THE MARINE MOLLUSCA OF THE KENDENG BEDS (EAST JAVA) GASTROPODA, PART I

(Families Fissurellidae - Vermetidae inclusive)

BY

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CONTENTS.

A. GENERAL PART.

1. Material, acknowledgements.

In the spring of 1937 I started the identification of a very large collection of marine mollusca from the plio-pleistocene Kendeng beds West of Soerabaja (Java). Though the whole material had already been arranged systematically and the greater part of the species had been identified provisionally by Dr. R. IJZERMAN, who very kindly placed his useful Ms. notes at my disposal, the revision of the entire material will certainly take several years. I therefore resolved to publish the results successively, the more so, as I am not sure that I shall remain in the condition to carry on these investigations.

The greater part of the present mollusca was collected by members of the staff of Geological Survey of the Netherland-Indies at Bandoeng (Java) during the exploration of the Kendeng region. This part was entrusted to me by professor Dr. L. M. R. RUTTEN of Utrecht after

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Dr. IJZERMAN had to give up his yet incomplete study of it. I am very much indebted to professor RUTTEN for his allowance to study this precious collection and for the constant interest he has shown in my work.

July 1937 I received, through the courtesy of Ir. W. HOLLEMAN, director of the Geological Survey at Bandoeng, a second, supplementary lot of shells, which had been collected in the same area after the first collection had been sent to Holland [1]).

At last professor Dr. B. G. ESCHER, director of the Geological Museum at Leiden, was so kind as to put at my disposal the fossil mollusca collected in a restricted part of the same region in 1930 and 1931 by Dr. J. COSIJN. This material had already been studied provisionally by professor K. MARTIN [2]) and Mr. IJZERMAN's Ms. notes mentioned above also refer to this collection.

The author further wishes to express his gratitude to:
Professor Dr. H. A. BROUWER, director of the Geological Institution at Amsterdam. for allowing him to carry on his investigations in this Institute and storing the extensive material there,
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2. Topography.

The situation of the Kendeng region is shown on the accompanying sketch map (fig. 1). Every sheet of the Geological Map of Java (scale

[1]) These materials will be sent back to Bandoeng after having been worked up, but the type specimens of the species and subspecies described as new, and duplicates of other species will be kept in the Geological Museum at Leiden. From those species of which there are plenty of specimens, duplicates will be deposited in the collections of the Geological Institutions of Utrecht and Amsterdam.

[2]) 1932, Ouderd. sedim. antikl. Res. Soerabaja.

1:100 000) has been divided into four parts A, B, C, D, according to the following diagram: | A | B | / | C | D |. The samples containing the fossil mollusca treated in this paper derive from the following parts of the Geological Map: 93B, 99A, 99B, 105A, 105B, 105D, 109C, 110A, 110B, 115C, 115D, 116A, 116B.

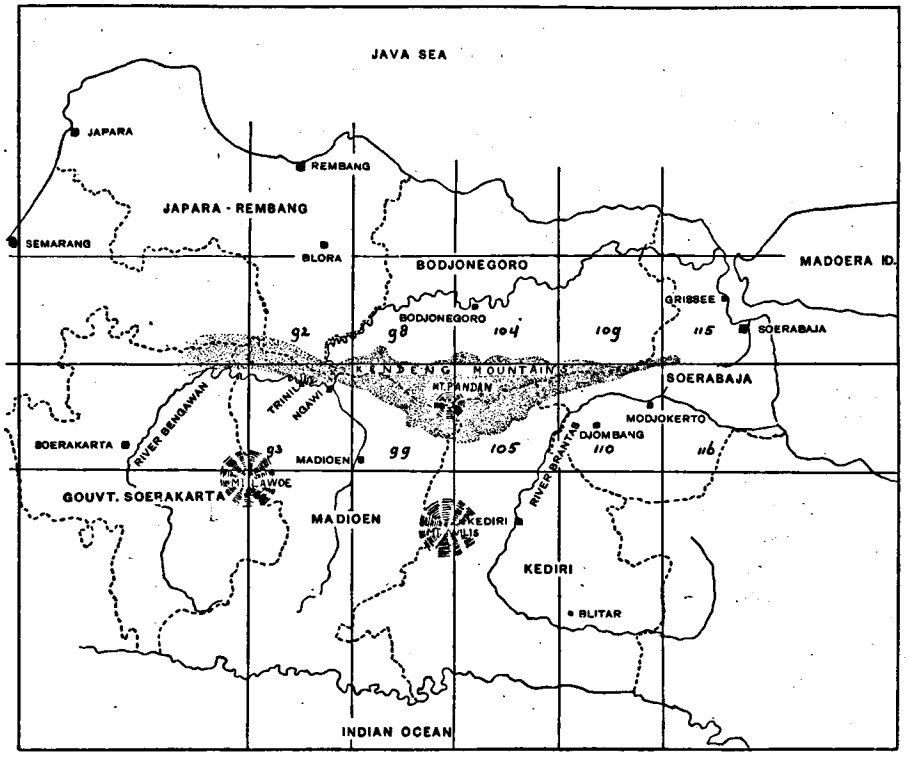

Fig. 1. Sketch map of East Java, showing the Kendeng Region. The numbers refer to the sheets of the Geological Map (after Van Benthem Jutting).

3. Stratigraphy.

The geology and stratigraphy of the Kendeng region have been described by DUYFJES [8]). Several authors before him dealt with the geology of parts of this area; especially the neighbourhood of Trinil, finding-place of the famous *Pithecanthropus erectus* DUBOIS, has been the object of many investigations. Different opinions have been emitted about the age and relations of the beds exposed near Trinil, a survey

[8]) 1936, Geol. u. Stratigr. Kendenggeb.

of which has recently been included by miss VAN BENTHEM JUTTING [4]) in her paper on the non-marine mollusca of these beds.

I have followed DUYFJES here, as his investigations are the most recent and the most extensive that have been carried on in this region. Besides his publication I had two Ms. reports and a set of preliminary geological maps at my disposal, kindly forwarded to me by Mr. DUYFJES. From all these sources together I drew up the following synopsis of the stratigraphy of the Kendeng region, which especially refers to the layers containing marine mollusca. A complete survey of the geology and stratigraphy of the region will soon appear in the explanations of the mentioned sheets of the Geological Map of Java, part of which are in the press, another part in preparation.

Miocene.

The oldest formation exposed in the region is considered to be of miocene age. These layers mainly consist of stratified lime-sandstones (locally containing *Lepidocyclina*) alternating with marls. No mollusca have been found in these miocene layers.

Pliocene.

Two series of strata are supposed to be of pliocene age, viz.: the lower and upper Kalibèng layers.

The lower Kalibèng layers consist of usually unstratified *Globigerina* marls with local thin beds of sandstones or tuff. They contain no mollusca.

The upper Kalibèng layers are developed in three different facies. In the western part of the region (sheets 93B, 99A, 99B, 105A) they mainly consist of white coral limestone. Near Padasmalang, Sonde and Bangoenredjokidoel (sheet 93B) between these limestones irregular, probably lenticular, deposits of sandy claymarls are found, which yield a rich molluscan fauna: the Sonde fauna of K. MARTIN [5]). The coral limestones themselves contain few fossil mollusca, mostly casts only.

In sheets 105B and 110A sandy marls or marly sandstones, sometimes alternating with beds of sandy limestone, represent the upper Kalibèng layers. They have been mentioned by VAN ES [6]) under the name of „transition beds''. A poor molluscan fauna has been collected in these marly sandstones.

The third facies of these layers is found from sheet 110A eastward. Here they consist of thin-bladed diatomaceous marls, sometimes including little thin beds of sandstone. No mollusca are found in this part of the upper Kalibèng layers.

Pleistocene.

Three series of strata covering the Kalibèng layers in the profile according to DUYFJES represent the lower, middle, and upper pleisto-

[4]) 1937, Non mar. moll. foss. hor. Java, pp. 166 seq.
[5]) See e.g.: 1919, Palaeoz. Kenntn. Java, p. 141.
[6]) 1931, Age *Pithecanthr.*, p. 89.

cene, viz.: the Poetjangan layers, the Kaboeh layers, and the Notopoero layers.

The Poetjangan layers show a volcanic facies in the western part of the region. West of Mount Pandan they consist of thick beds of unstratified tuffaceous breccias alternating with stratified tuffs, which sometimes contain beds of sandstone. No fossils are found in this part of the Poetjangan layers, except some freshwater mollusca in a bed of marly sandstone in sheet 99A (M 1, M 2 [7])).

From sheet 99A eastward the base of these volcanic Poetjangan layers is formed by marly sandstones containing tuffaceous matter. These sandstones [8]) can be followed up to sheet 110A; they lie relatively higher in the profile in the East part of the region than in the West part. Below them from sheet 105B eastward another facies — the argillaceous facies — of the Poetjangan layers occurs; it consists of blue or grey-blue, mostly unstratified, claystones. These marine beds gradually become thicker eastward, simultaneous with the decreasing of the overlying volcanic beds. The limit between these two facies is strongly marked in the field; in the accompanying schematic profile (fig. 2) it is represented by a broken line from the left below to the right above.

East of Mount Pandan the volcanic Poetjangan layers, which overlie the above mentioned marly tuffogenic sandstones, consist at first of tuffaceous breccias and tuffs as was the case West of it. In sheet 105B

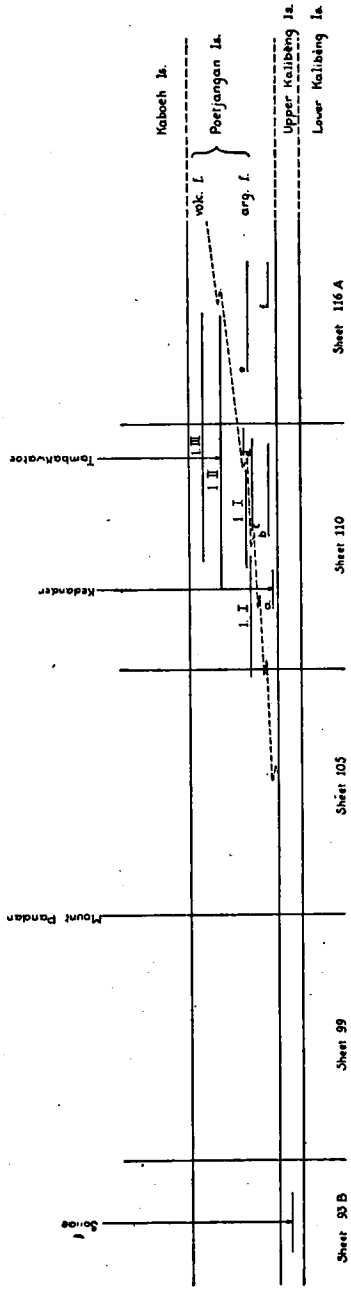

Fig. 2. Schematic profile through the Kendeng Region (drawn up with the assistance of Ir. J. DUYFJES).

[7]) The numbers preceded by „M'' refer to the samples of the Mijnwezen collection, those preceded by „C'' to the COSIJN collection.

[8]) „Ngronanhorizont'' of DUYFJES (1936, Geol. u. Stratigr. Kendenggeb., p. 143).

three distinct beds of tuffaceous breccias originate, of which the lower can be traced to the East as far as Kaboeh (near the middle of sheet 110A), the middle one farther up to Mount Poetjangan (East side of sheet 110A), and the upper one even up to Mount Pasinan, North of Koepang (sheet 110B). The intercalated tuffs are gradually replaced by sandstones, which sometimes yield freshwater mollusca (M 39, M 40, M 70, M 71 — M 74 incl.). From sheet 110A eastward these sandstones sometimes get a marly character and contain marine mollusca.

Distinct fossil horizons containing marine mollusca can be traced over long distances in the Poetjangan layers. Three of these horizons occurring in the sheets 110A, 110B, and 116A have been named layer I, II and III, I being the oldest.

From the most eastern part of sheet 105B, where it lies almost at the top of the marly sandstones forming the lower part of the volcanic facies in the sheets 99 and 105, layer I can be followed eastward in sheet 110A. Here a great number of samples has been taken from this layer, viz.: sheet 105B, M 66, M 67, M 69, sheet 110A, M 76, M 77, M 80— M 102, M 102a, M 291, M 292, C 52, C 53, C 55, C 56, C 100 — C 105. More to the West (sheet 99 and 105) there are no distinct fossil horizons to be traced in the above mentioned marly sandstones. The samples taken in this region, however, must be partly of the same age, partly a little older than layer I; they are: sheet 99B, M 3, M 5, M 7 — M 9, M 11 — M 17, sheet 105A, M 26 — M 32, sheet 105B, M 51 — M 61, M 63— M 65, M 68, M 75. East of Mount Goewo (sheet 110A), where these sandstones end, another horizon, which lies ± 50 m higher in the profile, can be traced in the volcanic Poetjangan layers. As it is but little younger than the horizon in the sandstones, it has not been named separately and is also referred to as layer I. The following samples originate from this part of layer I: sheet 110A, M 103?, M 104?, M 105, M 106, M 293 — M 302, C 1, C 59, C 60, sheet 110B, M 153— M 159, M 269?, M 270 — M 272, C 69, C 76, C 77, C 79, C 84, C 88, C 89, C 91, C 95.

From the layers II and III, which are exposed in the sheets 110A, 110B and 116A, numerous samples are contained in the collections of the Geological Survey and of Dr. COSIJN (see table I & II).

In the argillaceous facies of the Poetjangan layers horizons of marly sandstones occur yielding marine mollusca. Owing to the fact that the limit between the two facies crosses the profile obliquely, each of these horizons must have an equivalent of equal age in the volcanic facies of the Poetjangan layers. Figure 2 shows how Mr. DUYFJES supposes the fossil bearing beds in the different parts of the Poetjangan layers to be synchronised [9]).

In the literature the Poetjangan layers have sometimes been classed in the miocene, mostly in the pliocene. The „miocene" of

[9]) The fossil horizons in the argillaceous facies of the Poetjangan layers have been indicated in figure 2 by the characters a—f. From a the samples M 112 and M 113 derive; from b: M 148a, M 150 and C 90; from c: M 288, M 109, M 148, M 149, M 151, M 152, C 45, C 46, C 47, C 78, C 81, C 92, C 96 and C 99; from d: M 264—M 268 incl.; from e: M 319—M 322 incl., M 328, M 337; from f: M 333, M 334 and M 336.

Tambakwatoe [10]) has to be considered as layer II of the volcanic Poetjangan layers. The „under pliocene" at Kedander of VAN ES [11]) belongs to the argillaceous facies of the Poetjangan layers and the deposits called Soemberringin 2 and 3 by the same writer [12]) must be considered to be layer II in the volcanic facies of the Poetjangan layers. The older fossilhorizon („tweede fossielrijke horizont") of COSIJN [13]) is also identical with this layer II, whilst his younger fossilhorizon („bovenste van deze gidshorizonten" [14])) is the same as our layer III.

The Kaboeh layers consist of coarse grained, generally cross bedded sandstones, frequently intermixed with gravel. Some gravel beds can be traced in the field; they yield freshwater mollusca (sheets 99B, 105A, 110A, 110B). At the locality Kedoengbroeboes of DUBOIS such a fossiliferous bed is exposed. The Trinil beds of VAN ES [15]) must be ranged in the Kaboeh layers. More to the East the sandstones of the Kaboeh layers contain beds of marine mollusca (e.g. *Ostrea* and *Placuna*). These marine beds are found in the sheets 110A, 110B and 116A. More to the North of the region (in sheets 109 and 115) these layers show frequently a marine facies. They may consist of green claystone alternating with beds of andesitic sandstone and tuff-sandstone.

The Notopoero layers are of volcanic origin. They have been found in the neighbourhood of Mount Pandan and do not contain fossil mollusca.

Terraces.

At the border of the hills near Soerabaja (sheet 115D) locally very young terraces are found consisting of gravel with pieces of lime and andesitic matter and yielding marine mollusca.

It is one of the purposes of this study of the marine mollusca of the Kendeng beds to try and deduct the age and interrelations of the different layers from the molluscan fauna they contain, and to compare the result with the stratigraphy drawn up by DUYFJES on the strength of much other — non malacological — evidence. It will, however, not be possible to make these deductions until the whole material has been worked up.

4. Localities collection Geological Survey.

The localities from which Mollusca are contained in the collection of the Geological Survey (het Mijnwezen) at Bandoeng have been compiled in table I. In this table the following abbreviations have been used:

arg.	: argillaceous	R.	: river
f.	: facies	vill(s).	: village(s)
l(s).	: layer(s)	volc.	: volcanic
Mt.	: mount		

[10]) K. MARTIN, 1919, Palaeoz. Kenntn. Java, p. 145.
[11]) 1931, Age *Pithecanthr.*, p. 111.
[12]) l.c., p. 115—116.
[13]) 1932, 2e meded. foss. beend. heuvell. N. Djetis & Perning, p. 146.
[14]) l.c., p. 145.
[15]) l.c., p. 101.

TABLE I.

Number of Sample.	Sheet.	Locality.	Species of Rocks.	Stratigraphical Division.
M 1	99 A	Path from Poetjoeng to Perang	Sandy limestone	Poetjangan ls.?
M 2	99 A	R. Logantoeng	Calcareous sandstone	Poetjangan ls.?
M 3	99 B	R. Redjoeno	Sandstone	Poetjangan ls., volc. f.
M 4	99 B	idem	Shell (*Tridacna*?)	Upper Kalibèng ls.
M 5	99 B	Lorry track Pakoelan-Redjoeno	Bank of shells	Poetjangan ls., volc. f.
M 6	99 B	W. of vill. Sempol	Limestone	Upper Kalibèng ls.
M 7	99 B	Vill. Ngesong	Tuffogenic sandstone	Poetjangan ls., volc. f.
M 8	99 B	Lorry track to Ngronan	Calcareous sandstone	idem
M 9	99 B	W. of vill. Ngronan	Loose Mollusca from M 8	idem
M 10	99 B	Footpath Katok-Redjoso	Limestone	Upper Kalibèng ls.
M 11	99 B	Footpath Katok-Miana	Calcareous sandstone	Poetjangan ls., volc. f.
M 12	99 B	Near vill. Boetak	*Balanus* limestone	idem
M 13	99 B	R. Djoerit, branch of R. Gondang	Clay-sandstone	idem
M 14	99 B	idem	Marly sandstone [16])	idem
M 15	99 B	Footpath Klino-Mt. Poerwolo	Marly sandstone with intercalations of lime	idem
M 16	99 B	R. Gajam, branch of R. Gondang	Sandy marl	idem
M 17	99 B	R. Gondang	idem	idem
M 18	99 B	R. Ngetas	Marly claystone	Kaboeh ls.
M 19	99 B	R. Kedoengloemboe	Calcareous sandstone	idem
M 20	99 B	idem	Conglomeratic sandstone	idem
M 21	99 B	R. Odoöndo	Calcareous conglomeratic sandstone	idem
M 22	99 B	R. Gedeh	Conglomeratic sandstone	idem
M 23	99 B	R. Gondang	Marly limestone	Poetjangan ls., volc. f.
M 24	99 B	idem	as M 23, but more argillaceous	idem
M 25	99 B	R. Djoeblak	Sandy marl	idem
M 26	105 A	R. Grendjengan near Soekoen	Sandy marl	idem
M 27	105 A	S. of vill. Gesik	Bank of shells	idem
M 28	105 A	R. Djiloendang	Marly sandstone	idem
M 29	105 A	R. Kedoengtroetjoek	Marl	idem
M 30	105 A	Path Tjabean-Padjeng	Bank of shells	idem

[16]) M 14 has been taken close above M 13.

TABLE I (continued).

Number of Sample.	Sheet.	Locality.	Species of Rocks.	Stratigraphical Division.
M 31	105 A	S. of vill. Ngloejoe	Tuffogenic marly sandstone	Poetjangan ls., volc. f.
M 32	105 A	idem	idem	idem
M 33	105 A	R. Goejangan	Clay-marl	idem
M 34	105 A	Path to Ngloejoe	Loose oysters	?
M 35	105 A	R. Tritik	Calcareous conglomeratic sandstone	Kaboeh ls.
M 36	105 A	idem	idem	idem
M 37	105 A	R. Senantok	idem	idem
M 38	105 A	idem	Black marly clay	idem
M 39	105 A	Road Dodol-Kedoeng-pingit	Conglomeratic sandstone	Poetjangan ls., volc. f.
M 40	105 A	R. Kedoenggroeboek	Calcareous conglomeratic sandstone	idem
M 41	105 A	R. Bogo	idem	Kaboeh ls.
M 42	105 B	R. Garoetan (E. of Losari)	Marly sandstone	Upper Kalibèng ls.
M 43	105 B	idem	idem	idem
M 44	105 B	R. Banjoeoerip, branch of R. Asin	idem	idem
M 45	105 B	idem	idem	idem
M 46	105 B	R. Asin	Sandy limestone with *Lepidocyclina*	idem
M 47	105 B	R. Beng	Coarse calcareous sandstone	idem
M 48	105 B	idem	Calcareous conglomeratic sandstone	idem
M 49	105 B	idem	Marly sandstone	idem
M 50	105 B	R. Brangkal	Sandy marl	idem
M 50a	105 B	N. of vill. Djiparapah	idem	idem
M 51	105 B	S. of Losari	Sandstone	Poetjangan ls., volc. f.
M 52	105 B	R. Djoeranglangoe	Calcareous sandstone	idem
M 53	105 B	R. Garoetan	Marly sandstone	idem
M 54	105 B	idem	Calcareous sandstone	idem
M 55	105 B	idem	Bank of shells	idem
M 56	105 B	R. Bangle	Calcareous sandstone	idem
M 57	105 B	idem	idem	idem
M 58	105 B	idem	idem, with *Corbicula*	idem
M 59	105 B	R. Tijang	Marly sandstone with *Corbicula*	idem
M 60	105 B	idem	Marly sandstone	idem
M 61	105 B	idem	Calcareous tuffogenic sandstone	idem
M 62	105 B	R. Kedoengdjati	Very fine-grained sandstone	idem
M 63	105 B	W. of vill. Pinggir	Sandy marl	idem
M 64	105 B	R. Soemberpoele, branch of R. Beng	Breccious tuffsandstone	idem
M 65	105 B	Road to Moenoeng	Tuffogenic sandstone	idem
M 66	105 B	R. Setri, branch of R. Beng	Sandy marl	idem, l. I

TABLE I (continued).

Number of Sample.	Sheet.	Locality.	Species of Rocks.	Stratigraphical Division.
M 67	105 B	Lorry track near R. Beng	Fine-grained marly sandstone	Poetjangan ls., volc. f., l. I
M 68	105 B	R. Brangkal	Tuffogenic marly sandstone	idem, below l. I
M 69	105 B	E. of vill. Tambak	Marly sandstone	idem, l. I
M 70	105 D	Little branch of R. Kedoengtimbo	Gray clay-marl	Poetjangan ls., volc. f.
M 71	105 B	R. Klotok	Black marly claystone	idem
M 72	105 B	R. Watoegaleng, branch of R. Bangle	Sandstone with *Batissa*	idem
M 73	105 B	R. Bangle	Gray clay-sandstone	idem
M 74	105 B	R. Kedoengdjati	Gray marly claystone	idem
M 75	105 B	R. Krawilan	Fine-grained marly sandstone	idem
M 76	110 A	R. Klampokbang, branch of R. Beng	Marly sandstone	idem, l. I
M 77	110 A	E. of Mt. Watoelawang	Gray sandstone	idem, l. I
M 78	110 A	R. Soedo, branch of R. Beng	Coarse-grained sandstone with *Batissa*	Poetjangan ls., volc. f.
M 79	110 A	idem	Gray sandstone with *Corbicula*	idem
M 80	110 A	R. Gembajang	Coarse-grained sandstone	idem, l. I
M 81	110 A	idem	Gray sandy marl	idem, l. I
M 82	110 A	R. Soemberpelas	Sandy marl	idem, l. I
M 82a	110 A	E. of vill. Soemberpelas	Coarse-grained sandstone	idem, l. I
M 83	110 A	Footpath to Kendajakan	Tuffogenic marly sandstone	idem, l. I
M 84	110 A	Footpath to vill. Batjang	Sandy marl	idem, l. I
M 85	110 A	Path to R. Soendo	Marly tuffogenic sandstone	idem, l. I
M 86	110 A	idem	Sandy marl	idem, l. I
M 87	105 B	R. Kloemprit	idem	idem, l. I
M 88	110 A	R. Marmojo	Marly sandstone	idem, l. I
M 89	110 A	idem	Sandy marl	idem, l. I
M 90	110 A	idem	Calcareous sandstone	idem, l. I
M 91	110 A	Footpath to vill. Marmojo	Marly tuffogenic sandstone	idem, l. I
M 92	110 A	R. Pasinan	Tuffogenic sandstone	idem, l. I
M 93	110 A	R. Batjang	Marly tuffogenic sandstone	idem, l. I
M 94a	110 A	idem	idem	idem, l. I
M 94b	110 A	idem	as M 94a, but more argillaceous	idem, l. I
M 95	110 A	R. Klatjem	Fine-grained marly sandstone	idem, l. I
M 96	110 A	Path to Djatiradjah	Marly tuffogenic sandstone	idem, l. I

TABLE I (continued).

Number of Sample.	Sheet.	Locality.	Species of Rocks.	Stratigraphical Division.
M 97	110 A	Path to vill. Mandoero	Marly tuffogenic sandstone	Poetjangan ls., volc. f., l. I
M 98	110 A	Mt. Grobogan	Tuffogenic sandstone	idem, l. I
M 99	110 A	R. Soemberringin	Marly sandstone	idem, l. I
M 100	110 A	idem	Marly tuffogenic sandstone	idem, l. I
M 101	110 A	Path to vill. Soemberringin	Marly sandstone	idem, l. I
M 102	110 A	Near Mt. Goewo	idem	idem, l. I
M 102a	110 A	R. Soembergirang	idem	idem, l. I
M 103	110 A	R. Kedoengringin	idem	idem, l. I?
M 104	110 A	R. Kedoengglinggang	Calcareous tuffogenic sandstone	idem, l. I?
M 105	110 A	idem	Tuffogenic marly sandstone	idem, l. I
M 106	110 A	R. Tjoepak	Calcareous sandstone	idem, l. I
M 106a	110 A	idem	Sandstone with *Batissa*	Poetjangan ls., volc. f., l. I
M 107	110 A	R. Soemberan	Sandy marl	idem
M 108	110 A	R. Pandogan	idem	idem
M 109	110 A	R. Selodari	Marly sandstone	Poetjangan ls., arg. f.
M 110	110 A	R. Kedoengringin	idem	idem
M 111	110 A	idem	idem	idem
M 112	110 A	R. Soembergirang	idem	idem
M 113	110 A	Branch of R. Soembergirang	idem	idem
M 114	110 A	R. Soemberpelas	Fine-grained sandstone	Poetjangan ls., volc. f.
M 115	110 A	R. Ranger, branch of R. Beng	Sandstone with *Batissa*	idem
M 116	110 A	R. Gedoengkerang	idem	idem
M 117	110 A	idem	Black marly claystone	idem
M 118	110 A	R. Marmojo	Sandstone with *Batissa*	idem
M 119	110 A	Footpath Bringin-Wadoeng	idem	idem
M 120	110 A	R. Batjang	Fine-grained marly sandstone	idem
M 121	110 A	Near vill. Soemberringin	Tuffogenic marly sandstone	idem, l. II
M 122	110 A	idem	Coarse-grained sandstone	idem, l. II
M 123	110 A	idem	Fine-grained marly sandstone	idem, l. II
M 124	110 A	idem	Coarse conglomeratic sandstone	idem, l. II
M 125	110 A	R. Doeren, branch of R. Soemberan	Tuffogenic sandstone	idem, l. II
M 126	110 A	Trench to Moenoengkerep	Marly tuffogenic sandstone	idem, l. II
M 127	110 A	R. Kedoengringin	idem	idem, l. II

TABLE I (continued).

Number of Sample.	Sheet.	Locality.	Species of Rocks.	Stratigraphical Division.
M 128	110 A	R. Kedoenggling-gang	Calcareous tuffogenic sandstone	Poetjangan ls., volc. f., l. II
M 129	110 A	Little branch of R. Pang	Marly tuffogenic sandstone	idem, l. II
M 130	110 A	R. Kepoehredjo	Marly sandstone	Poetjangan ls., volc. f.
M 131	110 A	R. Ngembak, branch of R. Kedoeng-djengglong	Yellow clay-sandstone	idem, l. II
M 132	110 A	R. Pandogan	Sandstone with *Batissa*	Poetjangan ls., volc. f.
M 133	110 A	Path from Mt. Grobogan to vill. Sempol	Calcareous sandstone	idem
M 134a	110 A	R. Soemberan	Black sandy clay-stone	idem
M 134	110 A	R. Doeren, branch of R. Soemberan	Marly sandstone with *Venus*	idem
M 135a	110 A	Trench to Moenoeng-kerep	idem	idem
M 135b	110 A	idem	Sandstone with *Batissa*	idem
M 136	110 A	R. Kedoenggling-gang	Marly sandstone with *Venus*	idem
M 137	110 A	NW. of vill. Moe-noengkerep	Sandstone with *Thiara*	idem
M 138	110 A	N. of vill. Sloem-boeng	Sandstone with *Batissa*	idem
M 139	110 A	R. Doeren, branch of R. Soemberan	Marly tuffogenic sandstone	idem, l. III
M 140	110 A	S. of vill. Moenoeng-kerep	Marly sandstone	idem, l. III
M 141	110 A	R. Pang	Marly tuffogenic sandstone	idem, l. III
M 142	110 A	R. Djegrek	Marly clay-sandstone	idem, l. III
M 143	110 A	R. Kedoengtjeleng	Gray clay-marl	idem, l. III
M 144	110 A	Near vill. Soember-ringin	Calcareous sandstone with *Thiara*	Kaboeh ls.
M 145	110 A	idem	Black claystone with *Thiara*	idem
M 146	110 A	Near vills. Modjo-kerep & Kalipang	Tuffogenic sandstone	idem
M 147	110 A	Trench to Moenoeng-kerep	Sandstone	idem
M 148a	110 A	SW. of vill. Asem-gede	Marly sandstone	Poetjangan ls., arg. f.
M 148	110 B	Trench to Mt. Radjekwesi	Brown marly sand-stone	idem
M 149	110 B	R. Banjoeasin	idem	idem
M 150	110 B	Left branch of R. Banjoeasin	idem	idem
M 151	110 B	idem	idem	idem
M 152	110 B	R. Tegaldoekoeh	idem	idem

TABLE I (continued).

Number of Sample.	Sheet.	Locality.	Species of Rocks.	Stratigraphical Division.
M 153	110 B	R. Kedoengpoetjang	Gray sandstone	Poetjangan ls., volc. f., l. I
M 154	110 B	idem	Coarse-grained conglomeratic sandstone	idem, l. I
M 155	110 B	R. Tegaldoekoeh	Gray marly sandstone	idem, l. I
M 156	110 B	Trench B, N. of vill. Soembergajam	Fine-grained sandstone	idem, l. I
M 157	110 B	R. Belikdandang & branch	idem	idem, l. I
M 158	110 B	Banjoebanger	Brown marly sandstone	idem, l. I
M 159	110 B	Trench to vill. Soekomoeljo	Marly sandstone	idem, l. I
M 160	110 B	Trench to vill. Tjoepak	idem	idem, l. II
M 161	110 B	R. Kedoengdjeng-glong	idem	Poetjangan ls., volc. f.
M 162	110 B	idem	argillaceous sandstone	idem
M 163	110 B	idem	Marly sandstone	idem
M 164	110 B	R. Kedoengpoetjang, branch of R. Tjoepak	Tuffogenic marly sandstone	idem, l. II
M 165	110 B	R. Gondang	Marly sandstone	idem, l. II
M 166	110 B	R. Gedangan	Tuffogenic sandstone	idem, l. II
M 167	110 B	idem	Marly sandstone	Poetjangan ls., volc. f.
M 168	110 B	Trench of vill. Medowo	Tuffogenic sandstone	idem, l. II
M 169	110 B	R. Soembergajam	idem	Poetjangan ls., volc. f.
M 170	110 B	R. Belikdandang	Calcareous sandstone	idem
M 171	110 B	R. Goemoel	Tuffogenic sandstone	idem, l. II
M 172	110 B	Trench to vill. Soekomoeljo	Coarse calcareous sandstone	idem, l. II
M 173	110 B	E. of vill. Ranggon	Loose Mollusca	idem, l. II
M 174	110 B	Trench D N.	Marly clay	Poetjangan ls., volc. f.
M 175	110 B	R. Badjang	Claystone with intercalations of sand	idem, l. II
M 176	110 B	idem	Marly sandstone	idem, l. II
M 177	110 B	N. of vill. Gondang	Sandstone	idem, l. II
M 178	110 B	idem	idem	idem, l. II
M 179	110 B	R. Ngembak, branch of R. Kedoengdjeng-glong	Marly sandstone	idem, l. III
M 180	110 B	R. Tandjoeng	Tuffogenic sandstone	idem, l. III
M 181	110 B	Road to vill. Tjendoro	Tuffogenic marly sandstone	idem, l. III
M 182	110 B	Trench S. of Mt. Pasinan	Marly sandstone	Kaboeh ls.
M 183	110 B	E. of vill. Gondang	Marly sandstone	Poetjangan ls., volc. f., l. III
M 184	110 B	S. of vill. Sidorojol	Sandstone with *Batissa*	Poetjangan ls., volc. f.
M 185	110 B	idem	Marly sandstone	idem, l. III

TABLE I (continued).

Number of Sample.	Sheet.	Locality.	Species of Rocks.	Stratigraphical Division.
M 186	110 B	W. of vill. Kedoeng-paloeng	Marly sandstone	Poetjangan ls., volc. f., l. III
M 187	110 B	R. Bantengan	Sandstone with *Batissa*	Poetjangan ls., volc. f.
M 188	110 B	idem	Gray sandy marl	idem, l. III
M 189	110 B	R. Asin	Marly sandstone	idem, l. III
M 190	110 B	N. of vill. Bangeran	idem	idem, l. III
M 191	110 B	W. of vill. Bangeran	Gray sandstone	idem, l. III
M 192	110 B	Forestborder N. of vill. Pasinan-kloeboek	Fine-grained brown sandstone	idem, l. III
M 193	110 B	idem	Fine-grained gray sandstone	idem, l. III
M 194	110 B	Forestborder W. of Bangeran	Sandstone with *Batissa*	Poetjangan ls., volc. f.
M 195	110 B	Trench DN., N. of vill. Modjoroto	Sandstone with *Placuna*	idem
M 196	110 B	idem	Marly tuffogenic sandstone	idem, l. III
M 197	110 B	R. Pandankoening	Marly sandstone	Kaboeh ls.
M 198	110 B	Forestborder N. of vill. Pasinan-kloeboek	Sandstone with oysters	idem
M 199	110 B	N. of vill. Lokar-dowo	Loose gravel with *Thiara*	idem
M 200	110 B	In vill. Kedoeng-boeloeh	Sandstone with oysters & *Placuna*	idem
M 201	110 B	Trench DN., N. of vill. Modjoroto	Sandstone with oysters	idem
M 202	110 B	Vill. Manjarsari	Marly sandstone	idem
M 203	110 B	S. of vill. Brendjil Kidoel	Tuffogenic sandstone with oysters	Poetjangan ls., volc. f.
M 204	110 B	R. Garoeng	Brown sandstone with shell grit	idem
M 205	110 B	idem	Marly sandstone	Poetjangan ls., arg. f.
M 206	110 B	Vill. Djatirono	Sandstone with *Placuna*	Poetjangan ls., volc. f.
M 207	116 A	S. of vill. Soemberploso	Loose Mollusca	idem
M 208	116 A	idem	Sandstone	idem
M 209	116 A	N. of Mt. T 147	Tuffogenic sandstone	idem
M 210	116 A	W. of Mt. T 147	Sandstone	idem
M 211	116 A	W. of Mt. T 147	Loose Mollusca	idem
M 212	116 A	S. of Mt. T 147	idem	idem
M 213	116 A	S. of vill. Semboeng	Gray sandstone	idem
M 214	116 A	R. Retjo	idem	idem, l. II
M 215	116 A	idem	Marly tuffogenic sandstone	idem, l. II
M 216	116 A	N. of vill. Klagen-blandong	Marly tuffogenic clay-sandstone	idem, l. II
M 217	116 A	idem	Marly sandstone	idem, l. II
M 218	116 A	idem	idem	idem, l. II
M 219	116 A	idem	idem (tuffogenic)	idem, l. II

TABLE I (continued).

Number of Sample.	Sheet.	Locality.	Species of Rocks.	Stratigraphical Division.
M 220	116 A	R. Soemberdjo	Marly tuffogenic clay-sandstone	Poetjangan ls., volc. f., l. II
M 221	116 A	idem	Tuffogenic clay-sandstone	idem, l. II
M 222	116 A	Footpath to Soemberdjo	idem	idem, l. II
M 223	116 A	Between Soemberdjo & Soemberploso	Marly sandstone	idem, l. II
M 224	116 A	idem	Tuffogenic marly sandstone	idem, l. II
M 225	116 A	idem	Tuffogenic sandstone	idem, l. II
M 226	116 A	W. of vill. Poeting	Sandy tuffogenic marl	idem, l. II
M 227	116 A	E. of vill. Semboeng	Tuffogenic marly sandstone	idem, l. II
M 228	116 A	R. Klagen	Loose Mollusca	idem, l. III
M 229	116 A	N. of vill. Soemberploso	Marly sandstone	idem, l. III
M 230	116 A	N. of vill. Soembersoko	Sandstone	idem, l. III
M 231	116 A	N. of vill. Soemengka	Loose Mollusca	idem, l. III
M 232	116 A	W. of vill. Soemberdjo	Marly sandstone	idem, l. III
M 233	116 A	NE. of vill. Klagenblandong	idem	idem, l. III
M 234	116 A	R. Retjo	idem	Poetjangan ls., volc. f.
M 235	116 A	idem	Conglomeratic sandstone with *Batissa*	idem
M 236	116 A	R. Klagen	Sandstone with *Batissa & Thiara*	idem
M 237	116 A	N. of triangulation pole T 145	Gray sandstone with echinids	Kaboeh ls.
M 238	116 A	Near vill. Djoewetsemboeng	Sandstone	idem
M 239	116 A	N. of vill. Semboeng	Loose *Placunae*	idem
M 240	93 B	R. Sadang	Limestone	Upper Kalibèng ls.
M 241	93 B	Vill. Gembloeng near R. Sadang	idem	idem
M 242	93 B	Vill. Blandongan	idem	idem
M 243	93 B	Footpath Ngawi-Blandongan	idem	idem
M 244	93 B	R. Solo, N. of Ngawi	idem	idem
M 245	93 B	idem	idem	idem
M 246	93 B	N. of vill. Sidoredjo	idem	idem
M 247	93 B	R. Ngasinan	idem	idem
M 248	93 B	R. Solo near vill. Pentoek	idem	idem
M 249	93 B	idem	Sandy marl	idem
M 250	93 B	R. Solo near vill. Gadjah	Limestone	idem
M 250a	93 B	idem	idem	idem

TABLE I (continued).

Number of Sample.	Sheet.	Locality.	Species of Rocks.	Stratigraphical Division.
M 251	93 B	R. Solo NW. of Padasmalang	Sandy marl	Upper Kalibèng ls.
M 252	93 B	R. Solo near Padasmalang	idem	idem
M 253	93 B	idem	Corals from limestone	idem
M 254	93 B	Little branch of R. Solo near Padasmalang	Corals & oysters from limestone	idem
M 255	93 B	R. Solo downstream of Sonde	Sandy marl	idem
M 256	93 B	R. Solo SE. of Sonde	Sandstone with *Corbicula*	Terraces?
M 257	93 B	R. Solo S. of the mouth of R. Alastoewa, near Sonde	Sandy marl	Upper Kalibèng ls.
M 258	93 B	idem	idem	idem
M 259	93 B	W. of Sonde near bridge across R. Solo	Limestone	idem
M 260	93 B	R. Solo near Bangoenredjo Kidoel	Sandy marl	idem
M 261	93 B	idem	Argillaceous marl	idem
M 262	93 B	idem	Limestone	idem
M 263	110 B	R. Gangsir	Sandy claystone	Poetjangan ls., arg. f.
M 264	110 B	idem	Marly sandstone	idem
M 265	110 B	N. of vill. Sekeping	idem	idem
M 266	110 B	E. of vill. Soemberdadi	idem	idem
M 267	110 B	Near vill. Soemberdadi	Brown sandstone	idem
M 268	110 B	N. of vill. Soemberdadi	Marly sandstone	idem
M 269	110 B	N. of Bakoeng	Breccia of shell grit	Poetjangan ls., volc. f., ± l. I
M 270	110 B	idem	Marly sandstone	idem, l. I
M 271	110 B	SW. of vill. Djoeblang	Slightly marly sandstone	idem, l. I
M 272	110 B	R. Banjoeasin	Yellow-brown sandstone	idem, l. I
M 273	110 B	R. Kedoengpring	Brown sandstone	Poetjangan ls., volc. f. [11])
M 274	110 B	idem	idem	idem [11])
M 275	110 B	W. of vill. Doekoehdjatirono	Tuffaceous sandstone	idem, ± l. II
M 276	110 B	NW. of vill. Sekeping	Marly claystone	idem, l. II
M 277	110 B	R. Soemberdadi	idem	idem, l. II
M 278	110 B	S. of vill. Soemberdadi	Marly sandstone	idem, l. II
M 279	110 B	W. of vill. Soemberdadi	Sandy marly claystone	idem, l. II

[11]) From a fossil horizon some m. above l. I.

TABLE I (continued).

Number of Sample.	Sheet.	Locality.	Species of Rocks.	Stratigraphical Division.
M 280	110 B	R. Kedoengpring	Sandy marly claystone	Poetjangan ls., volc. f., l. II
M 281	110 B	R. Tambakwatoe [18])	Marly sandstone	idem, l. III
M 282	110 B	R. Glagah	Brown sandstone	idem, l. II
M 283	110 B	R. Banjoeasin	Loose shells	idem, ± l. II
M 284	110 B	R. Ngegreng	Tuffaceous marly claystone	idem, l. II
M 286	110 B	R. Soemberdadi	Tuff-sandstone	Poetjangan ls., volc. f.
M 287	110 B	S. of vill. Sekeping	Loose oysters	Kaboeh ls.
M 288	110 A	NE. of Mt. Goewo	Brown sandstone	Poetjangan ls., arg. r.
M 289	110 A	R. Seladji	Marly sandstone	idem
M 290	110 A	Branch of R. Seladji	Marly tuff-sandstone	idem
M 291	110 A	Footpath W. of Mt. Goewo	idem	Poetjangan ls., volc. f., l. I
M 292	110 A	idem	idem	idem, l. I
M 293	110 A	R. Ngegreng	Fine sandstone	idem, l. I
M 294	110 A	idem	Coarse sandstone	idem, ± l. I
M 295	110 A	E. of vill. Grendjengan	Marly clay-sandstone	idem, l. I
M 296	110 A	R. Grendjengan	Marly tuff-sandstone	idem, l. I
M 297	110 A	W. of Mt. Bareng	idem	idem, l. I
M 298	110 A	Carroad NE. of Mt. Bareng	Slightly marly tuff-sandstone	idem, l. I
M 299	110 A	Footpath Sahar-Gesing	Tuff-sandstone	idem, l. I
M 300	110 A	R. Sahar	Marly tuff-sandstone	idem, l. I
M 301	110 A	Footpath Sahar-Gesing	idem	idem, l. I
M 302	110 A	N. of vill. Gesing	idem	idem, l. I
M 303	110 A	R. Brindil	Loose oysters	Poetjangan ls., volc. f.
M 304	110 A	R. Tretes	Calcareous tuff-sandstone	idem, l. II
M 305	110 A	W. of vill. Sahar	Calcareous sandstone	Poetjangan ls., volc. f.
M 306	110 A	R. Banjoeasin	Limy sandstone	idem
M 307	110 A	R. Mendogo	Marly tuff-sandstone	idem
M 308	110 A	NW. of vill. Satri	Somewhat marly tuff-sandstone	idem, ± l. II
M 309	110 A	W. of vill. Satri	Marly tuff-sandstone	Poetjangan ls., volc. f.
M 310	110 A	N. of vill. Sidodadi	Coarse tuff-sandstone	idem
M 311	110 A	Carroad W. of Mt. Bareng	Calcareous tuff-sandstone	idem, l. II
M 312	110 A	R. Gedeh	Tuff-sandstone	Poetjangan ls., volc. f.
M 313	110 A	R. Toeloeng	Somewhat marly tuff-sandstone	idem, l. II
M 314	110 A	R. Mendogo	Fine-grained argillaceous sandstone	Kaboeh ls.
M 315	110 A	R. Djedjel	Sandy marly clay	idem
M 316	109 C	R. Lamong	Marly clay with little layers of lime	idem
M 317	109 C	R. Poetat	Sandy clay	idem

[18]) Presumably MARTIN's locality Tambakwatoe.

TABLE I (continued).

Number of Sample.	Sheet.	Locality.	Species of Rocks.	Stratigraphical Division.
M 318	109 C	R. Lamong	Marly argillaceous sandstone	Kaboeh ls.
M 319	116 A	N. of vill. Boekoe	Marly clay-sandstone	Poetjangan ls., arg. f.
M 320	116 A	E. of vill. Kemoening	Sandy claystone	idem
M 321	116 A	N. of vill. Modjolebak	Sandy claystone	idem
M 322	116 A	SE. of vill. Tambaksari	Marly sandstone	idem
M 323	116 A	E. of vill. Boekoe	Marly tuff-sandstone	Poetjangan ls., volc. f.
M 324	116 A	SW. of vill. Kloewoeng	idem	idem
M 325	116 A	E. of vill. Karangasem	Somewhat marly tuff-sandstone	idem
M 326	116 A	N. of vill. Goewa	Tuff-sandstone	idem
M 328	115 C	S. of vill. Balekambang	Marly clay-sandstone	Poetjangan ls., arg. f.
M 329	115 C	E. of vill. Randegan koelon	Somewhat marly tuff-sandstone	Poetjangan ls., volc. f.
M 330	115 C	S. of vill. Djatisari	Loose oysters	idem?
M 331	115 C	E. of vill. Sawen	Marly tuffaceous clay	idem
M 332	115 C	idem	Marly clay with lime concretions	Kaboeh ls.?
M 333	116 B	N. of vill. Moeloeng	Yellow limestone, somewhat sandy	Poetjangan ls., arg. f.
M 334	116 B	W. of triangulation pole S 761	Calcareous shell-breccia	idem
M 335	116 B	Vill. Moeloeng	Somewhat marly tuff-sandstone	Poetjangan ls., volc. f.
M 336	115 D	S. of vill. Gadoeng	Gray sandy limestone with shell-grit & loose mollusca	Poetjangan ls., arg. f.
M 337	115 D	SW. of vill. Soemoerwiloet	Calcareous shell-breccia	idem
M 338	115 D	Vill. Balaskloemprik	Calcareous gravel with *Balanus* & oysters	Marine terrace?
M 339	115 C	W. of vill. Kalisantri	Fine-grained calcareous sandstone	Poetjangan ls., arg. f.
M 340	115 C	Vill. Domas	Conglomeratic sandstone (locally calcified)	Poetjangan ls., volc. f.
M 341	115 D	E. of vill. Djadjarsanga	Lime-andesite gravel	Marine terrace?
M 342	115 D	Vill. Koewoehan	idem	idem?
M 343	99 B	Footpath vill. Sempol to vill. Pakoelan	Loose shells from limestone	Upper Kalibèng ls.
M 344	99 B	idem	idem	idem
M 345	99 B	idem	Bank of shells	Poetjangan ls., volc. f.
M 346	109 C	R. Pandan	Argillaceous tuff-sandstone	idem, ± l. II?
M 347	109 C	R. Ngampel	idem	idem, ± l. II?

5. Localities collection Dr. J. Cosijn.

With his valuable collection Dr. COSIJN presented to the Geological Museum at Leiden some maps of the eastern part of the Kendeng region, on which the greater part of his fossil-localities had been marked accurately. So I could project these localities on the previous-mentioned preliminary maps forwarded by Mr. DUYFJES and the layers from which COSIJN's samples originate could be fixed with more or less certainty. A small number of localities not indicated by COSIJN in his Ms. maps, was found on the map included in his second publication [19]), on which all his localities in the region N. of Modjokerto are indicated.

The localities from which COSIJN's Mollusca derive have been compiled in table II. Some of these loci could be identified with localities of the Bandoeng collection (table II, column 4).

In this table the same abbreviations have been used as in table I (see p. 247).

TABLE II.

Number of Sample.	Sheet.	Locality.	Locality Mijnwezen Collection.	Stratigraphical Division.
C 1	110 A	Carroad NE. of Mt. Bareng	= M 298	Poetjangan ls., volc. f., l. I
C 2	110 B	N. of vill. Gondang (N. of loc. C 3)		idem, l. II
C 3	110 B	N. of vill. Gondang	N. of M 177	idem, l. II
C 4	116 A	N. of vill. Klagen-blandong		idem, l. II
C 5	116 A	idem		idem, l. II
C 6	116 A	N. of vill. Soemberdjo		idem, l. II
C 7	110 B	N. of vill. Gondang		idem, l. II
C 8	116 A	Between vills. Soember-djo & Soemberploso	= M 225	idem, l. II
C 9	116 A	N. of vill. Kedoeng-waroe		Poetjangan ls., arg. f.
C 10	116 A	N. of vill. Boereng-lor		Poetjangan ls., volc. f.
C 11	116 A	NE. of vill. Kedoeng-waroe		Poetjangan ls., arg. f.?
C 12	116 A	NE. of vill. Kedoeng-waroe	near M 209	Poetjangan ls., volc. f.
C 14	116 A	± 250 m. E. of loc. C 10		idem
C 24	116 A	E. of vill. Djoewet		idem, l. II
C 25	110 B	N. of vill. Gondang	near M 177	idem, l. II
C 27	110 B	SW. of vill. Sidorojol	near M 185	idem, l. III
C 28	110 B	Beyond 1 km. E. of vill. Kedoengboeloe		Kaboeh ls.
C 29	110 B	N. of vill. Gondang	near M 178	Poetjangan ls., volc. f., l. II
C 30	116 A	E. of vill. Djoewet		idem, l. II

[19]) 1932, 2e meded. foss. beend. heuvell. N. Djetis & Perning.

TABLE II (continued).

Number of Sample.	Sheet.	Locality.	Locality Mijnwezen Collection.	Stratigraphical Division.
C 31	116 A	R. Soemberdjo	= M 221	Poetjangan ls., volc. f., l. II
C 32	116 A	± 50 m. N. of loc. C 31		idem, l. II
C 33	116 A	Between vills. Soemberdjo & Soemberploso	= M 224	idem, l. II
C 34	116 A	N. of vill. Klagen-blandong	= M 216	idem, l. II
C 35	116 A	± 150 m. E. of loc. C 36		idem, l. II
C 36	116 A	R. Retjo	= M 215	idem, l. II
C 37	116 A	N. of vill. Klagen-blandong	= M 219	idem, l. II
C 38	116 A	idem	= M 218	idem, l. II
C 39	116 A	idem		idem, l. II
C 40	116 A	idem	= M 217	idem, l. II
C 41	110 A	E. of Mt. Poetjangan		Poetjangan ls., arg. f.
C 42	110 A	idem		idem
C 43	110 A	Between Mt. Poetjangan & vill. Tjoepak		Poetjangan ls., volc. f.
C 44	110 B	E. of Mt. Poetjangan		idem
C 45	110 A	S. of vill. Asemgede	Horizon of M 288 etc.	Poetjangan ls., arg. f.
C 46	110 A	idem	idem	idem
C 47	110 B	SE. of vill. Asemgede	idem, near M 148	idem
C 48	110 B	SE. of Mt. Radjekwesi		idem
C 49	110 A	Near vill. Moenoengkerep	probably = M 140	Poetjangan ls., volc. f., l. III
C 50	110 A	WNW. of Mt. Pelemketjik	E. of M 124	idem, l. II
C 51	110 A	Near vill. Soemberringin	= M 144	Kaboeh ls.
C 52	110 A	Path to R. Soemberringin	= M 101	Poetjangan ls., volc. f., l. I
C 53	110 A	NE. of vill. Soember-ringin		idem, l. I
C 54	110 A	NNE. of vill. Soember-ringin	near M 123	idem, l. II
C 55	110 A	R. Soemberringin	= M 99, or M 100	idem, l. I
C 56	110 A	NE. of Mt. Grobogan	near M 98	idem, l. I
C 57	110 A	± 100 m. W. of loc. C 56		idem, l. I
C 58	110 A	E. of Mt. Kendil		Upper Kalibèng ls.
C 59	110 A	W. of Mt. Bareng	= M 297	Poetjangan ls., volc. f., l. I
C 60	110 A	± 50 m. N. of loc. C 59		idem, l. I
C 61	110 A	S. of vill. Saher		Upper Kalibèng ls.
C 62	110 A	R. Tretes near vill. Garoeng		Poetjangan ls., arg. f.
C 63	110 A	NE. of vill. Soekaredja	near M 301	Poetjangan ls., volc. f.
C 64	110 B	N. of Mt. Modjoroto	near M 195	idem
C 66	110 B	E. of vill. Banjoeasin		idem
C 67	110 B	Near vill. Simo		idem, fossil horizon above l. II
C 68	110 B	R. Tambakwatoe	= M 281	idem, l. II
C 69	110 B	N. of vill. Bakoeng	= M 270	idem, l. I

TABLE II (continued).

Number of Sample.	Sheet.	Locality.	Locality Mijnwezen Collection.	Stratigraphical Division.
C 70	110 B	Branch of R. Kedoeng-pring		Poetjangan ls., volc. f.
C 71	110 B	± 100 m. S. of C 72		idem
C 72	110 B	R. Kedoengpring		idem
C 73	110 B	idem		idem
C 74	110 B	idem	= M 274	idem
C 75	110 B	idem	= M 273	idem
C 76	110 B	idem		idem, l. I
C 77	110 B	S. of vill. Tjendoro		idem, l. I
C 78	110 B	R. Banjoebanger	Horizon of M 288 etc.	Poetjangan ls., arg. f.
C 79	110 B	R. Belikdanang	= M 157	Poetjangan ls., volc. f., l. I
C 80	110 B	idem		Poetjangan ls., arg. f.
C 81	110 B	± 2 km. N. of vill. Soegihanhar	Horizon of M 288 etc.	idem
C 82	110 B	SE. of Mt. Radjekwesi	near M 166	Poetjangan ls., volc. f., l. II
C 83	110 B	R. Belikdanang		Poetjangan ls., volc. f.
C 84	110 B	SE. of Mt. Radjekwesi		idem, l. I
C 85	110 B	Left branch of R. Banjoeasin		Poetjangan ls., arg. f.
C 86	110 B	idem		idem
C 87	110 B	Between R. Banjoeasin & R. Tegaldoeko		idem
C 88	110 B	N. of vill. Soembergajam	= M 156	Poetjangan ls., volc. f., l. I
C 89	110 B	idem	= M 156	idem, l. I
C 90	110 B	S. of vill. Bakoeng	Horizon of M 148a etc.	Poetjangan ls., arg. f.
C 91	110 B	N. of vill. Soembergajam		Poetjangan ls., volc. f., l. I
C 92	110 B	idem	Horizon of M 288 etc.	Poetjangan ls., arg. f.
C 95	110 B	Near vill. Banjoeasin	near M 272	Poetjangan ls., volc. f., l. I
C 96	110 A	WSW. of vill. Asemgede	Horizon of M 288 etc.	Poetjangan ls., arg. f.
C 97	110 A	R. Selodari		idem
C 99	110 A	NE. of Mt. Goewo	Horizon of M 288 etc., near M 288	idem
C 100	110 A	N. of Mt. Goewo		Poetjangan ls., volc. f., l. I
C 101	110 A	W. of Mt. Goewo	= M 102	idem, l. I
C 102	110 A	WSW. of Mt. Goewo	near M 291	idem, l. I
C 103	110 A	Path to vill. Djatiradjah	= M 96	idem, l. I
C 104	110 A	W. of Mt. Kintel	near M 95	idem, l. I
C 105	110 A	± 100 m. W. of loc. C 104	near M 95	idem, l. I
C 106	110 A	E. of vill. Ngapoes		Poetjangan ls., arg. f.
C 107	110 A	± 50 m. S. of C 106		idem
C 109	110 B	W. of vill. Gondang		Poetjangan ls., volc. f., l. III

TABLE II (continued).

Number of Sample.	Sheet.	Locality.	Locality Mijnwezen Collection.	Stratigraphical Division.
C 110	110 B	NW. of vill. Gondang		Poetjangan ls., volc. f.
C 111	116 A	Near vill. Soembertengah		idem, l. III
C 112	116 A	W. of vill. Soembertengah		idem, l. III
C 113	116 A	N. of vill. Soemberdja		idem, l. II
C 114	116 A	idem		idem, l. II
C 115	116 A	N .of vill. Klagenblandong		idem, l. II
C 117	110 B	NE. of vill. Bantengan		idem, l. III
C 118	110 B	N. of vill. Bantengan	= M 188	idem, l. III
C 119	116 A	SW. of Mt. T 147	near M 211 & M 212	Poetjangan ls., volc. f.
C 120	116 A	W. of Mt. T 147	near M 211	idem
C 121	116 A	S. of Mt. T 155	near M 224	idem, l. II
C 123	116 A	NW. of Mt. T 155		idem, l. III
C 125	110 B	S. of vill. Sidorejol		idem, l. III
C 126	110 B	idem		idem, l. III
C 127	116 A	E. of vill. Sidorejol		idem, l. III
C 130	110 B	E. of vill. Kedoengpalang		idem, l. III
C 131	110 B	idem		idem, l. III
C 133	116 A	N. of Mt. T 155		idem, l. III
C 134	116 A	W. of vill. Soemberplasa		idem, l. III
C 135	116 A	Near vill. Soemberplasa		idem, l. III
C 136	116 A	W. of Mt. T 155		idem, l. III
C 137	116 A	idem		idem, l. III
C 138	116 A	idem		idem, l. III

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B. SYSTEMATICAL PART.

1. Introduction.

In the following systematical survey of the mollusca examined the families, genera, etc. have been ranged according to THIELE's system [20]). It is frequently impossible to determine the subgenus or sectio in which a fossil species must be ranged, when this group is distinguished mainly by anatomical characters. On the other hand the splitting up of genera based on conchological characters only, as proposed e.g. by COSSMANN in his „Essays de Paléoconchologie comparée", seems sometimes unnatural. So I have preferred to leave some groups unsplit, though subdivisions of them have been proposed.

With every species the literature bearing upon its fossil occurrence has been cited as completely as possible. When the species is still living, besides the first description mostly one or more monographs, in which it is described and figured, are referred to. The reference to the first valid description of every species has been marked with a +. Of every species the fossil and recent distribution has been given. The large number of papers consulted in order to determine the recent distribution of the species has been included in the bibliography on pp. 263 seq. The „Toelichtingen tot de bladen van de geologische kaart van Java en Sumatra" (Explanations of the sheets of the Geological Map of Java and Sumatra) have not been cited among the literature, but after the localities borrowed from them a reference is made as e.g.: „T. J. 3, p. 14", which means: „Toelichting bij blad 3 van de geologische kaart van Java, p. 14" (Explanation of sheet 3 of the Geological Map of Java, p. 14).

In order to enlarge the surveyability the fossil localities have been grouped in regions, within these regions they are cited in stratigraphical order. As to the recent distribution only the regions in which the species occur are mentioned; in some cases a specification of the localities from which the species is recorded seemed desirable and was placed in parentheses after the name of the region.

The regions into which the Indo-Westpacific area [21]) is divided have been borrowed from SCHILDER [22]). They will be referred to with the abbreviations as used by SCHILDER and will be cited in the following order:

[20]) 1929—1935, Handb. syst. Weichtierk.
[21]) EKMAN, 1935, Tiergeogr. d. Meeres, p. 23.
[22]) Proc. Mal. Soc., 20, p. 49.

Mal:	Malayan	region:	Malacca to New Guinea.
Bro:	Broome	„ :	NW. Australia.
Fre:	Freemantle	„ :	Exmouth Gulf to Eucla.
Mel:	Melanesian	„ :	Torres Straits and New Brittian to New Hebrids.
Que:	Queensland	„ :	Queensland.
Syd:	Sydney	„ :	Sydney, New South Wales.
Loy:	Loyalty	„ :	Loyalty Is., New Caledonia to Samoa.
Tua:	Tuamotu	„ :	Paumotu Is.
Pol:	Polynesian	„ :	Phoenix Is., Christmas Is., Marquesas.
Haw:	Hawayan	„ :	Sandwich Is.
Mic:	Micronesian	„ :	Carolines to Ellice Is.
Jap:	Japan	„ :	Nagasaki to Tokyo.
Chi:	China	„ :	Hongkong, Formosa, Riu-Kiu, Annam.
Ind:	Indian	„ :	India, Ceylon, Chagos, Andaman Is., Seychelles, Somaliland.
Ery:	Erytraean	„ :	Red Sea, Persian Gulf.
Mad:	Madagascar	„ :	Madagascar, Mascarenes, Mombasa to Natal.
Cap:	Cape	„ :	from Keiskama River eastward.

In horizontal direction these regions are limited by the isotherms of 25°, 20°, and 15° of the surface water in the coldest month. Their situation is shown in the following diagram:

	Jap			
Ery	Chi			Haw
Ind	Mal	Mel	Mic	Pol
Mad	Bro	Que	Loy	Tua
Cap	Fre	Syd		

Sometimes it is impossible to decide in which region a record found in the literature must be ranged. Vaguely indicated localities could often not be taken in account. When mollusca are found in the Kendeng beds, which are recorded from localities outside of the Indo-Westpacific area, these localities will be especially mentioned.

If the dimensions of illustrations do not exactly agree with measurements in the text, it means that the enlargements are not precise or that the shell was tilted a little when the drawing was made.

The following abbreviations have been used:

ex.	: exemplar(s), specimen(s)
fr.	: fragment(s)
G.I.A.	: collection of the Geological Institution at Amsterdam
loc.	: locality
R.G.M.L.	: collection of the Geological Museum at Leiden
R.N.H.L.	: „ „ „ Natural History Museum at Leiden
Z.M.A.	: „ „ „ Zoological Museum at Amsterdam

2. Systematical survey of the marine mollusca of the Kendeng beds.

Classis Gastropoda.
Subclassis Prosobranchia.
Familia Fissurellidae.
Genus *Scutus* MONTFORT 1810.

1. SCUTUS UNGUIS (LINNÉ).

+ 1764 *Patella Unguis.* — LINNÉ, Mus. Ulricae, p. 693.
1869 *Parmophorus granulatus* BLAINVILLE. — ISSEL, Malac. Mar Rosso, p. 301.
1879 *Scutus unguis* L. — E. A. SMITH, Journ. of Conch., 2, p. 261.
1890 *Scutus unguis* LINNÉ. — PILSBRY, Man. Conch., 12, p. 289, pl. 40, figs. 4—8.
1900 *Scutus unguis* LINNAEUS. — NEWTON, Pleist. shells Red Sea, p. 503.
1911 *Scutus corrugatus* REEVE. — MARTIN-ICKE, Gastr. Trinil, p. 47.
1919 *Scutus corrugatus* REEVE. — K. MARTIN, Palaeoz. Kenntn. Java, p. 103.
1928 *Scutus unguis* (LINNÉ). — YOKOYAMA, Moll. Oil-Field Taiwan, p. 67, pl. 5, fig. 6.
1931 *Scutus corrugatus* REEVE. — VAN DER VLERK, Caenoz. Amphin., Gastr., p. 264.

Material examined:

Poetjangan layers (volcanic facies), layer I: Sheet 110A, M 298: 1 ex.; layer II: Sheet 110A, M 304: 1 ex.

This species, taken, as I did following E. A. SMITH, in a wide sense, is very variable. The specimen from loc. M 304 is an adult one; it has a rather oval outline and the following are its dimensions: Length: 42, Breadth: 23,5, Height: 12. The sculpture agrees with that of *Sc. corrugatus* REEVE (figs. 5, 6 of PILSBRY). The specimen from loc. M 298 is a young one. Its sides are nearly parallel and it has the following dimensions: Length 18,5, Breadth 9,5, Height: 4. It has been too badly preserved to examine the sculpture.

Fossil distribution:

Mal: Pliocene: Bentarsari Basin (Pekalongan, Java) (T. J. 54, pp. 25, 27); pliocene [= Upper Kalibèng layers]: Padasmalang (Madioen, Java).
Chi: pliocene: Taiwan Is. (= Formosa).
Ery: pleistocene: raised beaches of the Red Sea.

Recent distribution:

Mal, Mel, Que, Loy, Jap, Chi, Ind, Ery, Mad, Cap.

Bathymetrical distribution:

0—36 m.

Genus *Diodora* GRAY 1821.

2. DIODORA TICAONICA (REEVE).

+ 1850 *Fissurella Ticaonica.* — REEVE, Conch. Ic., 6, *Fissurella*, pl. 14, fig. 107.
1890 *Glyphis ticaonica* REEVE. — PILSBRY, Man. Conch., 12, p. 225, pl. 36, fig. 20.

Material examined:

Poetjangan layers (volcanic facies): Sheet 110B, C 44: 1 ex.

The only specimen of this species agrees with specimens from the Siboga Expedition (Z.M.A.).

Fossil distribution:

no previous records.

Recent distribution:

Mal, Tua, Jap, Chi.

Bathymetrical distribution:

0—45 m.

Familia Trochidae.

Genus *Perrinia* H. & A. ADAMS 1854.

3. PERRINIA ELISA (GOULD).

+ 1849 *Trochus elisus*. — GOULD, Proc. Bost. Soc. Nat. Hist., 3 (1851), p. 92.
1889 *Turcica elisa* GOULD. — PILSBRY, Man. Conch., 11, p. 417, pl. 67, figs. 67, 68, 69, 74.
1935 *Turcica elisa* (GOULD). — NOMURA, Cat. tert. a. quart. moll. Taiwan, 2, p. 212, pl. 10, fig. 15.

Material examined:

Poetjangan layers (volcanic facies): Sheet 110B, C 64: 1 ex.; layer II: Sheet 110A, M 126: 1 ex.; Sheet 110B, M 281: 1 ex.; M 304: 1 ex.; horizon above layer II: Sheet 110B, M 274: 1 ex.

The specimen from loc. C 64 has a rather flat base, but the convexity of the base proved to be pretty variable in the recent material of this species which I examined for comparison.

Fossil distribution:

Chi: pliocene (Byôritu beds): Taiwan Is. (= Formosa).

Recent distribution:

Mal, Que, Chi.

Bathymetrical distribution:

21—90 m.

4. PERRINIA MACULATA (BRAZIER).

Figure 3.

+ 1877 *Thalotia maculata* n. sp. — BRAZIER, Proc. Linn. Soc. N.S. Wales, 2, p. 44.
1889 *Turcica maculata* BRAZIER. — PILSBRY, Man. Conch., 11, p. 417, pl. 67, fig. 78.

Material examined:

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

My only specimen of this species has a more convex base than the specimen figured by PILSBRY. As the convexity of the base is variable in the closely related *P. elisa* (GOULD) (see above), I think this may

also be the case with *P. maculata* (BRAZIER). Its dimensions slightly exceed those mentioned by PILSBRY (Alt. 14, Diam. 11), they are: Alt. 16, Diam. 12,5.

Fossil distribution:

no previous records.

Recent distribution:

Bro, Mel, Que.

Bathymetrical distribution:

14—54 m.

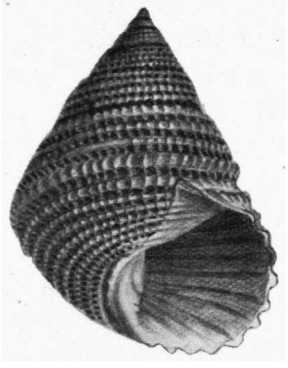


Fig. 3. *Perrinia maculata* (Brazier), × 3 (apex tilting slightly backward), from Sheet 93B, M 260, Upper Kalibèng layers.

Genus *Euchelus* PHILIPPI 1847.
Sectio *Euchelus* PHILIPPI.

5. EUCHELUS (EUCHELUS) ATRATUS (GMELIN).

+ 1790 *Turbo atratus*. — GMELIN in: LINNÉ, Syst. Nat., ed. 13, 1, p. 3601.
1888 *Euchelus asper* [non] GMELIN. — PILSBRY, Man. Conch., 10, p. 313, pl. 41, figs. 25, 26.
1889 *Euchelus atratus* GMELIN. — PILSBRY, ibid., 11, p. 439, pl. 38, fig. 22.
1934 *Euchelus atratus* (GMELIN). — NARDINI, Moll. spiagge em. Mar. Rosso, p. 248, pl. 18, fig. 16.

Material examined:

Poetjangan layers (volcanic facies): Sheet 110B, M 286: 1 fr.; layer II: Sheet 110B, M 176: 1 ex.; M 281: 2 ex.; Sheet 116A, M 216: 1 ex.; M 217: 1 ex.; M 219: 1 ex.; C 5: 1 ex.; C 37: 5 ex.; layer III: Sheet 110B, M 189: 2 ex.

The specimens agree with recent material of this species. To one of the shells from loc. C 37 specimens of *Ostrea* spec. and *Chama* spec. are fixed.

Fossil distribution:

Mal: pliocene or younger: Mud-volcano Kalang Anjar (Soerabaja, Java) (G.I.A.).
Ery: pleistocene: Dalahac Is. (Red Sea).

Recent distribution:

Mal, Bro, Mel, Que, Syd, Loy, Jap, Ind.

Bathymetrical distribution:

0—72 m.

Genus *Solariella* S. WOOD 1842.
Sectio *Solariella* S. WOOD.

6. SOLARIELLA (SOLARIELLA) KARIKALENSIS COSSMANN.

+ 1910 *Solariella karikalensis* nov. sp. — COSSMANN, Faune plioc. Karikal, 3, p. 76, pl. 5, figs. 18, 19.
1935 *Solariella karikalensis* COSSMANN. — OOSTINGH, Moll. Plioz. Boemiajoe, p. 4.

Material examined:

Upper Kalibèng layers: Sheet 93B, M 248: 1 ex.
Poetjangan layers (volcanic facies): Sheet 99 B, M 9: 1 ex.; layer I: Sheet 105B, M 87: 2 ex.; Sheet 110A, M 88: 3 ex.; M 89: 1 ex.
Poetjangan layers (argillaceous facies): Sheet 110B, M 263: 2 ex.; Sheet 115C, M 328: 3 ex.

The adult specimens are somewhat larger than those described by COSSMANN, and they possess secondary spiral ridges in the interstices between the primary ridges. They perfectly agree with OOSTINGH's description of specimens from the pliocene near Boemiajoe and with a specimen from the same locality kept in the Geological Institution at Amsterdam. The dimensions of my largest specimen (from loc. M 89) are: Alt. 12, Diam. 10.

Fossil distribution:

Mal: pliocene: Boemiajoe (Pekalongan, Java).
Ind: pliocene: Karikal.

Recent distribution:

not known living.

Genus *Calliostoma* SWAINSON 1840.
Subgenus *Calliostoma* SWAINSON.

7. CALLIOSTOMA (CALLIOSTOMA) TRANQUEBARICUM IJZERMANI subsp. nov.

Figures 4*a, b*, 5.

[1781 *Trochus conulus Tranquebaricus*, ... — CHEMNITZ, Syst. Conch. Cab., 5, p. 68, pl. 166, figs. 1595—1596.
+ 1840 *Trochus tranquebaricus* PFR. — L. PFEIFFER, Krit. Regist., p. VIII.

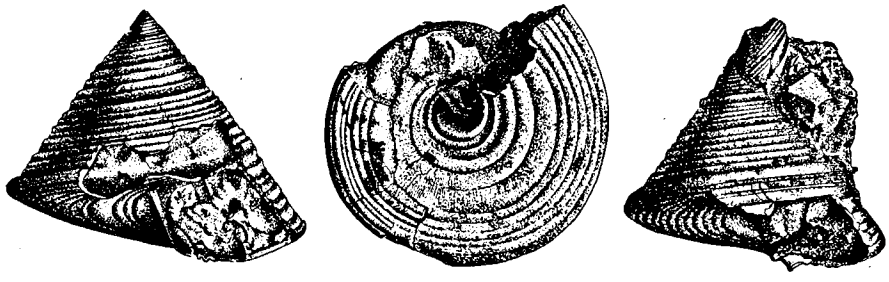
1889 *Calliostoma tranquebaricum* PFEIFFER. — PILSBRY, Man. Conch., **11**, p. 338, pl. 17, figs. 17, 18.
1908 *Calliostoma tranquebaricum* PFEIFFER. — HORST & SCHEPMAN, Cat. Syst., **3**, p. 470.]

Material examined:

Poetjangan layers (volcanic facies), layer II: Sheet 116A, C 34: 1 ex.; C 39: 1 ex.
Poetjangan layers (argillaceous facies): Sheet 110B, M 264: 1 ex.; M 267: 1 ex. (holotype).

This new subspecies differs from the typical *C. tranquebaricum* (L. PFEIFFER) by its spiral ridges being not obsolete or little pronounced, but conspicuous and threadlike. For the rest it agrees perfectly with the typical species. I have named this subspecies after Dr. R. IJZERMAN.

C. tranquebaricum (L. PFEIFFER) is recorded as a recent species only; it has been found at the Indian coast from Tranquebar to Viza-



4*a* 4*b* 5

Fig. 4*a, b*. *Calliostoma tranquebaricum ijzermani* subsp. n., paratype × 2½, from Sheet 116A, C 34, Poetjangan layers (volcanic facies), layer II.
Fig. 5. *Calliostoma tranquebaricum ijzermani* subsp. n., holotype × 1½, from Sheet 110B, M 267, Poetjangan layers (argillaceous facies).

gapatam and in the Gulf of Manaar. The occurrence of this species in Japan, as stated by HORST & SCHEPMAN, seems doubtful and needs confirmation.

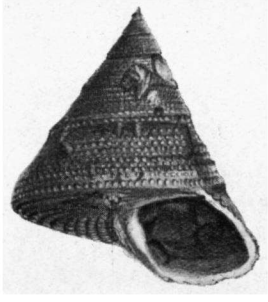
8. CALLIOSTOMA (CALLIOSTOMA) COSIJNI spec. nov.

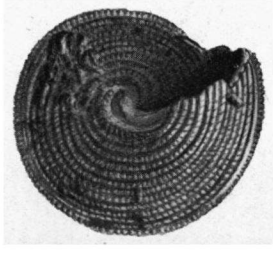
Figures 6*a, b*, 7.

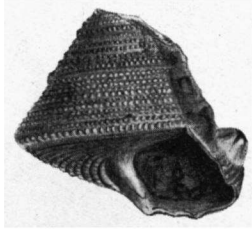
Material examined:

Upper Kalibèng layers: Sheet 105B, M 43: 1 ex.
Poetjangan layers (volcanic facies), layer I: Sheet 110A, M 291: 1 ex.; M 292: 2 ex.; M 295: 1 fr.; M 301: 5 ex.; C 1: 2 ex.; C 100: 1 ex. (holotype); layer I?: Sheet 110A, M 104: 1 ex.
Poetjangan layers (argillaceous facies): Sheet 110A, M 111: some fr.

Description: Shell conical, imperforate; whorls 8¾ in the holotype, presumably about 10 in quite adult specimens, flat; the bodywhorl of large specimens is concave above the middle and convex below, near the periphery. Sculpture starting on the second whorl, from the second to the fifth whorl it is reticulate: spiral lirae being crossed by transverse threadlike ridges. The strength of the transverse sculpture diminishes gradually; from the fifth whorl onward the sculpture consists of granulated spiral ridges only, stronger ones alternating irregularly with less stronger ones. Spiral lirae about 3 on the fourth whorl, about 9 on the seventh (on the bodywhorl of the largest paratype, from loc. C 1, their number is about 17). The basal edge of the whorls from the seventh onward may project over the suture. Base moderately convex, with 12 concentric granulate ridges. Mouth rhombiform; outer lip sharp; inner lip reflected over the straight columella, smooth, with a pearly shine.







6*a* 6*b* 7

Figs. 6*a*, *b*. *Calliostoma cosijni* sp. n., holotype × 2, from Sheet 110A, C 100, Poetjangan layers (volcanic facies), layer I.

Fig. 7. *Calliostoma cosijni* sp. n., paratype × 2, from Sheet 110A, M 104, Poetjangan layers (volcanic facies), layer I?

Alt. 17, Diam. 16 (holotype).

Alt. 20 + ?, Diam. 21,5 (largest paratype, from loc. C 1).

I have named this new species after Dr. J. COSIJN.

Calliostoma cosijni spec. nov. is closely related to *C. ornatum* (LAMARCK) [23]), which has, however, more convex whorls and of which the spiral lirae are more unequal in size. It seems to be rather closely related to *C. dyscritum* COSSMANN[24]) too; it differs from that species by its greater apical angle (62°——° instead of 45°), by the relation of height: breadth of the whorls being 1:4 instead of 1:3, by its larger dimensions and by its columella making a greater angle with the axis of the shell.

[23]) PILSBRY, 1889, Man. Conch., 11, p. 340, pl. 16, fig. 3.

[24]) COSSMANN, 1910, Fauna plioc. Karikal, 3, p. 80, pl. 5, figs. 24, 25.

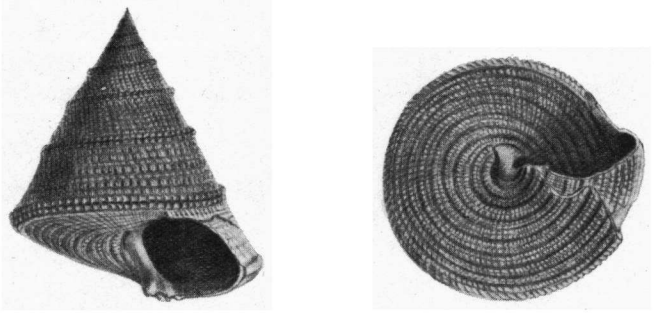
9. CALLIOSTOMA (CALLIOSTOMA) SOLOENSE spec. nov.

Figures 8*a, b*.

Material examined:

Upper Kalibèng layers: Sheet 93B, M 255: 1 ex. (holotype).

Description: Shell regularly conical, imperforate; whorls 10. Sculpture starting on the second half of the second whorl and consisting of spiral lirae, which are crossed by equal strong transversal ridges; ridges nodulous in consequence of this decussation. The number of spiral ridges increases from 3 on the second to about 12 on the last whorl; new spiral ridges start intermediate and smaller than the others and increase gradually to an equal strength. The whorls are perfectly plane but for a projecting basal keel bearing two spiral lirae, which runs above the suture. The base is rather flat and has a con-



8*a* 8*b*

Figs. 8*a, b*. *Calliostoma soloënse* sp. n., holotype × 2, from Sheet 93B, M 255, Upper Kalibèng layers.

centric sculpture consisting of about 12 ridges and finer ones in the interstices. At the periphery two lirae of the stronger type run close together. Owing to the crossing of radiating striae the concentric sculpture is nodulous. Mouth rhombiform, inner and outer lip parallel; outer lip thin (damaged in my specimen), inner lip reflected on the columella, with a pearly shine.

Alt. 20, Diam. 19.

I have named this new species after the river Solo.

Calliostoma soloënse spec. nov. is related to *C. nobilis* (PHIL.) [25]), which has, however, an even flatter base and differs in the characters of its sculpture.

[25]) PILSBRY, 1889, Man. Conch., 11, p. 349, pl. 15, figs. 47—49.

10. CALLIOSTOMA (CALLIOSTOMA) SIMPLEX SCHEPMAN.

Figure 9.

+ 1908 *Calliostoma simplex* n. sp. — SCHEPMAN, Prosobr. Siboga Exp., 1, p. 64, pl. 5, fig. 5.

Material examined:

Poetjangan layers (volcanic facies), layer II: Sheet 110B, M 176: 1 ex.; M 278: 1 ex.

The specimen from loc. M 176 only slightly differs from the type specimen (Z.M.A.): the bodywhorl has 6 instead of 7 beaded spiral lirae and in the interstices between the 4th and the 5th and between the 5th and the 6th spiral lira very minute secondary spiral ridges are running. The specimen from loc. M 278 has only 5 primary spiral lirae on the bodywhorl, but here secondary ones are to be found in all the interstices. In the interspaces of the most central concentric lirae of the base of the shell secondary lirae occur too in this specimen. I found

Fig. 9. *Calliostoma simplex* Schepman, × 3, from Sheet 110B, M 176, Poetjangan layers (volcanic facies), layer II.

also a beginning of two secondary lirae on the base of the type specimen close at the mouth; they have been omitted in SCHEPMAN's figure.

The dimensions of the specimen from loc. M 176 are: Alt. 13, Diam. 11.

Calliostoma inaequiliratum COSSMANN [26]) seems to be very closely related to this species; it has, however, a larger apical angle (65° instead of 55°—60°) and its sculpture is a little different.

Fossil distribution:

no previous records.

Recent distribution:

Mal (type locality only: 5° 48'. 2 S, 132° 13' E [27]), near the Kei Islands).

[26]) COSSMANN, 1910, Faune plioc. Karikal, 3, p. 78, pl. 5, figs. 22, 23.
[27]) SCHEPMAN (l. c.) erroneously quotes 123° 13' instead of 132° 13'.

Bathymetrical distribution:

304 m.

Genus *Cantharidus* MONTFORT 1810.
Subgenus *Thalotia* GRAY 1847.

11. **CANTHARIDUS (THALOTIA)** spec.

Material examined:

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

Judging from the form of the mouth a damaged shell belongs to the subgenus *Thalotia* GRAY of the genus *Cantharidus* MONTFORT. Perhaps it belongs to *C. (Thalotia) elongatus* (W. WOOD) [28]) or a closely related species.

Genus *Trochus* LINNÉ 1758.
Subgenus *Tectus* MONTFORT 1810.

12. **TROCHUS (TECTUS) FENESTRATUS** GMELIN.

+ 1790 *Trochus fenestratus.* — GMELIN in: LINNÉ, Syst. Nat., ed. 13, 1, p. 3582.
1889 *Trochus fenestratus* GMELIN. — PILSBRY, Man. Conch., 11, p. 22, pl. 4, figs. 28, 29.
1913 *Trochus fenestratus* GMEL. — PRATT & SMITH, Geol. Bondoc Penin., pp. 312, 324, pl. 1, fig. 8.
1922 *Trochus fenestratus* GMELIN. — DICKERSON, Rev. Philipp. Paleont., p. 229, pl. 15, fig. 8.
1923 *Trochus (Tectus) fenestratus* GMELIN. — OOSTINGH, Rec. shells Java, p. 14.

Material examined:

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

Fossil distribution:

Mal: pleistocene: province of Tayabas (Luzon, Philippines).

Recent distribution:

Mal, Bro, Fre, Mel, Que, Loy.

Bathymetrical distribution:

0—34 m.

Subgenus *Rochia* GRAY 1857.

13. **TROCHUS (ROCHIA) CONUS** GMELIN.

1781 *Trochus acutangulus, ...* — CHEMNITZ, Syst. Conch. Cab., 5, p. 81, pl. 167, fig. 1610.
+ 1790 *Trochus Conus.* — GMELIN in: LINNÉ, Syst. Nat., ed. 13, 1, p. 3569.
1889 *Trochus acutangulus* CHEMNITZ. — PILSBRY, Man. Conch., 11, p. 18, pl. 2, fig. 10.
1920 *Trochus* (s. str.) *acutangulus* CHEMN. — TESCH, Timor, 2, p. 74, pl. 133, fig. 215.
1931 *Trochus acutangulus* CHEMN. — VAN DER VLERK, Caenoz. Amphin., Gastr., p. 263.

[28]) PILSBRY, 1889, Man. Conch., 11, p. 143, pl. 45, fig. 56.

Material examined:

Upper Kalibèng layers: Sheet 99B, M 6: 2 ex.
Poetjangan layers (volcanic facies): Sheet 105A, M 28: 1 ex.

The specimens are very badly preserved, but as far as is to be seen they agree in every respect with recent specimens of this species, with which I compared them. So the identification seems to be pretty safe.

Fossil distribution:

Mal: young pliocene or old pleistocene: near Niki-Niki (Timor).

Recent distribution:

Mal, Mel, Loy, Jap.

Bathymetrical distribution:

not recorded.

14. TROCHUS (ROCHIA) NILOTICUS LINNÉ.

+ 1767 *Trochus niloticus*. — LINNÉ, Syst. Nat., ed. 12, p. 1227.
1889 *Trochus niloticus* LINNÉ. — PILSBRY, Man. Conch., **11**, p. 17, pl. 1, figs. 5—8.
1923 *Trochus* (s. str.) *niloticus* LINNÉ. — OOSTINGH, Rec. shells Java, p. 12.
1928 *Trochus niloticus* LINN. — K. MARTIN, Moll. Neog. Atjeh, pp. 5, 15.
1931 *Trochus niloticus* LINN. — VAN DER VLERK, Caenoz. Amphin., Gastr., p. 264.
1935 *Trochus (Pyramidea) niloticus* LINNAEUS. — NOMURA, Cat. tert. a. quart. moll. Taiwan., **2**, p. 211, pl. 10, fig. 46.
1937 *Trochus niloticus* LINN. — RAO, Rec. Ind. Mus., **39**, pp. 47. seq.

Material examined:

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

Fossil distribution:

Mal: pliocene: Atjeh (Sumatra).
Chi: holocene: Taiwan Is. (= Formosa).

Recent distribution:

Mal, Bro, Mel, Que, Loy, Pol, Mic, Jap, Chi, Ind, Mad.

Bathymetrical distribution:

0—36 m.

TROCHUS spec.

Material examined:

Upper Kalibèng layers: Sheet 99B, M 6: 1 ex.
Poetjangan layers (volcanic facies), layer II: Sheet 116A, M 227: 1 ex.

These specimens are preserved even too badly to identify the subgenus to which they belong.

Genus *Monilea* SWAINSON 1840.
Sectio *Monilea* SWAINSON.

15. MONILEA (MONILEA) CALLIFERA (LAMARCK).

+ 1822 *Trochus calliferus.* — LAMARCK, An. s. Vert., 7, p. 27.
1889 *Monilea callifera* LAMARCK. — PILSBRY, Man. Conch., 11, p. 247, pl. 41, figs. 1—5.
1911 *Gibbula (Monilea) callifera* LAM. — MARTIN-ICKE, Gastr. Trinil, p. 47.
1919 *Gibbula callifera* LAMK. — K. MARTIN, Palaeoz. Kenntn. Java, p. 102.
1931 *Gibbula callifera* LAMK. — VAN DER VLERK, Caenoz. Amphin., Gastr., p. 263.

Material examined:

Upper Kalibèng layers: Sheet 93B, M 249: 1 ex. + 1 fr.
Poetjangan layers (volcanic facies): Sheet 99B, M 9: 1 ex.; M 13: 1 ex.; Sheet 110A, M 130: 2 ex.; layer I: Sheet 110A, C 60: 1 ex.; Sheet 110B, M 153: 1 ex.; ± layer I: Sheet 110A, M 294: 2 ex.; layer II: Sheet 110A, M 313: 4 ex.; C 54: 1 ex.; Sheet 110B, M 177: 44 ex. + some fr.; M 281: 4 ex.; C 3: 3 ex.; C 29: 7 ex.; C 68: 1 ex.; Sheet 116A, M 214: 2 ex.; M 218: 1 ex.; M 219: 3 ex.; C 33: 1 ex.; C 34: 1 ex.; C 35: 11 ex.; C 37: 12 ex.; C 39: 1 ex.; C 40: 1 ex.; layer III: Sheet 110A, M 139: 6 ex. + 3 fr.; Sheet 110B, M 189: 2 ex.
Kaboeh layers: Sheet 110B, M 197: 1 ex.

The shells agree with recent malayan specimens of this species; like these they show some variability in the relation Alt.: Diam.

Fossil distribution:

Mal: pliocene [= Upper Kalibèng layers]: Padasmalang (Madioen, Java); pliocene or younger: Mud-vulcano Kalang Anjar (Soerabaja, Java) (G.I.A.).

Recent distribution:

Mal, Mel, Que, Jap, Ind.

Bathymetrical distribution:

not recorded.

16. MONILEA (MONILEA) CALYCULUS (W. WOOD).

+ 1828 *Trochus Calyculus.* — W. WOOD, Suppl. Ind. Test., p. 18, pl. 6, fig. 44.
1889 *Monilea calyculus* WOOD. — PILSBRY, Man. Conch., 11, pp. 247, 470, pl. 41, fig. 14, pl. 61, fig. 13.

Material examined:

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

The single shell agrees in every respect with specimens from the Siboga Expedition (Z.M.A.). There are distinct traces left from the colour pattern.

Fossil distribution:

no previous records.

Recent distribution:
Mal, Ind, Ery.

Bathymetrical distribution:
2—80 m.

MONILEA (MONILEA) spec.

1911 *Turbo* spec. 1. — MARTIN-ICKE, Gastr. Trinil, p. 47.

Material examined:
Poetjangan layers (volcanic facies): Sheet 99B, M 9: 1 ex.

In the Geological Museum at Leiden I could examine two specimens referred to by mrs. MARTIN-ICKE as „*Turbo* spec. 1". They undoubtedly belong to the genus *Monilea* SWAINSON, and if not to the above mentioned *M. calyculus* (WOOD) to a very closely related species. The largest of these two specimens is larger than any shell of *M. calyculus* (WOOD) I ever saw, and they differ both from typical specimens of this species in the conformation of the umbilical area.

A damaged specimen from loc. M 9 resembles these two shells; I have labelled it: *Monilea* spec.

Genus *Umbonium* LINK 1807.

17. UMBONIUM VESTIARIUM (LINNÉ).

+ 1758 *Trochus vestiarius*. — LINNÉ, Syst. Nat., ed. 10, p. 758.
1889 *Umbonium vestiarium* LINNÉ. — PILSBRY, Man. Conch., 11, p. 450, pl. 58, figs. 1—8, 24, 25.
1929 *Globulus vestiarus* LAM. — SIEMON, Jungtert. Moll. Niederl. O.-Ind., p. 40.
1931 *Globulus vestiarum* LAM. — VAN ES, Age *Pithecanthr.*, p. 45.
1931 *Umbonium vestiarium* LINN. — VAN ES, ibid., p. 116.
1931 *Umbonium vestiarum* LAMK. — VAN DER VLERK, Caenoz. Amphin., Gastr., p. 264.
1932 *Umbonium vestiarium* L. — K. MARTIN, Foss. Kedoengwaroe, p. 114.
1935 *Umbonium (Umbonium) vestiarium* (LINNAEUS). — NOMURA, Cat. tert. a. quart. moll. Taiwan, 2, p. 213, pl. 10, figs. 26a, 26b.

Material examined:
Poetjangan layers (volcanic facies): Sheet 110A, M 120: 1 ex.; M 134: 2 ex.; Sheet 110B, M 169: 10 ex.; M 170: 1 ex.; layer I: Sheet 110A, M 94b: 14 ex.; M 95: 2 ex.; M 100: many ex.; M 102: 11 ex.; M 291: 1 ex.; M 292: 1 ex.; M 301: 1 ex.; horizon above layer I: Sheet 110B, M 274: many ex.; layer II: Sheet 110A, M 122: 2 ex.; M 125: 2 ex.; Sheet 110B, C 2: 1 ex.; C 3: 2 ex.; Sheet 116A, M 216: many ex. (most of them enclosed in conglomerate); C 34: 3 ex.; layer III: Sheet 110A, M 139: 5 ex.; Sheet 110B, M 181: many ex.
Kaboeh layers: Sheet 110B, C 28: many ex. (part of them enclosed in conglomerate).

The specimens agree with recent material of the species; some of them match the var. *depressa* A. ADAMS (figs. 24, 25 of PILSBRY).

Fossil distribution:

Mal: pliocene: Tjidjadjar (Cheribon, Java); E. of Tjidjoelang (Banjoemas, Java) (T. J. 54, p. 37); „upper pliocene" [= Poetjangan layers (volcanic facies), layer II]: Soemberringin; between Djetis and Sidoteko (Soerabaja, Java).
Chi: pliocene (Byôritu beds): Taiwan Is. (= Formosa).

Recent distribution:

Mal, Mel, Chi, Ind, Ery, Cap.

Bathymetrical distribution:

not recorded.

Genus *Angaria* ROEDING 1798.
Sectio *Angaria* ROEDING.

18. ANGARIA (ANGARIA) DELPHINUS (LINNÉ).

+ 1758 *Turbo Delphinus.* — LINNÉ, Syst. Nat., ed. 10, p. 764.
? 1879 *Delphinula laciniata* LAM. (?) — K. MARTIN, Tertiärsch. Java, p. 75, pl. 13, fig. 3.
? 1879 *Delphinula fossilis* nov. spec. — K. MARTIN, ibid., p. 75, pl. 13, fig. 4.
1888 *Delphinula laciniata* LAMARCK. — PILSBRY, Man. Conch., 10, p. 266, pl. 67, figs. 1, 2, 4 (type), pl. 65, figs. 6, 7, pl. 66, figs. 15, 19 (vars.).
? 1905 *Delphinula laciniata* LAM. ? — K. MARTIN, Foss. Java, p. 281.
1908 *Delphinula laciniata* LMK. — O. BOETTGER, Tert. u. jüng. Verst., p. 673.
? 1911 *Delphinula laciniata* LAM. (?) — K. MARTIN, Vorl. Bericht, 1, p. 52.
? 1919 *Delphinula laciniata* LAMK. (?) — K. MARTIN, Palaeoz. Kenntn. Java, p. 103, 129.
1920 *Delphinula laciniata* LAM. var. *atrata* CHEMN.—TESCH, Timor, 2, p. 78, pl. 133, fig. 220.
1925 *Delphinula delphinus* (LINNÉ). — OOSTINGH, Obi and Halmahera, p. 14.
1931 *Delphinula laciniata* LAMK. [partim.]. — VAN DER VLERK, Caenoz. Amphin., Gastr., p. 264.

Material examined:

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

My only specimen of this species is in a rather bad condition. Nevertheless I think the identification pretty safe, but it is impossible to see if it belongs to the f. *typica* or to some variety.

Fossil distribution:

Mal: upper miocene: ?W. part of the district of Tjidamar (JUNGHUHN's loc. K), ? at Liotjitjangkang (JUNGHUHN's loc. P) (Priangan, Java); pliocene: Noil Soesoe (Timor); quaternary?: Soemba.

Recent distribution:

Mal, Bro, Mel, Que, Loy, Mic, Jap, Chi, Ind, Mad.

Bathymetrical distribution:

0—45 m.

Familia Turbinidae.
Genus *Leptothyra* PEASE 1869.

19. LEPTOTHYRA DUYFJESI spec. nov.

Figures 10*a, b, c.*

Material examined:

Poetjangan layers (argillaceous facies): Sheet 115D, M 337: some fr. of 2 or more ex.; Sheet 116B, M 333: 1 ex. (holotype).

Description: Shell globose, solid, imperforate; whorls 4½. Sculpture: spiral ridges crossed by minute lines of growth. On the penultimate whorl there are 9 spiral ridges, on the bodywhorl about 15, those on the base being less strong than those at and above the periphery. Mouth deflected, oval, making an angle of about 45° with the axis of the shell; inner lip expanded on the parietal and umbilical area. Inner surface pearly.

Alt. 9,5, Diam. 10 + ?

I have named this new species after Ir. J. DUYFJES.

10*a* 10*b* 10*c*

Figs. 10*a, b, c.* *Leptothyra duyfjesi* sp. n., holotype × 2, from Sheet 116B, M 333, Poetjangan layers (argillaceous facies).

Leptothyra duyfjesi spec. nov. is related to *L. amussitata* (GOULD) [29]) and others, but I do not know any species which resembles it very closely.

Genus *Turbo* LINNÉ 1758.
Subgenus *Marmarostoma* SWAINSON 1829.

20. TURBO (MARMAROSTOMA) SONDEIANUS K. MARTIN.

Figure 11.

+ 1905 *Turbo (Senectus) sondeianus* spec. nov. — K. MARTIN, Foss. Java, p. 275, pl. 40, fig. 664.
1908 *Turbo sondeianus* MART. — K. MARTIN, Alt. Sch. Sondé u. Trinil, p. 9.
1911 *Turbo (Senectus) sondeianus* MART. — MARTIN-ICKE, Gastr. Trinil, p. 47.
1919 *Turbo sondeianus* MART. — K. MARTIN, Palaeoz. Kenntn. Java, pp. 102, 142.
1928 *Turbo sondeianus.* — K. MARTIN, Nachl. neog. Moll. Java, p. 116.
1931 *Turbo sondeianus* MART. — VAN DER VLERK, Caenoz. Amphin., Gastr., p. 263.

Material examined:

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

[29]) PILSBRY, 1888, Man. Conch., 10, p. 250, pl. 55, figs. 71, 72.

The sculpture of my specimens is in a better state of preservation than that of the type specimen in the Leiden Museum. The spiral sculpture is crossed by rather regular lines of growth, which divide the spiral ridges into little squares.

Fossil distribution:

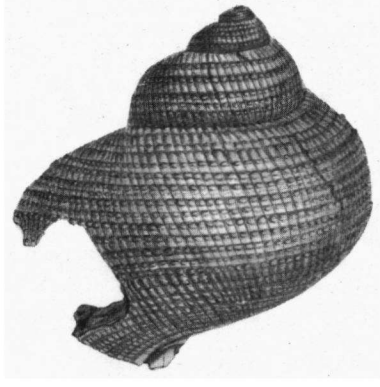
Mal: upper miocene: Tjilanang (Priangan, Java); pliocene [= upper Kalibèng layers]: Sonde, Padasmalang (Madioen, Java).

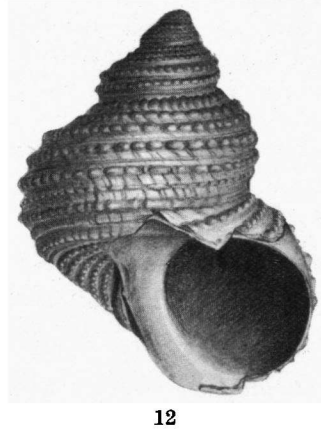
Recent distribution:

not known living.

21. TURBO (MARMAROSTOMA) GEMMATUS REEVE.

Figure 12.





11. 12

Fig. 11. *Turbo (Marmarostoma) sondeianus* K. Martin, × 1½, from Sheet 93B, M 260, Upper Kalibèng layers.

Fig. 12. *Turbo (Marmarostoma) gemmatus* Reeve, × 1½, from Sheet 93B, M 260, Upper Kalibèng layers.

\+ 1848 *Turbo gemmatus*. — REEVE, Conch. Ic., 4, *Turbo*, pl. 12, fig. 62.
1888 *Turbo gemmatus* REEVE. — PILSBRY, Man. Conch., 10, p. 206, pl. 44, figs. 68, 69.
1908 *Turbo (Senectus) gemmatus* REEVE. — SCHEPMAN, Prosobr. Siboga Exp., 1, p. 25, pl. 6, fig. 11.
1911 *Turbo (Senectus) ticaonicus* [non] REEVE. — MARTIN-ICKE, Gastr. Trinil, p. 47.
1919 *Turbo ticaonicus* [non] REEVE. — K. MARTIN, Palaeoz. Kenntn. Java, p. 102.
1931 *Turbo ticaonicus* [non] REEVE. — VAN DER VLERK, Caenoz. Amphin., Gastr., p. 263.

Material examined:

Upper Kalibèng layers: Sheet 93B, M 260: 1 ex.
Poetjangan layers (volcanic facies), layer II: Sheet 110A, M 313: 1 ex.; Sheet 110B, M 219: 2 ex.; Sheet 116A, C 37: 5 ex.

My largest specimen (from loc. M 260, Alt. 35 + x) considerably exceeds in dimensions the largest specimen from the Siboga Expedition (Alt. 24), for the rest these fossil shells agree in every respect with the specimens dredged by the Siboga.

Dr. R. IJZERMAN had already observed that the specimens labelled „*Turbo ticaonicus* REEVE" by mrs. MARTIN-ICKE, which are kept in the Geological Museum at Leiden, really belong to the present species.

Fossil distribution:

Mal: pliocene [= upper Kalibèng layers]: Padasmalang (Madioen, Java).

Recent distribution:

Mal, Que.

Bathymetrical distribution:

13—36 m.

22. TURBO (MARMAROSTOMA) spec.

Material examined:

Poetjangan layers (volcanic facies): Sheet 110B, M 156: 1 ex.

One damaged specimen belongs to another species of the subgenus *Marmarostoma* SWAINSON.

Subgenus *Lunella* ROEDING 1798.

23. TURBO (LUNELLA) CINEREUS BORN.

+ 1778 *Turbo cinereus*. — BORN, Ind. Mus. Caes. Vind., p. 356.
1873 *Turbo versicolor* GMELIN. — P. FISCHER, Coq. Viv., 10, *Turbo*, p. 71, pl. 7, fig. 2, pl. 28, fig. 3, pl. 36, fig. 6.
1873 *Turbo mespilus* GMELIN. — P. FISCHER, ibid., p. 73, pl. 35, fig. 2.
1873 *Turbo porcatus* REEVE. — P. FISCHER, ibid., p. 75, pl. 35, figs. 3, 3a.
1879 *Turbo versicolor* GMEL. — K. MARTIN, Tertiärsch. Java, p. 70, pl. 12, fig. 5.
1888 *Turbo porphyrites* MARTYN and var. *porcatus* RVE. — PILSBRY, Man. Conch., 10, pp. 215, 216, pl. 50, fig. 58, pl. 48, fig. 34.
1905 *Turbo (Marmorostoma) versicolor* GMEL. — K. MARTIN, Foss. Java, p. 276, pl. 41, fig. 666.
1908 *Turbo versicolor* GMEL. — K. MARTIN, Alt. Sch. Sondé u. Trinil, p. 9.
1919 *Turbo versicolor* GMEL. — K. MARTIN, Palaeoz. Kenntn. Java, p. 102, 142, 154.
1921 *Turbo versicolor* GMEL. — P. J. FISCHER, Pliocänfauna Seran, p. 243.
1927 *Turbo (Marmorostoma) versicolor* GMEL. — P. J. FISCHER, Seran u. Obi, p. 38.
1931 *Turbo versicolor* GMEL. — VAN DER VLERK, Caenoz. Amphin., Gastr., p. 263.

Material examined:

Poetjangan layers (volcanic facies), layer II: Sheet 110B, M 176: 1 ex.

My only specimen of this species belongs to the f. *porcata* REEVE, it strikingly agrees with P. FISCHER's figures of this form (l. c., pl. 35, figs. 3, 3a). This form has not yet been recorded as a fossil.

Fossil distribution:

Mal: upper miocene: W. part of the district of Tjidamar and Tjikarang W. of Tjilaoet Eureun (Locs. K and R of JUNGHUHN; Priangan, Java); pliocene: Tjimantjeuri (Bantam, Java) (T. J. 14, p. 34); [= upper Kalibèng layers]: Sonde (Madioen, Java); Ceram.

Recent distribution (regions from which the f. *porcata* REEVE has been recorded are marked with an +):
+Mal, +Bro, +Mel, Que, Loy, Chi, Ind, +Mad.

Bathymetrical distribution:
18—55 m.

TURBO spec.

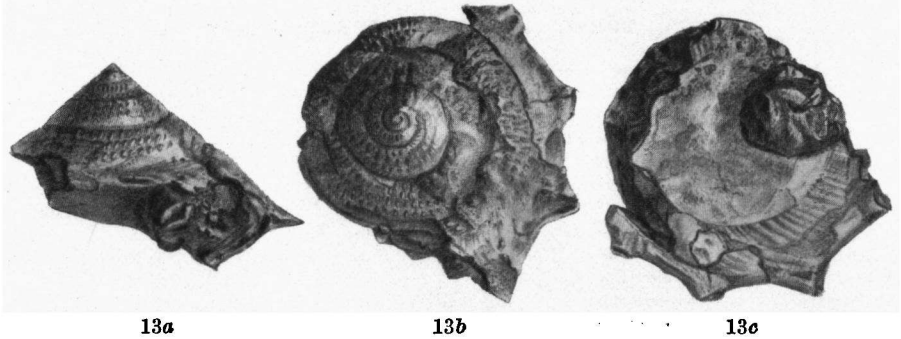
Material examined

Upper Kalibèng layers: Sheet 93B, M 260: 4 opercula.
Poetjangan layers (volcanic facies), layer II: Sheet 110B, M 177: 2 opercula.

Genus *Astralium* LINK 1807.
(= *Astraea* ROEDING 1798 non *Astrea* P. BROWNE 1789).
Sectio *Guildfordia* GRAY 1850.

24. **ASTRALIUM (GUILDFORDIA)** cf. **TRIUMPHATOR** (K. MARTIN).

Figures 13*a, b, c*.



13*a* 13*b* 13*c*

Figs. 13*a, b, c*. *Astralium (Guildfordia)* cf. *triumphator* (K. Martin), × 1, from Sheet 110A, M 291, Poetjangan layers (volcanic facies).

[+ 1879 *Trochus triumphator* nov. spec. — K. MARTIN, Tertiärsch. Java, p. 72, pl. 12, fig. 8.
1919 *Astralium triumphator* MART. — K. MARTIN, Palaeoz. Kenntn. Java, p. 102, 154.
1931 *Astralium triumphator* MART. — VAN DER VLERK, Caenoz. Amphin., Gastr., p. 262.].

Material examined:

Poetjangan layers (volcanic facies), layer I: Sheet 110A, C 102: 1 ex.; M 291: 1 ex. + 2 fr.

Two bad specimens and some fragments are referred with doubt to this species. They differ from MARTIN's types by the conformation of the umbilical area, which is so completely covered by a thick callus, that not the slightest trace of an umbilical excavation is left.

The dimensions of my specimens are:
Diam. 42 + ?, Alt. 27,5 (ex. from loc. M 291).
Diam. 57, Alt. 32 + ? (ex. from loc. C 102).

Astralium triumphator (K. MARTIN) is recorded from the upper miocene at Tjikarang (loc. R of JUNGHUHN; Priangan, Java) only.

Sectio *Cyclocantha* SWAINSON 1840.

25. ASTRALIUM (CYCLOCANTHA) PETROSUM (MARTYN).

+ 1784 *Trochus petrosus*. — MARTYN, Univ. Conch., 4, n. 124.
1875 *Calcar rhodostomum* LAMARCK. — P. FISCHER, Coq. Viv., 11, *Trochus*, p. 33, pl. 23, fig. 2.
1888 *Astralium petrosum* MARTYN. — PILSBRY, Man. Conch., 10, p. 234, pl. 64, figs. 65, 66.

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

My only specimen of this species has 7¼ whorls and the following dimensions: Alt. 20, Diam. 17,5. According to PILSBRY the number of whorls is 6 (Alt. 30—35) according to FISCHER 6—7 (Alt. 31). I think these figures are too small owing to the fact that in adult specimens the topwhorls are always in a very bad condition and cannot be counted exactly. They happen to be very well preserved in the present specimen; this being not quite adult I think the number of whorls may be 8 or more in adult specimens.

Fossil distribution:
no previous records.

Recent distribution:
Mal, Mel, Que, Loy, Tua, Pol, Haw, Mic, Chi.

Bathymetrical distribution:
10 m.

Sectio *Bolma* RISSO 1826.

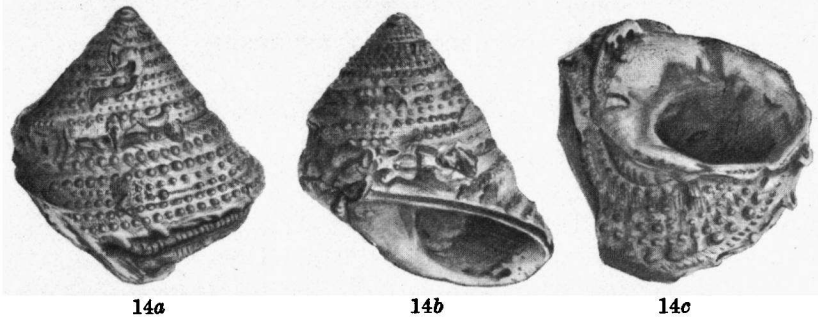
26. ASTRALIUM (BOLMA) KENDENGENSE spec. nov.

Figures 14*a, b, c*, 15*a, b*.

Material examined:
Poetjangan layers (volcanic facies): Sheet 99B, M 24: 1 ex.; layer I: Sheet 110A, M 292: 2 ex. (holotype + young paratype); M 298: 1 ex.; M 301: 1 ex.; C 1: 1 ex.

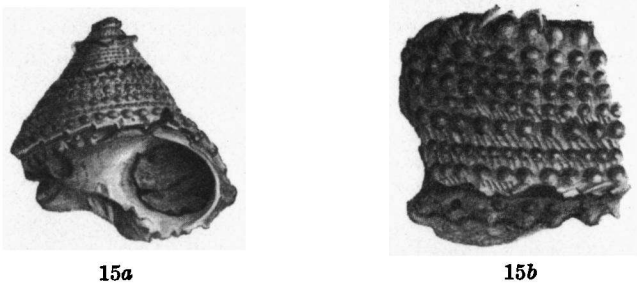
Description: Shell broadly conical, apex flattened. Whorls 6, somewhat concave in the holotype, nearly flat in the paratypes, boardered

by a keel bearing little spines, which are obsolete in the holotype, but which are especially conspicuous on the third and fourth whorls in one of the best preserved paratypes. Sculpture consisting of rather regular spiral rows of beads, 4 on the fourth whorl, this number increasing gradually to 7 (holotype) or 8 (paratype) on the bodywhorl. Through a lens very fine lines of growth are visible, especially in the interstices between the spiral rows of beads; they make an angle of about 45° with the axis of the shell. In the above mentioned, well preserved, paratype here and there equally minute spiral striae are to



14*a* 14*b* 14*c*

Figs. 14*a, b, c.* *Astralium (Bolma) kendengense* sp. n., holotype × 1½, from Sheet 110A, M 292, Poetjangan layers (volcanic facies).



15*a* 15*b*

Figs. 15*a, b.* *Astralium (Bolma) kendengense* sp. n., paratype, fig. *a*: × 1½, fig. *b*: detail of sculpture × 2, from Sheet 110A, M 24, Poetjangan layers (volcanic facies).

be seen, crossing the lines of growth. Base convex, with 6 concentric series of beads, the penultimate with stronger and fewer beads, separated from the spiny keel by a spiral depression in which runs a fine granulated spiral ridge. Bodywhorl deflected near the mouth. Mouth making an angle of about 45° with the axis of the shell; inner lip dilated over the umbilical area and parietal wall.

Alt. 25, Diam. 24 + ? (holotype).

Alt. 21 + ?, Diam. 20 + ? (paratype from loc. M 24).

I have named this new species after the Kendeng Mountains.

The sculpture of the present species agrees very well with the

sculpture of *Astralium (Lithopoma) graniferum* (K. MARTIN) [30]) from the javanese miocene. It is, however, twice as large as that species and moreover differs from it by its suture, which is not canaliculated, and in the characters of its mouth, which are those of the subgenus *Bolma* RISSO. *Astralium (Bolma) modestum* REEVE [31]) seems to be related to this new species, but it has a coarser sculpture and its sutures are canaliculated.

Familia Neritidae.
Genus *Nerita* LINNÉ 1758.
Subgenus *Nerita* LINNÉ.
Sectio *Ritena* GRAY 1858.

27. NERITA (RITENA) UNDATA LINNÉ.

+ 1758 *Nerita undata.* — LINNÉ, Syst. Nat., ed. 10, p. 779.
1879 *Nerita undata* LAM. — K. MARTIN, Tertiärsch. Java, p. 83, pl. 13, fig. 17.
1888 *Nerita undata* LINN. — TRYON, Man. Conch., 10, p. 28, pl. 5, figs. 86—94, pl. 6, figs. 96—98.
1889 *Nerita undata* L. — MARTENS, *Nerita* u. *Neritopsis*, p. 34, pl. 6, figs. 10—16.
1889 *Nerita striata* BURROW. — MARTENS, ibid., p. 37, pl. 7, figs. 1—5.
1889 *Nerita Spengleriana* RECL. — MARTENS, ibid., p. 39, pl. 7, figs. 6, 7.
1889 *Nerita quadricolor* GM. — MARTENS, ibid., p. 41, pl. 1, figs. 19, 20, pl. 8, figs. 8—13.
1901 *Nerita quadricolor* GM. — WERTH, Kenntn. jüng. Abl. trop. O.-Afrika, p. 292.
1919 *Nerita undata* LINN. — K. MARTIN, Palaeoz. Kenntn. Java, p. 101.
1925 *Nerita undata* LINNÉ. — OOSTINGH, Obi and Halmahera, p. 21.
1928 *Nerita undata.* — K. MARTIN, Nachlese, pp. 111, 116.
1930 *Nerita undata* LINNÉ. — COX, Kenya, p. 134.
1931 *Nerita undata* LINN. — VAN DER VLERK, Caenoz. Amphin., Gastr., p. 261.
1934 *Nerita undata* LIN. and var. *striata* BURROW .— NARDINI, Moll. spiagge em. Mar Rosso, pp. 240, 241, pl. 18, figs. 8, 9.
† 1935 *Nerita undata* LINNAEUS. — NOMURA, Cat. tert. a. quart. moll. Taiwan, 2, p. 218, pl. 10, fig. 21.

Material examined:

Poetjangan layers (volcanic facies), layer II: Sheet 110A, M 122: 1 ex.

My only specimen has a rather coarse sculpture and its habitus is pretty compact, but it appeared that recent specimens of this species may show these pecularities too.

The specimens from the holocene of Taiwan (= Formosa) are said to agree „as a whole" with *Nerita funiculata* REEVE, which TRYON [32]) considers to be only a variety of this species. Other authors, e. g. VON MARTENS [33]), think *N. funiculata* REEVE a good species, and I am inclined to the latter opinion. So I have cited the reference to NOMURA

[30]) PANNEKOEK, 1936, Altmioc. Moll. Rembang, p. 60, pl. 3, fig. 40 (refers to further literature).
[31]) PILSBRY, 1888, Mann. Conch., 10, p. 229, pl. 55, figs. 63, 64.
[32]) 1888, Man. Conch., 10, p. 29, pl. 5, fig. 95, pl. 7, fig. 30.
[33]) 1889, *Nerita* u. *Neritopsis*, p. 45, pl. 7, figs. 11, 12.

with doubt in the synonymy. *N. funiculata* has also been found in the miocene of Bondoc Peninsula (Luzon, Philippines) [34]).

Fossil distribution:

Mal: lower miocene: Njalindoeng (Priangan, Java); upper miocene: Tjilanang (only from JUNGHUHN's loc. O; Priangan, Java).
Chi: holocene: ? Taiwan Is. (= Formosa).
Ery: pleistocene: Dahalac Is., Adulis, Scheik Said, Buri Peninsula (Red Sea Region).
Mad: quaternary: Mombasa Is.; Tschapuani Is. (Bay of Zanzibar).

Recent distribution:

Mal, Bro, Fre, Mel, Que, Loy, Tua, Mic, Chi, Ind, Ery, Mad.

Bathymetrical distribution:

0—40 m.

Sectio *Theliostyla* MÖRCH 1852.

28. NERITA (THELIOSTYLA) ALBICILLA LINNÉ.

\+ 1758 *Nerita Albicilla.* — LINNÉ, Syst. Nat., ed. 10, p. 778.
non 1869 *Nerita albicilla* LINNEO. — ISSEL, Malac. Mar Rosso, pp. 214, 297.
1888 *Nerita albicilla* LINN. — TRYON, Man. Conch., 10, p. 19, pl. 2, figs. 21—23.
1889 *Nerita albicilla* L. — MARTENS, *Nerita* u. *Neritopsis*, p. 25, pl. 8, figs. 1, 2.
non 1900 *Nerita albicilla* LINNAEUS. — NEWTON, Pleist. shells Red Sea, p. 504.
? 1901 *Nerita albicilla* LINN. — BULLEN, Pleist. Moll. Perim Is., p. 255.
1924 *Nerita albicilla* LINNÉ. — YOKOYAMA, Moll. Coral-bed Awa, p. 31, pl. 2, fig. 6.
1925 *Nerita albicilla* LINNÉ. — OOSTINGH, Obi and Halmahera, pp. 20, 230.
1930 *Nerita albicilla* LINNÉ. — COX, Kenya, p. 134.
non 1934 *Nerita albicilla* LIN. — NARDINI, Moll. spiagge em. Mar Rosso, p. 239, pl. 18, figs. 5, 6.

Material examined:

Poetjangan layers (volcanic facies): Sheet 110A, M122: 1 ex.

The „*Nerita albicilla* LINNÉ" recorded by several authors from the Red Sea region (both recent and fossil) differs from the typical species and should be called *Nerita forskalii* RÉCLUZ (see: MARTENS, 1889, Conch. Cab., N.S., **2**, prt. 11, p. 28).

Fossil distribution:

Jap: upper pleistocene: Coral-bed of Awa (Central Japan).
Ery: pleistocene: ? raised beach deposits Perim Is.
Mad: pleistocene: Mombasa Is.

[34]) DICKERSON, 1922, Rev. Philipp. Paleont., p. 202, pl. 4, fig. 7.

Recent distribution:

Mal, Bro, Fre, Que, Syd, Loy, Tua, Pol, Mic, Jap, Chi, Ind, Ery, Mad, Cap.

Bathymetrical distribution:

0—40 m.

29. NERITA (THELIOSTYLA) CHAMELEON LINNÉ.

+ 1758 *Nerita Chameleon.* — LINNÉ, Syst. Nat., ed. 10, p. 779.
1841 *Nerita squamulata.* — LE GUILLOU, Rev. Zool. Soc. Cuvier., 4, p. 344.
1888 *Nerita chameleon* LINN. — TRYON, Man. Conch., 10, p. 20, pl. 2, figs. 31—36, pl. 3, figs. 37, 39, pl. 6, fig. 4.
1889 *Nerita chameleon* L. — MARTENS, *Nerita* u. *Neritopsis*, p. 19, pl. 2, figs. 13—16, pl. 5, figs. 5—15.
1905 *Nerita (Theliostyla) chameleon* LINN. var. *squamulata* LE GUILL. — K. MARTIN, Foss. Java, p. 272, pl. 40, figs. 654, 655.
1908 *Nerita chameleon* LIN. var. — K. MARTIN, Alt. d. Sch. Sondé u. Trinil, p. 9.
1908 *Nerita chameleon* LINN., var. *squamulata* LE GUILL. — K. MARTIN, ibid., p. 12.
1911 *Nerita (Theliostyla) chameleon* LINN. — MARTIN-ICKE, Gastr. Trinil, pp. 47, 48.
1919 *Nerita chameleon* LINN., var. *squammulata* LE GUILL. — K. MARTIN, Palaeoz. Kenntn. Java, p. 101, 142.
1920 *Nerita chameleon* L. — TESCH, Timor, 2, p. 73, pl. 133, fig. 213.
1921 *Nerita chameleon* LIN. — P. J. FISCHER, Pliocänfauna Seran, p. 243.
1923 *Nerita (Theliostyla) chameleon* LINNÉ. — OOSTINGH, Rec. shells Java, pp. 24, 159.
1927 *Nerita (Theliostyla) chameleon* L. var. *squamulata* LE GUILLON. — P. J. FISCHER, Seran u. Obi, p. 42.
1931 *Nerita chameleon* LINN. — VAN ES, Age *Pithecanthr.*, p. 116.
1931 *Nerita chameleon* LINN. var. *squammulata* LE GUILL. — VAN DER VLERK, Caenoz. Amphin., Gastr., p. 261.
1932 *Nerita chameleon* L. — VAN BENTHEM JUTTING, Preh. shells Sampoeng Cave, p. 103.
1935 *Nerita chameleon* LINNÉ, forma *squamulata* LE GUILLOU. — OOSTINGH, Moll. Plioz. Boemiajoe, p. 5.

Material examined:

Upper Kalibèng layers: Sheet 93B, M 257: 1 ex.; M 258: 2 ex.; M 260: 3 ex.
Poetjangan layers (volcanic facies), layer II: Sheet 110A, M 124: 1 ex.

All my specimens of this species belong to the f. *squamulata* LE GUILLOU except the single shell from loc. M 124.

Fossil distribution (localities from which the f. *squamulata* LE GUILLOU has been recorded are marked with a +):

Mal: pliocene: + Boemiajoe (Pekalongan, Java); [= upper Kalibèng layers]: Padasmalang, + Sonde (Madioen, Java); + Atamboea[35]) (Timor); + Ceram; „pliocene" [= Poetjangan layers (volcanic facies), layer II]: Soemberringin (Soera-

[35]) As OOSTINGH (1935, Moll. Plioz. Boemiajoe, p. 5) already remarked, the specimen figured by TESCH belongs to the f. *squamulata* LE GUILLOU.

baja, Java); subrecent: Sampoeng cave (near Ponorogo, Madioen, Java; secondary loc.).

Recent distribution (regions from which the f. *squamulata* LE GUILLOU has been recorded are marked with a +):
+ Mal, Bro, Mel, Que, + Loy, + Mic, Chi, Ind, Ery, Mad.

Bathymetrical distribution:
0—36 m.

Sectio *Amphinerita* MARTENS 1887.

30. NERITA (AMPHINERITA) POLITA LINNÉ.

+ 1758 *Nerita polita*. — LINNÉ, Syst. Nat., ed. 10, p. 778.
1841 *Nerita Rumphii*. — RÉCLUZ, Rev. Zool. Soc. Cuvier., 4, p. 147.
1869 *Nerita polita* LINNEO. — ISSEL, Malac. Mar Rosso, p. 297.
1879 *Nerita Rumphi* RECLUZ. — K. MARTIN, Tertiärsch. Java, p. 84, pl. 13, fig. 19.
1888 *Nerita polita* LINN. — TRYON, Man. Conch., 10, p. 30, pl. 6, figs. 7—11, pl. 7, figs. 12—16, 23.
1889 *Nerita polita* LINN. and var. *Rumphii* RECL. — MARTENS, *Nerita* u. *Neritopsis*, p. 72, figs. 5, 10—26, pl. 14, figs. 1—18, 22—26.
1911 *Nerita (Tenare) polita* LINNÉ. — MARTIN-ICKE, Gastr. Trinil, p. 47.
1919 *Nerita polita* LINN., var. *Rumphii* RECLUZ. — K. MARTIN, Palaeoz. Kenntn. Java, p. 101.
1923 *Nerita* (s. str.) *polita* LINNÉ. — OOSTINGH, Rec. Shells Java, p. 30.
1930 *Nerita polita* LINNÉ. — COX, Kenya, p. 135.
1931 *Nerita polita* LINN. var. *rumphii* RECL. — VAN DER VLERK, Caenoz. Amphin., Gastr., p. 261.
1934 *Nerita polita* LIN. — NARDINI, Moll. spiagge em. Mar Rosso, p. 241, pl. 18, fig. 7.

Material examined:
Upper Kalibèng layers: Sheet 93B, M250: 1 ex.

Owing to the bad preservation the characters of the mouth cannot be verified and thus it is impossible to decide whether the specimen belongs to the f. *typica* or to the f. *rumphii* RÉCLUZ.

Fossil distribution:
Mal: miocene: W. part of the district of Tjidamar (= JUNGHUHN's loc. K; Priangan, Java); pliocene [= upper Kalibèng layers]: Padasmalang (Madioen, Java).
Ery: pleistocene: Scheik Said and other localities in the Red Sea region.
Mad: quaternary: Mombasa Is.

Recent distribution:
Mal, Bro, Fre, Mel, Que, Loy, Tua, Haw, Mic, Chi, Ind, Ery, Mad, Cap.

Bathymetrical distribution:
0—27 m.

31. NERITA (AMPHINERITA) ANTIQUATA Récluz.

+ 1841 *Nerita antiquata*. — Récluz, Rev. Zool. Soc. Cuvier., 4, p. 106.
1888 *Nerita polita* Linn. var. *antiquata* Recluz. — Tryon, Man. Conch., 10, p. 31, pl. 7, fig. 17.
1889 *Nerita antiquata* Recl. — Martens, *Nerita* u. *Neritopsis*, p. 81, pl. 14, figs. 19—21.

Material examined:

Poetjangan layers (volcanic facies), layer II: Sheet 110A, M 122: 1 ex.

My only specimen of this species quite matches Martens' figures

Fossil distribution:
no previous records.

Recent distribution:
Mal, Mel, Tua, Mic.

Bathymetrical distribution:
0—27 m.

Familia Adeorbidae.
Genus *Vitrinella* C. B. Adams 1850.

32. VITRINELLA MOLENGRAAFFI spec. nov.

Figures 16*a, b, c.*

16*a* 16*b* 16*c*

Figs. 16*a, b, c.* *Vitrinella molengraaffi* sp. n., holotype × 9, from Sheet 109C, M 347, Poetjangan layers (volcanic facies).

Material examined:

Poetjangan layers (volcanic facies), ± layer II?; Sheet 109 C, M 347: 1 ex. (holotype).

Description: Shell depressed, widely umbilicate; whorls $4^1/_3$, increasing rapidly. Sculpture: the uppermost of three spiral ridges is visible from the second whorl onward, it is getting the shape of a keel on the third whorl, on the second half of the bodywhorl this keel is flattened. The second spiral ridge forms a sharp spiral keel encircling the periphery of the bodywhorl; the third, on the base, encircling the funnelshaped umbilicus bears two spiral threads and is flattened between

these two. Minute lines of growth are visible through a lens on the whole surface. Aperture making an angle of ± 45° with the axis of the shell, subcircular, with angles at the points where the spiral ridges are ending. Outer lip damaged, judging from the lines of growth it must have had a rounded protrusion between the hindermost and the peripheral ridge.

Alt. 2, Diam. 4,5.

I have named this new species after professor Dr. G. A. F. MOLENGRAAFF.

This species seems to be related to *V. dunkeri* (TRYON) [36]). From DUNKER's description and figure it appears, however, that this recent japanese species is about $^2/_3$ × as small as our fossil shell and has no wide funnelshaped umbilicus. I doubt, whether A. ADAMS has figured the same species. My specimen agrees much better with his figure, which has been copied by SOWERBY and TRYON and seems to represent a shell with a wider umbilicus than DUNKER's original species must have had.

33. VITRINELLA CINGULIFERA (A. ADAMS).

Figures 17*a, b, c.*

17*a* 17*b* 17*c*

Figs. 17*a, b, c. Vitrinella cingulifera* (A. Adams), × 10, from Sheet 110B, M 274, Poetjangan layers (volcanic facies), layer II.

+ 1850 *Cyclostrema cingulifera* ADAMS. — A. ADAMS, Proc. Zool. Soc. 1850, p. 43.
1864 *Cyclostrema cingulifera* A. AD. — A. ADAMS in: G. B. SOWERBY II, Thes. Conch., 3, p. 250, pl. 255, figs. 13, 14.
1874 *Cyclosterma cingulifera.* — G. B. SOWERBY II, Conch. Ic., 19, *Cyclostrema,* pl. 1, fig. 1.
1888 *Cyclostrema cingulifera* A. AD. — TRYON, Man. Conch., 10, p. 93, pl. 32, figs. 72, 73.
1925 *Vitrinella cingulifera* (A. AD.). — THIELE, Gastr. d. Tiefsee-Exp., 2, p. 37 (71).
1935 *Cyclostrema cingulifera* A. ADAMS. — OOSTINGH, Moll. Plioz. Boemiajoe, p. 4.
1936 *„Cyclostrema cinguliferum* A. ADAMS 1850. — NOMURA & ZIMBÔ, Simaziri Beds, p. 265.

*) 1860 *Cyclostrema cingulatum* DKR. [nec. PHILIPPI 1853]. — DUNKER, Mal. Blätter, 6 (for 1859), p. 225.
1861 *Cyclostrema cingulatum* DKR. [nec PHIL.]. — DUNKER, Moll. Jap., p. 20, pl. 3, fig. 11.
1864 *Cyclostrema cingulata* DKR. [nec PHIL.]. — A. ADAMS in: G. B. SOWERBY II, Thes. Conch., 3, p. 251, pl. 255, fig. 23, 24.
1874 *Cyclostrema cingulata* [nec PHIL.]. — G. B. SOWERBY II, Conch. Ic., 19, *Cyclostrema,* pl. 2, fig. 16.
+ 1888 *Cyclostrema Dunkeri* TRYON. — TRYON, Man. Conch., 10, p. 91, pl. 32, figs. 48, 49.

Material examined:

Poetjangan layers (volcanic facies), layer II: Sheet 110B, M 274: 1 ex.; horizon above layer II: Sheet 110B, M 281: ? 1 ex. Poetjangan layers (argillaceous facies): Sheet 110B, M 263: 4 ex.

The specimens have 7 main spiral ridges; the seventh encircles the umbilicus. Moreover there may occur:

1) a secondary spiral lira along the suture on the bodywhorl or on part of it, 2) one or two faint spiral lirae in the umbilicus. SOWERBY (Conch. Ic.) speaks of 6 spiral ridges, but ADAMS' figure in the Thesaurus seems to indicate a similar sculpture as I described above. My specimens quite agree with recent shells of this species in the DAUTZENBERG collection of the Natural History Museum at Brussels.

Mr. OOSTINGH was so kind as to forward some photographs of three specimens, identified by him as „*Cyclostrema cingulifera* A. ADAMS", from the pliocene near Boemiajoe. Two of these specimens agree with my material, the third is somewhat different, though I dare not decide if the differences are of specific or of varietal character. Mr. OOSTINGH found only young specimens with a maximum diameter of 2 mm. at Boemiajoe; my specimens are evidently adult (maximum diameter 3,5 mm.).

The identification of the specimen from loc. M 281 is doubtful; it seems to have a different sculpture, but its conservation is very bad.

Fossil distribution:

Mal: pliocene: Tjimantjeuri (Bantam, Java) (T. J. 14, p. 34); Boemiajoe (Pekalongan, Java); neogene (under pliocene): river Gintoeng (Banjoemas, Java) (T. J. 66, p. 18).
Chi: lower pliocene: Okinawa-zima (Ryû-Kyû Is.).

Recent distribution:

Mal, Loy, Tua, Jap, Ind, Ery, Mad.

Bathymetrical distribution

5 m.

Familia Turritellidae.

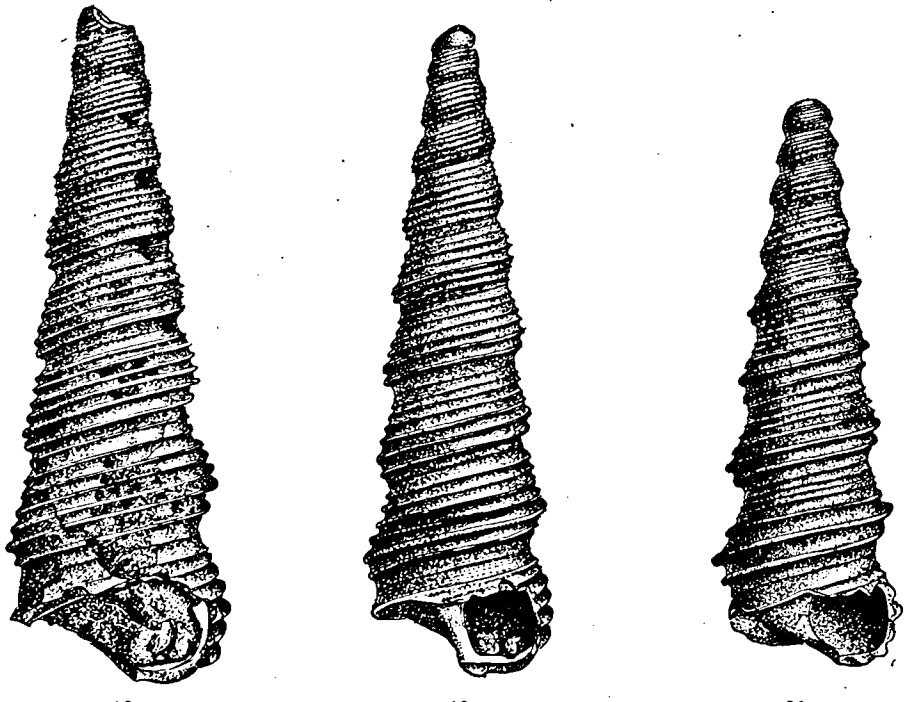
Genus *Turritella* LAMARCK 1799.

34a. TURRITELLA TEREBRA TEREBRA (LINNÉ).

Figures 18, 19, 20.

+ 1767 *Turbo terebra.* — LINNÉ, Syst. Nat., ed. 12, p. 1239.
non 1881 *Turritella terebra* LAM. — K. MARTIN, Jungtert. v. Sumatra, p. 86, pl. 4, fig. 2 [cf. K. MARTIN, 1905, Foss. Java, p. 232, note].
1884 *Turritella terebra* LAM. — K. MARTIN, Tiefbohr. Java, p. 171.
1886 *Turritella terebra* LINN. — TRYON, Man. Conch., 8, p. 195, pl. 59, figs. 32, 33.
1895 *Turritella terebra* LAM. — K. MARTIN, Tert. Foss. Philipp., p. 59.
1907 *Turritella terebra* LIN. — SCHEPMAN, Posttert. Celebes, p. 190.

1913 *Turritella terebra* LAM. — W. D. SMITH, Stratigr. and foss. invert. Philipp., pp. 248, 254, 267, pl. 6, fig. 1.
non 1915 *Turritella terebra* LAM. — TESCH, Onderz. foss. Padangsche Bovenl., p. 159 [quoting K. MARTIN 1881, see above].
1919 *Turritella terebra* LAMK. var. — K. MARTIN, Palaeoz. Kenntn. Java, pp. 96 [partim], 124, 134.
1922 *Turritella terebra* LAMARCK. — DICKERSON, Rev. Philipp. Paleont., p. 217.
1923 *Turritella* (s. str.) *terebra* LINNÉ sp. — OOSTINGH, Rec. shells Java, p. 39.
1928 *Turritella terebra* LINNÉ. — YOKOYAMA, Moll. Oilfield Taiwan, pp. 7, 56.
193. *Turritella terebra* (LINNÉ). — NASON-JONES, Finsch Coast Area, p. 34.
† 1931 *Turritella* n. sp. — VAN ES, Age *Pithecanthr.*, p. 40.
† 1931 *Turritella terebra* LAMK. — VAN ES, ibid., pp. 74, 120 [partim, loc. Baribis only].



18 19 20

Figs. 18, 19, 20. *Turritella terebra terebra* Linné, 3 ex. (showing passage into keeled form) × 1, from Sheet 99B, M 25, Poetjangan layers (volcanic facies).

1931 *Turritella terebra* LAMK. [partim]. — VAN DER VLERK, Caenoz. Amphin., Gastr., p. 254.
1935 *Turritella terebra* (LINNAEUS). — NOMURA, Cat. tert. a. quart. moll. Taiwan, 2, p. 190.

Material examined:

Poetjangan layers (volcanic facies): Sheet 99B, M 15: 1 fr.; M 25: 8 ex.

The specimens from loc. M 25 pass from the typical to a more keeled form (figs. 18—20), which approaches *T. bantamensis* K. MARTIN

var. *talahabensis* K. MARTIN [37]) and certain specimens of *T. djadjariensis* K. MARTIN [38]). It differs from the former in having 6 spiral ridges even on the oldest whorls available (diam. 7 mm.), which have only 5 in MARTIN's *talahabensis*, from the latter by its smaller apical angle and its less convex whorls. Some fragments must have belonged to large specimens, as they have a diameter of nearly 30 mm.; recent specimens of equal diameter have a length of about 130 mm. (Z.M.A.).

It seems probable that the form mentioned by VAN ES as „*Turritella terebra* LAMK." does not match the typical species, but must be ranged in the following subspecies. His „*Turritella* n. sp.", however, may be the same as the keeled form mentioned and figured above.

I cannot agree with NOMURA who has included *T. bacillum* KIENER [39]) in the synonymy of the present species.

Fossil distribution:

Mal: mio-pliocene: Finsch Coast Area (New Guinea); pliocene: ? Baribis (Cheribon, Java); Mindanao (Philippines); quaternary: Batavia (Java); Semarang (Java); Kajoe Ragi (Minahassa, Celebes); holocene: Manila (Luzon, Philippines).
Chi: pliocene (Byôritu beds): Taiwan Is. (= Formosa); holocene: Taiwan Is.

Recent distribution:

Mal, Bro, Chi, Ind, Ery (var. *spectrum* REEVE).

Bathymetrical distribution:

37 m.

34b. TURRITELLA TEREBRA KENDENGENSIS subsp. nov.

Figures 21, 22, 23*a*, *b*, 24.

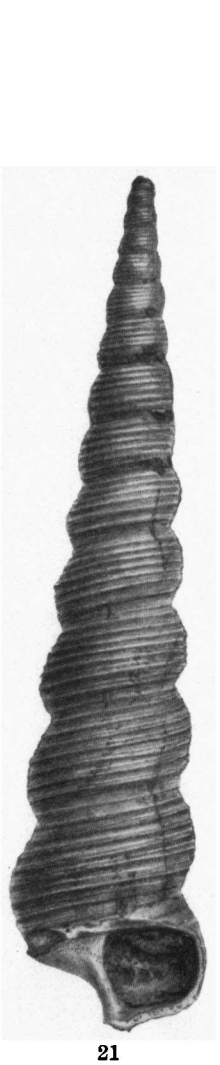
[1767 *Turbo terebra*. — LINNÉ, Syst. Nat., ed. 12, p. 1239].
1905 *Turritella terebra* LAM. var. — K. MARTIN, Foss. Java, p. 232, pl. 35, fig. 548.
1919 *Turritella terebra* LAMK. var. — K. MARTIN, Palaeoz. Kenntn. Java, pp. 96 [partim], 145.
1931 *Turritella terebra* LAMK. [partim]. — VAN DER VLERK, Caenoz. Amphin., Gastr., p. 254.
† 1931 *Turritella terebra* LAMK. — VAN ES, Age *Pithecanthr.*, pp. 74, 95, 120.
† 1932 *Turritella terebra* L. var. — VAN DER VLERK, Zuidrembangsche heuvell., p. 111.

Material examined:

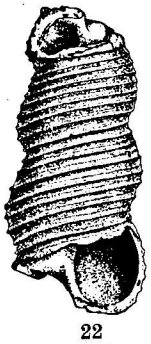
Poetjangan layers (volcanic facies): Sheet 99B, M 15: 1 ex.; Sheet 110B, M 161: 5 ex.; M 163: ± 20 ex. (to 1 fr. a specimen of *Ostrea* spec. is fixed); M 167: 1 ex.; C 64: 4 ex.; C 66: 2 ex.; C 71: 2 ex.; C 72: 1 ex.; C 74: 1 ex.; C 75: 2 ex.; C 83: 1 ex.; Sheet 116A,

[37]) K. MARTIN, 1905, Foss. Java, p. 230, pl. 35, figs. 542, 543, 544, 545.
[38]) K. MARTIN, Foss. Java, 1905, p. 228, pl. 34, fig. 537.
[39]) TRYON, 1886, Man. Conch., 8, p. 196, pl. 59, fig. 34, pl. 60, fig. 42.

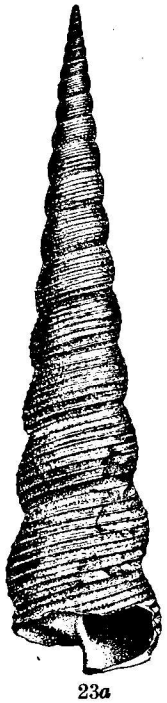
M 325: 2 ex.; layer I: Sheet 110A, M 88: 7 ex.; M 89: 1 ex.; C 103: 1 ex.; Sheet 110B, M 155: 7 ex.; C 69: 2 ex.; horizon above



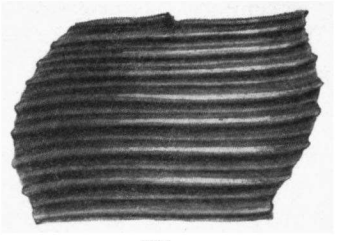
21



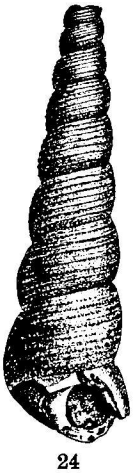
22



23*a*



23*b*



24

Fig. 21. *Turritella terebra kendengensis* subsp. n., holotype × 1, from Sheet 110B, C 82, Poetjangan layers (volcanic facies), layer II.

Fig. 22. *Turritella terebra kendengensis* subsp. n., paratype (subscalarid form) × 1, from Sheet 110B, M 193, Poetjangan layers (volcanic facies), layer III.

Figs. 23*a*, *b*. *Turritella terebra kendengensis* subsp. n., paratype (with distinct secondary spirals), fig. *a*: × 1, fig. *b*: detail of sculpture × 2, from Sheet 110B, M 281, Poetjangan layers (volcanic facies), layer II.

Fig. 24. *Turritella terebra kendengensis* subsp. n., paratype (with spiral sculpture becoming obsolete towards the bodywhorl) × 1, from Sheet 110A, M 193, Poetjangan layers (volcanic facies), layer III.

layer I: Sheet 110B, M 273: 4 ex.; layer II: Sheet 110A, M 122: 1 ex.; M 125: 1 ex.; M 304: 15 ex.; Sheet 110B, M 164: 1 ex.; M 168: 4 ex.; M 171: 2 ex.; M 172: 1 ex.; M 278: 14 ex.; M 281: 2 ex.; M 282: 2 ex.; M 284: 2 ex.; C 7: 1 ex.; C 82: holotype + 17 ex.; Sheet 116A, M 221: 1 ex. (a specimen of *Ostrea* spec. is fixed to this shell); M 222: 1 ex.; M 223: 2 ex.; M 224: 3 ex.; M 226: 1 ex.; M 227: 5 ex. + 1 fr.; C 6: 9 ex. (to 1 ex. a specimen of *Ostrea* spec. is fixed); C 30: 2 ex.; C 33: 2 ex.; C 113: 1 ex.; C 121: 2 ex.; layer II?: Sheet 109C, M 346: 2 ex.; layer III: Sheet 110A, M 139: 2 ex.; M 143: 1 ex.; Sheet 110B, M 183: 1 ex.; M 193: 23 ex. (to 1 ex. a specimen of *Ostrea* spec. is fixed); C 27B: 3 ex.; Sheet 116A, M 228: 4 ex.; M 232: 1 ex.; C 112: 3 ex.
Poetjangan layers (argillaceous facies): Sheet 110B, M 264: 1 fr.; Sheet 116A, M 320: 3 fr.
Kaboeh layers: Sheet 109C, M 198: 3 ex.; Sheet 110A, M 315: 1 ex.; Sheet 110B, M 182: 1 ex.; M 197: numerous ex.

This new subspecies, which occurs abundantly in the Poetjangan layers and moreover at some localities in the Kaboeh layers, was already distinguished as a variety by MARTIN, who examined one damaged specimen from Tambakwatoe. It is easily recognised by the number of its spiral ridges being 7 and not 6 as in the typical species. MARTIN remarks that he also saw some few recent specimens of this species possessing 7 spiral ridges. I examined a great number of recent specimens of *T. terebra* (L.) in different collections. It appeared that the number of spiral ridges may be greater than 6 owing to two reasons: 1) the suture may be displaced owing to a subscalarity and so a greater part of the whorls (bearing 7 instead of 6 spirals) is exposed. A similar variation has been observed in my new subspecies (e.g. from locs. M 226, M 193) with 8 instead of 7 spiral ridges; 2) secondary ridges may gradually increase to equal strength as the primary ones (var. *spectrum* REEVE [41])), in this variety the whole spiral sculpture may become obsolete towards the bodywhorl. This form is readily distinguished from analogous specimens of the subsp. *kendengensis* by its topwhorls always bearing 6 instead of 7 spiral ridges. The analogous variety is abundant in my material (e.g. from locs. M 278, M 304). As in the typical species the convexity of the younger whorls varies somewhat in this subspecies (see figures).

I have named this new subspecies after the Kendeng Mountains.

COX [42]) supposes that MARTIN's „*Turritella terebra* LAM. var." may be the same as his „*Turritella harrisoni*"; this is certainly not the case, as *T. harrisoni* COX has only 5 primary spiral ridges on the older whorls.

Fossil distribution:
Mal: „upper miocene" [= Poetjangan layers (volcanic facies), layer II; probably = loc. M 281]: Tambakwatoe (Soera-

[41]) TRYON, 1886, Man. Conch., 8, p. 195, pl. 59, fig. 33.
[42]) 1936, Foss. Moll. S. Persia, p. 40.

baja, Java); „pliocene": ? Beringinan (Soerakarta, Java); [probably = Poetjangan layers]: ? Bareng beds (Tondomoelo and Ngambon — Toeri — Pelem; Bondjonegoro, Java); ? Simo (Soerabaja, Java).

Recent distribution:

not known living.

35. TURRITELLA CINGULIFERA G. B. SOWERBY I.

+ 1825 *Turritella cingulifera*. — G. B. SOWERBY I, Cat. shells Tankerville, App., p. XIV.
non 1877 *Torcula parva*. — ANGAS, Proc. Zool. Soc., p. 174, pl. 26, fig. 74 [fide IREDALE, 1924, Proc. Linn. Soc. N. S. Wales, 49, p. 248].
1884 *Turritella vulgaris* nov. spec. — K. MARTIN, Tiefbohr. Java, p. 172, pl. 9, fig. 167.
1886 *Turritella cingulifera* SOWB. — TRYON, Man. Conch., 8, p. 198, pl. 59, figs. 38, 39 [tantum].
1887 *Turritella vulgaris* n. sp. — K. MARTIN, Tiefbohr. Java, p. 308.
1890 *Turritella vulgaris* MART. — K. MARTIN, Kei-Inseln, Timor, Celebes, p. 279.
1905 *Turritella cingulifera* SOW. — K. MARTIN, Foss. Java, p. 233.
1908 *Turritella vulgaris* K. MART. — O. BOETTGER, Tert. u. jüng. Verst., p. 669.
1911 *Turritella cingulifera* SOW. — MARTIN-ICKE, Gastr. Trinil, p. 47.
1913 *Turritella cingulifera* SOW. — W. D. SMITH, Stratigr. and foss. invert. Philipp., pp. 254, 267, pl. 6, fig. 2.
1919 *Turritella cingulifera* SOW. — K. MARTIN, Palaeoz. Kenntn. Java, pp. 96, 124, 125, 138.
1920 *Turritella cingulifera* SOW. — TESCH, Timor, 2, p. 61, pl. 132, fig. 193.
1921 *Turritella cingulifera* SOW. — P. J. FISCHER, Pliocänfauna Seran, p. 244.
1923 *Turritella* (s. str.) *cingulifera* SOWERBY. — OOSTINGH, Rec. shells Java, p. 40.
1927 *Turritella cingulifera* SOW. — P. J. FISCHER, Seran u. Obi, p. 49.
1929 *Turritella cingulifera* SOW. — SIEMON, Jungtert. Moll. Niederl. O.-Ind., pp. 7, 13, 29.
1931 *Turritella cingulifera* SOW. — VAN ES, Age *Pithecanthr.*, p. 58.
1931 *Turritella cingulifera* SOW. — VAN DER VLERK, Caenoz. Amphin., Gastr., p. 253.
1932 *Turritella cingulifera* SOW. — HAANSTRA & SPIKER, Benkoelen u. Palembang, p. 1313.

Material examined:

Poetjangan layers (volcanic facies): Sheet 99B, M 9: 4 ex.; Sheet 116A, M 325: 9 ex.; below layer I: Sheet 105B, M 68: 1 ex.; layer I: Sheet 105B, M 67: numerous ex. (most fr.); M 87: numerous damaged ex. + fr.; Sheet 110A, M 76: 1 ex.; M 80: ± 40 ex.; M 81: 8 ex.; M 82a: 7 ex.; M 83: numerous ex. (most top-fr.); M 84: numerous fr.; M 89: numerous ex.; M 90: 1 ex.; layer II: Sheet 116A, C 31: 1 ex.

Fossil distribution:

Mal: pliocene: Batavia[43]) (Java); Sangiran[43]) (Soerakarta, Java); Bentarsari Basin (Pekalongan, Java) (T. J. 54, pp. 25, 27); [= upper Kalibèng layers]: Padasmalang (Madioen, Java); Benkoelen — Kroeë[43]) (Benkoelen, Sumatra); Atamboea (Timor); Ceram; SW. New Guinea.

[43]) Pliocene: fide OOSTINGH, 1935, Moll. Plioz. Boemiajoe, p. 2.

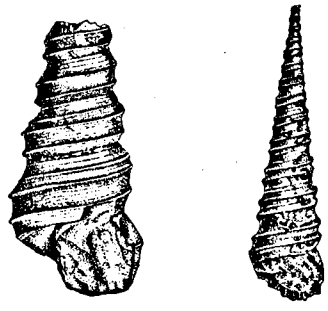
Recent distribution:
Mal, Bro, Mel, Que, Loy, Ind, Ery.

Bathymetrical distribution:
5—94 m.

36. TURRITELLA MACULATA REEVE.

Figures 25, 26.

+ 1849 *Turritella maculata.* — REEVE, Conch. Ic., 5, *Turritella*, fig. 33.
1886 *Turritella maculata* REEVE. — TRYON, Man. Conch., 8, p. 202, pl. 63, fig. 83.
1888 *Toroula maculata.* — JOUSSEAUME, Moll. Mer Rouge et Golfe d'Aden, p. 194.
1905 *Turritella vittulata* [non] AD. U. REEVE [partim]. — K. MARTIN, Foss. Java, p. 233, pl. 35, figs. 551—553.
1909 *Turritella (Haustator) maculata* REEVE. — SCHEPMAN, Prosobr. Siboga Exp., 2, p. 187.
1919 *Turritella vittulata* [non] AD. ET REEVE [partim]. — K. MARTIN, Palaeoz. Kenntn. Java, pp. 96, 122, 123, 132, ? 151.
1931 *Turritella vittulata* [non] AD. ET REEVE [partim]. — VAN DER VLERK, Caenoz. Amphin., Gastr., p. 254.



25 26

Fig. 25, 26. *Turritella maculata* Reeve, 2 ex. × 1, from Sheet 105B, M 53, Poetjangan layers (volcanic facies).

Material examined:

Poetjangan layers (volcanic facies): Sheet 99B, M 9: ± 45 ex.; M 15: 2 ex.; Sheet 105B, M 53: ± 70 ex.; M 54: 1 ex.; M 71: 1 ex.; Sheet 110B, C 110: 3 ex.; below layer I: Sheet 105B, M 68: 1 ex.; layer I: Sheet 105B, M 87: 1 ex.; Sheet 110A, M 88: 2 ex.; M 90: 10 ex.; M 105: 1 ex.; M 106: 2 ex.; M 292 or M 293: 1 ex.; layer II: Sheet 110A, M 122: 2 ex.; Sheet 110B, M 177: 40 ex.; C 2: 5 ex.; C 3: 16 ex.; C 29: 14 ex.; Sheet 116A, M 214: 1 ex.; M 216: 3 ex.; C 34: 1 ex.; C 35: 3 ex.; C 37: 5 ex.; C 39: 2 ex.; layer III: Sheet 110B, M 180: 1 ex.; M 189: 4 ex.
Poetjangan layers (argillaceous facies): Sheet 110B, M 267: 2 ex.; Sheet 115C, M 328: 1 ex.

My material of this species is rather well preserved; though entire adult specimens have not been collected, it is not difficult to reconstruct

them with the aid of the numerous more or less incomplete shells. It appears that these specimens do not vary very much and agree very well with SCHEPMAN'S *T. maculata* REEVE from the Siboga expedition (Z.M.A.) and with REEVE'S description and figure of this species.

On the other hand my specimens seem to be identical with MARTIN'S *T. vittulata* ADAMS & REEVE. This species, as described and figured by ADAMS & REEVE [44]), differs from *T. maculata* REEVE in the following respects: 1) its apical angle is slightly greater; 2) its maximum length is less; 3) its whorls are flatter; 4) it possesses 4 main spiral ridges, of which the middle two are but slightly more pronounced than the hindermost and foremost, whereas in *T. maculata* REEVE only those two middle spiral ridges are of a „primary" type, secondary spirals occurring before, between and behind them [45]).

I have examined MARTIN'S specimens at Leiden and found them to be more variable than my own specimens. The shells figured in „Die Fossilien von Java" match those from the Kendeng beds and seem to belong to *T. maculata* REEVE. But there are others, especially from the localities Tjikeusik and Tjimantjeuri (Bantam, Java), which have a greater apical angle, flatter whorls and of which the sculpture does not quite agree with that of *T. maculata* REEVE, but shows likeness with that of *T. vittulata* AD. & REEVE. As the whole material identified by MARTIN is pretty homogeneous, it is difficult to decide if both the species are to be recognised among it, and if so, where the limit between the two must be drawn. I prefer to leave this question unsolved, but at any rate MARTIN included specimens of *T. maculata* REEVE in his „*T. vittulata* AD. & REEVE" deriving from the following localities: Tjimantjeuri (e.g.: Foss. Java, pl. 35, fig. 551), Tjikeusik (e.g.: ibid., fig. 552), Waled (= „Menengteng-Schlucht") (e.g.: ibid., fig. 553).

„*Turritella vittulata* AD. & REEVE" of MARTIN 1928 [46]), SIEMON [47]) and VAN ES [48]) may also include *T. maculata* REEVE, as the identifications may have been made with the aid of the description and figures of „Die Fossilien von Java".

In the explanations of the sheets 14 (p. 34), 54 (pp. 36, 37) and 66 (p. 18) of the Geological Map of Java „*Turritella vittulata* AD. & REEVE" is mentioned from pliocene javanese localities. Mr. OOSTINGH was so kind as to forward to me some specimens identified by him as *T. vittulata* AD. & REEVE deriving from the Tjimantjeuri beds (Bantam, Java, cf. T. J. 14, p. 34), which appeared not to agree with *T. maculata* REEVE, but to have a greater apical angle, flatter whorls etc. just as some of the specimens of MARTIN'S mentioned above, so their identification may be right. From the other localities I have seen no material.

[44]) 1850, Zool. Voy. Samarang, p. 48, pl. 12, fig. 5.

[45]) I am indebted to miss T. VAN BENTHEM JUTTING for the examination of specimens of these two species in the British Museum, London.

[46]) Moll. Neog. Atjeh, p. 6.

[47]) 1929, Jungtert. Moll. N.-O.-Ind., p. 54.

[48]) 1931, Age *Pithecanthr.*, pp. 95, 115.

Fossil distribution:

Mal: p l i o c e n e: Tjikeusik (Bantam, Java); Tjimantjeuri (Bantam, Java); Waled (Cheribon, Java).
Ery: q u a t e r n a r y: raised beach of Cameran (Red Sea).

Recent distribution:

Mal, Ind, Ery.

Bathymetrical distribution:

32—55 m.

37. TURRITELLA DJADJARIENSIS K. MARTIN.

Figure 27.

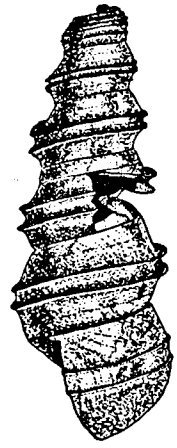


Fig. 27. *Turritella djadjariensis* K. Martin, × 1, from Sheet 105B, M 68, Poetjangan layers (volcanic facies), below layer I.

1879 *Turritella duplicata* [non] LAM. — K. MARTIN, Tertiärsch. Java, p. 69, pl. 11, fig. 13.
+ 1905 *Turritella djadjariensis* spec. nov. — K. MARTIN, Foss. Java, p. 228, pl. 34, figs. 532—538.
1910 *Turritella djadjariensis* MARTIN. — COSSMANN, Karikal, 3, p. 40, pl. 2, figs. 11—13.
1912 *Turritella djadjariensis* MART. — K. MARTIN, Vorl. Bericht, 2, p. 168, pl. 9, figs. 10, 11.
1919 *Turritella djadjariensis* MART. — K. MARTIN, Palaeoz. Kenntn. Java, pp. 95, 125, 132, 133.
1926 *Turritella djadjariensis* MART. — K. MARTIN, Plioc. Verst. Cheribon, p. 9.
1928 *Turritella djadjariensis*. — K. MARTIN, Nachlese, p. 115.
1929 *Turritella djadjariensis* MARTIN. — SIEMON, Jungtert. Moll. N.-O.-Ind., p. 40.
1931 *Turritella djadjariensis* MART. — VAN ES, Age *Pithecanthr.*, pp. 45, 51, 58, 59.
1931 *Turritella djadjariensis* MART. — VAN DER VLERK, Caenoz. Amphin., Gastr., p. 253.
1933 *Turritella djadjariensis* K. MART. — DE JONGH, Voorwoord, T. J. 14, p. 10.
1935 *Turritella djadjariensis* K. MARTIN. — OOSTINGH, Moll. Plioz. Boemiajoe, p. 5.

Material examined:

Upper Kalibèng layers: Sheet 93B, M 257: 2 ex.
Poetjangan layers (volcanic facies): Sheet 105A, M 31: 2 fr.; Sheet 105B, M 71: 1 ex.; below layer I: Sheet 105B, M 68: 11 ex.; layer I: Sheet 105B, M 67: 1 ex.; Sheet 110A, M 94a: 21 ex. (most fr.); M 95: 35 ex.; M 96: 7 ex.; C 103: 1 ex.; C 104: 15 ex.
Poetjangan layers (argillaceous facies): Sheet 110A, M 112: 3 ex.; M 113: 1 ex.; M 289: 5 ex.; M 290: 2 ex.; Sheet 110B, C 81: 2 fr.; C 92: 35 ex.

Several of MARTIN's variations can be distinguished in my material, but it is not always possible to range a specimen in one of these variations, as the older whorls may show the characters of another variety than the younger ones. MARTIN's var. d prevails among the shells I examined, besides I found specimens of the vars. a, c, e, f (not quite typical) and g. In this material from the Kendeng region the sculpture is generally more pronounced on the older whorls than on the younger ones, thus in large specimens of the variety d the sculpture becomes obsolete on the bodywhorl (fig. 27), which is not the case with specimens from the pliocene of Boemiajoe (G.I.A.) belonging to the same variety.

Fossil distribution:

Mal: neogene: Tjihowe (Buitenzorg, Java) (T. J. 30, p. 17); upper miocene: Tjilanang (only from JUNGHUHN's loc. O; Priangan, Java); Tjiodeng (Priangan, Java); pliocene: ? Tjimantjeuri (Bantam, Java); Tjidjadjar, Tjidjoerei (Cheribon, Java); Boemiajoe, Bentarsari Basin (Pekalongan, Java) (T. J. 54, pp. 27, 31); E. of Tjidjoelang (Banjoemas, Java) (T. J. 54, p. 37); Goenoeng Gombel (Semarang, Java); Sangiran[49]) (Soerakarta, Java); „pliocene" [probably = Poetjangan layers]: Bareng beds (Bodjonegoro, Java).
Ind: pliocene: Karikal.

Recent distribution:

not known living.

TURRITELLA spec.

Material examined:

Poetjangan layers (volcanic facies): Sheet 110A, M 130: 3 ex.; layer II: Sheet 110A, M 304: 1 ex.; Sheet 110B, C 3: 2 ex.
Poetjangan layers (argillaceous facies): Sheet 110A, M 289: 2 ex.; Sheet 110B, C 85: 1 ex.

[49]) Pliocene: fide OOSTINGH, 1935, Moll. Plioz. Boemiajoe, p. 2.

Familia Mathildidae.
Genus *Mathilda* O. SEMPER 1865.

38. MATHILDA INSULINDAE P. J. FISCHER.

1921 *Mathilda Insulindae* n. sp. — P. J. FISCHER, Pliocänfauna Seran, p. 244.
+ 1927 *Mathildia Insulindae* spec. nov. — P. J. FISCHER, Seran u. Obi, p. 50, pl. 212, figs. 14—15.
1931 *Mathildia insulindae* FISCHER. — VAN DER VLERK, Caenoz. Amphin., Gastr., p. 253.

Material examined:

Upper Kalibèng layers: Sheet 93B, M 257: 3 ex.; M 260: 1 ex.

The number of secondary spiral ridges appears to be variable: behind the hindermost primary spiral ridge there may be 3 instead of 2 secondary ones; between the two primary ones sometimes one secondary spiral ridge occurs instead of two.

Fossil distribution:

Mal: pliocene: Ceram.

Recent distribution:

not know living.

Familia Architectonicidae.
Genus: *Torinia* GRAY 1842.

39. TORINIA STRAMINEA (GMELIN).

+ 1790 *Trochus stramineus.* — GMELIN in: LINNÉ, Syst. Nat., ed. 13, 1, p. 3575.
1863 *Solarium stramineum* CHEMN. — HANLEY in: G. B. SOWERBY II, Thes. Conch., 3, p. 242, pl. 254, figs. 95, 96, 97.

Material examined:

Poetjangan layers (volcanic facies), layer II: Sheet 110A, M 123: 1 ex.

The dimensions of my only specimen are: Alt. 18, Diam. 21; it agrees with recent specimens of the species (Z.M.A., R.N.H.L.).

Fossil distribution:

no previous records.

Recent distribution:

Mal, Que, Ind.

Bathymetrical distribution:

not recorded.

40. TORINIA ASPERA (HINDS).

Figure 28.

+ 1844 *Solarium asperum*. — HINDS, Proc. Zool. Soc., 12, p. 23.
1863 *Solarium asperum* HINDS. — HANLEY in: G. B. SOWERBY II, Thes. Conch., 3, p. 241, pl. 254, figs. 77, 78.
1925 *Torinia aspera* (HINDS). — THIELE, Gastr. d. Tiefsee-Exp., 2, p. 268 (302), pl. 9 (21), figs. 6, 7.
1935 *Heliacus asperus* (HINDS). — NOMURA, Cat. tert. a. quart. moll. Taiwan, 2, p. 196, pl. 10, figs. 2a, 2b.

Material examined:

Poetjangan layers (volcanic facies), layer I: Sheet 110A, M 100: 1 ex.

My only specimen of this species agrees with HANLEY's careful description of the type specimen. THIELE has given beautiful figures of a young specimen, from which my specimen differs slightly: on the base some fine beaded secondary spiral ridges are visible; owing to

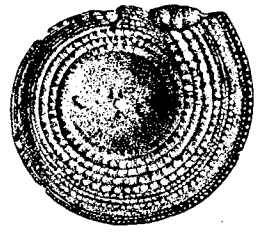


Fig. 28. *Torinia aspera* (Hinds), × 3, from Sheet 110A, M 100, Poetjangan layers (volcanic facies), layer I.

these the total number of spirals amounts to 8 instead of 6 as in THIELE's figure.

My specimen has a diameter of 11,5 mm.

Fossil distribution:

Chi: pliocene (Byôritu beds): Taiwan Is. (= Formosa).

Recent distribution:

Mal.

Bathymetrical distribution:

19—21 m.

Genus *Architectonica* RÖDING 1798.
(= *Solarium* LAMARCK 1799).

41. ARCHITECTONICA PERSPECTIVA (LINNÉ).

+ 1758 *Trochus perspectivus*. — LINNÉ, Syst. Nat., ed. 10, p. 757.
1863 *Solarium perspectivum* LINN. — HANLEY in: G. B. SOWERBY II, Thes. Conch., 3, p. 228, pl. 253, figs. 36, 37, 38.
1901 *Solarium perspectivum* (LINN.) — BULLEN, Pleist. Moll. Perim, p. 255.

1905 *Solarium* (s. str.) *perspectivum* LINN. — K. MARTIN, Foss. Java, p. 246, pl. 37, figs. 594—597.
1908 *Solarium perspectivum* LIN. — K. MARTIN, Alt. Sch. Sondé u. Trinil, p. 9.
1908 *Solarium (Architectonica) perspectivum* LMK. — O. BOETTGER, Tert. u. jüng. Verst., p. 671.
1910 *Solarium perspectivum* L. — KOERT & TORNAU, Geol. u. Hydr. Darressalam u. Tanga, p. 9.
1911 *Solarium* (s. str.) *perspectivum* LINN. — MARTIN-ICKE, Gastr. Trinil, p. 47.
1911-'12 *Solarium perspectivum* LINN. — K. MARTIN, Vorl. Bericht, 1, 2, pp. 21, 47, 159.
1919 *Solarium perspectivum* LINN. — K. MARTIN, Palaeoz. Kenntn. Java, pp. 97, 123, 127, 128, 132, 133, 142, 154.
1920 *Solarium perspectivum* L. — TESCH, Timor, 2, p. 65, pl. 132, fig. 200.
1925 *Architectonica perspectiva* (LINNÉ). — OOSTINGH, Obi and Halmahera, p. 29.
1926 *Solarium perspectivum* LINN. — K. MARTIN, Plioc. Cheribon, p. 8.
1927 *Solarium perspectivum* L. — P. J. FISCHER, Seran u. Obi, p. 33.
1928 *Solarium perspectivum* LINN. — VREDENBURG, Moll. Tert. NW. India, 2, p. 394.
1928 *Solarium perspectivum* LINN. — K. MARTIN, Moll. Neog. Atjeh, p. 5.
1928 *Solarium perspectivum*. — K. MARTIN, Nachlese, p. 115.
1929 *Solarium perspectivum* LINN. — SIEMON, Jungtert. Moll. Niederl. O.-Ind., pp. 15, 17, 26, 40, 52.
193. *Architectonica perspectivum* (MART.). — NASON-JONES, Finsch Coast Area, p. 34.
193. *Architectonica perspectivum* (LAM.). — NASON-JONES, ibid., pp. 48, 79.
1931 *Architectonica* [*Solarium*] *perspectiva* (LINNÉ). — COX, Farsan Is., pp. 5, 7.
1931 *Solarium perspectivum* LINN. — K. MARTIN, Wann löste sich, etc., p. 3.
1931 *Solarium perspectivum* LINN. — VAN ES, Age *Pithecanthr.*, pp. 39, 45, 51, 58, 69, 95, 116.
1931 *Solarium perspectivum* LINN. — VAN DER VLERK, Caenoz. Amphin., Gastr., p. 256.
1932 *Solarium perspectivum* LINN. — HAANSTRA & SPIKER, Benkoelen u. Palembang, pp. 1313, 1314.
1932 *Solarium perspectivum* LINN. — VAN DER VLERK, Zuidrembangsche heuvelland, p. 111.
1932 *Solarium perspectivum* L. var. — K. MARTIN, Kedoengwaroe, p. 114.
1933 *Solarium perspectivum* L. — NARDINI, Moll. Pleist. Somalia, p. 171 [50]).
1935 *Solarium* (s. str.) *perspectivum* LINNÉ var. MART. — WANNER & HAHN, Mioc. Moll. Rembang, p. 263.
1935 *Architectonica perspectiva* (LINNÉ). — OOSTINGH, Moll. Plioz. Boemiajoe, pp. 37, 215.
1935 *Architectonica perspectiva* (LINNAEUS). — NOMURA, Cat. tert. a. quart. moll. Taiwan, 2, p. 194, pl. 9, fig. 41.
1936 *Solarium perspectivum* L. — PANNEKOEK, Altmioc. Moll. Rembang, pp. 7, 12.

Material examined:

Upper Kalibèng layers: Sheet 93B, M 251: 3 ex.; M 260: 7 ex.; M 261: 1 ex.
Poetjangan layers (volcanic facies): Sheet 99B, M 9: 1 ex.; Sheet 110B, C 74: 1 ex.; C 75: 1 ex.; C 83: 1 ex.; layer I: Sheet 110A, M 98: 2 ex.; M 291: 1 ex.; Sheet 110B, M 272: 1 ex.; M 298: 1 ex.; C 89: 1 ex.; layer II: Sheet 110A, C 54: 1 ex.; Sheet 110B, M 278: 1 ex.; C 82: 3 ex.; Sheet 116A, M 216: 1 ex.; M 217: 1 ex.; M 218: 3 ex.; C 40: 1 ex.
Poetjangan layers (argillaceous facies): Sheet 110A, C 45: 1 ex.; C 92: 1 ex.

[50]) Citing M. DREYFUSS, whose original paper I was not able to consult.

In most of my specimens the axial sculpture is more pronounced than in recent shells of this species; for the rest they agree with recent material.

Fossil distribution:

Mal: neogene: Ajer Abab — Ajer Penoekal (Palembang, Sumatra); SW. New Guinea; Finsch Coast Area (New Guinea); lower miocene: Njalindoeng (Priangan, Java); Rembang beds (Java); upper miocene: Tjilanang (Priangan, Java); pliocene: Tjimantjeuri (Bantam, Java); Tjikarang (= loc. R of JUNGHUHN; Priangan, Java); Baribis, Rantja, Tjidjadjar, Waled (Cheribon, Java); Boemiajoe, Pangka (Pekalongan, Java); Kalioeter, Sangiran [51]) (Soerakarta, Java); [= upper Kalibèng layers]: Padasmalang, Sonde (Madioen, Java); Benkoelen — Kroeë [51]), Bintoehan (T. S. 7, p. 19), Peninsula of S. Benkoelen (T. S. 3, p. 23) (Benkoelen, Sumatra); Atjeh (Sumatra); Amanoeban (Timor); Obi (Moluccas); pliocene or younger: Mud-vulcano Kalang Anjar (Soerabaja, Java) (G.I.A.); „pliocene" [probably = Poetjangan layers]: Bareng beds (Bodjonegoro, Java); „pliocene" [= Poetjangan layers (volcanic facies), layer II]: Soemberringin, between Djetis and Sidoteko (Soerabaja, Java).
Chi: pliocene (Byôritu beds): Taiwan Is. (= Formosa).
Ind: upper miocene: (Talar stage of Mekran series): NW. India.
Ery: quaternary: French Somalia; pleistocene: Zifzaf Is. (Red Sea); Perim Is.
Mad: quaternary: Darressalam (E. Africa).

Recent distribution:

Mal, Que, Syd, Tua, Jap, Chi, Ind, Ery, Mad, Cap.

Bathymetrical distribution:

18—55 m.

42. ARCHITECTONICA MAXIMA (PHILIPPI).

† 1840 *Solarium affine* J. DE C. SOW. — J. DE C. SOWERBY, Trans. Geol. Soc. London, (2), **5**, prt. 2, p. 328, pl. 26, fig. 5.
+ 1849 *Solarium maximum* PH. — PHILIPPI, Zeitschr. f. Malakoz., **5** (for 1848), p. 170.
† 1854 *Solarium affinis* J. DE C. SOW. [partim]. — D'ARCHIAC & HAIME, Descr. an. foss. Inde, p. 288, pl. 26, fig. 13.
1863 *Solarium maximum* PHIL. — HANLEY in: G. B. SOWERBY II, Thes. Conch., **3**, p. 229, pl. 250, fig. 5, 6.
1895 *Solarium affine* SOW. — NOETLING, Mar. Foss. Mioc. Upp. Burma, p. 17, pl. 4, figs. 5, 6.
1901 *Solarium maximum* PHILIPPI. — NOETLING, Fauna Mioc. beds Burma, p. 261, pl. 17, figs. 17a—d.
1905 *Solarium* (s. str.) *maximum* PHILIPPI [partim]. — K. MARTIN, Foss. Java, p. 247, pl. 37, figs. 599, 599a, 599b.
1908 *Solarium maximum* PHILIPPI. — K. MARTIN, Alt. Sch. Sondé u. Trinil, p. 9.
1910 *Solarium maximum* PHIL. — COSSMANN, Karikal, 3, p. 47, pl. 3, fig. 1—3.

[51]) Pliocene: fide OOSTINGH, 1935, Moll. Plioz. Boemiajoe, p. 2.

? 1911 *Solarium* (s. str.) *maximum* PHIL. — MARTIN-ICKE, Gastr. Trinil, p. 48.
1918 *Solarium maximum* PHIL. — CHAPMAN, Rep. caen. foss. oil-field Papua, p. 9.
1919 *Solarium maximum* PHIL. [partim]. — K. MARTIN, Palaeoz. Kenntn. Java, pp. 97, 122, 132, 142.
1920 *Solarium maximum* PHILIPPI. — TESCH, Timor, 2, p. 66, pl. 132, fig. 201.
1921 *Solarium maximum* PHIL. — P. J. FISCHER, Pliocänfauna Seran, p. 243.
? 1921 *Architectonica pictum* [non] (PHILIPPI). — DICKERSON, Fauna Vigo group, pp. 5, 7, 9, 11, 13.
1922 *Architectonica pictum* [non] (PHILIPPI). — DICKERSON, Rev. Philipp. Paleont., pp. 202, 223, pl. 2, figs. 1a, 1b.
1927 *Solarium* (s. str.) *maximum* PHILIPPI. — P. J. FISCHER, Seran u. Obi, p. 43.
? 1928 *Solarium affine* J. DE C. SOWERBY. — VREDENBURG, Moll. Tert. NW. India, 2, p. 393.
1928 *Solarium perspectivum* [non] LINNÉ. — YOKOYAMA, Moll. Taiwan, pp. 8, 62, pl. 5, fig. 7.
? 1928 *Solarium maximum* PHIL. — K. MARTIN, Moll. Neog. Atjeh, pp. 5, 24.
? 1928 *Solarium maximum*. — K. MARTIN, Nachlese, p. 111.
? 1931 *Solarium maximum* PHILIPPI. — VAN ES, Age *Pithecanthr.*, p. 95.
1931 *Solarium maximum* PHIL. [partim]. — VAN DER VLERK, Caenoz. Amphin., Gastr., p. 256.
? 1932 *Solarium maximum* PHIL. — VAN DER VLERK, Zuidrembangsche heuvell., p. 111.
1932 *Solarium maximum* PHIL. — HAANSTRA & SPIKER, Benkoelen u. Palembang, p. 1313.
1935 *Architectonica maxima* (PHILIPPI). — OOSTINGH, Moll. Plioz. Boemiajoe, pp. 38, 215.
1935 *Architectonica maxima* (PHILIPPI). — NOMURA, Cat. tert. a. quart. moll. Taiwan, 2, p. 194, pl. 9, fig. 40.

Material examined:

Upper Kalibèng layers: Sheet 93B, M 251: 1 ex.; M 252: 1 ex.; Sheet 105B, M 43: 1 ex.
Poetjangan layers (volcanic facies): Sheet 110B, C 74: 1 ex.; C 75: 1 ex.; layer I: Sheet 110A, M 100: 1 ex.; M 291: 4 ex.; M 292: 6 ex.; M 292 or M 293: 7 ex.; M 297: 4 ex.; M 298: 5 ex.; M 299: 3 ex.; M 301: 9 ex.; C 1: 7 ex.; C 52: 2 ex.; C 60: 2 ex.; C 101: 1 ex.; C 102: 2 ex.; horizon above layer I: Sheet 110B, M 273: 2 ex.; M 274: 2 ex.; layer II: Sheet 110A, M 126: 1 ex.; Sheet 116A, C 35: ? 1 ex.; C 38: 1 ex.; C 40: 1 ex.
Poetjangan layers (argillaceous facies): Sheet 110B, C 78, 2 ex.

In K. MARTIN's opinion (1905, Foss. Java, p. 248) *A. picta* (PHIL.) and *A. modesta* (PHIL.) are not specifically distinct from *A. maxima* (PHIL.), but after the examination of a great many recent specimens of the 3 species I cannot accept this view. I think fossil specimens of these species can also be separated, though the lack of colour certainly makes the identification more difficult.

In Leiden I examined the shells labelled „*Solarium maximum* PHIL." by MARTIN, and it appeared that several specimens of *Architectonia picta* (PHIL.) occur among them. So the javanese localities Bajah? (1905, Foss. Java, pl. 37, figs. 598, 598a, 598b) (Bantam); Tjimantjeuri (Bantam); Palaboean Ratoe (Priangan); Waled (Cheribon) and Padasmalang (Madioen) must be cancelled for *A. maxima* (PHIL.); the specimen from JUNGHUHN's loc. R is badly preserved, but may also belong to

A. picta (PHIL.), and from Sonde I saw specimens of both species in the Leiden collection.

I have mentioned the references to those authors who may have followed MARTIN in the identification of this species, with doubt in the synonymy. The specimen recorded by HAANSTRA & SPIKER was kindly lent to me by professor L. M. R. RUTTEN and I found its identification to be correct.

Judging from the figures of D'ARCHIAC & HAIME and from VREDENBURG's description it seems very probable that „*Solarium affine* J. DE C. SOWERBY" is the same species as *Architectonica maxima* (PHIL.). YOKOYAMA's figure of „*Solarium perspectivum* LINNÉ" clearly represents a specimen of the present species and DICKERSON has figured it wrongly under the name of „*Architectonica pictum* (PHILIPPI)".

Fossil distribution:

Mal: neogene: Djampang Koelon (= JUNGHUHN's loc. C; Priangan, Java); lower miocene: ? Njalindoeng (Priangan, Java); upper miocene (Vigo group): Bondoc Peninsula (Luzon, Philippines); pliocene: Tjimantjeuri (T. J. 14, p. 34), Tjikeusik (Bantam, Java); Boemiajoe, Pangka (Pekalongan, Java); Sikoenang ridge (Banjoemas, Java) (T. J. 66, p. 18); [= upper Kalibèng layers]: Sonde (Madioen, Java); Benkoelen — Kroeë [52]), Bintoehan (T. S. 7, p. 19), Kroeë (T. S. 6, p. 20), Peninsula of S. Benkoelen (T. S. 3, p. 23) (Benkoelen, Sumatra); ? Atjeh (Sumatra); Atamboea (Timor); Ceram; Cape Possession (S. coast of N. Guinea); „pliocene" [probably = Poetjangan layers]: Bareng beds (Tondomoelo and Ngambon — Toeri — Pelem; Bodjonegoro, Java).
Chi: pliocene (Byôritu beds): Taiwan Is. (= Formosa); pleistocene (Ryûkyû limestone): Taiwan Is.
Ind: lower miocene (Gaj series): ? NW. India; miocene: Burma; pliocene: Karikal.

Recent distribution:

Mal, Syd, Jap, Chi, Ind.

Bathymetrical distribution:

not recorded.

43. ARCHITECTONICA PICTA (PHILLIPPI).

+ 1849 *Solarium pictum* PH. — PHILIPPI, Zeitschr. f. Malakoz., 5 (for 1848), p. 171.
1863 *Solarium pictum* PHIL. — HANLEY in: G. B. SOWERBY II, Thes. Conch., 3, p. 231, pl. 252, figs. 33, 34.
1905 *Solarium* (s. str.) *maximum* [non] PHILIPPI [partim]. — K. MARTIN, Foss. Java, p. 247, pl. 37, figs. 598, 598a, 598b.
1911 *Solarium* (s. str.) *maximum* [non] PHIL. — MARTIN-ICKE, Gastr. Trinil, p. 47.
1919 *Solarium maximum* [non] PHIL. [partim]. — K. MARTIN, Palaeoz. Kenntn. Java, pp. 97, 123, 126, 132, 142.
1931 *Solarium maximum* [non] PHIL. [partim]. — VAN DER VLERK, Caenoz. Amphin., Gastr., p. 256.

[52]) Pliocene: fide OOSTINGH, 1935, Moll. Plioz. Boemiajoe, p. 2.

Material examined:

Upper Kalibèng layers: Sheet 93B, M 255: 3 ex.
Poetjangan layers (volcanic facies): Sheet 99B, M 9: 1 ex.; Sheet 110B, M 161: ? 1 ex. juv.; layer I: Sheet 110A, M 89: 2 ex.; Sheet 110B, M 272: 2 ex.; layer II: Sheet 110B, M 281: 2 ex.; Sheet 116A, C 34: 1 ex.; layer II ?: Sheet 109C, M 347: 2 ex. (not quite typical); layer III: Sheet 110A, M 142: 1 ex. (with 1 ex. of *Vermetus (Lemintina) javanus* K. MART. fixed on it); Sheet 110B, M 189: 1 ex. (not quite typical).
Poetjangan layers (argillaceous facies): Sheet 110A, C 46: 2 ex.; C 97: 1 ex.; Sheet 110B, C 47: 1 ex.

From *A. maxima* (PHIL.) the present species can be separated by its finer axial sculpture and by the third spiral band (counting from the hindermost suture) being twice or more as broad as the second. This character can be observed from about the 5th whorl onward; sometimes the third spiral band is clearly broader than the second on the bodywhorl of adult specimens of *A. maxima* (PHIL.) too, but in this case the sculpture of the „middle whorls", on which they are of approximately equal breadth, readily shows their belonging to *A. maxima* (PHIL.).

A. picta (PHIL.) may be distinguished from typical specimens of the closely related *A. modesta* (PHIL.) [53]) by a character of the sculpture: in the spiral groove which runs on the whorls just behind the peripheral keel in *A. modesta* (PHIL.) a threadlike spiral lira can be observed, which is lacking in *A. picta* (PHIL.). I saw some specimens which are intermediate between *A. modesta* (PHIL.) and *A. picta* (PHIL.) as to the colour. As the just mentioned spiral lira is lacking in these specimens, I consider them to belong to *A. picta* (PHIL.), for I never saw a specimen with the typical colours of *A. modesta* (PHIL.) in which this lira was wanting. Mr. C. H. OOSTINGH and Mr. J. R. LE B. TOMLIN, however, both identified these shells as *A. modesta* (PHIL.). In the case these gentlemen are right, I do not think it possible to distinguish fossil specimens of these two species with certainty.

A. purpurata (HINDS) [54]) is also closely related to the present species. I could compare my specimens with two recent shells of this species (R.N.H.L.) and found that they differ from *A. purpurata* (HINDS) in the following respects: 1) they possess a canaliculated suture, 2) the axial sculpture is still finer in *A. purpurata* (HINDS), 3) *A. purpurata* (HINDS) possesses a fine spiral ridge in the peripheral groove on the base, which is lacking in *A. picta* (PHIL.).

Fossil distribution:

Mal: upper miocene: Palaboean Ratoe (Priangan, Java); pliocene: Tjimantjeuri (Bantam, Java); ? Tjikarang (= JUNGHUHN's loc.

[53]) HANLEY, 1863, in: G. B. SOWERBY II, Thes. Conch., 3, p. 229, pl. 250, figs. 11, 12.
[54]) HANLEY, ibid., p. 232, pl. 250, figs. 7, 8.

R; Priangan, Java); Waled (Cheribon, Java); [= upper Kalibèng layers]: Sonde (Madioen, Java).

Recent distribution:

Mal, Ind.

Bathymetrical distribution:

not recorded.

44. ARCHITECTONICA LAEVIGATA (LAMARCK).

Figures 29*a, b*.

+ 1816 *Solarium laevigatum.* — LAMARCK, Tabl. encycl. et méth., 23, p. 175, pl. 446, fig. 3.
1863 *Solarium laevigatum* LAMARCK. — HANLEY in: G. B. SOWERBY II, Thes. Conch., 3, p. 233, pl. 251, figs. 21, 22.
1869 *Solarium laevigatum* LAMARCK. — ISSEL, Malac. Mar Rosso, p. 285.

29*a* 29*b*

Figs. 29*a, b*. *Architectonica laevigata* (Lamarck), 1 ex. × 1, from Sheet 110B, M 175, Poetjangan layers (volcanic facies), layer II.

Material examined:

Poetjangan layers (volcanic facies), layer II: Sheet 110B, M 175: 1 ex.; M 176: 2 ex.

These specimens are not adult, the measurements of the largest one (from loc. M 175) are: Alt. 11,5, Diam. 21. The specimens agree in every respect with recent shells from the S. coast of Java.

Fossil distribution:

Ery: pleistocene: raised beaches of Red Sea.

Recent distribution:

Mal, Ind, Ery, Mad.

Bathymetrical distribution:

not recorded.

ARCHITECTONICA spec.

Material examined:

Upper Kalibèng layers: Sheet 93B, M 249: 1 ex.
Poetjangan layers (volcanic facies): Sheet 110B, C 71: 3 ex.

Poetjangan layers (argillaceous facies): Sheet 110B, C 92: 1 ex.

Some *Architectonicae* have been preserved too badly to identify the species.

Familia Vermetidae.
Genus *Vermetus* DAUDIN 1800.
Subgenus *Lemintina* RISSO 1826.

45. VERMETUS (LEMINTINA) JAVANUS K. MARTIN.

+ 1879 *Vermetus javanus* nov. spec. — K. MARTIN, Tertiärsch. Java, p. 77, pl. 14, fig. 13.
1884 *Vermetus javanus* MART. — K. MARTIN, Tiefbohr. Java, p. 170.
1895 *Vermetus javanus* MART. — K. MARTIN, Neues Tert. Java, p. 38.
1900 *Vermetus javanus* MART. — K. MARTIN, Eintheil. Verst. Sedim. Java, p. 177.
1905 *Vermetus javanus* MART. — K. MARTIN, Foss. Java, p. 223, pl. 34, figs. 513—516.
1908 *Vermetus javanus* MART. — K. MARTIN, Alt. Sch. Sondé u. Trinil, p. 9.
1910 *Vermetus javanus* MARTIN. — COSSMANN, Karikal, 3, p. 39, pl. 2, fig. 14.
1911 *Vermetus javanus* MART. — K. MARTIN, Vorl. Bericht, 1, p. 47.
1911 *Vermetus javanus* MART. — MARTIN-ICKE, Gastr. Trinil, pp. 47, 49.
1916 *Vermetus javanus* MART. — K. MARTIN, Altmioc. Fauna Westprogogeb., p. 254, pl. 3, fig. 70.
1919 *Vermetus javanus* MART. — K. MARTIN, Palaeoz. Kenntn. Java, pp. 95, 128, 130, 132, 137.
1920 *Vermetus javanus* MARTIN. — TESCH, Timor, 2, p. 59, pl. 132, fig. 192.
? 1921 *Vermetus javanus* K. MARTIN ? — DICKERSON, Fauna Vigo group, pp. 12, 15.
? 1922 *Vermetus javanus* ? K. MARTIN. — DICKERSON, Rev. Philipp. Paleont., p. 203.
1928 *Vermetus javanus*. — K. MARTIN, Nachlese, pp. 111, 115.
1929 *Vermetus javanus* MART. — SIEMON, Jungtert. Moll. Niederl. O.-Ind., p. 54.
1929 *Vermetus javanus* MART. — CHAPMAN, Foss. Barum River, pp. 59, 62.
1929 *Vermicularia (Thylacodes) javana* (MART.). — PAPP, Geol. NE. Sepik Distr., p. 72.
1929 *Vermicularia (Thylacodes) javana* (MART.). — CHAPMAN, Rep. Foss. Marienberg, p. 82.
193. *Vermicularia (Thylacodes) javana* MART. — NASON-JONES, Geol. Finsch Coast Area, pp. 34, 49, 90.
193. *Vermicularia (Thylacodes) javana*. — NASON-JONES, ibid., p. 81.
1931 *Vermetus javanus* MART. — VAN ES, Age *Pithecanthr.*, pp. 45, 51, 57, 62, 95.
1931 *Vermetus javanus* MART. — VAN DER VLERK, Caenoz. Amphin., Gastr., p. 253.
1932 *Vermetus javanus* MART. — HAANSTRA & SPIKER, Altmioz. Rembang, p. 1096.
1935 *Vermetus javanus* MART. — WANNER & HAHN, Mioc. Moll. Rembang, p. 260.
1935 *Vermetus (Lemintina) javanus* K. MARTIN, forma *tegalensis* nov. — OOSTINGH, Moll. Plioz. Boemiajoe, p. 2.
1935 *Lemintina javana* (MARTIN). — NOMURA, Cat. tert. a. quart. moll. Taiwan, 2, p. 192, pl. 8, fig. 39.
1936 *Vermetus* cf. *javanus* MART. — PANNEKOEK, Altmioc. Moll. Rembang, pp. 7, 55.

Material examined:

Upper Kalibèng layers: Sheet 93B, M 251: 2 fr.; M 252: 5 fr.; M 257: 11 fr.; M 260: 4 fr.
Poetjangan layers (volcanic facies): Sheet 99B, M 9: 4 fr.; M 14: 1 fr.; Sheet 105B, M 53: 2 ex.; M 63: 4 fr. (forma *tegalensis* OOSTINGH); Sheet 110A, M 309: 17 ex. + fr.; Sheet 110B, M 167: 5 fr.; C 83: 1 ex.; layer I: Sheet 110A, M 295: 1 fr.; M 301: 1 ex.

(on *Ostrea* spec.) + 1 fr.; Sheet 110B, M 270: 1 fr.; horizon above layer I: Sheet 110B, M 273: 1 fr.; layer II: Sheet 110A, M 125: ± 25 fr.; M 304: 4 ex. & fr.; Sheet 110B, M 166: 2 fr.; M 173: 3 fr.; M 280: 2 fr.; M 281: 1 ex. (on *Placuna* spec.) + 1 ex. (on *Ostrea* spec.) + 12 ex. & fr.; horizon above layer II: Sheet 110B, C 67: 1 ex. + 14 fr.; layer III: Sheet 110A, M 139: 9 fr.; M 142: 1 ex. (on *Architectonica picta* (PHIL.)); Sheet 110B, M 193: 1 fr. Poetjangan layers (argillaceous facies): Sheet 110B, M 266: 2 fr.

OOSTINGH's forma *tegalensis* was collected at loc. M 63; especially 2 of the 4 fragments of that locality strikingly agree with OOSTINGH's description and figures. I examined the specimens mentioned with some doubt by PANNEKOEK from the Rembang beds, and I think part of them really belong to this species.

Fossil distribution:

Mal: neogene: Barum River, Finsch Coast Area (New Guinea); miocene: W. part of the district of Tjidamar (= loc. K of JUNGHUHN; Priangan, Java), Ngembak (Semarang, Java); lower miocene: Njalindoeng (Priangan, Java); W. Progo Mountains (Jogjakarta, Java); Rembang beds (Java); upper miocene: Tjilanang, Tandasngamper (Priangan, Java); NE. Sepik district (New Guinea); (Vigo group): ? Bondoc Peninsula (Luzon, Philippines); pliocene: Tjihondje (Priangan, Java); Tjidjadjar, Tjidjoerei, Waled (Cheribon, Java); Boemiajoe (f. *tegalensis* OOSTINGH) (Pekalongan, Java); Sangiran[55]) (f. *tegalensis* OOSTINGH) (Soerakarta, Java); [= upper Kalibèng layers]: Doekoepengkal, Padasmalang, Sonde (Madioen, Java); Fialarang (Timor); „pliocene" [probably = Poetjangan layers]: Bareng beds (Bodjonegoro, Java).
Chi: pliocene (Byôritu beds): Taiwan Is. (= Formosa).
Ind: pliocene: Karikal.

Recent distribution:

not known living.

Genus *Tenagodus* GUETTARD 1774.

46. TENAGODUS OBTUSUS (SCHUMACHER).

Figures 30*a, b*, 31.

+ 1817 *Anguinaria obtusa*. — SCHUMACHER, Essai Vers test., p. 262.
? 1856 *Siliquaria anguina* [non] LINN. — HOERNES, Foss. Moll. Tert.-Beckens Wien, p. 487, pl. 46, fig. 18.
1868 *Siliquaria anguina* [non] LINNÉ. — WEINKAUFF, Conch. Mittelm., 2, p. 329 [refers to further literature].
1886 *Siliquaria obtusa* SCHUM. — TRYON, Man. Conch., 8, p. 189, pl. 57, figs. 15, 16.
1896 *Tenagodes anguinus* [non] (L.). — SACCO, Moll. Terr. Terz. Piemonte e Liguria, 20, p. 17, pl. 2, figs. 14, 14b, 14c, 14d, 14e [refers to further literature].

[55]) Pliocene: fide OOSTINGH, 1935, Moll. Plioz. Boemiajoe, p. 2.

Material examined:

Poetjangan layers (volcanic facies), layer I: Sheet 110A, M 295: ? 2 fr.; M 301: 1 fr.; layer II: Sheet 110A, C 54: 1 ex.; Sheet 110B, C 82: 1 ex.; Sheet 116A, C 37: 1 ex.; layer II ?: Sheet 109C, M 346: 1 ex.

Poetjangan layers (argillaceous facies): Sheet 110A, C 46: 1 fr.

I can find no differences between some shells in my material and the mediterranean *T. obtusus* (SCHUM.). Especially SACCO's fig. 14 represent two specimens which are strikingly like my Javanese shells.

In my specimens the margins of the spiral slit are waved dentate, which according to TRYON is not the case in this species. But SACCO (l. c., p. 18) doubts if this character has as great a value as MÖRCH ascribed to it, and in my opinion SACCO is right. At any rate a waved dentate slit may occur in *T. obtusus* (SCHUM.), as not only the specimens from the Italian neogene figured by SACCO present this character, but

30*a*

30*b*

31

Figs. 30*a*, *b*. *Tenagodus obtusus* (Schumacher), × 1, from Sheet 110A, C 54, Poetjangan layers (volcanic facies).

Fig. 31. *Tenagodus obtusus* (Schumacher), 1 fr. of uncoiled part (showing the longitudinal sculpture) × 1, from Sheet 110A, M 301, Poetjangan layers (volcanic facies), layer I.

even the specimen figured by BORN [56]), to which SCHUMACHER refers, shows is clearly.

The most closely related malayan species of this genus are the recent *T. trochlearis* MÖRCH [57]) and *T. ponderosus* MÖRCH [58]) and the fossil *T. obtusiformis* K. MARTIN [59]), which all three are distinctly different from my specimens.

The genus *Tenagodus* forms a difficult group for the taxonomist; it may be doubted if the variable shell shows sufficient characters to distinguish species of the same value as in other genera. An extensive study of the recent species of this genus will perhaps throw more light on this problem some day. In the meantime not much importance can be attached to the record of a recent mediterranean *Tenagodus* in pleistocene beds of Java.

[56]) 1780, Mus. Caes. Vind., pl. 18, fig. 15.
[57]) TRYON, 1886, Man. Conch., 8, p. 189, pl. 57, fig. 14.
[58]) TRYON, ibid., p. 188, pl. 57, fig. 11.
[59]) K. MARTIN, 1905, Foss. Java, p. 224, pl. 34, fig. 517.

Fossil distribution:

miocene: ? Vienna basin; miocene and pliocene (Helvetien — Astien): Northern Italy; young neogene: Mediterranean region.

Recent distribution:

Cap: (Port Elisabeth [60]); Mediterranean; Senegal.

Bathymetrical distribution:

not recorded.

TENAGODUS spec.

Material examined:

Poetjangan layers (volcanic facies), layer I: Sheet 110A, M 297: 1 fr.; Sheet 110B, M 158: 3 fr.

[60]) fide G. B. SOWERBY II, 1892, Mar. shells S. Africa, p. 39.