CHUBBINA, A NEW CRETACEOUS ALVEOLINID GENUS FROM JAMAICA AND MEXICO

by E. ROBINSON

ABSTRACT. *Chubbina jamaicensis* gen. et. sp. nov. and *Chubbina macgillavryi* sp. nov. from the Cretaceous rocks. of Jamaica and southern Mexico are described. *Borelis cardenasensis* Barker and Grimsdale is placed in the new genus. *Chubbina* appears to be a useful index for the Upper Cretaceous (Upper Campanian to Maastrichtian) of the Greater Antilles and Central America.

IN 1937 Barker and Grimsdale described a new alveolinid species, *Borelis cardenasensis*, from the Cardenas beds of north-eastern Mexico. In this description they doubtfully referred the species to *Borelis*, mainly on the grounds that it bore a superficial resemblance to *Borelis jamaicensis* Vaughan and *Borelis matleyi* Vaughan (1929). Cole (1956) showed that both of Vaughan's species belonged to the genus *Fabularia*.

Under *Cosinella*, Reichel (1937, p. 136 n.) mentioned a manuscript species of Schlumberger and compared it with *B. cardenasensis* but no description of *Cosinella* was given either then or subsequently. Reichel has indicated (pers. comm., 1966) that he is still in possession of Schlumberger's manuscript material for *Cosinella*, which must remain a nomen nudum. Nevertheless the name *Cosinella* was used, without further description, by Dunnington *et al.* (1960, p. 61) for specimens subsequently described by Smout as *Pseudedomia globularis* (1963), and was also considered by Seiglie and Ayala (1963) for specimens resembling *B. cardenasensis* found in the Cuban Maastrichtian. Smout (1963, p. 225) in emending the genus *Pseudedomia*, briefly discussed *B. cardenasensis*, suggesting, on the basis of information received from Grimsdale, that the species had a uniserial termination and was, therefore, possibly related to *Raadshoovenia* van den Bold (1946). On the other hand Colalongo (1963) included *B. cardenasensis* in her new genus *Sellialveolina*, apparently on the basis of the original description.

During studies of the Cretaceous inliers of Jamaica, undertaken by the Geology Department of the University of the West Indies, numbers of larger foraminifera have been collected, amongst which are numerous examples of an alveolinid related to 'Borelis' cardenasensis. The internal structures of the Jamaican form are also similar to those of *Pseudedomia* and *Sellialveolina*, although the mode of coiling is basically different.

On the basis of an examination of the Jamaican material, which contains a large number of microspheric individuals, the new genus *Chubbina* is proposed, with *Chubbina jamaicensis* sp. nov. as the type. 'Borelis' cardenasensis is considered to be congeneric with the Jamaican form. Recently Professor H. J. MacGillavry kindly sent me thin sections of a complanate alveolinid which he collected in southern Mexico. These specimens also belong to *Chubbina* and are further described below.

Location. The species described have come from the following localities.

Locality 1. ER 108, on the railway between Catadupa and Cambridge, Jamaica, W.I., at the tenth telegraph pole, plus 20 ft., after milepost 96.

Locality 2. ER 213A, three-quarters of a mile west of Frankfield, Parish of Clarendon, Jamaica, W.I., at Guinea Corn, in the bed of the Rio Minho, in the type section of the Guinea Corn Formation (Coates 1965), about 40 ft. stratigraphically below the top of the limestone.

Locality 3. Type locality for *Chubbina cardenasensis* (Barker and Grimsdale 1937).

Locality 4. On the road between Tuxtla Gutierrez and Ocozocuautla, state of Chiapas, Mexico, at stop 2, K.1061, (fig. 1, Excursion C-15-b, 20th International Geological Congress, Mexico, 1956).

Figured specimens are deposited at the British Museum (Natural History) (BMNH).

SYSTEMATIC DESCRIPTIONS

Family ALVEOLINIDAE Ehrenberg, 1839
CHUBBINA gen. nov.

Type species, Chubbina jamaicensis sp. nov.

Diagnosis. Test with walls composed of microcrystalline calcite, imperforate, probably originally porcellaneous; in the megalospheric generation subglobular or lenticular, becoming discoidal in the mature microspheric form; chamber coiling markedly streptospiral in the early stages, becoming almost planispiral in the last whorls of the microspheric generation; involute, often becoming pseudevolute in the later whorls and strongly recurved but not cyclical; the number of chambers per whorl increasing with the addition of each whorl and always being greater than two in the ephebic stage.

Dimorphism pronounced; the single, spherical proloculus of the megalospheric generation followed by a single tubular chamber, without internal structures; microspheric generation with a milioline nepiont; succeeding chambers subdivided into spirally directed, tubular chamberlets, embedded in a solid microcrystalline endoskeleton or 'couche basale'; chamberlets multiple, initially arranged in one or more tiers or layers, later becoming irregular in layering, with varying differentiation into a subepidermal layer of primary chamberlets and multiple supplementary chamberlets in the 'couche basale'; pre-septal canals present, irregularly equipped with buttresses; communication between chamberlets in successive chambers effected by means of rounded multiple apertures, more or less in alignment with the chamberlets.

Chubbina jamaicensis sp. nov.

Plate 101, figs. 1–6; Plate 102, figs. 1–5

Microspheric Form. Test free, subglobular to subdiscoidal, consisting of 6 to 8 streptospirally coiled whorls after the nepionic stage; early stages involute, forming a subspherical, immature test; at about the fifth whorl becoming flaring, with the development of a peripheral flange with an acute sub-angular margin; in the final whorl pseudevolute and flaring, with a broad, complanate flange partly surrounding an excentric, umbonate region containing the earlier part of the coil; peripheral margin of the final whorl usually acquiring a stoutly rounded rim which may become equal in thickness to the umbonate region of the test; the distal, recurved face of the final whorl flattened, with sub-angular

margins, and provided with numerous round apertures, scattered more or less uniformly over the whole face.

Coil subdivided into chambers by septa which are the turned-in continuations of the spiral wall; chambers about 6 in number in the fourth whorl, rising to 15 in the final, complanate whorl; septa becoming increasingly recurved in the later whorls; alar prolongations of the chambers of the final whorl slightly vorticiform.

The microspheric nepiont was not clearly seen but appears to be milioline. The succeeding chambers are filled with a solid mass of microcrystalline calcite forming the 'couche basale', pierced by spirally directed, tubular chamberlets. The chamberlets are continuous between the distal and proximal septal walls of each chamber and the chamberlets of any one chamber are connected with the chamberlets of the preceding and succeeding chambers by more or less directly aligned rounded apertures in the septa. In each chamber the material of the 'couche basale' does not extend as far as the distal septum, but leaves a space, a pre-septal canal, allowing free communication between the chamberlets. However, the pre-septal canal is traversed irregularly by projections from the 'couch basale', which reach the distal septum forming buttresses.

The 3 or 4 chamberlets in the chambers of the first whorl are arranged in a single, more or less regular tier. In the second or third whorl the increasing number of chamberlets gives rise to a second tier below the first. At about the fourth whorl a third tier of chamberlets is gradually inserted. In the last-formed whorl the number of tiers or rows rises from 4 or 5 to 80 or 90. Subdivision of the chamberlets occurs in the region of each pre-septal canal, by the addition of apertures through the distal septum, from which additional chamberlets project into the next-formed chamber. The addition of chamberlets is a more or less continuous process, so that the second tier of chamberlets is acquired gradually and only becomes clearly defined over the space of 2 or 3 chambers. The later addition of tiers occurs in a similar manner and these are largely acquired through the multiplication of chamberlets, along the inner margin of the whorl. Although all the chamberlets are spirally directed, a degree of undulation or meandering occurs so that, beyond about the fourth whorl, they are no longer arranged in regular tiers but occur scattered uniformly in the 'couche basale'. The distance between adjacent chamberlets is approximately the same as the diameter of the chamberlets themselves in the final whorl. In the early whorls it is less. The chamberlets nearest to the spiral wall tend to be aligned more regularly along the wall.

EXPLANATION OF PLATE 101

Fig. 1. *Chubbina jamaicensis* gen. et sp. nov., cotype, microspheric form, sectioned normal to the axis of coiling of the final whorl, ×20. BMNH P. 48049.

Fig. 2. *Chubbina jamaicensis* gen. et sp. nov., cotype, microspheric form, sectioned parallel to the axis of coiling of the final whorl, ×30. BMNH P. 48048.

Fig. 3. *Chubbina jamaicensis* gen. et sp. nov., cotype, megalospheric form, sectioned to show the progressive change in direction of coiling in successive whorls, 'canal flexostyle' and buttresses. ×45. BMNH P. 48052.

Fig. 4. Section through portion of terminal flange of *C. jamaicensis*, showing some differentiation of a subepidermal layer of chamberlets as seen in *Pseudedomia globularis* Smout. ×20. BMNH P. 48050.

Fig. 5. Natural internal mould of a portion of several chambers from a microspheric individual of *C. jamaicensis*, showing tubular chamberlets and preseptal canals. ×16. BMNH P. 48055.

Fig. 6. *Chubbina jamaicensis* gen. et sp. nov., cotype, external view, ×18. BMNH P. 48056.

All specimens from Locality 1, Jamaica.

Megalospheric form. Test much smaller than in the microspheric form, sub-globular to inflated lenticular, consisting of 4 to 6 streptospirally coiled, involute whorls, the last-formed whorl frequently showing a tendency to acquire a flaring end stage; megalospheric specimens with a fully complanate, pseudevolute final stage not observed.

Internally there is a single, spherical proloculus, followed by a single, tubular chamber without internal structure, a 'canal flexostyle'. Further internal development closely parallels that of the microspheric form, but megalospheric specimens with more than 10 rows of chamberlets in the last whorl, when seen in spiral section, have not been observed.

Critical measurements of *C. jamaicensis* are included in Table 1. Text-fig. 1 shows the size range of specimens of *Chubbina* from Jamaica and elsewhere.

Type locality. Locality 1. Additional material from locality 2.

Chubbina cardenasensis (Barker and Grimsdale 1937)

1937   *Borelis cardenasensis* Barker and Grimsdale, p. 173, pl. 9, figs. 1–5.

Examination of Barker and Grimsdale's original figures and of additional syntypes reveals that pre-septal canals or passages are present, and occupy the space in each chamber in front of the incomplete transverse septa mentioned by Barker and Grimsdale. No true buttresses are visible on any of the original figures, but one can see that buttresses are probably present from an examination of figures 3 and 4 of the original description. These show a certain irregularity in the shape of the spiral and transverse septa of Barker and Grimsdale, where parts of the sections are cut through the pre-septal canals. Dr. C. G. Adams of the British Museum (Natural History) has confirmed that no specimens likely to represent a microspheric form are present amongst Grimsdale's syntypes.

Chubbina cardenasensis differs from *C. jamaicensis* primarily in the rate of chamber enlargement. This is more rapid in *C. jamaicensis* resulting in the insertion of the third tier of chamberlets in the third or fourth whorl. In *C. cardenasensis* the third tier of chamberlets is not inserted until the fifth whorl or later.

Chubbina macgillavryi sp. nov.

Plate 102, figs 8; Plate 103, figs. 3, 4; see also Plate 102, figs. 6, 7

Thin-sections of a limestone collected in southern Mexico by Professor H. C. Mac-Gillavry and sent to the author, contained numerous random sections of *Chubbina*. They differ from *C. jamaicensis* and *C. cardenasensis*. The coiling is streptospiral, but the degree of eccentricity of the coiling is more variable than in the other two species. Some specimens, typified by that illustrated on Plate 103, fig. 3, are similar in their coiling mode to *C. jamaicensis*. Other specimens may approach a planispiral mode (Pl. 102, fig. 6). *C. macgillavryi* resembles *C. cardenasensis* in the relatively low rate of chamber enlargement. The third tier of chamberlets is normally inserted at about the fifth whorl. In some specimens even the second tier is not inserted until the fourth or fifth whorl. The preseptal canals of *C. macgillavryi* are narrower than in either *C. jamaicensis* or *C. cardenasensis* and the proloculus of the magalospheric generation is also larger. Table 1 compares some of the critical measurements. A single, uncentred

section of a microspheric individual (Pl. 103, fig. 4) is larger than the largest example of *C. jamaicensis* yet found. All the available thin sections show that the chamberlets of the first few chambers are relatively rectangular in cross-section with thin walls.

Type locality. Locality 4.

<div align="center">TABLE 1.</div>

<div align="center">Comparison of some critical measurements of species of Chubbina.
(A) C. jamaicensis, (B) C. cardenasensis, (C) C. macgillavyri.</div>

	A	B	C
	μ	μ	μ
Diameter of chamberlets	40–55	60	25–50
Spacing between chamberlets	30	10–30	10–20
Distance across pre-septal canal	90–140	120	25–100
Diameter of proloculus	100–180*	90–120	150–300†

* Only one specimen of *C. jamaicensis* has a proloculus reaching 180 μ in diameter. The next largest measured was 140 μ.

† Although all the magalospheric specimens of *C. macgillavyri* had large proloculi, there was some degree of recrystallisation at the centres of many individuals, making accurate measurement difficult.

Discussion. The specimens illustrated by Seiglie and Ayala-Castanares (1963, pl. 1, figs. 2 and 3) appear to belong to *Chubbina cardenasensis*. The section illustrated by these authors as *Rhapidionina* sp. (ibid., p. 27; pl. 1, fig. 1) is rather indistinct, but could be a portion of the terminal flange of *Chubbina*.

Most of the skeletal features mentioned in the preceding descriptions have already been noted in discussions of the complanate genus *Pseudedomia* by Eames and Smout (1955), Smout (1963) and Reiss *et al.* (1964). The major difference between *Pseudedomia* and *Chubbina* lies in the streptospiral mode of coiling in the latter genus. This coiling eccentricity continues on a diminishing scale throughout ontogeny and is readily distinguishable from the slight irregularities which may develop in a large specimen of *Pseudedomia*, due for instance to environmental conditions. The eccentricity is apparent in most thin sections of *Chubbina* but it is only when a centred thin section happens to be cut normal to the axis about which the coiling plane rotates that the degree of rotation can be measured (Pl. 101, fig. 3).

<div align="center">EXPLANATION OF PLATE 102</div>

Figs. 1, 2, and 4. *Chubbina jamaicensis* gen. et sp. nov., cotypes, all megalospheric individuals from Locality 1, showing limits of variation in rate of chamber enlargement and a progressive deterioration in the state of preservation of successive chamber walls, possibly due to diagenetic effects. Fig. 1, BMNH P. 48051, fig. 2, BMNH P. 48053, fig. 4, BMNH P. 48047.

Fig. 3. *Chubbina jamaicensis*, megalospheric form, from Locality 2. ×45. BMNH P. 48054.

Fig. 5. Off-centred section of *C. jamaicensis* from Locality 1, showing preseptal canals, buttresses and some differentiation of a subepidermal layer of chamberlets in the last whorl. ×45. BMNH P. 48046.

Fig. 6. *Chubbina* sp. cf. *C. macgillavryi* sp. nov., Locality 4, showing canal flexostyle, relatively low rate of chamber enlargement and relatively thin walls between chamberlets. ×30. BMNH P. 48042.

Fig. 7. *Chubbina* sp. cf. *C. macgillavryi* sp. nov., Locality 4. ? microspheric individual. ×30. BMNH P. 48040.

Fig. 8. *Chubbina macgillavryi* sp. nov., cotype, Locality 4. Off-centred section of megalospheric specimen. ×30. BMNH P. 48041.

The partitioning of the chambers, with the resultant chamberlets, preseptal canals, and buttresses, is very similar to that of *Pseudedomia globularis* Smout. Unlike those seen in *P. drorimensis* Reiss *et al.*, the chamberlets resemble tubes excavated in a solid 'couch basale' rather than chamberlets enclosed by regular, spirally directed partitions. The irregularity in chamberlet formation in the later chambers suggests that chamber division is not ordered by the secretion of subepidermal partitions, but occurs through the somewhat random development of spirally directed tubular filaments which surround themselves with a solid skeletal framework. The loss of regular tiering in the later stages is due to the confining influence of the spiral wall, which becomes progressively both higher and relatively narrower, forcing the tubular filaments to accommodate themselves within the available space. It is for this reason that the distinction between primary and secondary chamberlets, noted by Smout, for instance in the case of *P. globularis* (1963), is not here considered important. The distinction is sometimes seen in specimens of *Chubbina* (Pl. 101, fig. 4) but the development of primary chamberlets is irregular. The outermost chamberlets in any one chamber are confined in their position by the enclosing spiral wall, which is secreted first, by a process separate from that producing the 'couche basale'.

Chubbina resembles *Sellialveolina vialli* Colalongo in its gross internal structure and it is possible that *S. vialli* possesses a yet undiscovered complanate end stage. However the diagnosis for *Sellialveolina* should be emended to exclude *Chubbina cardenasensis*. Colalongo specifically mentions (1963, p. 7) as one of her distinctions between *S. vialli*, the genus type, and '*Borelis*' *cardenasensis*, that in '*B*'. *cardenasensis*: 'the coiling of the first whorls is streptospiral but in *S. vialli* it is always planispiral' (trans.). This distinction is considered here to be of generic importance, particularly as the stratigraphical and geographical distributions of the two forms are markedly different. On the other hand there is some justification for erecting a new subfamily to include complanate species of alveolinid.

Fourcade (1966) described the new genus *Murciella* from the Upper Cretaceous of Spain. The internal structures show that this form belongs correctly to the *Pseudedomia*/*Chubbina* group, and in my view, should also be included in the Alveolinidae, but the uniserial termination of its coil allows separation at the generic level. At the same time it should be noted that rare, megalospheric individuals in populations of *Chubbina jamaicensis* also terminate their growth with one or two uncoiled chambers. The apparently earlier appearance of *Murciella* in Europe (Bignot 1967) would preclude any direct connection with *Chubbina*.

Reiss *et al.* (1964) suggested that *Pseudedomia* could be related to the peneroplids through the development of excessive thickening of the subepidermal partitions to produce a 'couche basale'. It seems that a 'couche basale', with associated multiple rows of chamberlets, is developed characteristically in only two groups, the Alveolinidae (including complanate forms) and the so-called Fabulariinae, and this may suggest a close relationship. However, both groups evolve their multiple rows of chamberlets in different geological eras. Moreover, the Tertiary genus *Fabularia* retains a biloculine type of coiling, so that direct descent from a multiloculine Cretaceous alveolinid ancestor, with multiple rows of chamberlets, is unlikely. In Jamaica, *Fabularia* is seen to evolve from a primitive form with a single row of chamberlets (*Fabularia matleyi* (Vaughan)) through intermediate forms, retaining the single row of

chamberlets, but with basal thickening (*Fabularia vaughani* Cole), to advanced forms with multiple rows of chamberlets in a 'couche basale' (*Fabularia verseyi* Cole).

Another American species which appears to belong to the complanate alveolinid group is *Borelis gunteri* Cole. The type figures (Cole 1941, pls. 2, 18) are rather indistinct, but *B. gunteri* appears to be a planispiral form, like *Pseudedomia*. It may also be related to *Raadshoovenia* van den Bold, but both types need re-examination.
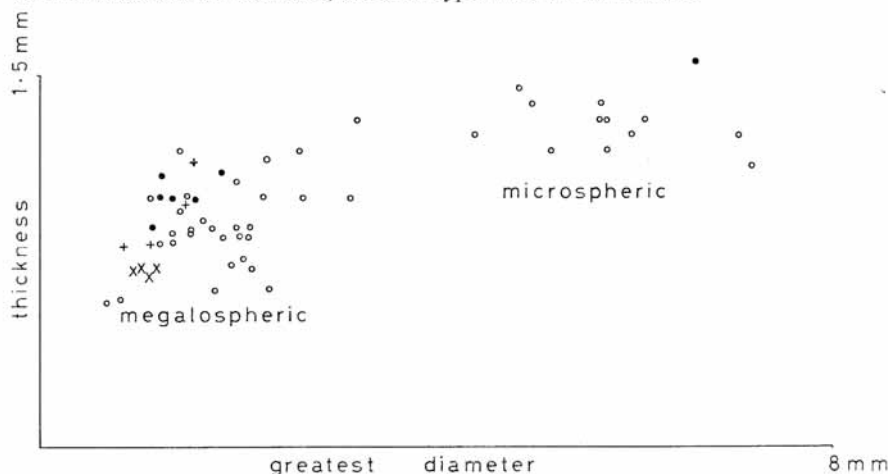
TEXT-FIG. 1. Measurements of thicknesses and greatest diameters of *Chubbina*.

Dots are *C. jamaicensis*, Locality 1.
Circles are *C. jamaicensis*, Locality 2.
× signs are syntypes of *C. cardenasensis* (Barker and Grimsdale), Locality 3.
+ signs are *C. macgillavryi*, Locality 4.

Distribution. *Chubbina* has been recorded from Mexico (Barker and Grimsdale, op. cit. and this paper), Cuba (Seiglie and Ayala, op. cit.) and Jamaica. There are a number of other records of Cretaceous alveolinids in the Caribbean and Central American region, which, on further investigation, would probably prove to be species of *Chubbina* (e.g. Bronnimann in Dixon 1956, p. 81, as *Cosinella*, from the upper Cretaceous of British

EXPLANATION OF PLATE 103

Fig. 1. *Ayalaina rutteni* (Palmer), from the lower part of the Guinea Corn Formation, near Locality 1. Jamaica. ×12. BMNH P. 48058.

Fig. 2. Undetermined alveolinid from Locality 4, having only a single layer of chamberlets in each chamber. ×30. BMNH P. 48039.

Fig. 3. *Chubbina macgillavryi* sp. nov., megalospheric cotype from Locality 4, showing large proloculus, canal flexostyle and low rate of chamber enlargement. ×30. BMNH P. 48043.

Fig. 4. *Chubbina macgillavryi* sp. nov. microspheric form, from Locality 4, section cut tangentially, normal to the axis of coiling of the final whorl. ×20. BMNH P. 48045.

Fig. 5. Part of a thin section from Locality 4, showing abundant specimens of *Chubbina*, rudistid fragments and an off-centred transverse section of *Ayalaina rutteni* (Palmer). ×8. BMNHP. 48044.

Honduras). Brown and Bronnimann (1957, p. 35). reported alveolinids from the type locality of *Kathina jamaicensis* (Cushman and Jarvis). This locality is only 20 metres from the type locality of *Chubbuna jamaicensis* (which also contains *K. jamaicensis*).

In Jamaica *C. jamaicensis* is an index fossil for the group of limestones, including the Guinea Corn Formation of Coates (1965), which contains the *Titanosarcolites* rudistid fauna of Chubb (1955, pp. 178, 183) considered by him to be of Maastrichtian age. It is normally associated with *K. jamaicensis*, miliolids, and ostracodes. *Vaughanina cubensis minor* Seiglie and Ayala and *Sulcoperculina dickersoni* (Palmer) are also found at this horizon. Recently *Ayalaina rutteni* (Palmer) has been found for the first time in the same limestone group (Pl. 103, fig. 1, specimen donated by Mr. A. D'Aguilar of the University of the West Indies). Previously this species (as ?*Meandropsina rutteni*) had been recorded in Jamaica only from the limestones containing the *Barrettia* rudistid fauna, considered by Chubb to be of Campanian age (in Zans *et al.* 1962, pp. 11–15).

In the material from locality 4, *C. macgillavryi* occurs with *K. jamaicensis*, *Sulcoperculina* sp. and *Ayalaina* sp. In Cuba Seiglie and Ayala (op. cit.) consider the range of their ' *Borelis*' cf ' *B*'. *cardenasensis* (*C. cardenasensis* of this paper) as being upper Campanian to lower Maestrichtian. The types of *C. cardenasensis* come from a section which Barker and Grimsdale considered to be of Campanian to Maastrichtian age (op. cit.).

Chubbina, then, appears to be of regional stratigraphical value in indicating a late Campanian to Maastrichtian age for rocks in which it is found. In Jamaica the genus is also restricted to rocks whose general appearance and faunas indicate a shallow shelf or lagoonal environment (Coates 1965).

Although *Chubbina* may be the most common late Cretaceous alveolinid in the Americas, other genera do occur. One of these is a planispirally coiled form, apparently with only one row of chamberlets to each chamber. A single section of this form, collected from Locality 4, is illustrated on Plate 103, fig. 2.

REFERENCES

BARKER, R. W. and GRIMSDALE, T. F. 1937. Studies of Mexican fossil Foraminifera, III. A new Alveo-linellid from the Upper Cretaceous of Mexico. *Ann. Mag. Nat. Hist.* (10) **19**, 173–8, pl. 9, figs. 1–5.

BIGNOT, G. 1967. Présence de *Murciella cuvillieri* Fourcade dans le Liburnien des environs de Trieste. *C.r. Somme Séane. Soc Géol. Fr.* **2**, 50, 51.

BROWN, N. K. and BRONNIMANN, P. 1957. Some Upper Cretaceous rotalids from the Caribbean region. *Micropaleont.* **3**, 29–38, pl. 1.

CHUBB, L. J. 1955. The Cretaceous succession in Jamaica. *Geol. Mag.* **92**, 177–95.

COATES, A. G. 1965. A new section in the Maestrichtian Guinea Corn formation near Crawle River, Clarendon. *Quart. J. Geol. Soc. Jamaica*, **7**, 28–33.

COLALONGO, M. L. 1963. *Sellialveolina vialli* n. gen. n. sp. di alveolinide cenomaniano dell'Appennino meridionale. *Giorn. Geol. Bologna* (2) **30**, 1–10, pl. 1.

COLE, W. S. 1941. Stratigraphic and paleontologic studies of wells in Florida. *Geol. Surv. Bull. Florida*, **19**, 1–34, pl. 2, 18.

—— 1956. Jamaican larger foraminifera. *Bull. Amer. Paleont.* **36**, 205–33, pl. 24–31.

CONGRESO GEOLÓGICO INTERNACIONAL, 1956. Geológia a lo largo de la carretera entre Tuxtla Gutierrez, Chiapas, y Mexico D.F., y visita a monumentos precoloniales de Oaxaca, Oaxaca. In *Libreto-Guia de la Excursion C-15B*, XX Congreso Geológico Internacional, Mexico. 53 pp.

DIXON, C. G. 1956. *Geology of southern British Honduras*. Govt. Printer, Belize, 91 pp.

EAMES, F. F. and SMOUT, A. H. 1955. Complanate alveolinids and associated Foraminifera from the Upper Cretaceous of the middle East. *Ann. Mag. Nat. Hist.* (12) **8**, 505–12, pl. 9–11.

FOURCADE, E. 1966. *Murciella cuvillieri* n. gen. n. sp. nouveau foraminifère du Senonien supérieur du sud-est de l'Espagne. *Revue Micropaléont.* **9**, 147–55.

REICHEL, M. 1936, 1937. Étude sur les Alveolines. *Mem. Soc. Paleont. Suisse*, **57, 59**, 1–147, pl. 1–11.

REISS, Z. HAMAOUI, M. and ECKER, A. 1964. *Pseudedomia* from Israel. *Micropaleont.* **10**, 431–37, pl. 1–2.

SEIGLIE, G. A. and AYALA-CASTANARES, A. 1963. Systematica y biostratigrafia de los foraminiferos grandes del Cretacico superior (Campaniano y Maastrichtiano) de Cuba. *Paleont. Mex.* **13**, 1–56, pl. 1–43.

SMOUT, A. H. 1963. The genus *Pseudedomia* and its phyletic relationships, with remarks on *Orbitolites* and other complex foraminifera. In *Evolutionary Trends in Foraminifera*. New York, Elsevier. 224–81, pl. 1–4.

VAUGHAN, T. W. 1929. Additional new species of Tertiary larger foraminifera from Jamaica. *J. Paleont.* **3**, 373–82, pl. 39–41.

ZANS, V. A., CHUBB, L. J., VERSEY, H. R., WILLIAMS, J. B., ROBINSON, E., and COOKE, D. L. 1962. Synopsis of the geology of Jamaica. *Geol. Surv. Jamaica Bull.* **4**, 1–72.

E. ROBINSON
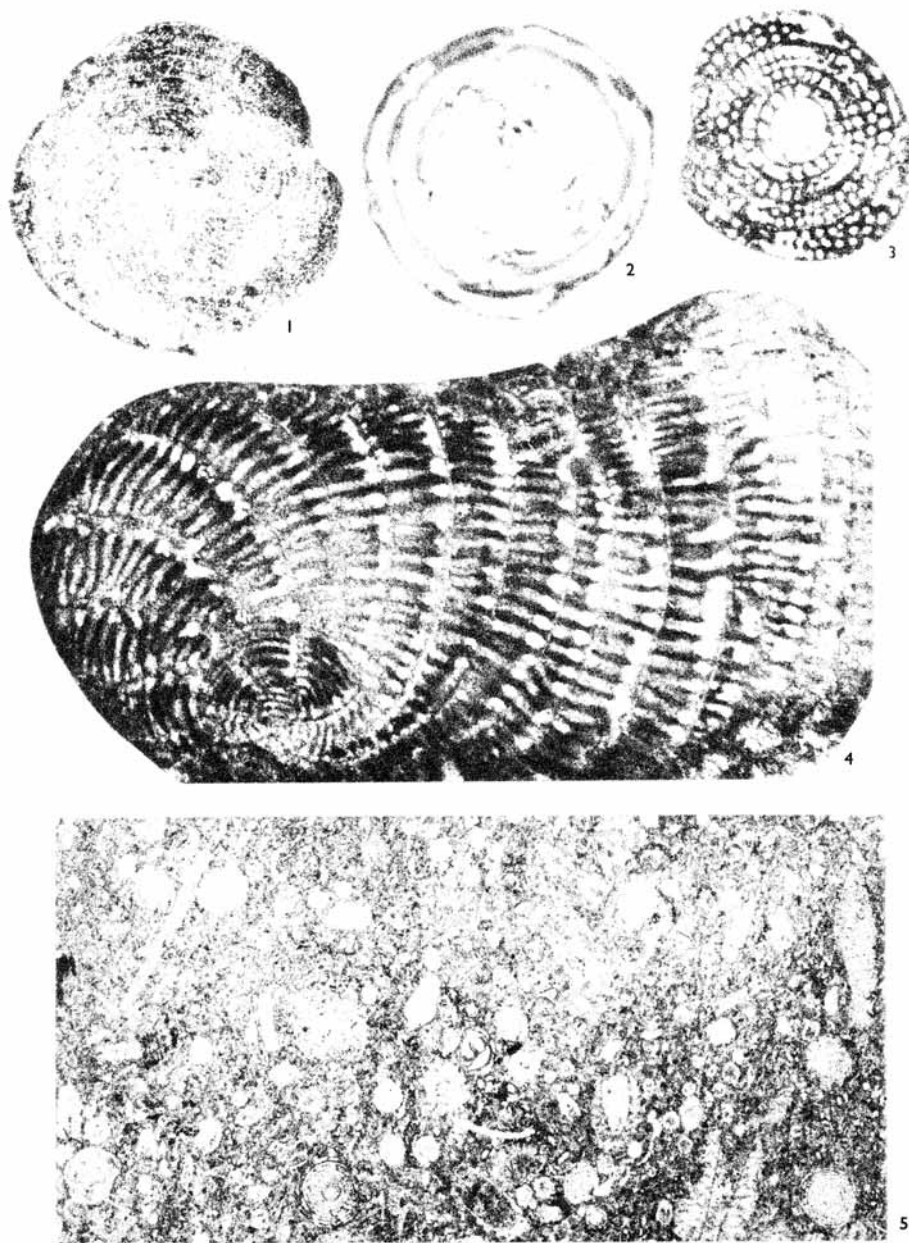Department of Geology
University of the West Indies
Mona
Jamaica

ROBINSON, *Chubbina* gen. nov.
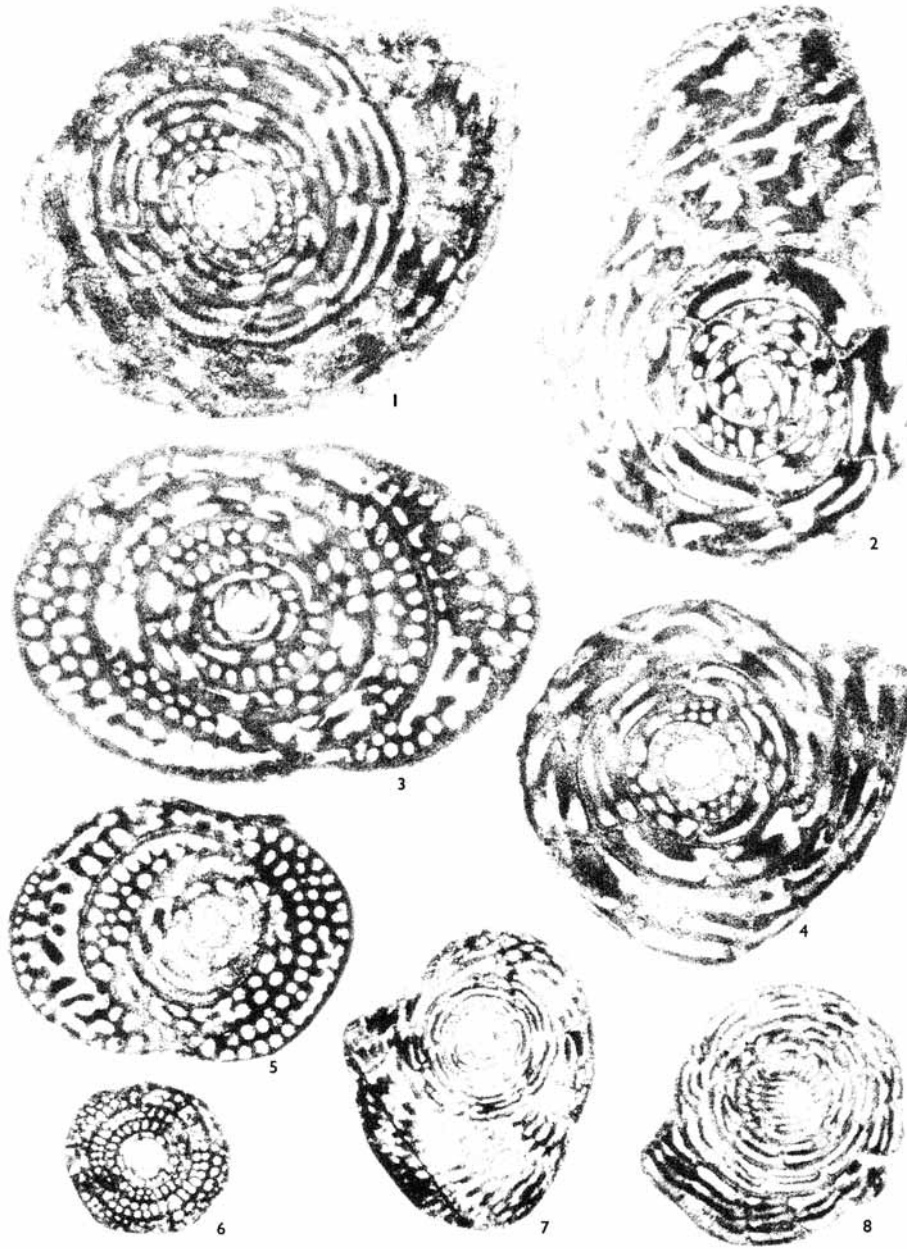
ROBINSON, *Chubbina* gen. nov.

ROBINSON, *Chubbina* and *Ayalaina*