

**Palaeontology.** — *Corals from the Upper Kalibeng beds (Upper Pliocene) of Java.* By J. H. F. UMBGROVE. (Communicated by Prof. L. RUTTEN.)

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The name Upper Kalibeng beds was introduced by members of the Geological Survey of Java to indicate a series of strata of Upper Pliocene age in the Kendeng region between Trinil and Surabaya. They were mapped as such by J. DUYFJES on the sheets 109 (Lamongan), 110 (Modjokerto), 115 (Surabaya) and 116 (Sidoardjo) of the Geological map of Java 1 : 100000 published in the year 1938. The same author published a summary of the stratigraphy of the whole region in 1936<sup>1)</sup>.

In the western part of the region the locality Sonde, which is well known for the Pliocene Molluscs described by K. MARTIN, belongs to these Upper Kalibeng beds. Corals from the neighbourhood of Sonde and Trinil were described by J. FELIX. At present Dr. C. O. VAN REGTEREN ALTENA is studying the Mollusca of the Kendeng region. In the publication of the first part of his results a complete list is given of localities from which the collection of fossils were made by the Geological Survey<sup>2)</sup>.

I am publishing here the results of my examination of the corals collected from the Upper Kalibeng beds by members of the Geological Survey. Consequently the numbers of the localities mentioned in the list below correspond to those of VAN REGTEREN ALTENA's table I. They are the following localities. (Sheets 93 and 99 have not yet been published! They are situated to the West of the sheets 109, 110 mentioned above.)

Locality M.	6,	sheet 99B,	W. of Sempol,	Limestone
„	M. 250,	„	93B, Soloriver near Gadjah,	Limestone
„	M. 251,	„	„ , „ „	N.W. of Padasmalang, sandy marl
„	M. 252,	„	„ , „ „	„ „ „ „ „ „
„	M. 253,	„	„ , „ „	„ „ „ „ „ „ Limestone
„	M. 254,	„	„ , „ „	„ „ „ „ „ „
„	M. 257,	„	„ , „ „	S. of the mouth of R. Alastoewa near Sonde, sandy marl
„	M. 258,	„	„ , „ „	idem
„	M. 260,	„	„ , „ „	near Bangoenredjo Kidol

The list gives a review of 35 corals from the Upper Kalibeng beds. The species of 29 could be identified. Twenty of these belong to still living species, i.e. 69 percent. This percentage figure agrees with the figure 68,8 resulting from my revised list of the corals described by J. FELIX from the region of Trinil and Sonde.

1) J. DUYFJES. Zur Geologie und Stratigraphie des Kendenggebietes zwischen Trinil und Soerabaja (Java). De Ingenieur in Nederl. Indië 3 (1936).

2) C. O. VAN REGTEREN ALTENA. The marine Mollusca of the Kendeng beds (East Java). Gastropoda, part I. Leidsche Geologische Mededeelingen, Vol. X (1938).

In the accompanying list of corals nos. 5, 16, 33 and 35 belong to well known fossil species; no. 1, 2, 3 and no. 30 will be amply described in my papers on the corals from the Lower Pliocene reef of Prupuk and the Lower Pleistocene Putjangan beds (Both the manuscripts are ready for the press). Nos. 7, 8, 9, 10, 11, 12, 13, 14, 15, 17, 18, 19, 23 and 24 were identified without doubt by comparison with large suites of recent corals. Nos. 20 and 21, though probably still living species, could not be identified as the specimens are too fragmentary. It is not necessary in my opinion to give full descriptions of the twenty-four coral species enumerated above. Therefore we may restrict ourselves in devoting only paleontological descriptions or taxonomical comments on the remaining 11 species.

Number of species	Coral species from the Upper Kalibeng beds	Recent	Numbers of Localities
1	<i>Acanthocyathus spinosa</i> nov. spec.		251
2	" <i>grayi</i> E. H.	+	251, 253, 257
3	<i>Heterocyathus aequicostatus</i> E. H.	+	252, 257, 260
4	<i>Seriatopora micrommata</i> Felix, var.		252, 258
5	<i>Pocillopora Jenkinsi</i> Reuss		252, 260
6	<i>Stylophora solida</i> nov. spec.		253
7	<i>Antillophyllia constricta</i> (Brügg.)	+	252, 260
8	<i>Cyphastraea seraila</i> (Forsk.)	+	260
9	<i>Leptastraea purpurea</i> (Dana)	+	253
10	" <i>transversa</i> (Klunz.)	+	260
11	<i>Galaxea clavus</i> (Dana)	+	260
12	<i>Favia speciosa</i> (Dana)	+	253
13	" <i>favus</i> (Forsk.)		
14	<i>Goniastraea retiformis</i> (Lam.)	+	253, 254
15	" <i>hombroni</i> (Reuss)	+	253
16	" <i>simplicitexta</i> Umbgrove		260
17	<i>Coeloria lamellina</i> (Ehrenb.)	+	253, 260
18	" <i>daedalea</i> (Forsk.)	+	253, 260
19	<i>Platygyra phrygia</i> (Ell. et Sol.)	+	253
20	<i>Merulina</i> spec. (cf. <i>ampliata</i> Ell. et Sol.)		252
21	<i>Lobophyllia</i> spec.		260
22	<i>Symphyllia recta</i> (Dana)	+	253, 260
23	<i>Diploastraea heliopora</i> (Lam)	+	250, 253
24	<i>Fungia cyclolites</i> Lam.	+	257, 260
25	" <i>sibogae</i> v. d. Horst	+	260
26	" <i>somervillei</i> Gard.	+	260
27	" <i>costulata</i> Ortmann	+	260
28	" <i>inaequicostata</i> Gerth		6
29	" <i>echinata</i> Pallas	+	260
30	" cf. <i>repanda</i> Dana		6
31	" cf. <i>concinna</i> Verrill		6
32	<i>Pachyseris curvata</i> Martin		6
33	<i>Cyathoseris lophiophora</i> Felix		252, 260
34	<i>Pavona microstoma</i> Umbgrove		252
35	<i>Dictyaraea anomala</i> Reuss.		260

*Seriatopora micrommata* Felix var. *javana* nov. var.

Pl. I, fig. 7 and 8.

The branchlets resemble *Seriatopora micrommata* which is known from the Upper Miocene (Tertiary *f* and *g*) of Borneo and Java. They differ, however, by (1) a greater diameter of the branches, up to 5 mm, (2) a greater number of longitudinally arranged calices, (3) the absence of a columellar papilla on the directive septa, (4) the calices being less prominent.

Perhaps some *Seriatopora* fragments from Gunung Linggapadang, Prupuk may also belong to the present variety.

*Stylophora solida* nova spec.

Pl. II, fig. 9 and 10.

The single specimen is a fragment of a large massive growth; it is 125 mm high and has a diameter of 100 mm. The calices are circular and have a diameter of 1 mm or slightly more. Corallites crowded, up to 1 mm distant, usually less. Six thin equal septa reach the columella, secondaries and tertiaries extending only as low ridges along the calicular walls. Coenenchyma formed by a loose dissepimental structure. Upper surface of the colony not preserved.

*Leptastrea transversa* (Klunzinger).

Pl. II, fig. 13.

1913 *Leptastrea transversa* Klunzinger, Felix, Java, p. 3481918 " " " , Vaughan, p. 94, plate 31, fig. 1,  
1a (with synonyms)

A figure is here given of part of one of the specimens, showing the septal arrangement which is characteristic of this species.

Distribution: Recent: Indo-Pacific; Pliocene of Duku Pengkol, Java.

*Symphyllia recta* (Dana).1913 *Symphyllia* cf. *sinuosa* Quoy et Gaim., Felix, Trinil, Palaeontogr. 60, p. 343.1913 " *acuta* Quelch, Felix, Trinil, Palaeontogr. 60, p. 343.1915 " *Molengraaffi* Felix, Palaeont. v. Timor II, p. 10.1928 " *recta* (Dana), Matthai, Catal. Madrep. corals British Mus. vol. 7, p. 227 Pls (with synonymy).1940 " *recta* (Dana), Umbgrove, Zoolog. Meded. 22, p. 288 (with synonymy).

The specimens are all fragments of large colonies undoubtedly belonging to the still living species *S. recta*. The Siboga specimen is from a pleistocene reef limestone 80 metres above sea level. I restudied a syntype of *S. Molengraaffi* Felix in the Institute of Mining at Delft. From a comparison with

a suite of recent specimens of *Symphyllia* it is obvious that FELIX's species belongs to *S. recta* (Dana). The differences mentioned by FELIX fall within the limits of variability of that species. From the description of *Symphyllia acuta* FELIX it may be deduced that FELIX studied not *Symphyllia agaricia* E. H. (= *S. acuta* Quelch according to Matthai, 1928, p. 233) but *S. recta* Dana as defined by MATTHAI (1928, p. 277).

*Fungia sibogae* Van der Horst.

Pl. I, fig. 1 and fig. 2.

The specimen is damaged; especially the edge of the disc is preserved in only one spot. However, the undamaged part allows an identification. The description of the recent *Siboga* specimen given by VAN DER HORST (*Siboga* Exped. Monogr. XVI b, 1921) is in every respect applicable to the fossil specimen; only in the Javanese fossil the central part of the lower surface is slightly convex, whereas the recent specimen has a slightly holowed aboral surface.

Moreover the recent specimen shows an individual prominence of the septa round the axial fossa which is absent in the fossil one.

*Fungia somervillei* Gardiner.

Pl. I, fig. 3 and 4.

1921. *Fungia somervillei* VAN DER HORST, *Siboga* Exp. Monogr. XVI 6, (with synonyms).

Although only one fragment of a disc is present, the specimen shows so many highly characteristic features that they must be described at some length. The disc had an elliptical shape. From the fragment it may be inferred that it must have had a length of about 140 mm, a breadth of 80 mm; thin along the edge of the disc (10 mm) but much thickened in the centre (40 mm). The lower surface is very irregularly undulating. Wall imperforate. Costae low, subequal; those of the first cycle slightly more prominent. All costae covered with small spinose and sub-equal granules. Costae near the centre of the disc interrupted; in the centre loosing themselves in an irregular pattern. Septa rounded along the edge of the disc; the first cycles thickened towards the central fossa and more prominent than those of the thinner septa; densely and finely granulate. Some of the septa showing an arrangement of grains in lines perpendicular to the edges of the septa. Edges of the septa locally with small teeth. The axial fossa is 40 mm long.

The species has the characteristics of *F. somervillei* as described by GARDINER but it is more elongate. In this respect the specimen described by VAN DER HORST is an intermediate form, but that specimen is only 20 mm high. Without studying a large suite of this species it is impossible to form an idea of its variability. There is, however, no reason to describe the present specimen under a new name, as it agrees in all principal characteristics with *F. somervillei*.

*Fungia costulata* Ortmann.

Pl. I, fig. 5 and 6.

1902. *Fungia costulata* Döderlein, Abh. Senckenb. Naturforsch. Gesellsch. vol. 27 (with synonymy).

The lower surface of the specimen is undulating, showing a concavity in the centre. Costae subequal, many times interrupted, running nearly straight to the centre of the disc, where they form an irregularly winding pattern. Costae covered by small and some larger irregular spinose granulations. Septa of subequal height, in their peripheral part strongly granulate even on their upper and outer gently rounded and free edges. Only the youngest cycle of septa very thin and low. Septa not dentated. Diameter of the disc 60 mm, height 18 mm.

Distribution: Recent: Ceylon, New Britain, Blanche Bay.

*Fungia inaequicostata* Gerth.

1925. *Fungia inaequicostata* Gerth, Java, Leidsche Geolog. Meded. I, p. 41, plate 6, fig. 1, 1a.

The sepal edges are not well preserved. It may, however, be seen that they are crowded with fine granules, which bear distinct teeth (8 per centimeter). In the specimens studied the theca is imperforate. The species seems to me allied to *Fungia decipiens* (MARTIN, 1880, Pl. 25, fig. 3) which appears to have less prominent costae.

It is, however, very difficult to compare the two as in MARTIN's specimens the marginal parts are not preserved while in GERTH's and in my specimens of *F. inaequicostata* the central area is either covered or worn off.

*Fungia echinata* Pallas.

A worn off specimen of an elongated, rather flat *Fungia*, length 115 mm, breadth 65 mm, shows on its lower surface spines which have suffered much by diagenetic processes. The habitus of the corallum, the strong granulation of the septa and the shape and arrangement of the spines show this species to belong to *Fungia echinata*. The specimen was broken in several parts along the longer axis. After reconstruction the length of the axial fossa could be estimated at about 30 mm. The upper surface is worn off. It seems to me, however, that there is no reason to doubt the specific identity with the recent *F. echinata*.

I mentioned this specimen and Thiel's *F. brachystoma* when discussing the recent corals from Togian.

*Fungia* cf. *repanda* Dana.

A fragment of a large disc (diameter 130 mm) shows the characteristics of a *Fungia* belonging to the *repanda* group. I am inclined to consider the specimen *Fungia repanda* Dana on account of the perforations, which

(apart from openings due to erosion) occur in the peripheral area of the underside.

However, the greatest part of the lower side is covered by strongly attached rock material. It may therefore be doubted whether we are dealing with *F. repanda* or with the closely allied *F. concinna*. That is the reason for placing a "cf" before the species name. However, it is a question of no great importance, because transitional forms between *F. repanda* and *F. concinna* have often been found among recent corals.

*Fungia* cf. *concinna* Verrill.

Aboral surface imperforate. Diameter of disc. 73 mm. The strongly developed costae of the first cycles bear very distinct rough granules; the thinner costae of the higher cycles show smaller but distinct blunt spinuliform granules, which occur also in the central part of the disc. The form must be considered closely allied to *Fungia concinna* Verrill, a well known recent species, which has been found in Neogene strata as well.

The septal edges are badly damaged, but small parts are preserved and show dentations as in *F. concinna*.

*Pavona microstoma* Umbgrove.

Pl. II, fig. 11 and 12.

1925. *Pavona microstoma* Umbgrove, Gerth, Nias, Leidsche Geol. Meded. I, p. 35.  
 1926. *Pavona microstoma* Umbgrove, Sumatra, Wetensch. Meded. Nr. 4, p. 43, Pl. II, fig. 8.

A description will be given here, summarising moreover the characteristics as described in the papers mentioned above. Corallum irregularly noduliform or branched. Diameter of branches irregular ellips-shaped or round. Surface

EXPLANATION OF PLATES.

Pl. I.

- Fig. 1—2. *Fungia sibogae* Van der Horst, natural size; loc. 93B, 260.  
 Fig. 3—4. *Fungia sommervillei* Gardiner, natural size; loc. 93B 498, no. 260 B.  
 Fig. 5—6. *Fungia costulata* Orthm, natural size; loc. 93B 498, 260 B.  
 Fig. 7—8. *Seriatopora micrommata* Felix, var. *javana* nov. var.  $\times 3$ ; fig. 7, loc. 99B no. 9 (Putjangan beds), fig. 8. loc. 93B no. 258 (Kalibeng beds).

Pl. II.

- Fig. 9—10. *Stylophora solida* nov. spec.,  $\times 3$ , loc. 93B no. 253; fig. 10 upper view, fig. 9 lateral view.  
 Fig. 11—12. *Pavona microstoma* Umbgrove, loc. 93B, 373, no. 252; fig. 11,  $\times 5$ ; fig. 12, natural size.  
 Fig. 13. *Leptastrea transversa* (Klunz.), loc. 93B, no. 260,  $\times 3$ .

J. H. F. UMBGROVE: *Corals from the Upper Kalibeng beds (Upper Pliocene) of Java.*

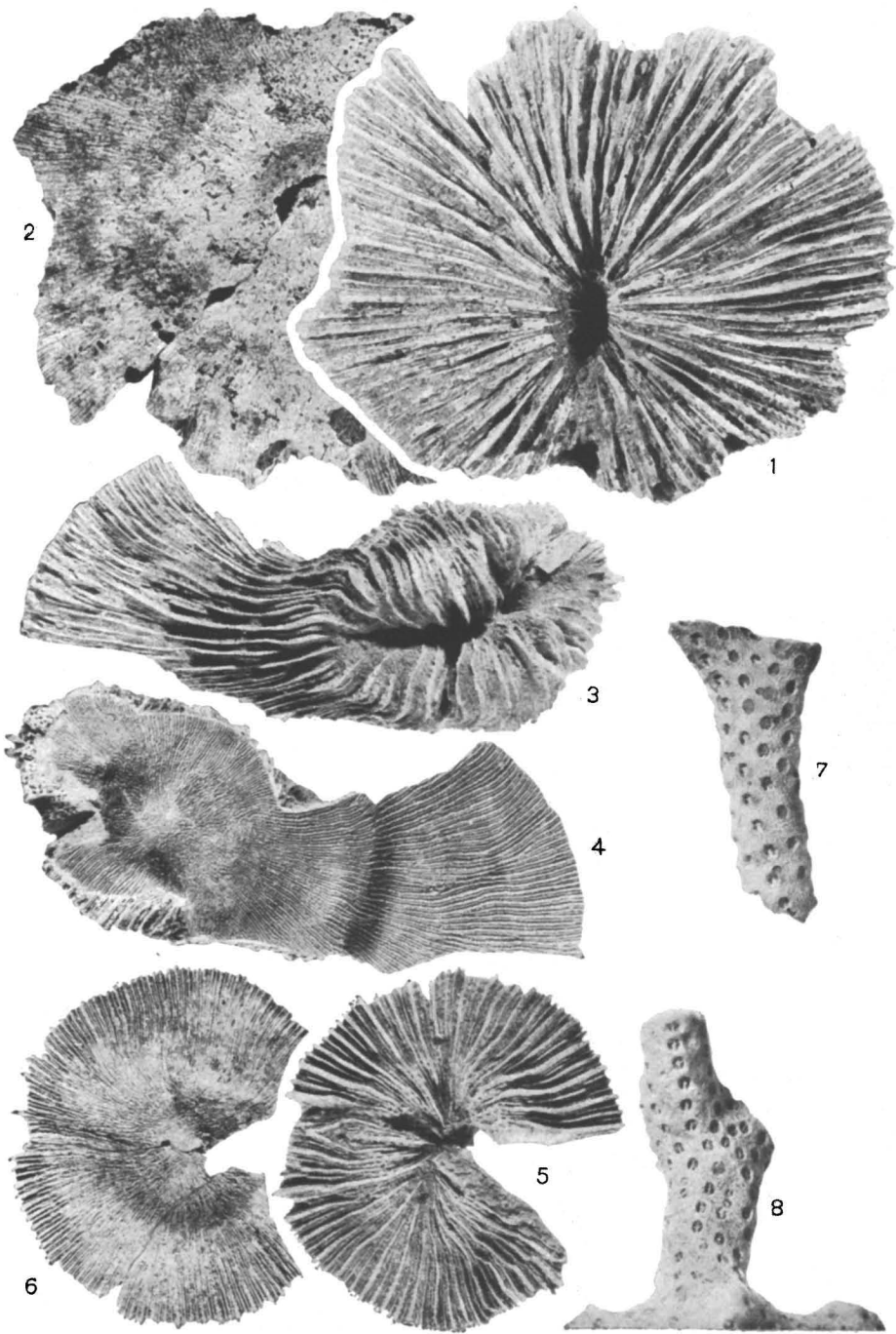
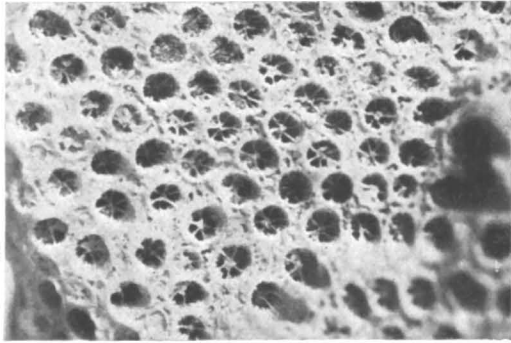


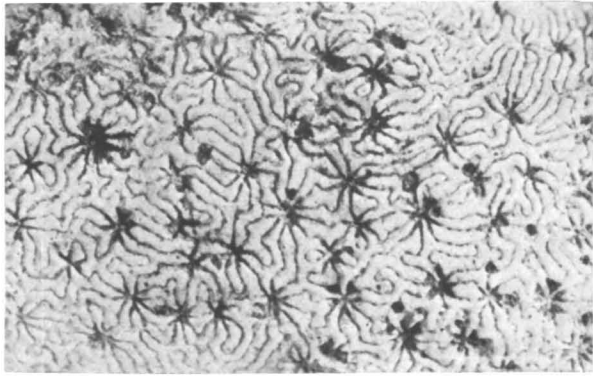
PLATE I.



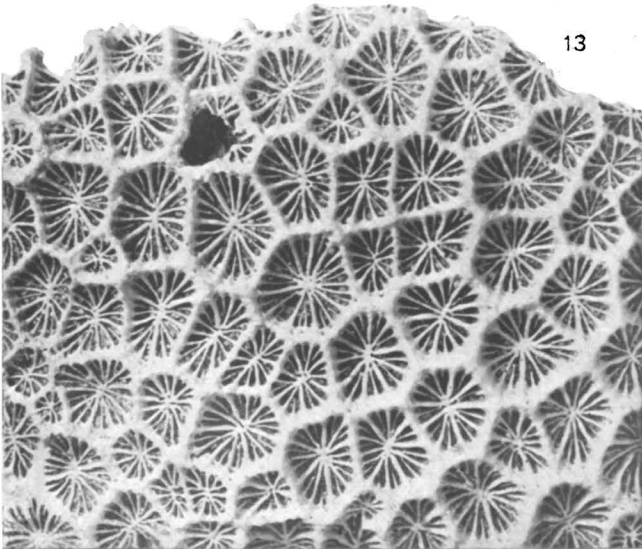
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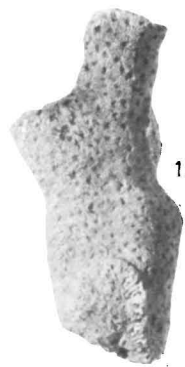
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11



13



12

PLATE II.



crowded with small calices. Calicular openings  $\frac{1}{2}$  mm in diameter. Distance between calicular centra varying from 1—2.5 mm.

Septa mostly in two complete cycles, sometimes the second cycle is incomplete. Septa locally developed alternately more strongly and more weakly, elsewhere subequal in size. Collines flattened, (no crests) crossed by the septocostae, which are continuous between the calices and often slightly gyrose. Primary septa joining the columella deep in the calice, columella not distinct from the surface. This species can be easily distinguished from other fossil and recent species of the genus *Pavona*, by its very small calices.

Distribution: Plio-Pleistocene, Nias and Atcheen (holotype, North Sumatra).