

Palæontology. — *Corals from the Upper Miocene of Tjisande, Java.*

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In his description of sheet 54 of the geological map of Java 1 : 100.000 (Ao. 1935) Dr. W. H. HETZEL mentioned the occurrence of a reef limestone along the Tjisande, North of Lurahgung (Central Java). Reef limestones occur rather abundantly in the form of lenses in the upper part of the so-called Halangbeds. Originally they must have grown up as patch reefs in the same way as the present reefs in the bay of Batavia and the Spermonde Archipelago. Gradually they were buried by the accumulation of muddy sediments.

The marly limestone which is overlying the reef limestone at Tjisande contains worn-off fragments of *Cyclöcypus* and *Lepidocyclus* derived from older strata. Moreover in the same beds a tooth was found of a rhinoceros, *Aceratherium boschi* Von Koenigswald (the oldest remain of a land vertebrate so far known from Java). It seems therefore that the limestone of Tjisande belongs to the *Lepidocyclus*-free part of the Neogene and should be reckoned to the uppermost miocene, tertiary g. As a matter of fact this conclusion is supported by the results of my examination of the corals from the Tjisande limestone.

The collection consists of 21 different corals and the species of 15 of these could be identified. Among these 15 species 7, i.e. 46,6 percent are species which are still living among the recent fauna's of the Indo-Pacific. This percentage figure shows the Tjisande limestone to be undoubtedly older than the coral-bearing localities in the pliocene Sonde beds of Java that belong to the Tertiary h. On the other hand it proves the Tjisande reef to be younger than coral fauna's known from the *Lepidocyclus*-bearing Upper Miocene (Tertiary f) of the East Indies. A very interesting lower-pliocene coral fauna of Prupuk in Central Java — being the largest suite of tertiary corals so far collected from one single locality in the East Indies — contains 54 percent recent species.

Many coral species of Tjisande were found also in the coral reef of Prupuk, viz. 71,4 percent. Most of the specimens from Tjisande could even be identified only by comparing them to the much better preserved material from Prupuk. It seems, therefore, that geologically speaking the Tjisande reef is only slightly older than the fossil reef of Prupuk and might belong either to the lowermost Pliocene or to the uppermost Miocene. This conclusion is in agreement with HETZEL's statement that the reef lenses of Tjisande occur in the upper part of the Halang series, i.e. in the transition beds towards the lower pliocene Kumbang beds.

The following table summarizes the identified corals from Tjisande and their distribution in the upper miocene Tjilanang beds, the lower pliocene Prupuk reef and the recent fauna.

	Corals from Tjisande	Tjilanang	Prupuk	Recent
1	<i>Seriatopora</i> spec.		+	
2	<i>Stylophora pistillata</i> Esper	+		+
3	<i>Antillophyllia constricta</i> (Brügg.)			+
4	<i>Lithophyllia grandissima</i> Felix		+	
5	<i>Galaxea clavus</i> (Dana)		+	+
6	<i>Galaxea</i> spec. 1.		+	
7	<i>Favites</i> spec. 1		+	
8	<i>Coelastrea rectangularis</i> nov. spec.			
9	<i>Coeloria</i> cf. <i>daedalea</i> (Forsk.)		+	+
10	<i>Merulina ampliata</i> (Ell. et Sol.)	+	+	+
11	<i>Lobophyllia corymbosa</i> (Forsk.)		+	+
12	<i>Lobophyllia costata</i> (Dana)		+	+
13	<i>Diploastrea heliopora</i> (Lam)		+	+
14	<i>Fungia pseudo echinata</i> Gerth		+	
15	<i>Fungia</i> spec. 1.		+	
16	<i>Pachyseris curvata</i> Martin	+	+	
17	<i>Cyathoseris lophiophora</i> Felix		+	
18	<i>Cyathoseris</i> cf. <i>crassilamellata</i> Gerth		+	
19	<i>Pavona micrommata</i> Felix			
20	<i>Tubipora</i> spec.			
21	<i>Isis</i> spec.			
		3	15	8

Species 1, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 17 and 18 will be treated at great length in a paper on the Prupuk reef which is ready for publication. This is the more reasonable as no 6 and 7 belong to new species, which are represented by much better preserved specimens in the collection from Prupuk.

No 3 was already mentioned by me when I described *Antillophyllia constricta* in my paper on the corals from Talaud.

So, I may restrict myself here in publishing only a description of the new species *Coelastrea rectangularis* (no 8) and in giving some comments on nos. 2, 4, 19, 20 and 21.

Stylophora pistillata Esper

1880. *Stylophora digitata* (Pallas), K. MARTIN, Die Tertiärschichten von Java, p. 135, plate 24, fig. 9 and 10.
1912. " " " J. FELIX, New Guinea, Ber. K. Sächs. Akad. d. Wissensch. 64, p. 443.
1913. " cf. " " J. FELIX, Trinil, Palaeontogr. 60, p. 360.

1915. .. pistillata Esper, J. FELIX, Palaeont. von Timor II, p 40.
 1921. .. " " " J. FELIX, Borneo, Palaeont. von
 Timor IX, p. 52.
 1922. .. digitata Pallas, H. GERTH, Java, Samml. Geolog.
 Reichsmus. Leiden I.2, p. 420.
 1923. .. pistillata (Esper), H. GERTH, Borneo, Samml. Geolog.
 Reichsmus., Leiden I,X, p. 96.
 1925. .. " " " H. GERTH, Nias, Leidsche Geol.
 Med, I, p. 32
 1926. .. " " " J. H. F. UMBGROVE, Sumatra,
 Wetensch. Med. Nr. 4, p. 41.
 1929. .. " " " J. H. F. UMBGROVE, Java, Tijdschr.
 Kon. Ned. Aardr. Gen. 46, p. 11.
 1929. .. " " " J. H. F. UMBGROVE, Borneo,
 Wetensch. Meded. Nr. 9, p. 63, fig. 2
 and plate 3, fig. 40—42.

For synonymy and distribution of recent species see UMBGROVE, Zoolog. Mededeel. Vol. 22, p. 23 and 274.

One well preserved specimen showing a striking resemblance to the coral figured by BEDOT (Madréporaires d'Amboine) in his plate 5 fig. 6.

Distribution: Upper Miocene: Borneo, Java; Pliocene: Java; Pliocene-Pleistocene: Timor, Sumatra, Nias; Recent: Indo-Pacific.

Lithophyllia grandissima Felix

1921. Lithophyllia grandissima Felix, Palaeontologie von Timor IX,
 p. 24, Pl. 3, fig. 5, 5a.
 1923. .. " " " H. GERTH, Anthoz. von Borneo
 Samml. Geol. Reichsmus., Leiden
 X, p. 64.

There is one specimen, which has well preserved septa and costae, both with broad-based spines as was described in detail by FELIX. A section through the coral shows a strongly developed vesicular endotheca. Diameter of calice 4 to 7,5 cm. Calicular margin rounded. Septa in 5 complete cycles and a 6th cycle incomplete. FELIX has not given a description of the columella. GERTH, however, mentions a specimen having a narrow columella, 3 cm in length. The columella of the specimen from Tjisande is not in a good state of preservation, but it can hardly have been more than a spongy columniform mass with a circular diameter.

There are, however, two more specimens from Tjisande, and, although these are badly damaged, one of them shows a columella of very irregular shape, divided as it were in two separate centra.

Two fragments from the Prupuk reef, apparently belong to the same

species. One of them has a columella consisting of a loose spongy structure, circular in diameter. It appears, therefore, that the shape of the columella is rather variable in this species.

Distribution: British Borneo from a locality of unknown age (FELIX). East Borneo from the surroundings of Bontang, amidst a fauna, which GERTH considers to be of Pliocene age.

Coelastrea rectangularis nova species, Fig. 1.

A lone fragment (holotype) of a well preserved coral from Tjisande shows polygonal to rectangular calices, which seem very characteristic. Calices deep, up to 6 mm. Calices fused by their thin walls. Diameter of calices 5 by 5 mm up to 5 by 11 mm. In the larger calices 12 steeply dipping septa nearly reach the calicular centre; between these 12 thinner and slightly shorter septa occur and a few rudimentary ones of the fifth order. In smaller calices only three orders are complete and a few of the fourth order may occur. Septa, when well preserved, show broad-based dentations. Septal faces smooth. Septa usually continuous and exert over the intercorallite wall, exceptionally alternating. Columella deep, loose; a small trabecular structure, not visible in undamaged calices. Corallum vesicular, dissepimental. Lower side lobed and costate.

Pavona micrommata (Felix)

1912. *Stephanocoenia intersepta* (Esper), J. FELIX, New Guinea, Ber. d. Sächs. Akad. d. Wissensch. 64, p. 444.
1913. *Siderastrea micrommata* Felix, TRINIL, Palaeontogr. 60, p. 335, fig. 3.
1915. " " " Palaeont. von Timor II, p. 34.
1924. *Stephanocoenia intersepta* (Esper), J. H. F. UMBGROVE, Geol. Results of Explor in Ceram II, 1, p. 11.
1926. *Siderastrea micrommata* Felix, J. H. F. UMBGROVE, Sumatra, Wetensch. Meded. Nr. 4, p. 43.

FELIX has given a good description. The surface of the colony is only locally well preserved, for the greater part of the surface layers are rather worn off, the deeper structure appearing to view. The specimen is irregular noduliform, 115 mm long, 70 mm broad. *Pavona duerdeni* VAUGHAN (1917) is perhaps an allied form among the recent coral fauna, but it has a compressed, often lamellate columella and a deeper calicular fossa.

Distribution: Plio-Pleistocene (?): New-Guinea, Ceram, Sumatra; Pliocene (?): Trinil (Java), Timor.

Tubipora spec., fig. 2 and 3, nat. size.

Two fragmentary specimens. Diameter of the corallites varying from 1 to 2 mm, usually 1,5 mm. Four corallites to 1 centimeter rarely more. Horizontal laminae 8 up to 10 mm apart (fig. 3). The specimens probably belong to a still living species, perhaps *Tubipora musica* Linn., but an identification of the species is not possible because of the bad state of preservation of the fossils. *Tubipora rubiola* Quoy et Gaim was mentioned by FELIX from the Pliocene (or Pleistocene) of Timor (Pal. von Timor VIII, 1920, p. 25).

Isis spec. Fig. 4, 5 and 6, nat. size.

Perhaps a specialist in this group might be able to identify a calcareous body and a fragment of the basal part of *Isis* from Tjisande.

I refrain, however, from constituting a specific name on so scanty material. The basal portion is an incrustation, showing narrowly waved ridges and furrows (fig. 6). The branching of the calcareous body (fig. 4) shows it to belong to the genus *Isis* and not to *Mopsea*. Its length is 65 mm; diameter oval 15×7 mm. One condylus is well preserved (fig. 5), the other end is broken off. Ridges and furrows straight and very distinct. No granules on the ridges. The species seems different from *Isis* cf. *polyacantha*, which was described by FELIX from the Plio-Pleistocene of Timor. According to my opinion *Isis danae*, *Isis elongata* and *Isis compressa*, described by DUNCAN from the miocene Gai series of Sind (Palaeont. Indica 1886) all belong to *Isis polyacantha* Steenstrup. The calcareous body from Tjisande seems also different from the *Isidac* described by DUNCAN from tertiary deposits of New Zealand (Quart. Journ. Geol. Soc. 31, 1875) and by TENNISON Woods from New Zealand (Palaeont. of New Zealand IV, 1880).



Fig. 1.
Coelastrea rectangularis nova species. $\times 2$.



Fig. 2 and 3.
Tubipora spec. Nat. size.

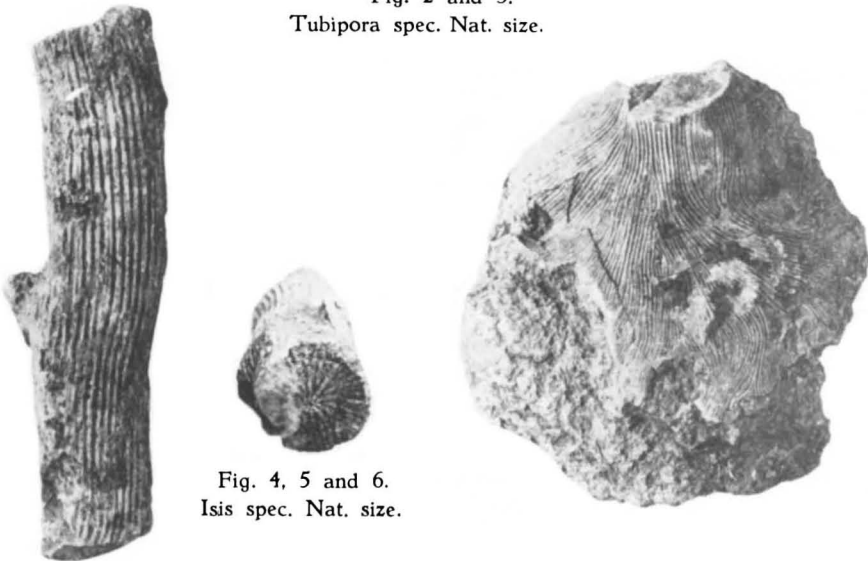


Fig. 4, 5 and 6.
Isis spec. Nat. size.