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## Stratigraphy and Age of the Dump Limestone Lenticle, Central Jamaica

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### SUMMARY

The locality in the Yellow Limestone group of Jamaica from which *Charactosuchus kugleri* Berg was recovered is regarded as being basal Middle Eocene. Lower horizons in the Yellow Limestone group, characterised by *Fabularia colei* n.sp., may be of late early Eocene age.

### A. Stratigraphy and Larger Foraminifera

The locality from which the jaw fragment of *Charactosuchus kugleri* Berg (1969) was recovered (Nat. hist. Mus. Basel 10969) lies within a lenticle of impure lignitic limestones and marls exposed at the village of Dump (Text-Fig. 1, b). The limestone lenticle outcrops in the region for a distance of about one kilometre and lies entirely within the Guy's Hill sandstone member (BURKE et al. 1965) of the Chapelton formation (ex. HILL, 1899, p. 129). Its stratigraphical relationships are shown in Text-Fig. 2. Units in the White Limestones group are those of HOSE and VERSEY (1956). VERSEY (in ZANS et al. 1963) has outlined the palaeogeographical conditions existing in Jamaica during 'Yellow Limestone' times.

Larger foraminiferal faunas from four samples investigated from Dump and from other Chapelton formation localities (Text-Fig. 1), include the following species (Nat. hist. Mus. Basel localities listed in descending stratigraphical order, see also HOTTINGER 1969).

- 10970 *Discorinopsis gunteri* COLE  
*Dictyoconus americanus* (CUSHMAN), sensu COLE (1942, 1956)  
'Coskinolina' *elongata* COLE  
*Yaberinella jamaicensis* VAUGHAN  
*Pellatispirella matleyi* VAUGHAN
- 10969 *Discorinopsis gunteri* COLE  
*Fabularia matleyi* (VAUGHAN)  
*Yaberinella trelawniensis* VAUGHAN  
*Pellatispirella matleyi* VAUGHAN
- 10967 *Fabularia colei* n.sp.  
'Coskinolina' *elongata* COLE  
*Coskinolinoides jamaicensis* COLE

- 10955 ? *Discorinopsis* sp.  
*Fabularia colei* n. sp.  
 'Coskinolina' *elongata* COLE  
*Coskinolinoides jamaicensis* COLE

In general the larger foraminifera of the Dump lenticle appear to be more closely related to the fauna from 10970 in the upper part of the Chapelton formation, than to those of the lower part.

### B. Age

The Chapelton formation (part of the 'Yellow Limestone' of authors, here considered as a formation belonging to the Yellow Limestone group) has long been considered as Middle Eocene. TRECHMANN (1922) correlated the molluscan faunas of the 'Yellow Limestone' with the Lutetian of the Paris Basin. HOSE and VERSEY (1956) divided faunas in the 'Yellow Limestone' into two zones, a lower zone with *Lituanella* sp. A (= *Coskinolinoides jamaicensis* COLE, *fide* VERSEY in ZANS et al. 1963) and an upper zone with *Lepidocyclina antillea* CUSHMAN. These zones were regarded as being of early and late middle Eocene age respectively.

Investigations by the present writer in eastern Jamaica have shown that the Yellow Limestone Group there contains planktonic foraminiferal assemblages of *Hantkenina aragonensis* to *Globorotalia lehneri* zone age (cf. BOLLI 1957). The con-

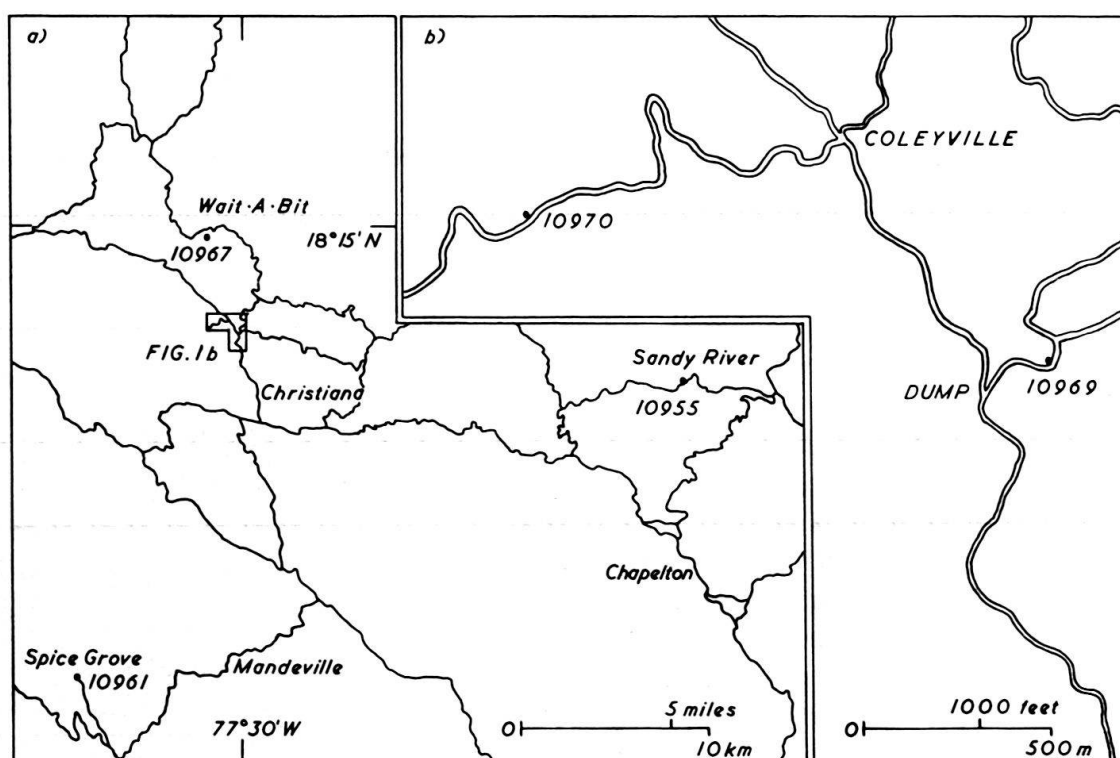


Fig. 1. a) Central Jamaica showing locations of samples. b) Enlargement of part of a) showing details of localities 10969 and 10970, near Dump.

formably underlying Richmond beds contain '*Globorotalia palmerae* zone faunas. *Lepidocyclina antillea* occurs with planktonic foraminiferal faunas belonging to the *Globigerapsis kugleri* and *Globorotalia lehneri* zones, but, the species has not yet been seen there in *Hantkenina aragonensis* zone or earlier assemblages. Although not present in the samples investigated from the Dump region, *L. antillea* has been found in neighbouring districts at horizons within the upper part of the Chapelton formation approximately equivalent to that of locality 10970, and available information indicates that the entire Yellow Limestone group is older than late middle Eocene.

COLE and APPLIN (1964) considered that sediments in Florida containing '*Coskino-lina elongata* COLE were of late early Eocene age, and suggested that parts of the "Yellow Limestone" in Jamaica containing the same species might therefore be early Eocene. BUTTERLIN and MOULLADE (1968) indicated '*C. elongata* as being a characteristic early Eocene marker in Yucatan and Haiti.

In Text-Fig. 2 the Lower/Middle Eocene boundary has been inserted provisionally between the Dump lenticle and the lower limestone in the Chapelton formation, the Dump lenticle being regarded as basal Middle Eocene.

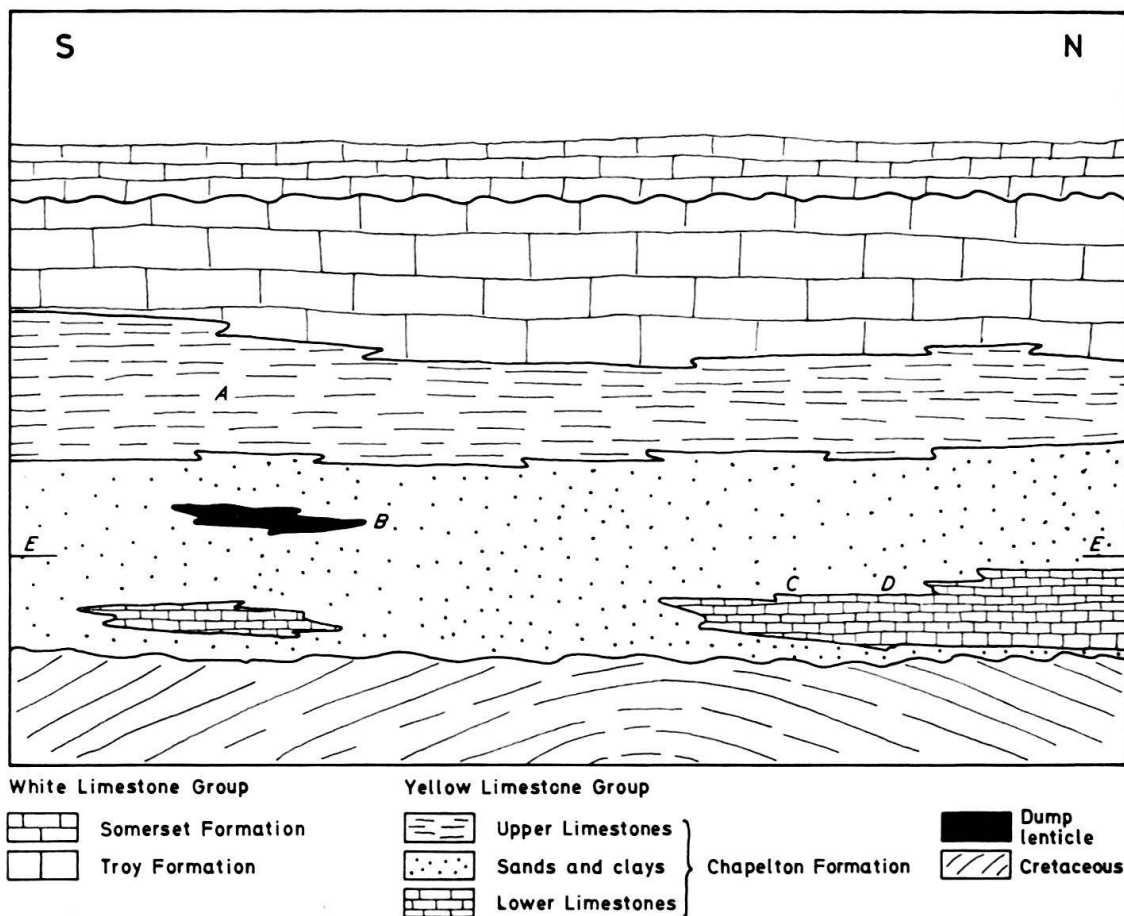


Fig. 2. Diagrammatic section through Central Jamaica to show approximate stratigraphic position of localities. A, Locality 10970; B, Locality 10969; C, Locality 10967; D, Locality 10955; E - E, suggested position for Lower/Middle Eocene boundary.

### C. Systematic Descriptions

Systematic descriptions are arranged alphabetically by genera. Locality numbers referred to in the text and plates are those of the Natural History Museum, Basel.

#### *Dictyoconus americanus* (CUSHMAN)

(Plate II, fig. 8)

- 1942 *Dictyoconus americanus* (CUSHMAN), COLE, Florida Geol. Surv. Bull. no. 20, pp. 21–24; pl. 3, figs. 12, 14; pl. 6, figs. 1–9; pl. 7, figs. 1–5; pl. 16, figs. 14, 15 (references).  
 1956 *Dictyoconus americanus* (CUSHMAN), COLE, Bull. Amer. Paleont., vol. 36, no. 158, pp. 217, 218; pl. 25, figs. 8–11.

VAUGHAN (1928, p. 282) remarked that the number of 'horizontal' partitions seen in the marginal zone of American dictyoconi of the *D. americanus* group was variable and that it varied even in a single individual. HOFKER Jr. (1966, p. 4) suggested that the density of 'horizontal' partitions in orbitolinids might vary in relation to the structural requirements of different parts of the test, being related, perhaps, to the thickness of the wall.

Before these suggestions can be further investigated the concept of 'vertical' and 'horizontal' partitions needs some revision. Plate 2, fig. 8 shows a section cut tangentially to the wall of a specimen of *D. americanus* at the 18th and 19th chambers. Immediately beneath the wall itself the partitions of the marginal zone cannot be considered as vertical or horizontal. The cellules formed by the partitions are polygonal (see also VAUGHAN 1928, pl. 44, fig. 2 and later authors). Even the major partitions become unrecognisable at the outer part of the marginal zone, only the chamber septa remaining identifiable. Vertical or transverse sections cut through the marginal zone will vary in the number of partitions intercepted. Different vertical sections could intersect as few as two or as many as five partitions in that part of the 18th (higher) chamber illustrated here.

Studies of cellule density in the *D. americanus* group, using sections of this type may yield significant biostratigraphical results. In Jamaica *D. americanus* has been recorded upwards from the higher part of the '*Lituonella* sp. A' zone of HOSE and VERSEY (1956, p. 27). The present writer has not seen it in the lower part of the Chapelton Formation.

#### *Discorinopsis gunteri* COLE

(Plate II, fig. 6; plate III, figs. 4, 6; ? plate II, fig. 3; ? plate III, fig. 2)

- 1941 *Discorinopsis gunteri*, COLE, W. S., Florida Geol. Surv. Bull. no. 19, pp. 36, 37, pl. 1, figs. 7–9.  
 1952 *Discorinopsis gunteri* COLE, COLE, W. S. and GRAVELL, D. W., Jour. Paleont. vol. 26, no. 5, p. 714, pl. 91, fig. 5.  
 ? 1937 *Valvulammina affinis*, CUSHMAN, J. A. and BERMUDEZ, P. J., Cushman Lab. Foram. Res. Spec. Publ. no. 8, p. 9, pl. 5, figs. 1a–c.

The specimens provisionally referred to *Discorinopsis gunteri* in this paper vary considerably in their dimensions and apertural characteristics although all possess 6–7 chambers in the final whorl. Those found, rarely, at locality 10955 are small (height 0.6–0.7 mm, length 1.0–1.1 mm) and without the cribrate aperture characterising the genus (pl. 2, Fig. 3). They may be immature individuals of the kind suggested by LOEBLICH and TAPPAN (1964, p. C 281). Rare specimens from locality 10969, at Dump, are slightly larger, having a height of 0.65–0.71 mm and length of 1.15–1.45

mm, but these still retain an aperture almost covered by a broad valvular tooth. It is possible that such specimens should be placed in the genus *Valvulammina* CUSHMAN, the figures of *Valvulammina affinis* CUSHMAN and BERMUDEZ being particularly close. The specimens of *D. gunteri* figured by COLE and GRAVELL also resemble those from the above two Jamaican localities, being smaller than the type specimens from the Florida Middle Eocene.

The common specimens from locality 10970 are much larger (height 1.5–1.7 mm, length 2.00–2.2 mm) and with a cribrate aperture (pl. 2, Fig. 6, pl. 3, Figs. 4 and 6). They belong to *Discorinopsis* but differ from COLE's description of *D. gunteri* in possessing a relatively higher spire, being subglobular in shape, and in developing a more inflated apertural plate with more numerous, subcircular openings. More work is needed on this group from the American Paleogene, using material from adequately controlled sections, but it appears that typical *Discorinopsis* only appears above the base of the Middle Eocene, and that the smaller forms develop near the Lower/Middle Eocene boundary.

‘*Coskinolina*’ *elongata* COLE

(Plate II, Fig. 7; plate III, Figs. 3, 5)

- 1942 *Coskinolina elongata* COLE, Florida Geol. Surv. Bull. no. 20, pp. 20, 21; pl. 3, Figs. 15–17; pl. 4, Figs. 1–3; pl. 5, Figs. 2–7; pl. 16, Fig. 6.  
 1956 *Coskinolina elongata* COLE, Bull. Amer. Paleont. vol. 36, no. 158, p. 215, pl. 24, Figs. 6–11; pl. 31, Figs. 1, 2.

The specimens of ‘*Coskinolina*’ *elongata* collected from locality 10970 differ from those at 10967 and 10955 in possessing a broader, rounded apex to the cone, containing the coiled part of the test, and in developing a somewhat more inflated apertural face distinctly separate from the marginal face, on which radial grooves or sulci are unusually deeply incised. The internal skeletal elements appear to be similar in specimens from all three localities. Locality 10955 is the same as that from which COLE (1956, loc. cit.) first identified ‘*C.*’ *elongata* from Jamaica.

The generic position of ‘*C.*’ *elongata* is not clear, following recent observations made on *Coskinolina liburnica* STACHE (DOUGLASS, 1960; HOFKER, 1966). The suggestion by HOFKER (ibid. p. 24) and BUTTERLIN and MOULLADE (1968, p. 15) that ‘*C.*’ *elongata* should be placed in the genus *Dictyoconus* BLANCKENHORN, is not accepted here. ‘*C.*’ *elongata* has no minor partitions in the marginal zone, a coarse wall structure and pillars in the central zone which are more irregularly positioned than those of *Dictyoconus*. The early, coiled chambers are without partitions (pl. 3, Fig. 5).

*Fabularia matleyi* (VAUGHAN)

(Plate II, Figs. 1, 2, 4, 5)

- 1929 *Borelis matleyi* VAUGHAN, Jour. Paleont. vol. 3, pp. 377, 378; pl. 40, Figs. 2, 3, 3a.  
 1929 *Borelis jamaicensis* VAUGHAN, ibid. pp. 378, 380; pl. 40, Figs. 4–10.  
 1929 *Borelis jamaicensis* var. *truncata* VAUGHAN, ibid. p. 380, pl. 40, Figs. 11, 12.  
 1956 *Fabularia matleyi* (VAUGHAN), COLE, in part, Bull. Amer. Paleont. vol. 36, no. 158, p. 218; pl. 26, Figs. 7–10 (not Figs. 11–14).

In the three forms of *Fabularia* described by VAUGHAN (1929) from Jamaica the distinguishing features were mainly those of overall size and shape of the test. Internally



the arrangement and shape of the chamberlets is basically the same and they are considered to be conspecific. In *Fabularia matleyi* the proloculus has a diameter which normally varies between 0.25 and 0.35 mm. Coiling in megalospheric specimens is planispiral and the chambers are subdivided into chamberlets which are usually closely crowded, and slightly elongated radially in cross-section, when they appear wedge-shaped or sub-rectangular. The chamberlets are arranged in a single row in each chamber and their number increases progressively until the twelfth chamber contains between 17 and 33 chamberlets, usually about 25. Normally the spirally directed partitions separating the chamberlets are thinner than the distance across each chamberlet.

The type localities of all three of VAUGHAN's original species are in the upper part of the Chapelton Formation. *Fabularia matleyi* is widespread at this horizon and also occurs in the lower (middle Eocene) part of the White Limestone Group.

The specimens from locality 10969 are smaller than typical, and possess a smaller proloculus but the wedge-shaped chamberlets are distinct and are more numerous than those of *F. colei* n.sp. Coiling is irregularly planispiral, with development of 2 chambers per whorl (pl. 2, Fig. 2).

*Fabularia colei* n.sp.

(Plate I, Figs. 1-7, plate III, Fig. 1)

1956 *Fabularia matleyi* (VAUGHAN) of COLE, in part, Bull. Amer. Paleont. vol. 36, no. 158, pl. 26, Figs. 11-14.

Description:

a. Megalospheric Form:

The test is ovoid, being more or less circular in axial section. The proloculus is relatively small and subspherical. The remaining chambers are biloculine in their arrangement and coiled planispirally in the adult stage, although most specimens show deviation from the planispiral form in the earliest whorls. There are 12 to 14 chambers in a typical adult test.

The proloculus is followed by a single undivided chamber. The other chambers are subdivided into a single row of chamberlets by spirally directed partitions. The partitions are not always constant in their shape. Normally they are more or less equal in thickness to or slightly thinner than the chamberlet diameters and to the thickness of the spiral chamber wall. The resulting chamberlets are subcircular to slightly depressed oval in cross-section. Rarely they are slightly elongate radially in cross-section. The number of chamberlets per chamber increases to the extent that there are 13 to 14 present in the twelfth chamber. The greatest number observed (in one specimen) was 18 in the twelfth chamber. Measurements are given in Table.

Table of Measurements of *Fabularia colei* n.sp.

Diameter of proloculus . . . . .	0.13-0.16 mm
Diameter of chamberlets . . . . .	0.04-0.09 mm
Transverse diameter of test . . . . .	up to 2.0 mm
Axial diameter of test (bisecting each chamber) . . . . .	up to 1.6 mm

## b. Microspheric Form:

The microspheric embriont was not seen. Coiling in the nepionic stage is not planispiral. The details of the remainder of the test are similar to those of the megalospheric form.

## c. Type locality and horizon:

Locality 10955, Clarendon Parish, Jamaica, half a mile south-west of Sandy River, in cuts at the side of the road leading from Kellits to James Hill. Stratigraphically the locality is about 50 ft. above the base of the Tertiary sequence, in the lower limestone of the Chapelton Formation, Yellow Limestone Group. COLE's (1956) figures of specimens placed in this species are from the same locality.

## d. Discussion:

*Fabularia colei* n. sp. differs from *Fabularia matleyi* in having a consistently smaller proloculus, relatively thicker spiral partitions between chamberlets, relatively fewer chamberlets per chamber at similar stages of development, and chamberlets which are subcircular and often slightly depressed in cross-section. It seems to be a stratigraphically restricted species, at present known only from the lowest part of the Chapelton formation, of probable late early Eocene age.

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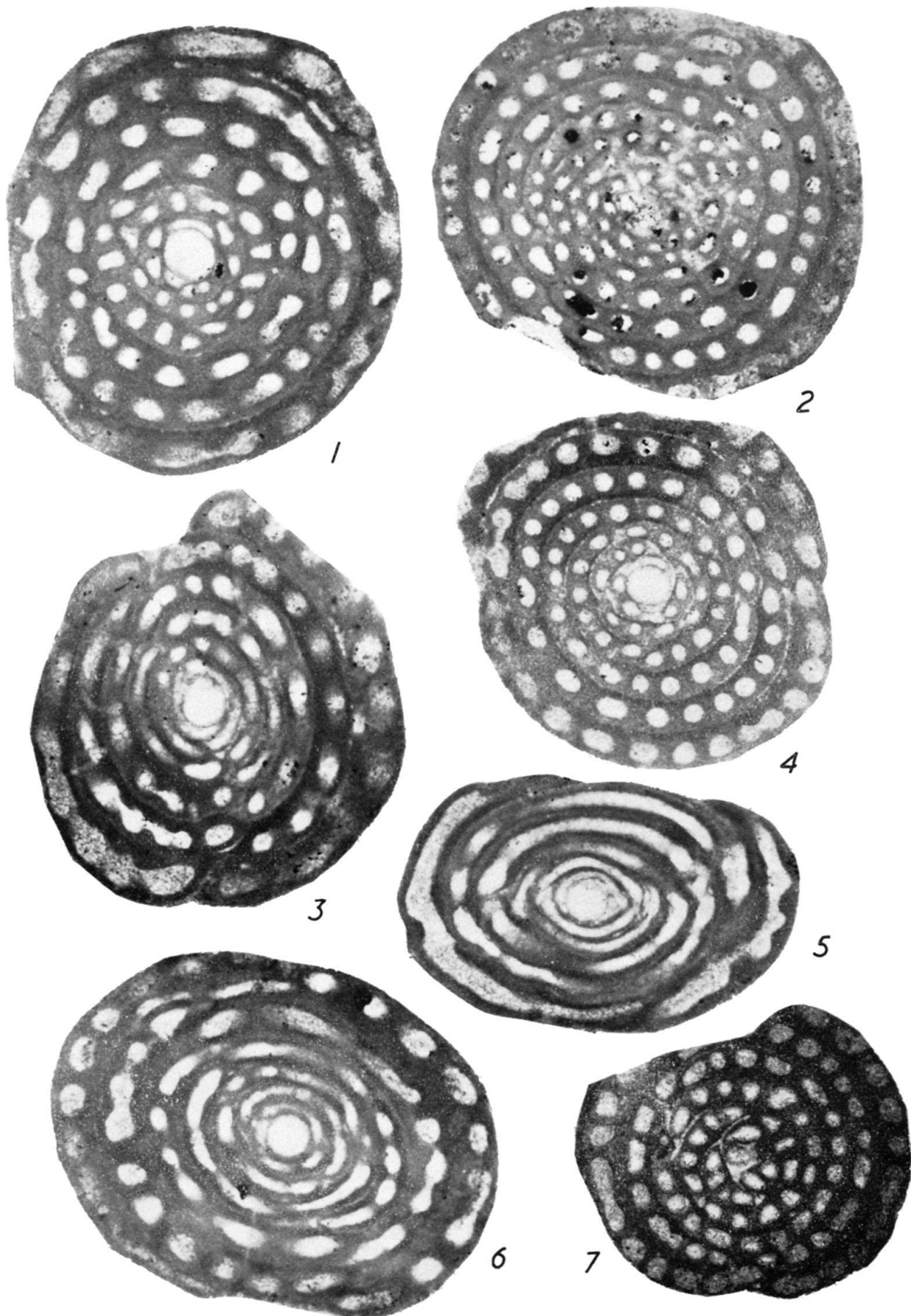


## Plate I

*Fabularia colei* n.sp., all x 50.

- Fig. 1. Axial section of megalospheric specimen. NMB Nr. C 25565/a 8.
- Fig. 2. Off-centred oblique section of microspheric specimen. NMB Nr. C 25565/a 9.
- Fig. 3. Centred section of a megalospheric specimen, almost transverse through the nepiont, to show irregular coiling. NMB Nr. C 25565/a 7.
- Fig. 4. Megalospheric axial section showing coiling of nepiont. NMB Nr. C 25565/a 5.
- Fig. 5. Transverse section of megalospheric specimen. NMB Nr. 25565/a 7.
- Fig. 6. Oblique section through a megalospheric individual, which is almost transverse through the 3rd whorl. NMB Nr. C 25565/a 2.
- Fig. 7. Off-centred near-axial section of a megalospheric specimen. NMB Nr. C 25567/b 7.  
Figs. 1–6, NMB locality 10955, Fig. 7, NMB locality 10967.

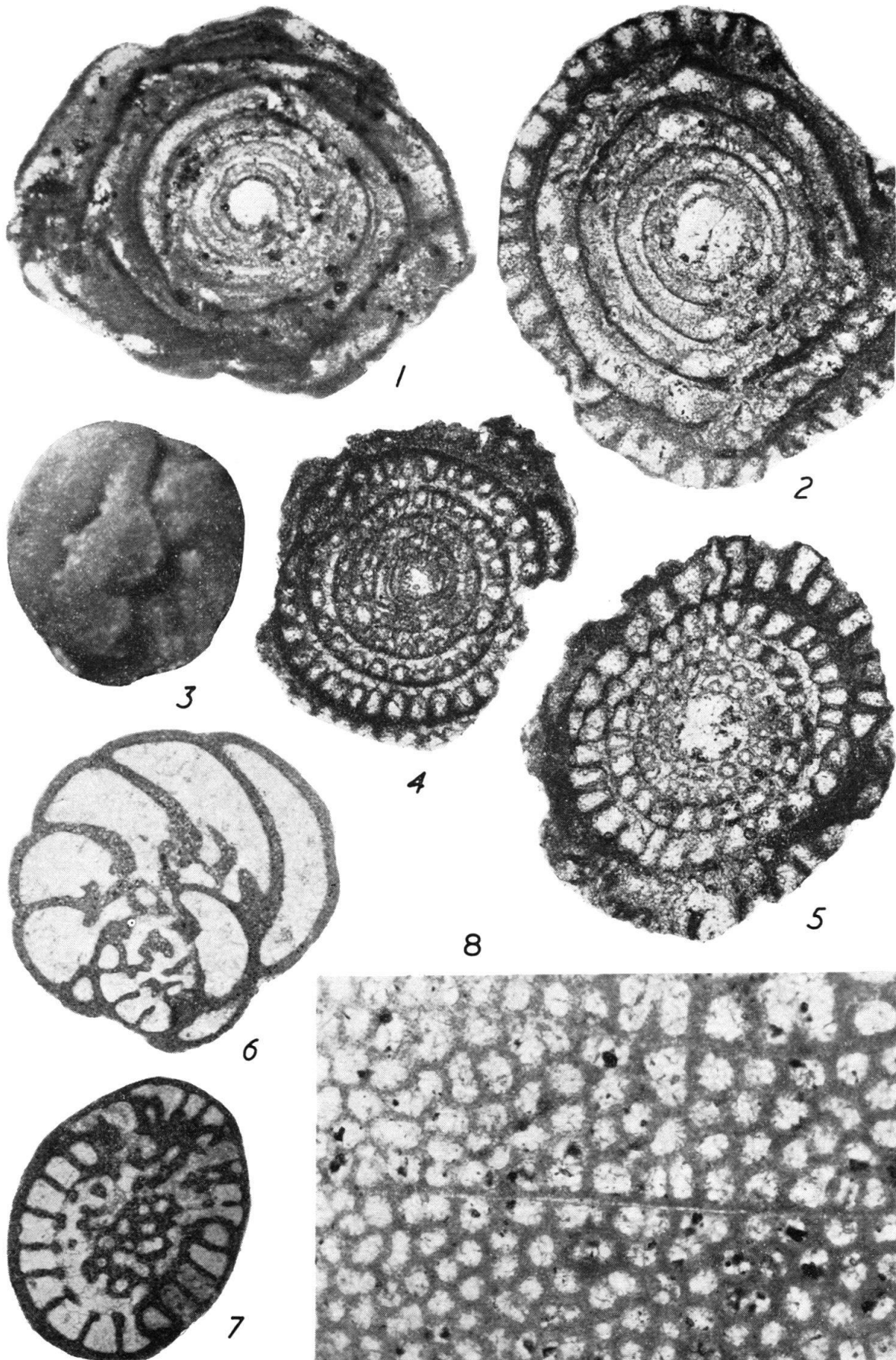
NMB = Naturhistorisches Museum Basel



## Plate II

- Fig. 1. *Fabularia matleyi* (VAUGHAN), transverse section, x 50. NMB Nr. C 25566/b.
- Fig. 2. *Fabularia matleyi* (VAUGHAN), section which is transverse through the inner whorls, x 50. NMB Nr. C 25566/a 4.
- Fig. 3. ? *Discorinopsis* sp., x 50. NMB Nr. C 25564.
- Fig. 4. *Fabularia matleyi* (VAUGHAN), axial section, not quite centred, x 50. NMB Nr. C 25566/a 1.
- Fig. 5. *Fabularia matleyi* (VAUGHAN), oblique section, x 50. NMB Nr. C 25566/a 5.
- Fig. 6. *Discorinopsis gunteri* COLE, to show composition of test, x 25. NMB Nr. C 25568/a.
- Fig. 7. '*Coskinolina*' *elongata* COLE, basal section, x 25. NMB Nr. C 25567/b 2.
- Fig. 8. *Dictyoconus americanus* (CUSHMAN), portion of a tangential section, just below surface of wall, x 160. NMB Nr. C 25568/b.
- Figs. 1, 2, 4, 5, NMB Locality 10969; Fig. 3, NMB Locality 10955; Figs. 6, 8, NMB Locality 10970; Fig. 7, NMB Locality 10967.

NMB = Naturhistorisches Museum Basel



### Plate III

- Fig. 1. *Fabularia colei*, n.sp., holotype, x 50. NMB Nr. C 25561.
- Fig. 2. ? *Discorinopsis gunteri* COLE, x 50. NMB Nr. C 25562.
- Fig. 3. 'Coskinolina' *elongata* COLE, tangential section reaching central zone, x 50. NMB Nr. C 25567/b 4.
- Fig. 4, 6. *Discorinopsis gunteri* COLE, dorsal and ventral views, x 50. NMB Nr. C 25563.
- Fig. 5. 'Coskinolina' *elongata* COLE, section through nepiont, x 80. NMB Nr. C 25567/a. Fig. 1, NMB Locality 10955; Fig. 2, NMB Locality 10969; Figs. 3, 5, NMB Locality 10967; Figs. 4, 6, NMB Locality 10970.

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