaris miliaris* (GMEL.). — SCHILDER & SCHILDER, Cypr. Ost-Indien, p. 192.  
 + 1937 *Erosaria (Erosaria) miliaris effossa* nov. subsp. — SCHILDER, Neog. Cypr. Ost-Java, p. 205, figs. 25—27.  
 † 1938 *Erosaria (Erosaria) miliaris differens* SCHILDER. — SCHILDER & SCHILDER, Prodrome, p. 138.  
 1938 *Erosaria (Erosaria) miliaris effosa* SCHILDER. — SCHILDER & SCHILDER, Prodrome, p. 138.

Material examined:

Poetjangan layers (volcanic facies), layer II: Sheet 110B, M 278: 2 ex.<sup>25)</sup> and 1 doubtful fr.; M 281: 2 ex.<sup>26)</sup>

<sup>25)</sup> Formulae: 28 (65.†) 17: 1 + 15 (16: 15) and 32 (63.49) 18: 15 (17: 14).

<sup>26)</sup> Formulae: 28 (63.49) 18: 14 (17: 14) and 33 (58.47) 20: 14 (18: 13).

Material previously examined:

Poetjangan layers (volcanic facies): Sheet 110B, M 167: 1 fr.; layer II: Sheet 110B, M 177: 1 ex.; C 68: 1 ex.; Sheet 116A, M 217: 1 ex.; M 219: 2 ex. and 1 fr.; C 37 (= M 219): 4 ex.; C 39: 1 ex.; layer III: Sheet 110A, M 139: 1 fr.; Sheet 110B, M 189: 1 ex. — Besides there are three shells from the mud-volcano Kalang Anjar near Soerabaja (coll. Dr. COERT, G. I. A.): 3 ex.<sup>27)</sup>.

The question, whether the pleistocene *effossa* really is separable from the living *differens*, still remains unsolved.

Fossil distribution:

Mal: pleistocene of Java.

Chi: pliocene (upper Byoritz layers) of Formosa.

Recent distribution:

The race *differens* lives in Mal, Chi, and in Western Mic; other races occur in Jap, Bro, Que, Syd, Mel, and Loy.

#### Genus and Subgenus *Staphylaea* JOUSSEAUME 1884.

##### 135. STAPHYLAEA (STAPHYLAEA) STAPHYLAEA PROSTAPHYLAEA SCHILDER.

+ 1937 *Staphylaea prostaphylaea* nov. spec. — SCHILDER, Neog. Cypr. Ost-Java, p. 200, fig. 20.

Material examined:

Poetjangan layers (volcanic facies), layer I: Sheet 110A, M 295: 1 fr.

Material previously examined:

Upper Kalibèng layers: Sheet 93B, M 260: 1 ex. (holotype).

The fragment from M 295 consists of an outer lip with the labial teeth attaining the margin, the right marginal rim pitted, and the adjacent anterior part of the dorsum almost smooth, brownish fulvous, adorned with numerous small, hardly raised whitish spots; the total length of the shell probably was about 18 mm., its shape is oblong with the anterior extremity rather produced; unfortunately, the essential parts characterizing the shell of *prostaphylaea*, viz. the terminal ridge, the anterior columellar teeth, and the fossula, are not preserved in this unique lower pleistocene specimen<sup>28)</sup>, so that its identity with the plio-

<sup>27)</sup> Formulae: 24 (62) 17: 13 (17: 13), 19 (64) 14 + 1: 13 (16: 14), and 27 (66) 17: 11 (17: 11).

<sup>28)</sup> „*Cypraea staphylaea* LINN.’’, mentioned by SCHEPMAN (1907, Posttert. Celebes, p. 185) from pleistocene beds of Kajoe Ragi (N. Celebes) seems to belong to the living *staphylaea staphylaea* (LINNÉ): nine shells (6 in R. G. M. L., 3 in Z. M. A.) with the mean formula 15 (59) 22: 18—19 (27: 22) are rather globular with the extremities produced, the dorsal granulation well developed (the granules are rather fine), and with the terminal ridge and the fossula typical as in living specimens.

cene holotype cannot be proved, though it is very probable. But the characters separating *prostaphylaea* from the living Malayan *St. (St.) staphylaea staphylaea* (LINNÉ) (see: SCHILDER & SCHILDER, 1938, Pro-drome, p. 129) should be regarded as subspecific only.

Fossil distribution:

no other record.

Recent distribution:

The living *staphylaea staphylaea* occurs in Mal, Chi, Jap, and Mic, other geographical races occur as far as Ery, Cap, Syd, and Tua.

Subgenus *Nuclearia* JOUSSEAUME 1884.

136. STAPHYLAEA (NUCLEARIA) SOLOENSIS SCHILDER.

+ 1937 *Staphylaea (?) soloënsis* nov. spec. — SCHILDER, Neog. Cypr. Ost-Java, p. 201, fig. 21.

No new material; material previously examined:

Upper Kalibèng layers: Sheet 93B, M 260: 1 ex. (holotype).

A singular extinct species, probably representing a primitive branch of the genus. It has not been found elsewhere.

Subfamilia Cypraeovulinae.

Genus *Erronea* TROSCHEL 1863.

Subgenus *Adusta* JOUSSEAUME 1884.

137. ERRONEA (ADUSTA) JUNGENS SCHILDER.

† 1932 *Adusta buplicata* n. sp. — SCHILDER, Sitz. Ges. Naturforsch. Freunde, 1932, p. 267 [partim: paratype only].  
+ 1937 *Erronea (Adusta) jungens* nov. spec. — SCHILDER, Neog. Cypr. Ost-Java, p. 202, fig. 35.

No new material; material previously examined:

Upper Kalibèng layers: Sheet 93B, M 260: 1 ex. (holotype).

This rather primitive *Adusta* seems to connect the living *E. (A.) vredenburgi* SCHILDER from S.W. Java with *E. (A.) pyriformis* (GRAY); the closely allied antecessor of the latter, *E. (A.) pyriformis buplicata* SCHILDER<sup>29)</sup> from the pliocene of Kampong Tjikeusik (Bantam, Java), has not yet been recorded from the Kendeng Mountains<sup>30)</sup>.

<sup>29)</sup> 1899 *Cypraea (Luponia) sondeiana* var. 1. — K. MARTIN, Foss. Java, p. 173 [partim], pl. 28, fig. 404.

+ 1932 *Adusta buplicata* n. sp. — SCHILDER, Sitz. Ges. Naturforsch. Freunde, 1932, p. 267 [partim: holotype only], fig. 3.

1932 *Erronea (Adusta) pyriformis buplicata* SCHIL. — SCHILDER, Foss. Cat., p. 187 [partim].

1937 *Erronea (Adusta) buplicata*. — SCHILDER, Neog. Cypr. Ost-Java, p. 203.

<sup>30)</sup> „*Erronea (Adusta) pyriformis* GRAY”, mentioned by OOSTINGH, 1935, Plioz. Boemiajoe, p. 59, from the pliocene of Boemiajoe (Pekalongan, Java) cannot be identified without examination of the original specimen.

## Fossil distribution:

The identity of the paratype of *biplicata* from the pliocene beds of Waled (= Menengteng ravine; Cheribon, Java) with *jungens* needs confirmation.

138. *ERRONEA (ADUSTA) PYRIFORMIS PYRIFORMIS* (GRAY).

- + 1824 *Cypraea pyriformis*. — J. E. GRAY, Zool. Journ., 1, p. 371.  
 1870 *Cypraea pyriformis* GRAY. — G. B. SOWERBY II, Thes. Conch., 4, *Cypraea*, pl. 19, figs. 145—146.  
 1907 *Cypraea pyriformis* GRAY. — HIDALGO, Monogr. *Cypraea*, p. 488.  
 1932 *Erronea (Adusta) pyriformis pyriformis* (GRAY). — SCHILDER, Foss. Cat., p. 187.  
 1933 *Erronea (Adusta) pyriformis pyriformis* (GRAY). — SCHILDER & SCHILDER, Cypr. Ost-Indien, p. 194.  
 1937 *Erronea (Adusta) pyriformis*. — SCHILDER, Neog. Cypr. Ost-Java, p. 206, figs. 30—32.  
 1937 *Erronea (Adusta) pyriformis propyriformis* nov. subsp. — SCHILDER, l. c. p. 206.  
 1937 *Erronea (Adusta) pyriformis ponderosa* nov. subsp. — SCHILDER, l. c. p. 207, fig. 33.  
 1938 *Erronea (Adusta) pyriformis* GRAY. — SCHILDER & SCHILDER, Prodrome, p. 150.

## Material examined:

Poetjangan layers (argillaceous facies): Sheet 116A, M 320: 1 worn ex.; Sheet 116B, M 333: 1 worn ex., 2 fr. and 1 fr. of a doubtful specimen).

Poetjangan layers (volcanic facies): Sheet 99B, M 9: 1 fr.; layer I: Sheet 110A, M 292: 1 ex.; M 294: 1 ex.; M 295: 5 fr.; Sheet 110B, M 272: 1 young ex.; layer II: Sheet 110A, M 311: 1 worn ex.; Sheet 110B, M 278: 3 ex., 6 worn ex. (two of which are young), and 5 fr.; M 280: 1 worn ex.; M 281: 1 ex.; ± layer II?: Sheet 109C, M 346: 1 ex. and 1 fr. — Besides there is a cast labelled „E. 21, Goenoeng Djoerit, West of Goenoeng Pandan, coll. DUBOIS, 9762”.

## Material previously examined:

Poetjangan layers (argillaceous facies): Sheet 110B, M 205: 1 ex. (holotype of *propyriformis*); C 47: 1 ex. (called *propyriformis*).

Poetjangan layers (volcanic facies): Sheet 110B, M 167: 3 ex. and 1 worn ex.; layer I: Sheet 110A, M 82a: 1 ex.; M 84: 4 ex.; M 89: 1 ex.; layer II: Sheet 110A, M 123: 1 ex. and 1 worn ex.; M 126: 2 ex. (called *ponderosa* and including its holotype); M 128: 1 fr.; C 54: 1 ex.; Sheet 110B; M 168: 1 ex.; C 92: 1 ex.; Sheet 116A, M 219: 1 worn ex.; C 37 (= M 219): 1 ex.; M 221: 1 ex.; C 39: 1 fr.; C 40 (= M 217): 1 ex.; layer III: Sheet 110A, M 139: 1 worn ex. — Besides there is a complete shell with the formula 22 (61) 17: 21 (18: 22), from the mud-volcano Kalang Anjar near Soerabaja (coll. Dr. COERT, G. I. A.).

The mean formula of the 23 newly examined measurable shells is 20 (63.53) 20:18 (21:20), they show 0 to 11 intercalated ribs on the outer lip (mean = 5 ribs); their length varies from 13 to 29 mm. — The limits of variation of all 48 measurable pleistocene specimens examined up to the present are 13—31 (58—70.48—59) 17—25:15—24 (19—25:17—24), their mean formula is 22 (63.52) 20:18 (21:19); there is no distinct difference between the pleistocene and the living Malayan shells nor between the pleistocene specimens collected in different facies or layers, as can be learned from the following table<sup>21)</sup>:

ex.	occurrence	mean formula	
14	Recent .... {	Lacepede Bay, N.W. Australia	25 (63) 19:16 (19:16)
25		Kaimana, N.W. New Guinea	26 (60) 20:19 (20:19)
13		11 other localities of Malaysia	27 (60) 20:19 (20:19)
1	Pleistocene {	Poetj. layers (volc.), layer III	21 (61) ? : 17 ( ? : 18)
27		Poetj. layers (volc.), layer II	21 (63) 20:18 (21:19)
10		Poetj. layers (volc.), layer I	22 (61) 20:18 (21:19)
4		Poetj. layers (volcanic facies)	24 (60) 20:20 (20:20)
6		Poetj. layers (argillaceous facies)	21 (65) 19:17 (20:18)
1	Pliocene ...	Cheribon (= <i>biplicata</i> SCHILDER)	21 (58) 18:19 (19:20)

The „subspecies” *propyriformis* and *ponderosa* should be suppressed: *propyriformis* has been established on two dwarf stunted shells from the argillaceous beds, in which now also typical *pyriformis* have been collected, so that *propyriformis* can be regarded as a local (not stratigraphical!) variety at most; and *ponderosa* is evidently also a local (ecological) variety connected with the typical *pyriformis* by the intermediate shell from M 294, as similar varieties occur among living *pyriformis* too.

#### Fossil distribution:

restricted to the pleistocene of Java<sup>22)</sup>.

#### Recent distribution:

Mal, Ind, Que; the subsp. *smithi* (Sow.) lives in Bro.

<sup>21)</sup> In the unique pliocene *biplicata* the columellar teeth are more numerous than the labial teeth, whereas in the pleistocene and recent series including a sufficient number of specimens the average number of the columellar teeth is smaller than that of the labial teeth. The North Australian *pyriformis* evidently are smaller, broader, less pyriform, more callous, and have the teeth of both lips less numerous than those from Malaysia and India; therefore they can be separated as a geographical race *smithi* SOWERBY 1881 (= *kaiseri* KENYON 1897) with the formula 23 (63) 18:16 (18:16) instead of 27 (60) 20:19 (20:19) in *pyriformis* s. str.

<sup>22)</sup> „*Cypraea sondei* MARTIN”, mentioned by VAN ES, 1931, *Age Pithecanthr.*, p. 95, from Poetjangan layers (said to be pliocene!) of Baring cannot be identified without examination of the original specimen.

139. *ERRONEA (ADUSTA) SEMICOSTATA* SCHILDER.

- + 1937 *Erronea (Adusta) pyriformis semicostata* nov. subsp. — SCHILDER, Neog. Cypr. Ost-Java, p. 207, fig. 34.  
 1938 *Erronea (Adusta) semicostata* SCHIL. — SCHILDER & SCHILDER, Prodrôme, p. 150.

No new material; material previously examined:

P o e t j a n g a n l a y e r s ( v o l c a n i c f a c i e s ), l a y e r I I :  
 Sheet 110A, M 125: 1 ex. (holotype).

In my opinion *semicostata* is not an individual variety only of *pyriformis pyriformis* occurring in the same layers, but it should be regarded as a species connecting it with the recent *E. (A.) pulchella* (SWAINSON).

Fossil distribution:

no other record.

Recent distribution:

no record, as the species evidently became extinct; four races of its descendant *pulchella* (SWAINSON) live in Mel, Chi, and Ery (see: SCHILDER & SCHILDER, 1938, Prodrôme, p. 150).

140. *ERRONEA (ADUSTA) SUBVIRIDIS PUTJANGANENSIS* SCHILDER.

- + 1937 *Erronea (Adusta) subviridis putjanganensis* nov. subsp. — SCHILDER, Neog. Cypr. Ost-Java, p. 207, figs. 37—38.  
 1938 *Erronea (Adusta) subviridis putjanganensis* SCHIL. — SCHILDER & SCHILDER, Prodrôme, p. 149.

No new material; material previously examined:

P o e t j a n g a n l a y e r s ( v o l c a n i c f a c i e s ), l a y e r I :  
 Sheet 110A, C 1: 1 ex.; layer II: Sheet 110B, C 44: 1 ex. (holotype), C 78: 1 ex.; Sheet 116A, M 218: 1 ex.

These shells seem to connect the pleistocene *pyriformis pyriformis* (GRAY) with the living *subviridis* (REEVE)<sup>33</sup>.

Fossil distribution:

no other record.

Recent distribution:

the species became extinct in Malaysia, the Aroe islands excepted, where the N.W. Australian race *dorsalis* SCHILDER & SCHILDER is said to occur<sup>34</sup>; the living races of *subviridis* occur in Bro, Que, Syd, and in Southern Mel.

141. *ERRONEA (ADUSTA) SONDEIANA* (MARTIN).

- + 1899 *Cypraea (Luponia) sondeiana* spec. nov. — K. MARTIN, Foss. Java, p. 173 [partim], pl. 28, fig. 403 [non fig. 404 nec 405].  
 1932 *Erronea (Adusta) sondeiana* MARTIN. — SCHILDER, Sitz.-Ges. Naturforsch. Freunde, 1932, p. 267.

<sup>33</sup>) See SCHILDER & SCHILDER, 1938, Prodrôme, p. 149.

<sup>34</sup>) See: SCHILDER & SCHILDER, 1933, Cypr. Ost-Indien, pp. 177, 185.

- 1932 *Erronea (Austa) walkeri sondeiana* (MARTIN). — SCHILDER, Foss. Cat., p. 189.  
 1937 *Erronea (Austa) sondeiana*. — SCHILDER, Neog. Cypr. Ost-Java, p. 197 and p. 202, fig. 29.

No new material; material previously examined:

Pliocene [= upper Kalibèng layers]: Sonde: 2 ex. (including MARTIN's holotype); upper Kalibèng layers: Sheet 93B, M 260: 1 ex.

This species evidently is the antecessor of the pleistocene *E. (A.) walkeri surabajensis* SCHILDER, though it seems to be allied also to the living *E. (A.) pulchella* (SWAINSON).

Fossil distribution:

no other record.

142. **ERRONEA (ADUSTA) WALKERI SURABAJENSIS SCHILDER.**

- 1843 *Cypraea walkeri* GRAY. — KIENER, Coqu. viv., *Cypraea*, pl. 14, fig. 3 [non Sow.].  
 1845 *Cypraea walkeri*, GRAY. — KIENER, Coqu. viv., *Cypraea*, p. 33 [non Sow.].  
 1907 *Cypraea walkeri* GRAY. — HIDALGO, Monogr. *Cypraea*, p. 563 [partim].  
 1932 *Erronea (Austa) walkeri walkeri* (SOW.). — SCHILDER, Foss. Cat., p. 189 [partim].  
 1933 *Erronea (Austa) walkeri walkeri* (SOW.). — SCHILDER & SCHILDER, Cypr. Ost-Indien, p. 194.  
 + 1937 *Erronea (Austa) walkeri surabajensis* nov. subsp. — SCHILDER, Neog. Cypr. Ost-Java, p. 207, figs. 39—40.  
 1938 *Erronea (Austa) walkeri surabajensis* SCHILDER. — SCHILDER & SCHILDER, Prodrome p. 121 (note 7) and p. 151.

Material examined:

Poetjangan layers (volcanic facies), layer I: Sheet 110A, M 295: 2 ex.<sup>35</sup>).

Material previously examined:

Poetjangan layers (volcanic facies), layer I: Sheet 110A, M 96: 1 ex.; C 60: 1 ex.; layer II: Sheet 110A, M 125: 2 ex.; M 127: 1 ex. (holotype); M 128: 3 ex.

There is evidently no difference between the pleistocene and the living Malayan shells belonging to *walkeri*.

Fossil distribution:

no other record.

Recent distribution:

Mal; other geographical races occur in Que, Syd, Loy, and Eastern Mad.

<sup>35</sup>) The complete shell is 19 (60.48) 18: 19 + 1 (20: 21) with 3 intercalated ribs on the outer lip; the other shell is about 18 (61.48), with the extremities broken off.

Subgenus *Erronea* TROSCHEL 1863.143. *ERRONEA (ERRONEA) OVUM OVUM* (GMELIN).

- + 1791 *Cypraea ovum*. — GMELIN, in: LINNÉ, Syst. Nat., ed. 13, p. 3412.  
 1870 *Cypraea erronea* [non] LINNÉ. — G. B. SOWERBY II, Thes. Conch., 4, *Cypraea*, pl. 20, figs. 156—157 [non fig. 158].  
 1907 *Cypraea erronea* LINNÉ, var. 5. — HIDALGO, Monogr. *Cypraea*, p. 341.  
 1927 *Erronea (Erronea) ovum* GMEL. — SCHILDER, Arch. Naturgesch., 91, A 10, p. 120 and p. 159, note 371.  
 1932 *Erronea (Erronea) erronea ovum* (GMEL.). — SCHILDER, Foss. Cat., p. 189 [partim].  
 1933 *Erronea (Erronea) erronea ovum*. — SCHILDER, Zool. Anz., 101, p. 189.  
 1933 *Erronea (Erronea) erronea ovum* (GMEL.). — SCHILDER & SCHILDER, Cypr. Ost-Indien, p. 194.  
 1938 *Erronea (Erronea) ovum ovum* GMELIN. — SCHILDER & SCHILDER, Prodrome, p. 152.

No new material; material previously examined:

[probably pleistocene]: mud-volcano Kalang Anjar near Soerabaja (coll. Dr. COERT, G. I. A.): 1 ex.

The formula of this only known fossil specimen, 16(62)16:15 (18:17), proves that it is smaller than any known living shell of *ovum*; besides, the teeth are very closely set, so that their relative number on both lips corresponds to the upper limit of variation in series of living *ovum*; the other characters<sup>36)</sup>, however, agree with the recent Malayan *ovum*. Nevertheless, more numerous specimens possibly may prove the pleistocene shells to be separable as subspecies.

Fossil distribution:

no previous record.

Recent distribution:

Mal, Bro, Chi; other geographical races live in Mel, Que, and in Western Mic.

The pliocene antecessor of *ovum*, *Erronea (Erronea) cheribonensis* SCHILDER<sup>37)</sup> from Waled (= Menengteng ravine; Cheribon, Java), has

<sup>36)</sup> Pyriform, spire umbilicate, right side regularly rounded, hardly margined at the extremities only, base convex, outer lip constricted in front, hind top of the inner lip rather blunt and slightly thickened, labial teeth crossing almost the inner half of the lip, columellar teeth short, terminal ridge short, rather obsolete, but distinctly oblique, fossula broad, shallow, ribbed, columellar sulcus hardly impressed, ribbed, the posterior ribs being replaced by a row of internal denticles.

- <sup>37)</sup> 1899 *Cypraea (Luponia) sondaiana* spec. nov. — K. MARTEN, Foss. Java, p. 173 [partim], pl. 28, fig. 405 [non figs. 403—404].  
 + 1932 *Erronea cheribonensis* n. sp. — SCHILDER, Sitz. Ges. Naturforsch. Freunde, 1932, p. 268.  
 1932 *Erronea (Erronea) cheribonensis* SCHILDER. — SCHILDER, Foss. Cat., p. 189.  
 1937 *Erronea (Erronea) cheribonensis*. — SCHILDER, Neog. Cypr. Ost-Java, p. 198, fig. 9.

not yet been collected in the Kendeng Mountains<sup>38</sup>); the holotype is preserved in R. G. M. L.

Genus and Subgenus *Palmadusta* IREDALE 1930.

144. **PALMADUSTA (PALMADUSTA) PUNCTATA ATOMARIA** (GMELIN).

- + 1791 *Cypraea atomaria*. — GMELIN, in: LINNÉ, Syst. Nat., ed. 13, p. 3412.  
 1870 *Cypraea sterous-muscarum* [non] LAMK. — G. B. SOWERBY II, Thes. Conch., 4, *Cypraea*, p. 29, pl. 32, fig. 363 [non figs. 364—365].  
 1907 *Cypraea punctata* [non] LINN. — SCHEPMAN, Posttert. Celebes, p. 184.  
 1907 *Cypraea punctata* LINNÉ. — HIDALGO, Monogr. *Cypraea*, p. 482 [partim].  
 1927 *Cypraea* (s. str.) *punctata* LINNÉ. — J. FISCHER, Seran u. Obi, p. 58.  
 1932 *Palmadusta punctata atomaria* (GMEL.). — SCHILDER, Foss. Cat., p. 196 [partim].  
 1933 *Palmadusta punctata atomaria* (GMEL.). — SCHILDER & SCHILDER, Cypr. Ost-Indien, p. 196.  
 1937 *Palmadusta punctata atomaria*. — SCHILDER, Neog. Cypr. Ost-Java, p. 203.  
 1938 *Palmadusta (Palmadusta) punctata atomaria* GMELIN. — SCHILDER & SCHILDER, Prodrôme, p. 156.  
 1939 *Palmadusta punctata atomaria* GMELIN. — SCHILDER, Neues Jahrb. Min., Beil. 81, B, p. 496, pl. 19, fig. 4.

No new material; material previously examined:

Upper Kalibèng layers: Sheet 93B, M 260: 1 ex.

The pliocene *atomaria* seems to be identical with the living Malayan race of *punctata* (LINNÉ): in the specimen from M 260 the relative number of teeth is very small (23:22), as the mean of living shells is (27:25); in two other pliocene shells, however, collected at Fufa (Ceram), it is extremely great, viz. (29:26) and (31:29), so that the mean of the three pliocene shells of Malaysia (28:26) agrees with that of the living specimens.

Fossil distribution:

Mal: pliocene of Java and Ceram; pleistocene of Kajoe Ragi (N. Celebes)<sup>39</sup>.

Recent distribution:

Mal, Jap; other geographical races of *punctata* (LINN.) live in Mel, Que, Loy, Tua, Mad, Cap, and Southern Ery.

145. **PALMADUSTA (PALMADUSTA) MODJOKERTENSIS** SCHILDER.

- + 1937 *Palmadusta saulae modjokertensis* nov. subsp. — SCHILDER, Neog. Cypr. Ost-Java, p. 208, fig. 36.  
 1938 *Palmadusta (Palmadusta) saulae modjokertensis* SCHILDER. — SCHILDER & SCHILDER, Prodrôme, p. 158.

<sup>38</sup>) „*Cypraea (Luponia) erronea* L.’’, mentioned by H. MARTIN-ICKE, 1911, Gastr. Trinil, p. 47 from the Pliocene of Padasmalang, cannot be identified without examination of the original specimen.

<sup>39</sup>) Three „*punctata* LINNÉ’’ from Kajoe Ragi (2 ex. in R. G. M. L., 1 ex. in Z. M. A.) are typical *atomaria* with the mean formula 11 (54) 20: 19 (27: 25).

No new material; material previously examined:

Poetjangan layers (volcanic facies), layer II:  
Sheet 116A, C 39: 1 ex. (holotype).

The unique shell from the pleistocene of Java evidently is allied to the very rare species *P. (P.) saulae* (GASKOIN), three races of which <sup>40</sup>) live in Northern Mal (Philippine Is. and Mergui Archipelago), in Que, and in Western Mic.

146. **PALMADUSTA (PALMADUSTA) LUTEA LUTEA** (GRONOVIVS).

- + 1781 *Cypraea lutea*. — GRONOVIVS, Zoophyl. Gronoviani, 3, p. V, pl. 19, fig. 17.  
1870 *Cypraea lutea* GRON. — G. B. SOWERBY II, Thes. Conch., 4, *Cypraea*, pl. 19, fig. 144.  
1907 *Cypraea lutea* GRON. — SCHEPMAN, Posttert. Celebes, p. 184.  
1907 *Cypraea lutea* GRONOVIVS. — HIDALGO, Monogr. *Cypraea*, p. 405 [partim].  
1932 *Palmadusta lutea* (GRONOV.). — SCHILDER, Foss. Cat., p. 197 [partim].  
1933 *Palmadusta lutea* (GRON.). — SCHILDER & SCHILDER, Cypr. Ost-Indien, p. 196.  
1938 *Palmadusta (Palmadusta) lutea lutea* GRONOW. — SCHILDER & SCHILDER, Prodrome, p. 159.

No new material; material previously examined:

[probably pleistocene]: mud-volcano Kalang Anjar near Soerabaja (coll. Dr. COERT, G. I. A.): 1 ex.

The formula of this shell, 15 (60) 16:13 (19:15), shows that its teeth are less numerous than in most living Malayan specimens, the mean formula of which is 16 (58) 18:16 (21:18); its right side is slightly thickened, but not margined (the anterior extremity excepted), but as the other characters <sup>41</sup>) are typical, the pleistocene shell should not be separated from the living *lutea lutea* (GRON.). Moreover, three pleistocene shells from Kajoe Ragi (North Celebes: 2 ex. in R. G. M. L. and 1 ex. in Z. M. A.) exhibit the same relative number of teeth as the living shells, for their mean formula is 15 (57) 18:16 (21:18); their right side is distinctly margined throughout, and their dorsal spots are numerous, but discrete. The fossula of these 3 shells varies from distinctly concave to nearly flattened.

Fossil distribution:

Mal: pleistocene of Java and North Celebes.

<sup>40</sup>) Besides the two races distinguished by SCHILDER & SCHILDER, 1938, Prodrome, p. 158, a third race, *jensostergaardi*, recently has been described by INGRAM (1939, Nautilus, 52, p. 122, pl. 9, fig. 3) from Palau.

<sup>41</sup>) Spire slightly umbilicate, base flattened, aperture rather wide, dilated in front (because the inner lip is receding in this part) and slightly bent in its hindmost part, outer lip hardly constricted in front and not declivous, the rib-like labial teeth crossing one third, the columellar teeth one quarter of the lip, terminal ridge short, oblique, fossula shallow, columellar sulcus very shallow, left border of the aperture not accentuated; no traces of colour are preserved.

## Recent distribution:

Mal, Chi, Jap, Ind; other geographical races live in Bro, Que, Syd, in Southern Mel and Loy.

Genus and Subgenus *Blasicrura* IREDALE 1930.147. **BLASICRURA (BLASICRURA) QUADRIMACULATA INSCULPTA**  
(K. MARTIN).

- + 1899 *Cypraea* (s. str.) *insculpta* spec. nov. — K. MARTIN, Foss. Java, p. 166, pl. 26, fig. 382.  
1932 *Erronea* (*Blasicrura*) *insculpta insculpta* (MARTIN). — SCHILDER, Foss. Cat., p. 192.

No new material; material previously examined:

Pliocene: „Sonde?": 1 ex. (holotype, R. G. M. L.).

The unique specimen is closely allied to *B. (B.) quadrimaculata quadrimaculata* (GRAY)<sup>42)</sup> living in Malaysia; the chief difference seems to consist in the terminal ridge, which is composed of two convergent ribs with an obsolete third rib intercalated between these two ribs; besides, its outer lip is more projecting behind and the relative number of teeth on both lips approaches the upper limit of the variation in denticulation of *quadrimaculata*, as the formula of *insculpta* is 16 (50.43) 18:19<sup>43)</sup> (21:22) instead of 20 (51.42) 18:19 (19:20), the mean of living Malayan shells of *quadrimaculata*; the other characters<sup>44)</sup>, however, seem to be identical.

Fossil distribution:

no other record.

There is another fossil shell, *B. (B.) quadrimaculata nikinikiensis* SCHILDER<sup>45)</sup> from the upper pliocene or lower pleistocene of Timor, which seems to differ from *insculpta* by the same characters as *quadrimaculata*

<sup>42)</sup> See: SCHILDER & SCHILDER, 1938, Prodrôme, p. 164.

<sup>43)</sup> K. MARTIN erroneously indicated 20 labial and 24 columellar teeth.

<sup>44)</sup> MARTIN's description may be completed as follows: posterior extremity recurved, aperture narrow, a little dilated in front, outer lip hardly declivous in front, teeth crossing more than the inner half of each lip, columellar teeth hardly raised in front, but much raised behind, where they become still longer, but hardly thickened; fossula broad, very shallow, with the inner denticles more numerous than the opposite columellar teeth, columellar sulcus broad, ribbed in front and with an inner row of denticles behind. No traces of colour can be observed.

<sup>45)</sup> 1920 *Cypraea neglecta* SOW. — TESCH, Timor, 2, p. 45, pl. 129, fig. 160 [non SOW.].

+ 1928 *Stolida nikinikiensis* n. nov. — SCHILDER, Arch. Molluskenkunde, 60, p. 194.

1932 *Erronea* (*Blasicrura*) *insculpta nikinikiensis* (SCHIL.). — SCHILDER, Foss. Cat., p. 192.

1938 *Blasicrura* (*Blasicrura*) *quadrimaculata nikinikiensis* SCHILDER. — SCHILDER & SCHILDER, Prodrôme, p. 164.

1939 *Blasicrura quadrimaculata nikinikiensis* SCHILDER. — SCHILDER, Neues Jahrb. Min., Beil. 81, B, p. 497, pl. 19, fig. 5.

does, but otherwise evidently approaches the North Australian race *B. (B.) quadrimaculata thielei* SCHILDER & SCHILDER; the pliocene antecedents of *quadrimaculata*, however, need further research, as the two only known specimens (*insculpta* and *nikinikiensis*) do not yet allow to establish definite differences between the fossil and living races of *quadrimaculata*.

Moreover, 56 specimens (50 in R. G. M. L., 6 in Z. M. A.) of this species have been collected in the pleistocene of Kajoe Ragi<sup>46</sup>); they evidently quite agree with the living Malayan *quadrimaculata*. But though so common in the pleistocene of Celebes, the species has not yet been found in the Kendeng Mountains.

Recent distribution:

the living *quadrimaculata quadrimaculata* occurs in Mal, Chi, Mel and in Western Mic, other geographical races live in Bro, Que and Loy (Fiji).

Familia Amphiperatidae.

Subfamilia Amphiperatinae.

Genus *Prionovolva* IREDALE 1930.

148. PRIONOVOLVA NUBECULATA (ADAMS & REEVE)<sup>47</sup>.

- + 1848 *Ovulum nubeculatum*. — ADAMS (A.) & REEVE, Voy. Samarang, Moll., p. 23, pl. 6, fig. 12.
- 1865 *Ovulum fruticum* ADAMS MS. — REEVE, Conch. Icon., 15, Ovulum, pl. 4, fig. 16.
- 1932 *Prionovolva fruticum*, REEVE. — SCHILDER, Proc. Malac. Soc. London, 20, pp. 53, 59, pl. 4, fig. 35.
- 1932 *Prionovolva nubeculata*, ADAMS & REEVE. — SCHILDER, loc. cit., pp. 53, 59.
- 1932 *Prionovolva (Prionovolva) nubeculata nubeculata* (ADAMS & REEVE), and *P. (P.) nubeculata fruticum* (REEVE). — SCHILDER, Foss. Cat., p. 231.

Material examined:

Poetjangan layers (argillaceous facies): Sheet 110B, M 267: 2 ex.

The two specimens, the formulae of which are 16 (58.45) 21:0 (24:0) and 18 (62.51) 20:0 (22:0), are very similar to each other, and they quite agree, with the fig. 35 (called *fruticum*) in Proc. Malac. Soc. London, 20, pl. 4, except in the labial teeth, which are slightly less numerous and much produced in the central third of the outer lip, so that the sharp longitudinal carina of the lip becomes strongly serrate in this part; the columellar carina is distinct and also sharply cut at the extremities. The dorsum exhibits fine, close, longitudinal striae and irregularly distant transversal breaks only; the right side is margined,

<sup>46</sup>) 1907 *Cypraea quadrimaculata* GRAY. — SCHEPMAN, Posttert. Celebes, p. 183.  
1933 *Erronea (Blasicrura) quadrimaculata* (GRAY). — SCHILDER & SCHILDER, Cypr. Ost-Indien, p. 195.

<sup>47</sup>) A short description of this species (s.n. *P. cf. fruticum*) is found in: Arch. f. Molluskenk., 73, part 2/3, p. 117, 1941.

the fossula is shallow though distinctly concave, and there is a feeble internal carina extending along the columella. Therefore the two shells undoubtedly belong to *nubeculata fruticum*, which has not been collected as a fossil before; but the characteristic markings of the species became destroyed by fossilization. The size and the shape of the two fossils, however, agree more with those of *nubeculata nubeculata*, and they confirm my former opinion that *nubeculata* with the formula 17 (60) 24:0 (28:0)<sup>48</sup> and the more frequent *fruticum* with the formula 11 (57) 20:0 (27:0) are ecological varieties of only one species, the mean formula of which is 13 (58) 22:0 (28:0).

Fossil distribution:

no previous record.

Recent distribution:

Mal, Chi, Mad, Ery.

#### Genus and Subgenus *Volva* ROEDING 1798.

##### 149. *VOLVA (VOLVA) JAVANA* (K. MARTIN).

+ 1899 *Ovula (Amphiperas) javana* spec. nov. — K. MARTIN, Foss. Java, p. 165, pl. 26, fig. 381.

1932 *Volva javana* (MARTIN). — SCHILDER, Foss. Cat., p. 240.

1937 *Volva javana* MARTIN. — SCHILDER, Neog. Cypr. Ost-Java, p. 205.

No new material; material previously examined:

Upper pliocene [= upper Kalibènè layers]: Sonde: 1 ex. (holotype, R. G. M. L.).

The characters in dentition of the unique specimen prove it to be the most primitive *Volva* (s.str.) known up to this day; it evidently is the antecessor of *V. (Phenacovolva) sowerbyana* (WEINKAUFF) as well as of *V. (V.) volva* (LINNÉ).

Fossil distribution:

no other record.

##### 150. *VOLVA (VOLVA) VOLVA SURABAJENSIS* SCHILDER.

+ 1937 *Volva volva surabajensis* nov. subsp. — SCHILDER, Neog. Cypr. Ost-Java, p. 205, fig. 19.

Material examined:

Poetjangan layers (volcanic facies), layer I: Sheet 110A, M 291: 1 ex.

Material previously examined:

[Pleistocene of] Soerabaja (no exact indication): 1 ex. (holotype).

<sup>48</sup>) The type specimen of *nubeculata* evidently is a rather young shell, in which the lips are not yet fully developed.

The newly examined specimen, by which the exact geological age of the „fossil” *surabajensis* could be stated, confirms most characters formerly supposed to separate it from the living *V. (V.) volva volva* (LINNÉ)<sup>49)</sup>, viz. the minor size, the dorsal striae restricted to the extremities, and the absence of any traces of labial teeth; but there is a distinct though very feeble thickening on the left part of the posterior beak (replacing the funiculum of other species), and the finely granulate outer lip is slightly margined as in *volva volva*; besides, the completely preserved outer lip of this second specimen of *surabajensis* shows that it is less rounded, but rather flattened behind and declivous in front, with the outer edge much more accentuated in this part than in *volva volva*. In the second shell the tips of the beaks are also broken off, but as the body whorl is  $31 \times 19 \times 16$  mm., the total length probably was about 55 mm., well agreeing with the supposed length of the holotype (53 mm.).

Fossil distribution:

no other record.

Recent distribution:

The living *volva volva* (LINNÉ) occurs in Mal, Chi, Jap, and Bro; the races *cumulata* IREDALE and *lemurica* SCHILDER live in Syd and in Mad respectively.

- <sup>49)</sup> + 1758 *Bulla volva*. — LINNÉ, Syst. Nat., ed. 10, p. 725.  
 1849 *Ovulum volva*, LINN. — G. B. SOWERBY II, Thes. Conch., 2, *Ovulum*, pl. 99, figs. 6—8.  
 1932 *Volva volva*, LINN. — SCHILDER, Proc. Malac. Soc. London, 20, p. 56, 62, fig. 76.  
 1932 *Volva volva* (LINN.). — SCHILDER, Foss. Cat., p. 240.