

EOCENE MOLLUSCA FROM NIGERIA:
A REVISION

BY

FRANK E. EAMES

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By F. E. EAMES

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SYNOPSIS

The molluscan fauna described by R. B. Newton (1922) from the Eocene of Bende Ameki (Nigeria) is revised. Fifteen new gastropod species and eight new lamellibranch species are described; ten new genera and seven new subgenera of gastropoda and four new genera and six new subgenera of lamellibranchia are proposed, one of the lamellibranch genera belonging to a new family. The Eocene age of the fauna is confirmed, but it is believed to be of Upper Eocene (Bartonian), rather than Middle Eocene (Upper Lutetian), age.

I. INTRODUCTION AND GENERAL REVIEW

DURING the course of exploration in Nigeria by the joint Shell and British Petroleum organization it has frequently been necessary to consult R. B. Newton's work on Eocene Mollusca from Nigeria (1922). Certain problems concerning the age of the beds arose, and these led the writer to investigate the fauna more fully. A detailed study of the material described by Newton, which is in the collections of the British Museum (Natural History), was undertaken, with the result that, while the conclusions agreed fairly closely with Newton's opinion as to the age, it became apparent that many of the generic determinations required revision, and that not only was only one European species present, but also that all forms compared by Newton with European ones were specifically, and in some cases even generically, distinct. A full description of many of the forms is given in Part II of this paper.

On the basis of the fauna he described, Newton concluded that the beds were of Upper Lutetian age, although he recognized that the Bartonian facies was very apparent. The result of the present revision has been to show that only two lamellibranchia—*Plicatula polymorpha* Bellardi and *Raetomya schweinfurthi* (Mayer-Eymar)—occur outside Nigeria, in the Upper Mokattam Beds of Egypt; the *Plicatula* has been found also in the Priabonian of Italy, and the *Raetomya* in the Eocene of Senegal and the Cameroons. Of the gastropod genera, *Strepsidura* (sensu lato) ranges from Eocene to Oligocene, and *Exechostoma* and the subgenus *Buccinorbis* range from Maestrichtian to Eocene; not one of the gastropod species has yet been found elsewhere. The cephalopod genus *Belosepia* is restricted to the Eocene. Although the bryozoan genus *Cupuladria*, hitherto believed to range only from Miocene to Recent, has been found in the beds by palaeontologists of the Shell Oil Company, the Eocene age indicated by the mollusca is also confirmed by the fish remains recorded, which include the genus *Cylindracanthus*. The coral *Turbinolia*, which is also of fairly common occurrence in the beds, is known only from Eocene and Oligocene deposits.

Although two of the lamellibranch species have been recorded from the Upper Mokattam Beds of Egypt, these beds have also yielded *Nummulites beaumonti* and *Orbitolites complanatus*; these latter fossils suggest a rather earlier age than Bartonian (to which stage the Upper Mokattam Beds have been assigned), and appear to suggest that the Upper Mokattam is not entirely of Bartonian age.

In Angola, Darteville & Roger have recently clearly shown that the beds (Quimbriz Beds) in which *Platyodon klinghardti* (mistakenly referred to *Raetomya schweinfurthi* by Caster) and *Macrocallista palmerae* (to which the Nigerian form here named *Sinodiopsis coxi* was erroneously referred) are really of Miocene age. Any similarity

of the Angola fauna to that of the Nigerian Bende Ameki Beds is evidently purely superficial, no species being in common. Darteville & Roger refer to *Raetomya* as a mastrid, but Newton has clearly shown that it is a myid; indeed, Darteville & Roger had some doubts about referring the species *klingshardti* to the American genus *Platyodon*, and it may well be that it also is a *Raetomya*.

As a result of the revision of the molluscan fauna from Bende Ameki, the writer believes that the evidence and the general relationships of the fauna, while confirming Newton's opinion as to the Eocene age, suggest that an Upper Eocene (Bartonian) rather than a Middle Eocene (Upper Lutetian) age, is indicated.

II. SYSTEMATIC DESCRIPTIONS

GASTROPODA

Family POTAMIDIDAE

Genus *EXECHOSTOMA* Cossmann, 1889

Exechostoma cossmanni Newton

1922. *Exechostoma cossmanni* Newton, p. 45, pl. 5, figs. 8-9.

REMARKS. Specimen G.42177 (Newton's fig. 9) is now selected as lectotype.

Genus *TEREBRALIA* Swainson, 1840

Terebralia nigeriensis sp. nov.

1922. *Terebralia* sp.A. Newton, p. 46, pl. 4, fig. 10.

MATERIAL. The holotype (G.42174).

DESCRIPTION. Apical whorls missing and aperture broken. Of medium size, turriculate-conic, spire angle 19° . Whorls (of which four or five are preserved) almost flat-sided, their height very slightly more than half their width; sutures deeply impressed, distinctly undulatory. Ornament consisting of moderately coarse and fairly widely-spaced ribs crossed by strong spiral threads; ribs somewhat irregularly spaced, sometimes only slightly narrower than, but sometimes (especially on the later whorls) only half the width of, their intervals, gently opisthoclinal apically, their forward-directed face slightly concave, more strongly so abapically, where they tend to be slightly swollen. On the whorls preserved there are 11 strong spiral threads with intervals of about the same width. There is no noticeable development of varices. Abapical portion of last whorl poorly preserved, without ribs, but with about nine incised spiral grooves separated by intervals of approximately half their width. Columella moderately concave and callous; other apertural characters not determinable.

DIMENSIONS. Height (incomplete) 49.7 mm. Diameter of last whorl 21.0 mm.

REMARKS. The above characters are sufficient for specific determination.

Terebralia amekiensis sp. nov.

1922. *Terebralia* sp.B. Newton, p. 48, pl. 4, fig. 11.

MATERIAL. The holotype (G.42175).

DESCRIPTION. Apical whorls missing and aperture broken, about five whorls preserved. Of small-medium size, turriculate-conic, spire angle 17° - 18° . Whorls flat-sided, their height about two-fifths of their width; sutures linear and moderately deep, gently undulatory. Ornament consisting of relatively fine and closely-spaced ribs crossed by strong spiral threads; ribs of about the same width as their intervals, their forward-directed face sometimes gently concave, vertical or slightly opisthoclinal abapically. On the whorls preserved there are eight to ten fairly strong spiral threads with intervals of about the same width; no noticeable development of varices. Base broken, without ribs, but carrying strong spiral threads with intervals of about the same width.

DIMENSIONS. Height (incomplete) 38.4 mm. Diameter of last whorl 15.3 mm.

REMARKS. The above characters are sufficient to define the species.

Family TURRITELLIDAE

Genus *TURRITELLA* Lamarck, 1799

Turritella amekiensis sp. nov.

(Pl. 5, figs. 1, 2)

1922. *Turritella* cf. *sulcifera* Deshayes: Newton, p. 50, pl. 5, fig. 7.

MATERIAL. Numerous specimens, including the holotype (G. 42215, Newton's fig. 7).

DESCRIPTION. Of medium size, turriculate-conic, spire angle 15° , last whorl about one-eighth of the total height. Protoconch not preserved, evidently small. Whorls distinctly convex, their greatest convexity slightly below the middle, upper slope less convex than the lower. Sutures linear. Height of whorls about seven-twelfths of their width. The earliest whorls seen carry four spiral threads, the number increasing to about 18 on the last spire whorl, on which a few very fine additional threads are present in some of the intervals. Base of last whorl with threads of a similar type. Columella gently concave; columellar lip narrow, especially abapically. Aperture evidently rounded-subquadrate. No siphonal fasciole. Growth lines concave forwards, distinctly prosoclinal abapically, very slightly prosoclinal abapically, the maximum concavity at about three-fifths the height of the whorl.

DIMENSIONS. Height 27.4 mm., width 7.5 mm.

REMARKS. The Nigerian form is consistently smaller than *T. sulcifera* Deshayes of the Paris Basin Lutetian; its whorls do not tend to be concave above, and the details of the spiral ornament are different.

Subgenus *COELOCONICA* nov.

TYPE SPECIES. *Turritella mauryana* Newton.

SUBGENERIC CHARACTERS. Of moderate size to fairly large, distinctly coeloconoid. Protoconch not preserved, evidently small. Early whorls subcylindrical to slightly convex, with three sharp spiral threads the uppermost of which is fairly close to the suture; traces of a fourth thread at the lower suture; all four threads with sharp, closely-spaced, vertically disposed crenulations where crossed by growth lines; rest of surface with microscopic spirals. With growth the third thread from the adapical suture gradually develops into a very prominent, sharp flange. Base of last whorl with a second prominent, but feebler, keel and two obscure threads below, as well as microscopic spirals. Aperture rounded-subquadrate, as in *Turritella*. Growth-lines with a deep U-shaped sinus the apex of which is slightly above the second keel; markedly prosocline at the adapical suture, orthocline at the abapical suture, their lower end immediately below the upper.

REMARKS. The high, gently coeloconoid spire, the details of ornament (including development of the strong flange), and the form of the growth-lines differentiate this from other described groups of *Turritella*.

Turritella (Coeloconica) mauryana Newton

1922. *Turritella mauryana* Newton, p. 48, pl. 5, figs. 4-6.

MATERIAL. Several specimens, including the lectotype (G. 42209, Newton's fig. 4) here selected.

Family ARCHITECTONICIDAE

Genus *ARCHITECTONICA* (Bolten MS.) Röding, 1798

Subgenus *NIPTERAXIS* Cossmann, 1915

Architectonica (Nipteraxis) bendeica sp. nov.

(Pl. 5, figs. 3a-c)

1922. *Solariaxis* cf. *canaliculata* (Lamarck): Newton, p. 54.

MATERIAL. The holotype (G.42373) and a few other specimens.

DESCRIPTION. Moderately small, low-conic to slightly cyrtoconoid, apical angle 140°-145°. Protoconch smooth, anastrophic; 3-4 flattened, very slightly convex spire whorls with deep, sunken sutures. Ornament consisting of five crenulated spiral threads, the uppermost one the most prominent and with the strongest crenulations, the others subequal. Last whorl sharply rounded at the periphery where there is a sixth and broader cordon, and with a fine subsidiary thread in each interval; on large specimens a second order of intercalaries may appear. Base gently convex, with seven crenulated or beaded spiral threads, the outer three finer and moderately widely spaced, the inner three coarser and with coarser beading, the innermost one well within the umbilicus; blunt, accentuated growth lines join

the crenulations. Umbilicus deep, wide and completely visible, occupying about two-fifths of the diameter of the base. Growth lines gently prosocline, slightly sinuous, becoming orthocline at the upper suture. Aperture rounded kite-shaped, peristome discontinuous; columella thin, slightly excavated, with two small furrows corresponding to the two innermost spiral threads on the base, the upper furrow more distinct.

DIMENSIONS. Holotype: height 5.7 mm., width 12.0 mm.

A topotype (G.42374) has a width of 13.8 mm.

REMARKS. Compared with *A. canaliculata* (Lamarck), this form lacks the sharp peripheral keel, and the details of the ornament are quite distinct.

Subgenus *STELLAXIS* Dall, 1892

Architectonica (*Stellaxis*) *bicingulata* (Newton)

(Pl. 5, fig. 4)

1922. *Stellaxis bicingulata* Newton, p. 52, pl. 5, figs. 10-11.

MATERIAL. Numerous specimens, including the lectotype (G. 42355, Newton's fig. 10) here selected.

SUPPLEMENTARY DESCRIPTION. Of medium size, solaroid, spire slightly cyrtocoid; spire angle decreasing during growth from about 125° to about a right angle or slightly less; last whorl forming slightly more than one-third of the height. Protoconch smooth and loosely coiled, anastrophic. About five spire whorls, which are gently convex, the main surface separated from a narrow but distinct, smooth, abapical sutural cord by a spiral groove; main surface smooth in the earlier stages, later developing extremely vague, irregular spiral threads. Sutures linear. Growth lines almost straight, prosocline. Marginal keel on last whorl with a few very faint threads, occasionally appearing to be slightly bifid. Base gently convex medially, flatter marginally where there is one smooth spiral cord close to the peripheral keel. Umbilicus very deep, wide and completely visible, occupying about a third of the diameter of the base, margined by blunt teeth which are sometimes made to appear vaguely bifid by the accentuated growth-lines, its inner wall vertical and with a spiral thread at about two-thirds of its height; a fine spiral groove limits the teeth externally in young forms, but is often obsolete or absent in adults. Aperture kite-shaped, with a small indentation level with the row of umbilical teeth, and a still fainter one by the umbilical thread above.

Subgenus *SOLARIAXIS* Dall, 1892

Architectonica (*Solariaxis*) *amekiensis* sp. nov.

(P. 5, figs. 5a-c)

1922. *Solariaxis* cf. *spectabilis* (J. de C. Sowerby): Newton, p. 53, pl. 5, figs. 12-13.

MATERIAL. A few specimens, including the holotype (G.42361, Newton's fig. 12).

DESCRIPTION. Of medium size, moderately low, gently cyrtocoid, spire angle

decreasing during growth from about 130° to about 105° (excluding the peripheral downturn of the last whorl). Protoconch not well preserved, anastrophic. About five flattened spire whorls with deep sutures, slightly imbricate. Ornament consisting of seven rather finely crenulated, not very coarse spiral threads, the fourth and sixth (from the adapical suture) finer than the others, the second, third and fifth coarser, the first even a little coarser than these. Last whorl bluntly angular at the periphery, its upper four primary threads rather wide-spaced, with a faint double intercalary, a fine single intercalary, and a stronger double intercalary in the upper, median and lower intervals, respectively; the five lower primary threads more closely-spaced, the upper interval with a fine intercalary, the peripheral thread double. Base flattened, only very slightly convex, with seven crenulated or beaded spiral threads increasing in strength towards the umbilicus, the wall of the latter with two finer, widely-spaced threads; growth lines serrate but not thickened. Umbilicus deep, wide and completely visible, occupying about a third of the diameter of the base. Growth lines distinctly prosocline, fairly straight, but becoming orthocline at the adapical suture. Aperture oval, kite-shaped; peristome discontinuous. Columella thin, gently concave, with four slight furrows corresponding to the two umbilical threads and the two innermost spiral threads on the base.

DIMENSIONS. Holotype: height 13.4 mm., width 22.8 mm.

REMARKS. Compared with that of *A. (Solariaxis) spectabilis* (J. de C. Sowerby) the spiral ornament is coarser and differently disposed.

Family SCALIDAE

Genus *ACRILLA* H. Adams, 1860

Acrilla nigeriensis sp. nov.

(Pl. 5, fig. 6)

1922. *Acrilla* cf. *affinis* (Deshayes): Newton, p. 50, pl. 3, figs. 10-12.

MATERIAL. The holotype (G.42285, Newton's fig. 10), and a few other specimens.

DESCRIPTION. Specimens incomplete, apical whorls missing and aperture broken. The largest specimen (the holotype) has about eight whorls preserved, spire angle 11° ; they are rather loosely coiled, with deep, linear sutures, and are very strongly convex, with a tendency to angularity at about three-quarters or more of their height. Ornament consisting of fine, sharp, prominent axial ribs with subdued spiral threads in the intervals. The ribs are considerably narrower than their interspaces, occasionally slightly varicose, straight or gently concave forward, gently prosocline, and more strongly bent forward at the adapical suture. There are some 30-35 vague, irregular spirals on the last-preserved whorl of the holotype. A topotype (G. 42286) shows a basal disk limited by a fairly sharp carina; the ribs continue over the disk, but are much flattened, and there are some 20 spirals similar to those on the spire whorls. Aperture oval, a little higher than wide; columellar lip slightly concave, more callous abapically, where a small auricle is developed.

REMARKS. This species was compared by Newton with *A. affinis* (Deshayes) of the Paris Basin Eocene, but is distinctly more aciculate, the spire angle being smaller. The whorls are distinctly more convex, and the sutures more deeply sunk, the shell being more loosely coiled.

Family CALYPTRAEIDAE

Genus *CALYPTRAEA* Lamarck, 1799

Calyptraea newtoni sp. nov.

(Pl. 5, figs. 7a, b)

1922. *Calyptraea crepidularis* Lamarck : Newton (pars), p. 59.

MATERIAL. The holotype (G.42438) and one topotype (G.42439).

DESCRIPTION. Of moderate size, calyptraeiform, irregularly conic. Protoconch small, smooth, dextral, *Nerita*-like, obliquely set. Surface ornamented, at least in the later stages, with oblique threads bearing papillae, the threads becoming more nearly parallel to the apertural margin as they approach it. Aperture subcircular, with margin lying in one plane, septum with very concave edge.

DIMENSIONS. Height 4.7 mm., width 12.8–13.5 mm.

REMARKS. *C. crepidularis* Lamarck, of the Paris Basin Eocene, with which Newton identified this form, is much flatter, is subrectangular in outline, has a markedly eccentric apical region, and does not possess oblique threads bearing papillae.

Genus *TURBOCALYPTRAEA* nov.

TYPE SPECIES. *T. scabrosa* sp. nov.

GENERIC CHARACTERS. Of medium size to moderately small, calyptraeiform, tending to turbinatate, apex markedly eccentric. Whorls strongly convex, with several spirally disposed rows of short, hollow, forward-directed spines together with obliquely disposed threads. Aperture as in *Calyptraea*, subcircular to suboval. A distinct, sunken, gently concave septum, the margin of which is noticeably concave in its upper part and gently convex in its lower part, occupies nearly half the aperture. A small, deep umbilicus is developed in the upper part of the septum.

REMARKS. The form, ornament, character of the septum, and presence of an umbilicus together characterize this new genus.

Turbocalyptraea scabrosa sp. nov.

(Pl. 5, figs. 8, 9a, b)

1922. *Calyptraea crepidularis* Lamarck : Newton (pars), p. 59, pl. 4, figs. 18–19.

MATERIAL. A few specimens, including the holotype (G.42437, Newton's fig. 19).

DESCRIPTION. As above.

REMARKS. *C. crepidularis* Lamarck, from the Eocene of the Paris Basin, with which Newton identified this species as well as the last, differs markedly in its almost flat

form and subrectangular outline, its very small spire, its lack of coarse ornament, and in the characters of the septum.

Genus *CREPIDULA* Lamarck, 1799

Subgenus *CONCAVIMARGO* nov.

TYPE SPECIES. *Crepidula falconeri* Newton.

SUBGENERIC CHARACTERS. Like *Crepidula*, but teleoconch whorls not in contact; surface smooth; body cavity deep; aperture oval; septum rather deeply sunk and with a cavity extending underneath the inner lip; edge of septum distinctly concave.

Crepidula (Concavimargo) falconeri Newton

1922. *Crepidula falconeri* Newton, p. 58, pl. 2, figs. 13, 13a.

MATERIAL. Several specimens, including the lectotype (G.42411, Newton's fig. 13) here designated.

Family XENOPHORIDAE

Genus *XENOPHORA* Fischer von Waldheim, 1807

Xenophora nigeriensis (Newton)

(Pl. 6, figs. 1a-c)

1922. *Tugurium nigeriense* Newton, p. 51, pl. 4, figs. 20-21.

MATERIAL. Numerous specimens, including the lectotype (G.42291, Newton's fig. 21) here designated.

REMARKS. The presence of numerous agglutinated objects covering most of the whorl surface indicates that the species is better regarded as a *Xenophora*; an umbilicus as small as the one it possesses may occur in this genus.

Family STROMBIDAE

Genus *TIBIA* (Bolten MS.) Röding, 1798

Tibia bidigitata (Newton)

1922. *Rostellaria bidigitata* Newton, p. 12, pl. 4, figs. 8-9.

MATERIAL. Several specimens, including the lectotype (G.41643, Newton's fig. 8) here designated.

Genus *CYRTULOTIBIA* nov.

TYPE SPECIES. *Rostellaria unidigitata* Newton.

GENERIC CHARACTERS. Form somewhat like that of a *Tibia* with a very short, inclined siphonal canal; often developing a strong shoulder on the last whorl and thus recalling *Cyrtulus*. Protoconch conic, of two or three smooth, moderately

convex whorls. Spire like that of *Tibia*, conic, of five or six gently convex whorls ; early stages with fine axial riblets, which are orthocone above and opisthocline below (i.e., concave forwards), crossed by increasingly broad spiral threads ; coarse, swollen varices developed occasionally. On later spire whorls the axial riblets become obsolete and are represented by accentuated growth lines only. Last whorl slightly to very strongly shouldered, the more strongly shouldered specimens with a narrow callous band (an extension of the callus of the posterior sinus) extending back some one and a half to two whorls along the sutural region. Last whorl smooth except for spiral threads on the base, rather conic, base very slightly excavated, neck oblique. Rostrum short, curved to the right. Aperture oval, with a narrow, slit-like posterior sinus curving back on to the suture ; columellar lip callous, developing a prominent, raised knob of callus limiting the inner side of the posterior sinus ; a broad notch to the right of the rostrum is delimited on the right by a short spine. Outer lip rather thick, not varicose, internally smooth, with no additional spines, gently parasigmoidal, distinctly opisthocline as a whole.

Remarks. The general form, short inclined rostrum, single abapical labial spine, the contour of outer lip, broad abapical notch, and extremely strong adapical parietal callus (extending back along the suture for two or three whorls) readily distinguish this genus from *Tibia*.

Cyrtulotibia unidigitata (Newton)

1922. *Rostellaria unidigitata* Newton, p. 14, pl. 4, figs. 3-7.

MATERIAL. Many specimens, including the lectotype (G.41688, Newton's fig. 3) here selected.

Genus *SEMITEREBELLUM* Cossmann, 1889

Subgenus *AFRICOTEREBELLUM* nov.

TYPE SPECIES. *Semiterebellum elongatum* Newton.

SUBGENERIC CHARACTERS. Form much like that of *Terebellum*, but more narrowly fusiform. Protoconch consisting of some three to four smooth, moderately convex whorls, less acute than the shell as a whole. About six spire whorls, at first gently convex, becoming flatter with growth. Ornament in the earlier stages consisting of a sharp, fine adapical thread finely crenulated by growth lines, with a narrow, shallowly excavated band below it, the abapical half of the remaining portion of the whorls with four to six fine, incised spiral lines ; ornament obsolete on later whorls. Last whorl with numerous irregular spiral threads (finer and with broader intervals abapically) on the base, which is only vaguely concave ; neck short, gently swollen. Rostrum extremely short, its end barely projecting more than the outer lip abapically. Aperture oval-subtriangular, narrower adapically, with a broad, shallow notch to the right of the rostrum. Columellar callus thin, especially medially, with a low, oblique ridge adapically, forming the upper edge of the short posterior sinus which extends only slightly above and back along the suture. Outer lip opisthocline as a

whole, forming a strongly projecting, rounded lobe to the right of the abapical channel, thin, not varicose, internally smooth.

REMARKS. This subgenus differs from *Semiterebellum* (sensu stricto) in being more lanceolate, in the less projecting rostrum, in the posterior sinus which does not ascend partly up the spire, and in the more opisthocline outer lip which is more lobate below.

Semiterebellum (*Africoterebellum*) *elongatum* Newton

(Pl. 5, figs. 10a, b)

1922. *Semiterebellum elongatum* Newton, p. 17, pl. 2, figs. 14-15.

MATERIAL. Numerous specimens, including the lectotype (G.41762, Newton's fig. 15) here selected.

Genus *AMEKICHILUS* nov.

TYPE SPECIES.—*Semiterebellum suturocostatum* Newton.

GENERIC CHARACTERS. Of small-medium to medium size, having the general form of *Ectinochilus*. Protoconch helicoid-trochoid, consisting of about four smooth, moderately convex whorls. Spire gently cyrtocoid ; last whorl slightly more than half the height of the shell. Whorls only slightly convex, sutures distinct ; five to six spire whorls. An incised line separates a narrow juxtasutural band which is always crenulated or beaded in the early stages ; later, the band is either smooth or beaded, and may be vaguely bifid. Last whorl oval, base declivous ; neck short, not swollen. Rostrum short, scarcely projecting, inclined gently to the right, with a broad, very shallow notch to its right, the notch limited externally by a short, sharp spine. Aperture oval, rather small, with a long, narrow, callous posterior sinus which curves over and slightly down on to the suture of the last whorl, extending only a short distance back. On those specimens which have a heavily beaded juxtasutural thread, the upper part of the posterior sinus extends back right up the spire as a gently convex callous band occupying the lower half of the whorls. Columella gently concave, smooth, with thick callus developing an even thicker ridge along the upper side of the posterior sinus. Outer lip thin, varicose, internally smooth, but with a slight internal thickening, externally strongly varicose, especially at the posterior sinus, nearly straight and orthocline, slightly convex adapically. Ornament consisting of a few incised spiral lines with minute pits, widely spaced posteriorly, often obsolete on the middle of the last whorl, changing to more closely spaced spiral threads on the base.

REMARKS. This form is shorter and more oval than *Semiterebellum*, and has a less projecting rostrum, a distinct juxtasutural band, and an abapical labial spine ; the posterior sinus does not ascend above the suture of the last whorl. Its closest relatives seem to be the *Ectinochilus* and *Dientomochilus* group of shells, but there are no obvious varices and the posterior sinus curves over at the suture of the last whorl. The posterior sinus in *Africoterebellum* is similar, but in that genus the form of the shell, ornament and labial spine are quite different.

Amekichilus suturocostatum (Newton)

1922. *Semiterebellum suturocostatum* Newton, p. 15, pl. 4, figs. 14-17.

MATERIAL. Many specimens, including the lectotype (G.41757, Newton's fig. 14) here selected.

Family AMPHIPERATIDAE

Genus *EOVOLVA* Schilder, 1932

Eovolva nigeriensis (Newton)

(Pl. 6, figs. 2, 3)

1922. *Amphiperas nigeriensis* Newton, p. 18, pl. 3, figs. 14-15.

1932. *Eovolva nigeriensis* (Newton): Schilder, p. 212.

MATERIAL. Several specimens, including the lectotype (G.41786, Newton's fig. 14) here selected.

REMARKS. This is the monotype of *Eovolva*.

Genus *SPHAEROCYPRAEA* Schilder, 1927

Sphaerocypraea sudanensis (Schilder)

(Pl. 6, figs. 4a, b)

1922. *Cypraea* cf. *bowerbanki* J. de C. Sowerby: Newton, p. 18, pl. 3, fig. 13.

1929. *Sphaerocypraea bowerbankii* (J. de C. Sowerby): Schilder, p. 305.

1932. *Eocypraea* (*Sphaerocypraea*) *bowerbanki* (J. de C. Sowerby) var. *sudanensis* Schilder, p. 218.

MATERIAL. A few specimens, including the lectotype (G.41780, Newton's fig. 13) here selected.

Remarks. In spite of its general similarity to *S. bowerbanki*, Schilder (1929) suspected that the Nigerian form was probably specifically distinct. The details of the fossula cannot be compared as they are not seen in available British specimens, but the outer lip of the Nigerian form is somewhat broader and is distinctly more callous and margined, and the shell was evidently a little more globose. It seems advisable to regard the Bende Ameki specimens as constituting a distinct species for which Schilder's name must be adopted, in spite of its unsuitability.

Family NATICIDAE

Genus *NEVERITA* Risso, 1826

Neverita amekiensis sp. nov.

(Pl. 6, figs. 5a, b)

1922. *Neverita* cf. *calvimontana* (Deshayes): Newton, p. 55, pl. 5, figs. 16-17.

MATERIAL. The holotype (G. 42383).

DESCRIPTION. Of small-medium size, having the form of *Polinices* rather than *Neverita*, a little less flattened than is usual in the latter genus. Protoconch conic, very low, of about two smooth, gently convex whorls. Last whorl forming about four-fifths of the height of the shell. Spire consisting of about two and a quarter almost flat, smooth whorls with fine linear sutures. Last whorl very large, rather flattened adapically, its flank moderately sharply rounded; base declivous. Aperture semilunar, not much produced to the right. Columella straight, its callus very heavy, a solid, gently convex plug almost, but not quite, filling the umbilicus.

REMARKS. In *N. calvimontana* (Deshayes), from the Eocene of the Paris Basin, the umbilical callus is less extensive and solid, the whorls are more distinctly convex, and the sutures are not quite linear.

Genus *SINUM* (Bolten MS.) Röding, 1798

Sinum africanum Newton

(Pl. 6, figs. 6a-c)

1922. *Sinum africanum* Newton, p. 57, pl. 4, figs. 12-13.

MATERIAL. Several specimens, including the lectotype (G.42406, Newton's fig. 12) here selected.

Sinum nigeriense sp. nov.

(Pl. 6, figs. 7a, b)

1922. *Sinum* cf. *clathratum* (Gmelin): Newton, p. 56, pl. 2, figs. 16-17.

MATERIAL. Several specimens, including the holotype (G.42390, Newton's fig. 16).

DESCRIPTION. Of small-medium size, not very thin-shelled, not very auriform, outline more like that of *Polinices*. Protoconch conic, very low, of two smooth, slightly convex whorls with a small nucleus. One and a quarter almost flat spire whorls with 13-15 wavy, fine spiral threads the course of which is slightly deflected at each growth line; up to three microscopic spirals developed in the intervals on the penultimate whorl. Last whorl very large, occupying most of the height of the shell, adapical portion rather extensive and flattened, flanks rounded, base declivous; ornament as on the spire whorls, but primary threads more numerous (approximately 40 in number). Aperture rounded-subquadrate, somewhat produced abapically and to the right. Umbilical callus narrow, but distinct, leaving a very small umbilical opening. Outer lip markedly prosocline and gently convex.

REMARKS. *S. clathratum* is more auriform and compressed, has a lower spire and a more ample aperture, and does not have the adapically flattened whorls which in the new species produce a rather conic appearance.

Family CYMATIIDAE

Genus *VARICOHILDA* nov.

TYPE SPECIES. *Hilda turriculata* Newton.

GENERIC CHARACTERS. Of small-medium size, having the general form of *Hilda*.

Protoconch not well preserved, evidently smooth and naticoid. Last whorl constituting about half the height of the shell. Spire consisting of four to five whorls which are about half as high as wide and carry a quite sharp median angulation; ornament consisting of narrow, rather widely-spaced, straight, orthocone or slightly opisthocline axial ribs crossed by fairly prominent spiral threads which are a little broader than their intervals; no varices on spire whorls. Last whorl ornamented like the spire whorls, with the addition of fine intercalary spiral threads near the shoulder and a very strong varix 240° back from the outer lip; base excavated abapically, the ribs becoming fainter but the spiral ornament persisting; neck short, swollen, inclined to the left. Aperture narrow and parallel-sided, rather like that of *Anachis*, a fairly broad, oblique adapical part limited by a spiral parietal fold; a fairly short, narrow siphonal canal, slightly inclined to the left, has a deep lateral notch at the end. Siphonal fasciole swollen. Outer lip almost orthocone, with a very strong varix slightly behind its sharp edge, internally thickened and with long lirae. Columellar lip straight and vertical, with three strong, spiral columellar folds, forming angular junctions with the parietal lip and with the siphonal canal; callus well-developed, spreading a little over the base, distinctly limited, becoming slightly detached by the siphonal fasciole, with numerous knobs and transverse wrinkles between its outer margin and the columellar and parietal folds.

REMARKS. Although generally resembling *Hilda*, this genus differs in having a slightly shorter spire, angular whorls, a strong varix in addition to the labral varix on the last whorl, a narrower and more parallel-sided aperture, the canal inclined to the left, and three strong columellar folds in addition to wrinkles and knobs on the inner lip.

Varicohilda turriculata (Newton)

(Pl. 7, figs. 1a-c)

1922. *Hilda turriculata* Newton, p. 29, pl. 4, figs. 24-25.

MATERIAL. Many specimens, including the lectotype (G.41971, Newton's fig. 24) here selected.

Family MURICIDAE

Genus *HEXAPLEX* Perry, 1811

Subgenus *PAZIELLA* Jousseau, 1880

Hexaplex (Paziella) bendeica sp. nov.

1922. *Poirieria* cf. *calcitrapa* (Lamarck): Newton, p. 31, pl. 3, figs. 22-23.

MATERIAL. The holotype (G.41983, Newton's fig. 22).

DESCRIPTION. Of small-medium size, fusiform, ribs aligned in seven irregular axial series, each rib being, on the last three whorls, slightly behind that on the whorl above. Protoconch not preserved. Last whorl forming about half the height of the shell. Spire conic, consisting of five to six whorls which are distinctly angulated medially, irregularly flattened and shelving above, subcylindrical or even slightly

inturned below, with linear, wavy sutures. Adapical shelf with two or three very vague spirals near the middle; one spiral thread on the angulation, and one close to the abapical suture, the latter on later whorls with a faint spiral just above it. Ribs nodular and subspinose at the shoulder on early whorls, a little narrower than their intervals, becoming considerably narrower than the intervals with growth and also developing short upturned spines at the shoulder, the spines being channelled on the forward-facing side. Last whorl inflated, base well excavated, neck moderately long; siphonal fasciole bulging, carrying widely-spaced scales. Three primary threads and vague intercalaries on the flank of the last whorl. Aperture oval, with no distinct adapical channel, with a moderately long, narrow, gently curved siphonal canal which is gently inclined to the left. Columella gently excavated, smooth, twisted, and with a vague fold at the beginning of the canal. Columellar lip callous, not widely spread, becoming detached abapically, leaving a small false umbilicus between it and the siphonal fasciole. Outer lip thin, with a varix close behind it, gently parasigmoidal and definitely prosocline adapically, with a deep lateral notch at the spine on the shoulder, internally thickened, dentate below the notch. Growth lines serrate on forward-facing side of varices.

REMARKS. *H. (P.) calcitrapa* has a much more inflated last whorl and a lower spire. *Poirieria* has five, not seven, axial rows of varices.

Genus *PTERYNOTUS* Swainson, 1833

Pterynotus newtoni sp. nov.

1922. *Pteropurpura* cf. *tricarinata* (Lamarck): Newton, p. 30, pl. 4, figs. 26-27.

MATERIAL. The holotype (G.41982, Newton's figs. 26-27).

DESCRIPTION. Of medium size, fusiform, markedly triangular when viewed from above on account of three rows of lamellar, non-spinose varices, each varix being slightly behind the corresponding one on the preceding whorl. Protoconch (nucleus missing) apparently rather tectiform, of about three smooth, gently convex whorls. Last whorl forming slightly more than half the height of the shell. Spire conic, consisting of nearly five convex whorls with linear, undulatory sutures. Early whorls carry two ribs, later whorls only one, between the varices; ribs nodular and crossed by muricate spiral threads, three orders of which are present on the last whorl; serrate, rather widely-spaced growth threads are also present. Last whorl inflated; base well excavated, neck long and straight except for the protuberant, tubular siphonal fasciole. Aperture oval, with an abapical channel and a long, narrow siphonal canal which is slightly longer than the height of the aperture, inclined to the left but vaguely curved towards the right, and then curved well back at the tip. Columella gently concave, twisted at the start of the canal. Inner lip callous, a little wider adapically, rather detached medially, well detached abapically, smooth except for a spiral ridge limiting the adapical channel. Outer lip with a broad, leaf-like, non-spinose varix, orthocline, its edge thin and dentate, internally thickened and dentate. Growth lines serrate on forward-facing side of varices.

REMARKS. *Pterynotus (Pteropurpura) tricarinatus* (Lamarck) has the varices upturned and spinose adapically.

Family BUCCINIDAE

Genus *BENDEIA* nov.

TYPE SPECIES. *Liomesus africanus* Newton.

GENERIC CHARACTERS. Of small-medium size, buccinoid, intermediate in general form between *Cominella* and *Strepsidura*, oval-conic. Protoconch naticoid, of two to two and a half smooth, moderately convex whorls. Last whorl forming slightly less than three-quarters of the height of the shell. Spire consisting of about two and a half gently convex whorls with conspicuous, deep sutures, slightly stepped; two incised spiral lines close to the adapical suture define two raised cords. Last whorl inflated-oval, ornamented like the spire whorls, base well excavated and with 11-13 spiral threads which are narrower and stronger abapically; neck moderately long and swollen. Aperture rather narrowly oval, with an adapical channel, and with a siphonal canal of moderate length which is inclined to the left and notched. Columellar callus not thick or extensive; columella with a fairly strong fold limiting the canal, and a series of wrinkles where the spiral threads of the base pass under the columellar callus. Siphonal fasciole only moderately swollen, carrying five to eight longitudinal threads, limited above by a strong, sharp, raised thread. Outer lip thin, internally smooth, almost orthocline, slightly prosocline adapically.

REMARKS. Although superficially resembling *Liomesus*, this genus is more strepsiduriform (i.e. it has a shorter spire, and is more produced abapically), has a longer and more inflected canal, a less callous inner lip, and a distinct siphonal fasciole limited above by a fine, raised carina; moreover, spiral ornament is present on the upper part of the whorls, the base of the last whorl is more excavated, the aperture is narrower, and there is a distinct columellar fold in an abapical position. The relationships evidently lie more with *Cominella* than with *Liomesus* or *Strepsidura*.

Bendeia africana (Newton)

(Pl. 7, figs. 2a, b)

1922. *Liomesus africanus* Newton, p. 38, pl. 3, figs. 20-21.

MATERIAL. Several specimens, including the lectotype (G.42096, Newton's fig. 21) here selected.

Genus *LACCINUM* nov.

TYPE SPECIES. *Athleta lugardi* Newton.

GENERIC CHARACTERS. Attaining a large size, thick-shelled, conic to buccinoid, with a low spire. Protoconch (worn in available specimens) evidently not large and bulbous as in many Volutidae. Shell completely smooth except for growth lines which are somewhat accentuated on the siphonal fasciole, although extremely vague; fine spirals can sometimes be distinguished. Last whorl forming about ten-thirteenths

(younger specimens) to seven-eighths (larger specimens) of the height of the shell. Spire distinctly coeloconoid, composed of about five flattened, very gently convex whorls with distinct, linear sutures, relatively narrower in later stages of growth. Last whorl very large, its shoulder even more sharply rounded in large specimens than in juveniles, flank subcylindrical, base slightly excavated, neck moderately long and swollen by the siphonal fasciole. Aperture narrowly oval, with a broad, flat channel situated adapically at the shoulder, and with a fairly short, poorly-defined siphonal canal which is slightly inclined to the left and deeply notched. Outer lip thin, smooth internally, orthocline as a whole, gently bisinuous. Columella gently concave, vaguely bent at its junction with the canal; inner lip with a thick, moderately wide layer of callus which becomes slightly detached abapically at the extensive siphonal fasciole, and which develops a large, protruding knob of callus beside the adapical channel. No columellar folds.

REMARKS. The above characters indicate that this genus is not related to *Athleta*, nor even a volutid. It is evidently a buccinid, and seems best placed near *Lacinia*, from which it differs in its more cylindrical last whorl, the lack of an umbilicus, and its less ample aperture and better defined siphonal canal.

Laccinum lugardi (Newton)

1922. *Athleta lugardi* Newton, p. 25, pl. 5, figs. 1-3.

MATERIAL. Several specimens, including the lectotype (G.41860, Newton's fig. 1) here selected.

Genus **JANIOPSIS** Rovereto, 1899

Janiopsis nigeriensis Newton

1922. *Janiopsis nigeriensis* Newton, p. 41, pl. 4, figs. 22-23.

MATERIAL. Several specimens, including the lectotype (G.42131, Newton's fig. 22) here selected.

Family **VOLEMIDAE**

Genus **PSEUDOMAZZALINA** nov.

TYPE SPECIES. *Bulbifusus nigeriensis* Newton.

GENERIC CHARACTERS. Of large-medium size, rather thin-shelled, inflated-fusiform, entirely smooth. Protoconch unknown. About six moderately convex spire whorls which are broadest a little below the middle, height about two-fifths of the width. Sutures linear. Last whorl forming one-half to three-fifths the height of the shell, inflated, base evenly excavated, neck moderately long, straight, vertical. Aperture oval, with a narrow adapical channel, vaguely constricted abapically where it is extended into a moderately oblique and wide, notched siphonal canal the length of which is about one-half the height of the aperture proper. No siphonal fasciole. Columella gently excavated, rather vaguely bent at the beginning of the canal, with a narrow, thin layer of callus, without columellar folds. Outer lip thin, strongly

convex in its median and anterior parts, receding strongly adapically at an angle of about 45° and becoming nearly orthocline close to the suture. Some 10-12 irregular, elongate lirae are developed well inside the aperture in its upper half.

REMARKS. Compared with *Mazzalina* (of which *Bulbifusus* is a synonym) this genus is less inflated and more fusiform, and has a higher spire, a narrower aperture and canal, no columellar folds, no spiral ornament on the base, and an outer lip which is deeply excavated adapically. *Levifusus* is distinctly ornamented and has a longer canal. *Sycostoma* is less fusiform and has heavier columellar callus; its outer lip is less excavated adapically.

Pseudomazzalina nigeriensis (Newton)

1922. *Bulbifusus nigeriensis* Newton, p. 35, pl. 4, figs. 1-2.

MATERIAL. Several specimens, including the lectotype (G.42057, Newton's fig. 2) here selected.

Family FUSINIDAE

Genus *CLAVILITHES* Swainson, 1840

Subgenus *AFRICOLITHES* nov.

TYPE SPECIES. *Rhopalithes africanus* Newton.

SUBGENERIC CHARACTERS. Of large-medium size, fusiform. Protoconch not preserved. Last whorl forming about half the height of the shell. Spire conic (apex rather cyrtoconoid), of about eight gently convex whorls, with a slight spiral depression just below the suture. First five or six whorls with moderately fine spiral threads crossing strong nodular ribs which are not in alignment from whorl to whorl. In the later stages the ribs become obsolete adapically, and on the last two whorls are absent completely, the spiral threads also becoming feebler. Base of last whorl excavate; neck long, straight, vertical. No siphonal fasciole. Imperforate. Aperture oval, with a small adapical channel and a long, straight siphonal canal only slightly inclined to the left. Outer lip thin, broadly concave, internally smooth. Columellar callus not widely spread, detached externally. Columella straight, joining the canal without any twist. No columellar folds.

REMARKS. *Clavilithes* is considerably less fusiform. *Rhopalithes* has rather shouldered whorls, a more oblique canal, and a heavier adapical apertural callus, and it tends to have a siphonal fasciole and small pseudumbilicus. *Chiralithes*, from the Upper Eocene of Peru, is somewhat similar, but has a considerably broader aperture. *Perulithes*, also from the Upper Eocene of Peru, has a higher spire, and its later whorls are quite smooth.

Clavilithes (Africolithes) africanus (Newton)

1922. *Rhopalithes africanus* Newton, p. 32, pl. 2, figs. 9-10.

MATERIAL. Several specimens, including the lectotype (G.42004, Newton's fig. 10) here selected.

Genus *LEUCOZONIA* Gray, 1847

Leucozonia pseudominax sp. nov.

(Pl. 6, fig. 8)

1922. *Cornulina minax* (Solander) : Newton, p. 34, pl. 3, figs. 6-7.

MATERIAL. The holotype (G.42052, Newton's figs. 6-7).

DESCRIPTION. Of medium size, similar in form to *Cornulina minax*. Protoconch not preserved. Last whorl forming a little more than half the height of the shell. Probably about four spire whorls forming a conic spire; whorls angulated at about one-third of their height, cylindrical or with sides inclined slightly inwards abapically, sloping and gently concave adapically. Ornament of spiral threads crossing vague, broad ribs which form blunt, slightly upturned spines on the keel. Last whorl large, base excavated, lower portion missing; spines well developed and protruding both on the main keel and on a subsidiary one developed abapically, with a narrow slit on their forward-facing side and thus evidently hollow. Aperture rounded-oval, with a small adapical channel limited below by a small spiral ridge; evidently with a fairly short siphonal canal distinctly inclined to the left. Columella concave, with at least two strong columellar folds abapically. Outer lip thin, gently parasigmoidal, orthocline as a whole, coarsely but vaguely fluted internally. The broken lower end of the columella is solid.

REMARKS. Apart from the fact that the ornament on the lower part of the last whorl differs from that of *Cornulina minax* in consisting of widely-spaced, sharp spiral threads instead of numerous closely-spaced threads of several orders, the presence of strong columellar folds indicates that the Nigerian form is not a *Cornulina*. Since the genus *Fascioplex* has an umbilicus, a lower spire, and a last whorl which is less inflated adapically, the Nigerian form seems best placed in the genus *Leucozonia*.

Family VOLUTIDAE

Genus *VOLUTOCORBIS* Dall, 1890

Volutocorbis multispinosa (Newton)

1922. *Volutospina multispinosa* Newton, p. 28, pl. 3, figs. 3-5.

MATERIAL. Numerous specimens, including the lectotype (G.41949, Newton's fig. 3) here selected.

REMARKS. This species is now removed from *Volutospina*, as the more scabrous ornament, less spinose ribs, and more oval form indicate that it is a *Volutocorbis*.

Genus *BENDELUTA* nov.

TYPE SPECIES. *Volutospina conicoturrita* Newton.

GENERIC CHARACTERS. Of medium size, not very thick-shelled, in general form somewhat similar to *Volutospina* and related genera. Protoconch conical, not large, of

about three smooth, moderately convex whorls. Spire conic. Four flat-sided spire whorls, a little wider than high, ornamented with rather weak and narrow, straight axial ribs crossed by low, flat spiral ribbons; whorls shouldered above, shoulder bearing increasingly prominent but short, upturned, hollow spines, both shoulder and horizontal sutural ledge free of spiral ornament; sutures linear, undulatory. Last whorl large, inflated, with a second row of short, laterally directed spines at the level of the adapical end of the aperture, this level forming the widest part of the whorl; ribs dying out below and spiral ornament obsolete on flanks; base moderately sharply excavated at its junction with the rather broad neck at the middle of which a vague spiral depression demarcates the slightly swollen siphonal fasciole; base, neck and siphonal fasciole with irregular spiral threads. Aperture elongate, rather irregular in shape on account of the constriction of the shell above the neck and on the flank, rather deeply notched below, and with a moderately short, oblique, poorly-differentiated siphonal canal. Columella oblique, well set off above, slightly convex, its upper half with three spiral folds of which the upper one is a little weaker and is a little closer to the median fold than is the lower one. Parietal callus spread adapically over half the ventral surface of the last whorl as a very thin glaze, almost absent medially and abapically. Lip straight and orthocline as a whole, slightly receding and sinuous abapically, strongly prosocline on the narrow shoulder, thin-edged, internally smooth.

REMARKS. The more globose last whorl (the widest part of which bears the lower row of spines), the thicker neck, and the shorter and more irregularly shaped aperture, together with the other characters mentioned above, readily distinguish this from *Volutospina*.

Bendeluta conicoturrita (Newton)

1922. *Volutospina conicoturrita* Newton, p. 27, pl. 3, figs. 1-2.

MATERIAL. Several specimens, including the lectotype (G.41901, Newton's fig. 1) here selected.

Family OLIVIDAE*

Genus *PSEUDOLIVA* Swainson, 1840

Subgenus *BUCCINORBIS* Conrad, 1865

Pseudoliva (Buccinorbis) kitsoni (Newton)

1922. *Buccinorbis kitsoni* Newton, p. 37, pl. 3, figs. 16-19.

MATERIAL. Many specimens, including the lectotype (G.42069, Newton's fig. 16) here selected.

REMARKS. The umbilicus is mostly covered by the umbilical callus, but the presence of such a distinct depression as is present in this species is more a feature of *Buccinorbis* than of *Pseudoliva*.

Family STREPSIDURIDAE

Genus *STREPSIDURA* Swainson, 1840Subgenus *STREPSIDUROPSIS* nov.

SUBGENERIC CHARACTERS. Like *Strepsidura*, but with one strong spiral fold on the columella at the beginning of the canal, and above it a convex pad on which are grouped six more folds; anterior part of shell more constricted, siphonal canal a little longer and more twisted; outer lip internally thickened and weakly crenulated.

REMARKS. *Mazzalina* has no carinate siphonal fasciole, and its canal is shorter and less oblique.

Strepsidura (Strepsiduopsis) spirata Newton

(Pl. 7, fig. 3)

1922. *Strepsidura spirata* Newton, p. 33, pl. 3, figs. 24-25.

MATERIAL. Many specimens, including the lectotype (G.42008, Newton's fig. 25) here selected.

Family CANCELLARIIDAE

Genus *SVELTIA* Joussemae, 1887Subgenus *AFRICOSVELTIA* nov.TYPE SPECIES. *Cancellaria multiplicis* Newton.

SUBGENERIC CHARACTERS. Of small-medium size, having the form of *Sveltia* or *Sveltella*, but with a rather shorter spire. Protoconch unknown. Spire conic; three to four spire whorls which are convex and tend to be slightly subangular just above the middle; sutures linear, undulatory. Ornament consisting of strong, widely-spaced spiral threads crossing solid axial ribs which are narrower than their intervals; ribs fairly strong, becoming very solid on the last whorl, gently prosocline. Last whorl oval, narrower abapically, base declivous. Aperture oval, narrower and gently emarginate (not channelled) abapically. Columella straight, with three columellar folds of which the uppermost is the strongest. Columellar callus moderately widely spread adapically, narrower and detached abapically, leaving a narrow but distinct pseudumbilicus which is limited externally by a broad, vague swelling rather than by a siphonal fasciole. Lip straight to gently concave, slightly prosocline, thin-edged, with a strong varix close behind it, lirate and slightly thickened internally.

REMARKS. The aperture has no siphonal notch as in *Cancellaria*. Compared with *Sveltia* s.str., in the new subgenus the spire is lower, there is a distinct pseudumbilicus, and there are three (not two) columellar folds. *Sveltella* has no noticeable umbilicus, a higher spire, and only two columellar folds.

Sveltia (Africosveltia) multiplicis (Newton)

(Pl. 7, figs. 4a-c)

1922. *Cancellaria multiplicis* Newton : p. 42, pl. 3, fig. 26.

MATERIAL. The holotype (G.42137).

Genus *BONELLITIA* Jousseaume, 1887Subgenus *ADMETULA* Cossmann, 1889*Bonellitia (Admetula) amekiensis* sp. nov.

(Pl. 7, figs. 5a-c)

1922. *Bonellitia* cf. *evulsa* (Solander) : Newton, p. 44, pl. 5, figs. 14-15.

MATERIAL. The holotype (G.42171, Newton's fig. 15) and several other specimens.

DESCRIPTION. Small, like *Admete* and *Admetula* in form. Protoconch unknown. Last whorl slightly less than half the height of the shell. Spire conic, consisting of about four strongly convex whorls with deep, linear, undulatory sutures. Ornament consisting of solid axial ribs, practically straight and gently prosocline, equal to or slightly narrower than their intervals, occasionally varicose, crossed by spiral threads. Last whorl swollen-ovate, narrower abapically, base declivous and with the ribs feebler. Aperture rounded-oval, not notched abapically, but with a broad, slightly emarginate channel inclined to the left. Columella vertical, with three well-developed columellar folds of which the lower two are the more closely spaced. Parietal callus thin; columellar callus narrow, its outer edge separated from the region of the neck by a well-marked, linear, vertical depression, but not by an umbilicus. No siphonal fasciole. Outer lip fairly straight, gently prosocline, blunt, limited behind by a varix, internally thickened and lirate, the lirae continuing over the floor of the aperture.

REMARKS. Although *Admetula* is placed in the synonymy of *Bonellitia* by Wenz, the name seems worth retaining for those forms with less muricate ornament. The Nigerian form differs from *B. (A.) evulsa* in its more oval-conic outline and less inflated form, its relatively finer and more numerous spiral threads, and its more callous and more detached columellar lip.

Subgenus *AFRICOSTOMA* nov.TYPE SPECIES. *Trigonostoma decorata* Newton.

SUBGENERIC CHARACTERS. Small, having the general form of a *Bonellitia* except for the marked, canaliculate ramp behind the shoulder. Protoconch naticoid, of two smooth, convex whorls. Last whorl forming slightly less than half the height of the shell. Spire conic, of two and a half subcylindrical, gently convex whorls which are slightly inturred below and have a sharp, upturned, undulatory carina on the shoulder angle; ramp horizontal as a whole, gently concave, smooth except

for irregular continuations of the ribs. Ornament consisting of delicate, gently prosocline axial ribs crossed by spiral threads, both being narrower than their intervals; the occasional very strong varices develop even stronger lobes on the upturned carina than do the ribs. Last whorl large, slightly convex abapically, ornamented like the spire whorls. No neck or siphonal fasciole. Aperture oval-pyriform, wider adapically, slightly emarginate abapically (not notched), with a slight projection at the shoulder carina. Columella vertical, with a double fold abapically (limiting the very short, oblique siphonal canal), and with a well-separated median fold. Parietal callus thin and not widely spread above, thicker and tending to be slightly detached below. Lip straight, gently prosocline, thin-edged but with a broad, strong varix just behind it, internally thickened and lirate.

REMARKS. The absence of an umbilicus together with other characters described above indicate that this species is not a *Trigonostoma*; it seems best regarded as belonging to a new subgenus of *Bonellitia*.

Bonellitia (Africostoma) decorata (Newton)

(Pl. 7, figs. 6a-c)

1922. *Trigonostoma decorata* Newton, p. 43, pl. 5, figs. 18-19.

MATERIAL. Several specimens, including the lectotype (G.42138, Newton's fig. 18) here selected.

Family CONIDAE

Genus **CONUS** Linné, 1758

Subgenus **LEPTOCONUS** Swainson, 1840

Conus (Leptoconus) amekiensis sp. nov.

(Pl. 7, figs. 7a-c)

1922. *Conospirus* cf. *parisiensis* (Deshayes): Newton, p. 24, pl. 3, figs. 8-9.

MATERIAL. Several specimens, including the holotype (G.41837, Newton's fig. 9).

DESCRIPTION. Of small-medium size, biconic. Protoconch rather tectiform, of three smooth, slightly convex whorls. Last whorl forming at least five-eighths of the height of the shell. Spire gently coeloconoid, of five to five and a half whorls with small nodes on an angulation close to the abapical suture; the narrow portion below the angulation vertical or sloping slightly inwards and causing a slightly imbricate appearance; upper part flattened or vaguely concave, shelving, with four or five spiral threads on its abapical two-thirds, the threads being slightly crenulated where crossed by the deeply concave growth-lines. Last whorl inverted-conic, shoulder with small, low nodes, base slightly excavated and neck slightly swollen; coarse, irregular spiral ribbons, which have narrow intervals and are fainter adapically, are vaguely beaded where crossed by low, flat ribs extending from the small nodes on the shoulder; the ribs are of about the same width as their intervals. Aperture

narrow and parallel-sided, vaguely constricted near the abapical end, emarginate but not notched terminally.

REMARKS. *Conus parisiensis*, with which Newton compared this species, is more produced abapically and has compound crenulations on the uppermost thread of the spire whorls (not small nodes on the lower angulation); its spiral ornament is not beaded and is restricted to the abapical half of the last whorl.

Family TURRIDAE

Genus *EOPLEUROTOMA* Cossmann, 1889

Eopleurotoma nigeriensis Newton

1922. *Eopleurotoma nigeriensis* Newton, p. 23, pl. 2, figs. 11-12.

MATERIAL. A few specimens, including the lectotype (G.41829, Newton's fig. 12) here selected.

Genus *TURRICULA* Schumacher, 1817

Subgenus *SURCULA* H. & A. Adams, 1853

Turricula (Surcula) africana (Newton)

1922. *Surcula africana* Newton, p. 22, pl. 2, figs. 6-8.

MATERIAL. Several specimens, including the lectotype (G.41809, Newton's fig. 7) here selected.

Genus *SURCULITES* Conrad, 1865

Subgenus *CLINURA* Bellardi, 1875

Surculites (Clinura) ingens (Mayer-Eymar)

1922. *Surcula ingens* (Mayer-Eymar): Newton, p. 20, pl. 2, figs. 3-5 (*cum syn.*).

MATERIAL. Two specimens.

Genus *MITRELLOTURRIS* nov.

TYPE SPECIES. *Asthenotoma (Endiatoma) casteri* Chavan.

GENERIC CHARACTERS. Having the general form of *Mitrella*, elongate oval-conic to rather turriculate-conic. Protoconch unknown. About six spire whorls (only four preserved), which are flat-sided, their height a little more than half their width. Sutures linear, slightly stepped. A narrow, flat, slightly raised juxtasutural band is limited abapically by a vague, narrow, spiral depression; whorls otherwise smooth. Last whorl about two-fifths of the height of the shell, narrowly oval, base narrowly and gently excavated, the neck of moderate length and swollen. Base and neck with spiral threads becoming increasingly stronger and more closely spaced abapically.

Aperture narrow and parallel-sided, with a short, distinct siphonal canal notched at the end. Columellar callus not extensive, smooth. Small adapical channel present. Outer lip (broken) evidently thin, not varicose, internally smooth, gently convex abapically, orthocline or slightly prosocline at the suture, with a broad, shallowly V-shaped sinus at a position corresponding to two-thirds of the height of the spire whorls. The two last whorls with a very vague angulation of the surface at the apex of this sinus.

REMARKS. Although obviously related to *Asthenotoma* and *Endiatoma*, this genus differs in the complete lack of axial ornament, the reduced spiral ornament, the smooth columella, and the absence of folds inside the outer lip.

Mitrelloturris casteri (Chavan)

(Pl. 7, figs. 8a, b ; Pl. 8, fig. 1)

1952. *Asthenotoma* (*Endiatoma*) *casteri* Chavan, p. 80, text-fig.

MATERIAL. The holotype (G.69600).

Genus *AMEKICYTHARA* nov.

TYPE SPECIES. *Cominella douvillei* Newton.

GENERIC CHARACTERS. Of small-medium size, form resembling that of the *Cythara* group of the Turridae. Protoconch naticoid, consisting of two and a half smooth, convex whorls. Last whorl forming four-sevenths of the height of the shell. Spire conic, consisting of three to four gently convex whorls which are moderately angulated at about two-thirds of their height ; sutures linear. Ornament delicately cancellate, *Ficus*-like, with tiny crenulations at the intersections of the axial and spiral elements. Last whorl oval, gently angulated adapically like the spire whorls and similarly ornamented ; base declivous and gently excavated at the origin of the moderately short neck ; axial ornament obsolete and spiral ornament irregular abapically. Aperture narrowly oval, with a short siphonal canal which is gently inclined to the left and flares a little at its deeply emarginate end. Columella gently concave, with one prominent fold (well inside the aperture) at half the height of the aperture proper. Columellar lip with thin callus which is moderately widely spread adapically but narrow abapically. No siphonal fasciole. Imperforate. Outer lip thin at edge, moderately convex medially, slightly concave at a level corresponding with that of the columellar fold, receding adapically, and with a very shallow, rounded sinus adjacent to the suture ; thickened internally and with prominent, short lirae.

REMARKS. The above characters indicate that the species is a member of the Turridae. *Cominella*, in which genus Newton placed the species, is a buccinid genus with fundamentally different characters.

Amekicythara douvillei (Newton)

(Pl. 8, figs. 2a-c)

1922. *Cominella douvillei* Newton, p. 39, pl. 2, figs. 18-19.

MATERIAL. Several specimens, including the lectotype (G.42100, Newton's fig. 19) here selected.

LAMELLIBRANCHIA

Family NUCULIDAE

Genus *NUCULA* Lamarck, 1799*Nucula costaeimbricatis* Newton1922. *Nucula costaeimbricatis* Newton, p. 73, pl. 6, figs. 10-11.

MATERIAL. The holotype (L.48096, Newton's figs. 10-11).

Family GLYCYMERIDAE

Genus *AFRICARCA* nov.TYPE SPECIES. *Glycymeris nigeriensis* Newton.

GENERIC CHARACTERS. Of small-medium size, moderately thick-shelled, moderately strongly inflated, oval-subtrapezoidal in outline. Beaks submedian, almost orthogyrous. Hinge-line almost straight, forming only about two-thirds of the length of the shell. Greatest height anterior to the median line, at about two-thirds of the length, the shell being slightly produced antero-ventrally. Cardinal area inclined mainly at an angle of about 45° to the surface of the hinge-plate. Hinge-plate fairly solid, straight medially, gently arched downwards on the flanks. Teeth taxodont, numerous, anterior ones slightly more numerous than the posterior, the eight most anterior and six most posterior ones larger and oblique; a minute gap between anterior and posterior series. Muscle scars fairly large, not buttressed. No byssal sinus. Numerous low, square-cut ribs. Surface without carina. Ventral margin internally fluted.

REMARKS. Although the hinge is somewhat like that of *Glycymeris*, the subtrapezoid (rather *Arcopsis*-like) outline and other characters described above readily distinguish this genus.

Africarca nigeriensis (Newton)

(Pl. 8, figs. 3a, b)

1922. *Glycymeris nigeriensis* Newton, p. 72, pl. 8, figs. 8-10.

MATERIAL. Several specimens, including the lectotype (L.48441, Newton's fig. 8) here selected.

SUPPLEMENTARY CHARACTERS. Beaks very slightly anterior to the middle line, the extreme tips tending to be slightly prosogyrous. Hinge-line sloping vaguely downwards and outwards away from the beak. Dorso-lateral angles obtusely rounded, the anterior a little the more angular. Anterior end gently convex, joining the ventral margin in a well-rounded curve. Ventral margin gently convex. Posterior end obliquely truncated, slightly convex, joining the ventral margin in a rounded, blunt angle. Cardinal area moderately narrowly triangular, placed symmetrically beneath the beak, slightly concave where abutting against the slight projecting ridges constituting the dorsal margin of the shell, carrying fairly numerous ridges, slightly wider than their intervals medially and narrower than their intervals on the flanks, at right angles to the hinge-line. Adult with 24 anterior and 20 posterior teeth, distally converging ventrally; median 30 teeth all small, especially medially. Surface with nearly 70 rather low, square-cut, finely beaded ribs of about the same width as their intervals, rather finer on the flanks. Surface evenly convex.

Family NOETIIDAE

Genus *PROTONOETIA* MacNeil, 1938

Protoñoetia nigeriensis (Newton)

1922. *Anadara nigeriensis* Newton, p. 70, pl. 8, figs. 4-7.

1938. *Protoñoetia nigeriensis* (Newton): MacNeil, p. 25, pl. 4, figs. 1-3.

MATERIAL. Several specimens, including the lectotype (L.48544, Newton's fig. 4) here selected.

REMARKS. This is the type species of *Protoñoetia*.

Genus *ARCOPSIS* von Koenen, 1885

Arcopsis africana (Newton)

(Pl. 8, fig. 4)

1922. *Fossularca africana* Newton, p. 68, pl. 8, figs. 14-17.

MATERIAL. Several specimens, including the lectotype (L.48113, Newton's fig. 14) here selected.

REMARKS. *Fossularca* is a synonym of *Arcopsis*.

Genus *RECTANGULARCA* nov.

TYPE SPECIES. *Striarca africana* Newton.

GENERIC CHARACTERS. Of small-medium size, not very thick-shelled, rather strongly inflated, subrectangular in outline. Beaks median, practically orthogyrous, the extreme tips slightly opisthogyrous. Cardinal area narrowly triangular, the portion anterior to the beak slightly the shorter; with one fine chevron-shaped groove very close to the two shorter sides, the remainder of the surface with

numerous, fine, closely-spaced ridges perpendicular to the hinge-line; when the valves are in contact the two areas are in one plane, occasionally pouting slightly along the line of junction. Hinge-line straight, forming about seven-ninths of the length of the shell. Dorso-lateral angles obtuse, the anterior a little the more so. Anterior end gently convex near the dorso-lateral angle, rather sharply rounded below. Ventral margin almost straight, gently upturned near the ends. Posterior end fairly straight, joining the ventral margin in a sharply rounded curve. No byssal depression. Hinge-plate very narrow, straight, its base horizontal, slightly expanded at the extreme ends; a small, narrow gap, slightly depressed, beneath the beak, with 22-23 taxodont teeth on each side, the teeth being short and vertical except for the five or six flanking ones which are slightly longer and oblique (converging ventrally). Surface not carinate, with fine, very numerous radial riblets of three orders minutely beaded by fine concentric threads. Muscle scars large, subequal, not buttressed. Valve margins smooth.

REMARKS. The more elongate and subrectangular form, characters of the hinge, lack of a buttress to the posterior muscle scar, and smooth valve margins distinguish this genus from *Striarca*. *Breviarca* is much shorter and has a much more convex ventral margin.

Rectangularca africana (Newton)

(Pl. 8, figs. 5a, b, 6)

1922. *Striarca africana* Newton, p. 69, pl. 8, figs. 11-13.

MATERIAL. Several specimens, including the lectotype (L.48172, Newton's fig. 11) here selected.

DIMENSIONS. Height 9.6 mm., length 18.3 mm., thickness (two valves) 7.8 mm.

Family PLICATULIDAE

Genus *PLICATULA* Lamarck, 1801

Plicatula polymorpha Bellardi

1922. *Plicatula polymorpha* Bellardi: Newton, p. 65, pl. 6, figs. 6-9 (*cum syn.*).

MATERIAL. Fourteen specimens.

Family OSTREIDAE

Genus *OSTREA* Linné, 1758

Ostrea amekiensis sp. nov.

(Pl. 8, fig. 7)

1922. *Ostrea* cf. *ludensis* Deshayes: Newton, p. 61, pl. 8, figs. 2-3.

MATERIAL. The holotype (L.48195, Newton's figs. 2-3).

DESCRIPTION. The single specimen is a right valve, rounded-subtriangular, a little

narrower in the upper third near the ligament area which (although worn) is much enrolled forward but otherwise typical. The valve is almost flat, very slightly concave medially, vaguely out-turned laterally and at the rounded end. Outer surface, apart from growth lines, with numerous, fine vermicular riblets like those of *Placuna* (about six to the mm. near the rounded end). Muscle scar slightly posterior to the middle. Valve margin smooth internally.

DIMENSIONS. Height 28.7 mm., length 26.3 mm.

REMARKS. Although known only by a right valve, this species is well characterized by its *Placuna*-like ornament. As shown by Deshayes's illustration, the right valve (called "left valve") of *O. ludensis* is larger and less transverse, and has a larger ligament area and ornament of a different type (not *Placuna*-like).

***Ostrea pseudomarginidentata* sp. nov.**

(Pl. 8, fig. 8)

1922. *Ostrea* cf. *marginidentata* S. V. Wood: Newton, p. 60, pl. 6, figs. 2-5.

MATERIAL. Several specimens, including the holotype (L.48203).

DESCRIPTION. Of medium size, moderately thick-shelled, linguiform. Left valve (incomplete) with a large, flattened attachment area occupying most of the surface, leaving a narrow area, inturned ventrally almost at right angles, with numerous rather small radial ribs of about the same width as their intervals (four occupying 5.2 mm. ventrally, where they are widest). Valve margin correspondingly frilled.

Right valve irregularly flat. Outer surface smooth except for growth lines and a few irregularities. A narrow, inturned margin, flanking the ligament area, has rather prominent, short ribs which are irregularly spaced but normally narrower than their intervals; further from the umbo these merge into relatively coarse, much wider-spaced crenulations on the inner margin of the valve. Muscle scar fairly large, posterior to the middle.

DIMENSIONS. Holotype (a left valve): height (incomplete) 24.3 mm., length 19.6 mm. Topotype (Newton's illustrated right valve, L.48202): height, 36.5 mm., length 22.8 mm.

REMARKS. While showing some superficial similarity to *O. marginidentata* S. V. Wood, this species differs not only in being smaller, but in being usually higher, and in having a larger attachment area, and plications which are finer on both valves.

Subgenus **CRASSOSTREA** Sacco, 1897

***Ostrea (Crassostrea) lugardi* (Newton)**

1922. *Crassostrea lugardi* Newton, p. 62, pl. 6, fig. 1; pl. 7, fig. 1; pl. 8, fig. 1.

MATERIAL. Several specimens, including the lectotype (L.48217, Newton's pl. 6, fig. 1 and pl. 7, fig. 1) here selected.

Family CARDITIDAE

Genus *GLANS* M. von Mühlfeldt, 1811*Glans nigeriensis* sp. nov.

(Pl. 8, figs. 9a, b)

1922. *Cardita* cf. *planicosta* J. Sowerby : Newton, p. 80.

MATERIAL. The holotype (L.48318).

DESCRIPTION. The solitary right valve is small, subtrapezoidal in outline, and rather strongly inflated. Umbo moderately prominent, distinctly prosogyrous, situated at about one-third of the length from the anterior end. Lunule small, indistinct, limited in its early stages by a fine, raised thread. Escutcheon well defined. Antero-dorsal margin gently convex, more steeply descendent than the longer, straight postero-dorsal margin. Anterior end rather sharply rounded, situated rather low down. Ventral margin almost straight. Posterior end truncated slightly obliquely, joining the ventral margin in a rounded angle which is only a little more than a right angle, and the postero-dorsal margin in a rounded angle of about 155°. Surface ornamented with 23 rather low, moderately broad, rather vaguely beaded ribs which are slightly wider than their intervals over the main body of the shell but more closely spaced at the extreme ends; they have rather square-cut, shallow intervals, and are flattened on top, although slightly depressed along the middle line. Valve margins coarsely fluted. Right valve hinge: AI small, pointed, with a small, shallow socket above it; 3a broken, evidently thin and moderately oblique; 3b solid, rather narrowly triangular, its dorsal pointed portion projecting into the shell cavity; a small PIII may have been present, but cannot be observed as the margin of the shell is rather worn posteriorly.

DIMENSIONS. Height 11.9 mm., length 14.7 mm.

REMARKS. From its general form and ornamentation, as well as from the characters of the hinge, it is evident that this specimen is not a juvenile of the large *Venericardia* (*Venericor*) *planicosta* (Lamarck).

Subgenus *BENDEGLANS* nov.TYPE SPECIES. *Cardita costaeirregularis* Newton.

SUBGENERIC CHARACTERS. Of small-medium size, only moderately thick-shelled, subtriangular-cuneiform, moderately strongly inflated; anterior and posterior parts of surface with flat ribs separated by linear intervals, median portion with only three very wide, rather high and flat-topped ribs separated by broad intervals, the intervals showing as raised broad ridges on the inner surface of the shell; right valve with small AI, low 3a, solid 3b, lamellar 5b, and small PIII; left valve with AII, fairly solid 2 and 4b, PII, and small PIV.

Glans (Bendeglans) costaeirregularis (Newton)

(Pl. 9, figs. 1, 2)

1922. *Cardita costaeirregularis* Newton, p. 81, pl. 9, figs. 30-31.1944. *Cyclocardia costaeirregularis* (Newton): Chavan, p. 35.

MATERIAL. Many specimens, including the lectotype (L.48324, Newton's fig. 30) here selected.

SUPPLEMENTARY SPECIFIC DESCRIPTION. Beaks pointed, rather high, prosogyrous, situated anterior to the middle line at about two-thirds of the length. Lunule small, cordiform, concave. Escutcheon rather short, narrow. Anterior part of surface with nine depressed, flatly rounded, unbeaded ribs separated by linear intervals; posterior part with 11 similar but rather narrower ribs; median part with three very broad, elevated, flat-topped, unbeaded ribs separated by broad, subrectangular intervals; the anterior ribs increase in size posteriorly, the ninth being almost as large as the adjacent one on the median part and separated from it by a linear interval; the most anterior of the posterior group is a little larger than the remainder; valve margins fluted according to the ribbing, the three main depressions of the outer surface showing as ridges on the inner surface. Posterior adductor impression of normal shape, anterior one rather elongate. Right valve: AI small, low, close to the end of 3a; 3a obscure, thin, low, more or less fused to the valve margin, only slightly inclined forwards; 3b solid, elevated, not very broadly triangular, inclined slightly backwards; 5b long, thin and lamellar, almost straight, fused to the lower edge of the nymph from which it is separated by a narrow groove; PIII lamellar, moderately long, fused to the continuation of the ridge limiting the escutcheon. Left valve: AII short, fused to the ridge limiting the inner margin of the lunule; 2 solid, elevated, narrowly triangular, slightly inclined forwards; 4b solid, elevated, rather more narrowly triangular, oblique; PII small; apparently a still smaller tooth (PIV) above and behind PII. Nymph narrow, relatively short. Escutcheon of right valve with a groove outside it, radiating from beneath the beak and enlarging with growth.

REMARKS. Chavan placed this species in *Cyclocardia*, but in *C. borealis* (Conrad), as represented by specimens in the British Museum (Natural History), the shell is suborbicular and has beaded ribs in youth, and vague, flatly V-shaped ribs in the adult, with no median enlarged ribs; there are no posterior lateral teeth, and the cardinal teeth of the right valve differ in orientation. The hinge of *Cardita (Cyclocardia) granulata* Say, as figured by Chavan, differs in a similar manner. The greatly enlarged median ribs and the hinge characters warrant the placing of the Nigerian species in a new subgenus.

Subgenus *AMEKIGLANS* nov.

TYPE SPECIES. *Cardita costaenodulosis* Newton.

SUBGENERIC CHARACTERS. Of small-medium to medium size, very thick-shelled, oval-subtriangular to cuneiform, inflation moderate; extreme posterior ribs flat

and rather low, slightly wider than their intervals, the remainder very narrow and high, with rounded tops, finely beaded, with deep, broader, smooth, U-shaped intervals; right valve with AI, low 3a, solid 3b, lamellar 5b, and distinct PIII; left valve with short, pointed AII, solid triangular 2, narrower and longer 4b, and distinct PII.

Glans (Amekiglans) costaenodulosis (Newton)

(Pl. 9, figs. 3, 4)

1922. *Cardita costaenodulosis* Newton, p. 82, pl. 9, figs. 22-25.

1938. *Cossmannella costaenodulosis* (Newton): Chavan, pp. 3-10, fig. 1.

1944. *Cossmannella costaenodulosis* (Newton): Chavan, p. 35.

MATERIAL. Many specimens, including the lectotype (L.48360, Newton's figs. 24-25) here selected.

SUPPLEMENTARY SPECIFIC DESCRIPTION. Beaks pointed, rather high, prosogyrous, situated anterior to the middle line at about two-thirds of the length. Lunule small, narrowly cordiform, depressed, bulging medially. Escutcheon narrow, rather short. Extreme posterior end with five rather flattened, unbeaded ribs with slightly narrower intervals, the remainder of the surface with 14 very narrow and high, finely beaded ribs with rounded tops, separated by smooth, broadly U-shaped intervals of nearly three times their width. Valve margins coarsely fluted. Right valve: AI rather small, fairly close to and in line with the end of 3a; 3a low, not very long, sloping forwards at about 45°, partially fused to the inner margin of the lunule, from which it is separated by a slight groove; 3b solid, elevated, triangular, its anterior edge vertical; 5b rather long, very thin and lamellar, fused to the lower edge of the nymph; PIII distinct, moderately long, rather distant, situated fairly near the valve margin. Left valve: AII small, pointed, situated at the forward end of the inner edge of the lunule; 2 solid, elevated, triangular, its posterior edge vertical; 4b solid, more narrowly triangular, oblique at about 45°; PII distinct. Posterior adductor impression tending to be obliquely subrectangular; anterior adductor impression moderately elongate.

REMARKS. Chavan placed this species in *Cossmannella*. None of the specimens of *Cardita fayumensis* Oppenheim (*C. aegyptiaca* Fraas non Monterosato), the type species of *Cossmannella*, in the British Museum (Natural History), shows the hinge. It is not recorded as having any lateral teeth, but Chavan has intimated to me that the hinges of the two species are identical as judged from specimens in his own collections. The ribs of *C. fayumensis* are recorded as being "few, strong, sharp, slightly tripartite", but while specimens in the British Museum (Natural History) do occasionally show tripartite ribs, this is due to wear. The ribs are considerably more numerous and less high than in *costaenodulosis*, the intervals being much less conspicuous, and the shell is not normally so pointed posteriorly, often being truncated. In view of the doubts concerning the exact characters of the hinge of *Cossmannella*, and since its form and ribbing apparently differ appreciably from those of the Nigerian species, a new subgeneric name seems warranted for the latter.

Subgenus *DIVERGIDENS* nov.

TYPE SPECIES. *Cardita triparticostata* Newton.

SUBGENERIC CHARACTERS. Of small to small-medium size, fairly thick-shelled, rather strongly inflated, outline subtriangular, moderately high. A few simple, narrow ribs posteriorly, the remainder of the surface with broad, low, square ribs with deep, narrow, almost linear, square-cut intervals, the middle third of each rib bearing a strong, rounded, beaded cord. Right valve with AI, obsolete and very oblique 3a, solid and rather broadly triangular 3b, and distinct PIII; left valve with AII, strongly divergent 2 and 4b (the latter the more oblique), PII and weak PIV.

Glans (Divergidens) triparticostata (Newton)

(Pl. 9, figs. 5a, b, 6, 7)

1922. *Cardita triparticostata* Newton, p. 83, pl. 9, figs. 26-29.

1938. "*Venericardia*" *triparticostata* (Newton): Chavan, p. 7.

MATERIAL. Several specimens, including the lectotype (L.48319, Newton's fig. 26) here selected.

SUPPLEMENTARY SPECIFIC DESCRIPTION. Beaks pointed, prominent, moderately prosogyous, situated anterior to the middle line at about three-fifths of the length. Lunule rather small, moderately broadly cordiform, smooth, not much sunk. Escutcheon short. Extreme posterior end with seven low, gently rounded, unbeaded ribs with rather narrower intervals, the remainder of the surface with 18 low, flat, broad ribs with deep, narrow, almost linear, square-cut intervals, the middle third of each rib carrying a strong, rounded, beaded cord. Valve margins coarsely fluted. Right valve: AI small but distinct, slightly elongate; 3a obscure, long, low, thin, lamellar, very oblique and only gently descendent, fused to the inner margin of the lunule; 3b solid, elevated, rather broadly triangular, its anterior edge sloping gently forwards, its posterior edge sloping more obliquely backwards; PIII distinct. Left valve: AII distinct, slightly elongated; 2 and 4b strongly divergent, solid, elevated, narrowly triangular, their inner margins forming an angle of about 80°, 4b slightly more oblique than 2; PII distinctly elongated; PIV similar but weaker. Nymph rather narrow, moderately long. Posterior adductor impression normal in shape; anterior adductor impression moderately elongate.

REMARKS. Chavan tentatively referred this species to *Glyptoaxis*, but the right cardinal is not curved and elongate; he has recently suggested to me that it may be a *Cardiocardita* (group of *Cardita beaumonti*), but *Cardiocardita* has no anterior laterals. In its form, ornament, and hinge characters the Nigerian species appears to belong to a new subgenus.

Family LUCINIDAE

Genus *PHACOIDES* Gray, 1847

Phacoides eaglesomei Newton

1922. *Phacoides eaglesomei* Newton, p. 75, pl. 8, figs. 18-20.

MATERIAL. Numerous specimens, including the lectotype (L.48237, Newton's fig. 18) here selected.

Genus **GIBBOLUCINA** Cossmann, 1904Subgenus **EOMILTHA** Cossmann, 1910***Gibbolucina (Eomiltha) (?) subrhomboidalis*** (Newton)1922. *Phacoides subrhomboidalis* Newton, p. 77, pl. 7, figs. 4-5.

MATERIAL. The holotype (L.48244).

REMARKS. The characters of the hinge are unknown since the valves of the single specimen available cannot be separated. Chavan (in correspondence) has suggested that the species may be an *Eomiltha*.Genus **POMPHOLIGINA** Dall, 1901Subgenus **EODIVARICELLA** Chavan, 1951***Pompholigina (Eodivaricella) oppenheimi*** (Newton)1922. *Divaricella oppenheimi* Newton, p. 78, pl. 7, figs. 2-3.1951. *Pompholigina (Eodivaricella) oppenheimi* (Newton): Chavan, p. 23, fig. 27.

MATERIAL. A few specimens, including the lectotype (L.48097, Newton's fig. 2) here selected.

REMARKS. This is the type species of *Eodivaricella*.Family **CARDIIDAE**Genus **FRAGUM** (Bolten MS.) Röding, 1798Subgenus **AFRICOFRAGUM** nov.TYPE SPECIES. *Cardium* cf. *obliquum* Lamarck : Newton = *Fragum (Africofragum) newtoni* sp. nov.SUBGENERIC CHARACTERS. Small, outline *Fragum*-like, length and height nearly equal, posteriorly subcarinate. Ornament of flattened ribs which have rather narrower intervals, and are smooth except for the most anterior four or five which bear small prickles; ribs on posterior area more irregular and producing short spines at the margin. Postero-dorsal margin, of left valve only, with a row of six short, upturned and outward-bent spines. Hinge less arched than in *Fragum*, anterior lateral teeth a little closer to cardinals than posterior lateral teeth. Nymph short.***Fragum (Africofragum) newtoni*** sp. nov.

(Pl. 9, figs. 8a-c)

1922. *Cardium* cf. *obliquum* Lamarck : Newton, p. 74, pl. 7, figs. 6-9.

MATERIAL. Many specimens, including the holotype (L.48416, Newton's fig. 6).

DESCRIPTION. Beaks moderately prominent, not large, prosogyrous, situated slightly anterior to the median line. Antero-dorsal margin short, straight or slightly

convex, joining the anterior end in an obtusely rounded angle. Anterior end well rounded, receding a little ventrally. Ventral margin convex, its posterior part the straighter, joining the posterior end in a blunt angle of a little more than 90°. Posterior end obliquely truncated, gently convex. Postero-dorsal margin short, nearly straight. About 34 ribs. Left valve: AII obscure, below the forward end of a well-developed AIV; 2a massive, upturned, pointed; 2b small; PII and PIV small. Right valve: AI larger than AIII; 3a small; 3b massive, upturned, pointed; PI well developed; no PIII below the straight shell margin, above which are the spines. Valve margins fluted.

REMARKS. *Cardium obliquum* Lamarck appears to be a *Loxocardium*, and is quite different from the Nigerian form in that it is transversely oval in outline, not subcarinate, and has distinct transverse scales or beads on the ribs, but no spines.

Family VENERIDAE

Genus *TIVELINA* Cossmann, 1886

Tivelina newtoni sp. nov.

(Pl. 9, figs. 9a, b, 10a, b)

1922. *Tivelina* cf. *sphenarium* (Bayan): Newton, p. 90, pl. 9, figs. 7-10.

MATERIAL. Many specimens, including the holotype (L.48504, Newton's fig. 7).

DESCRIPTION. Small to small-medium. Moderately thick-shelled, oval-subtriangular. Beaks small, prosogyrous, high, situated anterior to the middle line at about two-thirds of the length. Inflation moderate; greatest height anterior to the middle line, at the position of the beaks. Lunule large, narrowly cordiform, limited by a fine raised thread. Escutcheon narrow, rather short. Antero-dorsal margin gently convex, steeply descendent. Anterior end well rounded, a little produced antero-ventrally. Ventral margin convex, straighter (even vaguely emarginate) posteriorly. Posterior end moderately produced, situated rather low down, sharply rounded. Postero-dorsal margin long, slightly convex, rather steeply descendent. Surface with numerous strong, rather irregular, fairly sharp, concentric threads. Right valve: AI and AIII small, short, lamellar; 3a rather short, simple, thin, inclined forwards; 1 vertical, narrowly triangular, simple; 3b oblique, deeply grooved. Left valve: AII prominent; 2a thin, simple, inclined forwards; 2b narrowly triangular, simple, inclined backwards; 4b oblique, thin, lamellar, simple, moderately long. Nymph moderately long, thin. Pallial sinus subtriangular, rather short, its apex not reaching the middle line, its upper arm subhorizontal, its lower arm steeply descendent. Valve margins smooth.

REMARKS. Comparison with specimens in the British Museum (Natural History) shows that this is not Bayan's species; the ornament is more serrate and less *Costacallista*-like, the pallial sinus is larger, and the hinge-plate has no rectangularly ending projection beneath the anterior lateral teeth, as in *T. sphenarium*.

Genus *PITAR* Roemer, 1857

Pitar amekiensis sp. nov.

(Pl. 9, figs. 11a-c, 12; Pl. 10, fig. 1)

1922. *Cordiopsis incrassata* (J. Sowerby) : Newton, p. 85 (pars).

MATERIAL. The holotype (L.48253) and two topotypes (L. 48245-6).

DESCRIPTION. Of medium size, moderately thick-shelled, rather strongly inflated, equivalve, subtriangular in outline. Beaks rather prominent, prosogyrous, situated anterior to the middle line at about one-fifth of the length. Escutcheon moderately long, narrow. Lunule large, rather narrowly cordiform, limited by a vague incised line. Antero-dorsal margin straight, steeply descendent. Anterior end rather sharply rounded. Ventral margin convex, with a gentle median bulge, straighter anteriorly and posteriorly. Posterior end vaguely truncated, joining the ventral margin in an obtusely rounded angle. Postero-dorsal margin moderately long, gently convex. Surface with irregular concentric threads, often with noticeably narrower intervals. Right valve: AI and a smaller, shorter AIII; 3a vertical, rather thin, its forward face less perpendicular to the surface of the hinge-plate than its posterior face; 1 sloping slightly backwards, its posterior face the less nearly perpendicular to the hinge-plate; 3b oblique, moderately long, deeply grooved. Left valve: AII prominent, pointed; 2a thin, lamellar, vertical; 2b oblique at about 45°, narrowly triangular, higher posteriorly; 4b moderately long, simple, gently curved downwards near its end. Nymph of medium length (about twice as long as the posterior cardinal tooth). Muscle impressions not very large. Pallial sinus rather acutely triangular, its upper arm gently ascendent, its apex narrowly rounded and situated slightly less than half-way across to the anterior adductor impression, its lower arm very steeply descendent. Valve margins smooth.

DIMENSIONS. Holotype: height 27.0 mm., length 30.7 mm. Topotype (L.48245): height 30.9 mm., length 35.0 mm.

REMARKS. These three specimens, which were labelled "*Cordiopsis incrassata*" by Newton, together with those here recorded as *Sinodiopsis coxi* sp. nov., are quite different from that species; they are more inflated and more triangular, the beaks are much higher and less anterior in position, the hinge-plate is placed less forward and less inclined, the pallial sinus is a little shorter and more ascendent, the nymph is shorter, the teeth differ in the details of their orientation, the ventral margin is more bulging, and the concentric ornament is less serrate.

Genus *CHIONELLA* Cossmann, 1886

Subgenus *COSTACALLISTA* Palmer, 1927

Chionella (*Costacallista*) *elongatotrigona* (Newton)

1922. *Callista elongatotrigona* Newton, p. 88, pl. 9, figs. 1-5.

MATERIAL. Many specimens, including the lectotype (L.48065, Newton's fig. 3) here selected.

Subgenus *MICROCALLISTA* Stewart, 1930

Chionella (Microcallista) kitsoni (Newton)

(Pl. 10, figs. 2a, b, 3)

1922. *Callista kitsoni* Newton, p. 89, pl. 9, figs. 6, 11-14.

MATERIAL. Several specimens, including the lectotype (L.48069, Newton's fig. 11) here selected.

REMARKS. The left anterior cardinal tooth (2a) is simple, not grooved as in "*Callista*" auct. (= *Costacallista* Palmer, 1927).

Genus *SINODIA* Jukes-Browne, 1908

Sinodia heward-belli Newton

1922. *Sinodia heward-belli* Newton, p. 86, pl. 9, figs. 18-21.

MATERIAL. Several specimens, including the lectotype (L.48102, Newton's fig. 21) here selected.

REMARKS. The left anterior cardinal tooth (2a) is not faintly grooved as in *Sinodia*, but in all other characters the species agrees with that genus and seems best retained in it.

Genus *SINODIOPSIS* nov.

TYPE SPECIES. *Cordiopsis incrassata* (J. Sowerby) : Newton = *Sinodiopsis coxi* sp. nov.

GENERIC CHARACTERS. Of medium size, moderately well inflated, transversely oval-subquadrate in outline, equivalve. Beaks rather small, prosogyrous, not prominent, well recurved, situated anterior to the middle line at about one-quarter to one-fifth of the length. Escutcheon fairly long, narrow. Lunule vague, large and moderately narrowly cordiform, limited by a fine incised line. Surface ornamented with rather irregular, strong, closely-spaced concentric threads. Hinge-plate moderately well developed; not as thick, as inclined, or as high as in *Cordiopsis* and *Sinodia*. Right valve: AI rather solid and triangular; AIII small; 3a thin, lamellar, gently inclined forwards; 1 rather triangular, its forward edge vertical, high, lamellar, its surface shelving downwards posteriorly; 3b oblique and deeply bifid. Left valve: AII very prominent and pointed; 2a thin, lamellar, vertical; 2b not so thin as 2a but lamellar at the apex, oblique at about 45°; 4b simple, thin, long, gently arched. Nymph long, narrow, gently arched. Muscle impressions rather large, situated relatively more dorsally than in *Cordiopsis* and *Sinodia*. Pallial sinus bluntly and moderately acutely triangular, its upper arm horizontal or slightly ascendent, its apex sharply rounded, its lower arm descendent at about 45°, the apex situated at about mid-length of the shell. Valve margins smooth.

Sinodiopsis coxi sp. nov.

(Pl. 10, figs. 4, 5)

1922. *Cordiopsis incrassata* (J. Sowerby) : Newton, p. 85 (pars), pl. 9, figs. 15-17 (non J. Sowerby).

1938. *Macrocallista palmerae* Caster, p. 66 (pars) (non pl. 1, figs. 9-10; pl. 8, fig. 7).

MATERIAL. The holotype (L.48250) and several topotypes.

REMARKS. This form is quite distinct from *Sinodia* (*Cordiopsis*) *orbicularis* (Goldfuss) (= *Venus incrassata* J. Sowerby non Brocchi) in its outline, hinge, and pallial sinus; the species was erroneously referred by Caster to the Angola Miocene species *Macrocallista palmerae*, but it differs still more from *Macrocallista*. While the hinge and pallial sinus are of the same type as in *Sinodia*, the form is quite different, the hinge-plate is less massive and less inclined, and tooth 2a is not grooved. *Cordiopsis*, which also has a much more massive and more inclined hinge and a different outline, has a shorter pallial sinus. The species is named after Dr. L. R. Cox.

Family MACTRIDAE

Genus *SPISULA* Gray, 1837Subgenus *CREPISPISULA* nov.

TYPE SPECIES. *Maetra semisulcata* Lamarck: Newton = *Spisula* (*Crepispisula*) *amekiensis* sp. nov.

SUBGENERIC CHARACTERS. Of medium size, moderately thin-shelled, subtriangular, rather *Hecuba*-like in outline, rather strongly inflated, subcarinate anteriorly and posteriorly. No lunule or escutcheon. Ornament of coarse incrementals. Left valve: AII rather short, prominent; 2a and 2b meeting in a right angle dorsally, projecting; resilium pit moderately narrowly triangular, its anterior side limited by a high, thin lamella, its posterior side by a very slight ridge; PII prominent, a little longer than AII; posterior and anterior lateral teeth at about equal distances from the cardinal teeth. Right valve: AI a little larger and stronger than AIII; 3a and 3b simple, divergent, 3a a little the more oblique; resilium pit as in the left valve; PI and PIII better developed than the opposing anterior lateral teeth. A narrow ligament slit extends from the dorsal side of the hinge-plate to the tip of the beak. Pallial sinus narrow, forming a gently ascending tongue with its apex at mid-length of the shell. Valve margins smooth.

Spisula (*Crepispisula*) *amekiensis* sp. nov.

(Pl. 10, figs. 6a, b, 7)

1922. *Maetra semisulcata* Lamarck: Newton, p. 93, pl. 7, figs. 10-13.

MATERIAL. Several specimens, including the holotype (L.48224, Newton's figs. 10-11).

SUPPLEMENTARY SPECIFIC DESCRIPTION. Beaks rather high, narrow, prosogyrous. Antero-dorsal margin long, straight. Anterior end narrowly rounded, even bluntly pointed. Ventral margin straightest posteriorly, bulging somewhat downwards along its anterior half. Posterior end sharply and narrowly rounded to bluntly pointed. Postero-dorsal margin arched, obtusely angulated in two places. Anterior carination formed by a vague depression anterior to which the concentric ornament becomes less closely spaced than on the middle of the shell. Posterior angulation formed of two very obtuse carinae, the ornament behind the posterior one being likewise relatively less closely spaced.

REMARKS. Although this form is somewhat similar in outline to the Recent genus *Scissodesma* Gray, it has definite concentric ornament, its posterior carina is less marked, the ligament slit from the dorsal side of the hinge-plate to the tip of the beak is distinctly smaller, and the lateral teeth are not crenulated. *Mactra semisulcata* Lamarck, a Paris Basin Eocene species with which Newton identified the Nigerian form, possesses a similar ligament slit, but its outline differs in being less triangular and less bulging antero-ventrally, it has a less definite anterior ridge, and its ornament is weaker.

Family TELLINIDAE

Genus *MACOMA* Leach, 1819

Subgenus *BENDEMACOMA* nov.

TYPE SPECIES. *Peronaea nigeriensis* Newton.

SUBGENERIC CHARACTERS. Of large-medium size, rather thick-shelled, transversely oval-subtriangular, length considerably exceeding height, inflation moderate. Beaks small, moderately prominent, prosogyrous. Surface ornamented with accentuated growth-lines, posteriorly with two very vague carinae. Escutcheon long, narrow. Lunule narrow, shorter than escutcheon, limited by a fine incised line. Left valve : 2a vertical, distinctly grooved dorsally ; 2b moderately oblique, very thin and lamellar, simple ; no lateral teeth. Right valve : 3a rather solid, directed moderately forwards, grooved dorsally ; 3b a little longer than 3a, directed backwards moderately obliquely, well grooved ; no lateral teeth. Nymph long and rather narrow. Pallial sinus rather narrowly tongue-shaped, its upper part rising slightly for a short distance from the posterior adductor impression, then gently descendent for most of its length, narrowly rounded at its apex, its lower part coalescent with the pallial line posteriorly for nearly half its length. Valve margins smooth.

Macoma (Bendemacoma) nigeriensis (Newton)

1922. *Peronaea nigeriensis* Newton, p. 91, pl. 11, figs. 1-3.

MATERIAL. Several specimens, including the lectotype (L.48513, Newton's fig. 1) here selected.

REMARKS. The characters of the hinge and the form of the pallial sinus indicate that this species is not a *Peronaea* ; it appears to belong to a new subgenus of

Macoma characterized by the shape of the shell, the grooved 3a, and the form of the pallial sinus.

Family MYIDAE

Genus *RAETOMYA* Newton, 1919

Raetomya schweinfurthi (Mayer-Eymar)

1922. *Raetomya schweinfurthi* (Mayer-Eymar) : Newton, p. 96, pl. 10 (*cum syn.*).
 1942. *Raetomya schweinfurthi* (Mayer-Eymar) : Rossi, p. 182, pl. 11, fig. 3.
 1952. *Labiosa (Raeta) schweinfurthi* (Mayer-Eymar) : Tessier, pp. 350-351, pl. 29, figs. 7-8.
 1954. *Labiosa (Raeta) schweinfurthi* (Mayer-Eymar) : Darteville & Roger, pl. 5 fig. 4.
 1955. *Raeta schweinfurthi* (Mayer-Eymar) : Darteville & Roger, pp. 164-167.

REMARKS. This is the type species of *Raetomya*. Tessier placed it as a subgenus of the mastrid genus *Labiosa* Schumacher, 1817, which is evidently a synonym of *Anatina* Lamarck, 1816. *Raeta* is also a mastrid genus, but *schweinfurthi* has been well described by Newton and is undoubtedly a myid. Since it was recorded from Egypt and Nigeria, it has also been recorded from the Eocene of Tripolitania and the Cameroons and from the (reputed) Lower Lutetian or Ypresian of Senegal; the horizon stated in the latter record is rather low, and it might be advisable to re-investigate the evidence on which the age was assigned. The Angola Miocene specimens referred to this species by Caster actually belong to *Platyodon klinghardtii* (J. Böhm); Darteville & Roger express doubts concerning the generic assignation of the latter species, and it may well be that it is a distinct Miocene species of *Raetomya*.

Family CORBULIDAE

Genus *VARICORBULA* Grant & Gale, 1931

Varicorbula amekiensis sp. nov.

(Pl. 8, figs. 10, 11; Pl. 10, figs. 8a-c)

1922. *Corbula rugosa* Lamarck : Newton, p. 98, pl. 7, figs. 14-18.

MATERIAL. Many specimens, including the holotype (L.48264, Newton's fig. 14).

DESCRIPTION. Small, thick-shelled, inequivalve, right valve larger and more strongly inflated than the left, beaks submedian (on the right valve a little anterior to the middle line on account of the greater rostration), prosogyrous, right valve umbo strongly enrolled. Outline subtriangular.

Right valve very strongly inflated, umbo prominent but not broad, posterior end with a moderately short, slightly upturned rostrum, with two blunt carinae posteriorly, limiting the upper and lower portions of the rostrum. Anterior end sharply rounded. Ventral margin gently convex, straighter posteriorly. Ornament consisting of strong, rounded concentric folds of about the same width as or slightly wider than their intervals, regularly increasing in size with growth. Valve margin internally smooth, with a fine incised line some distance from the edge for the recep-

tion of the margin of the smaller left valve. Tooth 1 solid, triangular, strongly upturned and pointed, with a deep, triangular chondrophore behind it; PI short, lamellar. Pallial sinus widely rounded, reaching about one-third of the distance towards the anterior adductor impression. Inner half of rostrum with two short grooves extending downwards and outwards, one near the top, the other half-way down; these are not associated with a left valve siphonal plate (such as is present in *Caestocorbula*), no trace of which has been found on any of the specimens.

Left valve fitting within the margin of the right, inner portion of right valve rostrum remaining visible. Valve oval-subtriangular, inflated (a little flattened posteriorly near the blunt carina), beak narrow, umbo with fine concentric folds, main portion of surface with growth-lines only, apart from four very fine, widely-spaced radial threads on its middle third. Tooth 2b oblique, simple, with a deep, triangular chondrophore in front of it; there is a trace of a very small, pointed AII at the anterior corner of the chondrophore. Pallial sinus as in the right valve. Valve margin smooth.

REMARKS. The illustrations of Cossmann & Pissarro, and specimens from France in the British Museum (Natural History), suggest that the name *Corbula rugosa* Lamarck has been applied to two forms, one relatively finely ornamented, the other (probably a *Varicorbula*) more strongly ornamented, higher, and more inflated. The Nigerian form is not conspecific with either of these; the rostrum and umbonal region are narrower, the shell is more triangular, and there is no distinct initial stage separated off by a constriction.

Family KITSONIIDAE nov.

TYPE GENUS. *Kitsonia* gen. nov.

FAMILY CHARACTERS. *Lithophaga*-like in form. No gape. Not nacreous externally. Sinupalliate. Internally, that part of the surface behind the pallial sinus is highly polished and nacreous. Ligament external. No hinge-plate, the two right valve teeth and the one left valve tooth, all cardinals, project markedly beyond the plane of commissure. Apparently a boring form.

REMARKS. This form belongs to a new family which is provisionally regarded as being related to the Clavagellidae and is placed in the Clavagellacea.

Genus *KITSONIA* nov.

TYPE SPECIES. *Coralliophaga eocenica* Newton.

GENERIC CHARACTERS. Small, thin-shelled, equivalve, very elongate, ventral margin slightly excavated, posterior end slightly curved downwards. Beaks small, low, prosogyrous, situated slightly behind the anterior end. Surface smooth except for growth lines. Anterior adductor impression moderately broad and large; posterior adductor impression situated medially just below the dorsal margin. Pallial sinus apparently extending for two-fifths of the length of the shell. That part of the surface anterior to the pallial sinus dull, white, with obscure, raised, rather vermicular, radial markings (reminiscent of the Lucinidae), that part posterior

to the sinus highly polished and nacreous. No lunule or escutcheon. Ligament narrow, rather long, external. Right valve: two lamellar subumbonal teeth, subhorizontal and slightly ascending posteriorly, the anterior one relatively short, highest distally; posterior tooth very obliquely bifid, its posterior portion very close to the anterior portion and largely behind it. Left valve: one long, lamellar, simple, subumbonal tooth, highest distally, subhorizontal, and slightly ascending posteriorly. No other teeth. Valve margins smooth internally.

REMARKS. As noted by Newton, this form is quite different from the edentulous and gaping *Gastrochaena* and from the mytilid genus *Lithophaga*, which is integripalliate and likewise edentulous. However, the lack of a hinge-plate, the entirely different dentition, and the lack of radial ornament and of wide-spaced concentric frills distinguish it readily from *Coralliophaga*.

Kitsonia eocenica (Newton)

(Plate 9, figs. 13, 14)

1922. *Coralliophaga eocenica* Newton, p. 99, pl. 11, figs. 4-5.

MATERIAL. Two specimens (a right valve and a left valve); lectotype (L.48192, Newton's fig. 5) here selected.

III. ACKNOWLEDGMENTS

The writer is indebted to the authorities of the British Museum (Natural History) for facilities to undertake the work; to the Chairmen and Directors of the joint Shell and British Petroleum organization for permission to publish the results; to Dr. L. R. Cox for advice at all stages of the investigation; to palaeontologists of the Shell organization for stimulating discussions concerning the fauna and its age; and to Mr. A. Chavan, who has collaborated in the study of the Lucinidae.

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PLATE 5

- FIG. 1. *Turritella amekiensis* sp. nov. Holotype (G.42215). × 1.
- FIG. 2. *Turritella amekiensis* sp. nov. Paratype (G.42222). × 3.
- FIGS. 3a-c. *Architectonica (Nipteraxis) bendeica* sp. nov. Holotype (G.42373). × 3.
- FIG. 4. *Architectonica (Stellaxis) bicingulata* (Newton). Syntype (G.42356). × 1.
- FIGS. 5a-c. *Architectonica (Solariaxis) amekiensis* sp. nov. Holotype (G.42361). × 1.
- FIG. 6. *Acrilla nigeriensis* sp. nov. Holotype (G.42285). × 2.
- FIGS. 7a, b. *Calyptraea newtoni* sp. nov. Holotype (G.42438). × 2.
- FIG. 8. *Turbocalyptraea scabrosa* gen. et sp. nov. Holotype (G.42437). × 2.
- FIGS. 9a, b. *Turbocalyptraea scabrosa* gen. et sp. nov. Paratype (G.42436). × 2.
- FIGS. 10a, b. *Semiterebellum (Africoterebellum) elongatum* Newton. Syntype (G.41761). × 1.



1



2



4



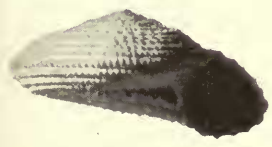
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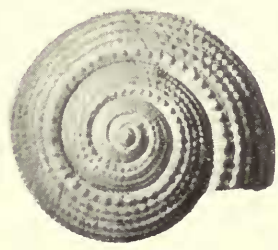
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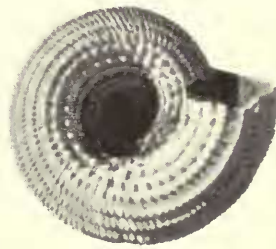
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3a



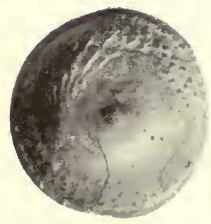
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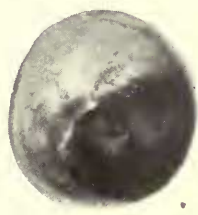
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6



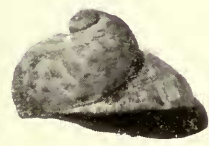
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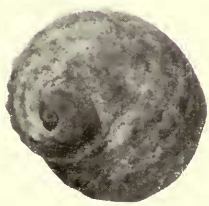
7b



8



9a



9b



10a



10b

PLATE 6

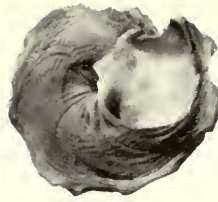
- FIGS. 1a-c. *Xenophora nigeriensis* (Newton). Lectotype (G.42291). × 2.
FIG. 2. *Eovolva nigeriensis* (Newton). Lectotype (G.41786). × 2.
FIG. 3. *Eovolva nigeriensis* (Newton). Syntype (G.41787). × 2.
FIGS. 4a, b. *Sphaerocypraea sudanensis* (Schilder). Syntype (G.45778). × 1.
FIGS. 5a, b. *Neverita amekiensis* sp. nov. Holotype (G. 42383). × 1.
FIGS. 6a-c. *Sinum africanum* Newton. Lectotype (G.42406). × 2.
FIGS. 7a, b. *Sinum nigeriense* sp. nov. Holotype (G. 42390). × 2.
FIG. 8. *Leucozonia pseudominax* sp. nov. Holotype (G.42052). × 1.



1a



1b



1c



2



3



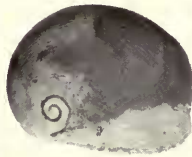
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4b



5a



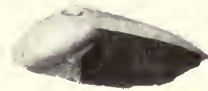
6a



5b



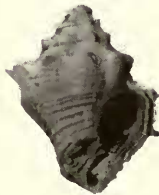
6b



6c



7a



8



7b

PLATE 7

FIGS. 1a-c. *Varicohilda turriculata* (Newton). Lectotype (G.41971). $\times 2$.

FIGS. 2a, b. *Bendeia africana* (Newton). Lectotype (G.42096). $\times 2$.

FIG. 3. *Strepsidura* (*Strepsiduropsis*) *spirata* Newton. Lectotype (G.42008).
 $\times 2$.

FIGS. 4a-c. *Sveltia* (*Africosveltia*) *multiplicis* (Newton). Holotype (G.42137).
 $\times 1$.

FIGS. 5a-c. *Bonellitia* (*Admetula*) *amekiensis* sp. nov. Holotype (G.42171). $\times 2$.

FIGS. 6a-c. *Bonellitia* (*Africostoma*) *decorata* (Newton). Lectotype (G.42138). $\times 2$.

FIGS. 7a-c. *Conus* (*Leptoconus*) *amekiensis* sp. nov. Holotype (G.41837). $\times 2$.

FIGS. 8a, b. *Mitrelloturris casteri* (Chavan). Holotype (G.69600). $\times 2$.



1a



1b



1c



3



2a



2b



4a



4b



4c



6a



6b



6c



5a



5b



5c



7a



7b



7c



8a



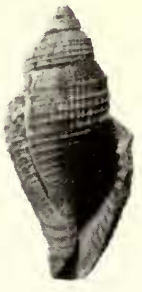
8b

PLATE 8

- FIG. 1. *Mitrelloturris casteri* (Chavan). Holotype (G.69600). $\times 2$.
- FIGS. 2a-c. *Amekicythara douvillei* (Newton). Lectotype (G.42100). $\times 2$.
- FIGS. 3a, b. *Africarca nigeriensis* (Newton). Syntype (L.48443). $\times 2$. Right valve.
- FIG. 4. *Arcopsis africana* (Newton). Syntype (L.48135). $\times 2$. Right valve.
- FIGS. 5a, b. *Rectangularca africana* (Newton). Lectotype (L.48172). $\times 2$. 5a: left valve.
- FIG. 6. *Rectangularca africana* (Newton). Syntype (L.48173). $\times 2$. Right valve.
- FIG. 7. *Ostrea amekiensis* sp. nov. Holotype (L.48195). $\times 2$. Right valve.
- FIG. 8. *Ostrea pseudomarginidentata* sp. nov. Holotype (L.48203). $\times 2$. Antero-ventral end of left valve.
- FIGS. 9a, b. *Glans nigeriensis* sp. nov. Holotype (L.48318). $\times 2$. Right valve.
- FIG. 10. *Varicorbula amekiensis* sp. nov. Syntype (L.48265). $\times 2$. Right valve.
- FIG. 11. *Varicorbula amekiensis* sp. nov. Syntype (L.48255). $\times 2$. Left valve.



1



2a



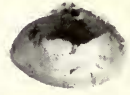
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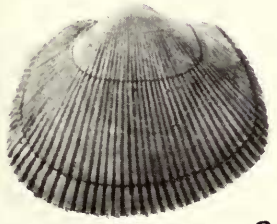
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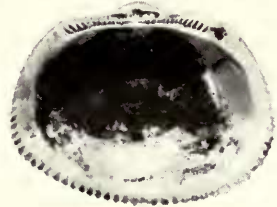
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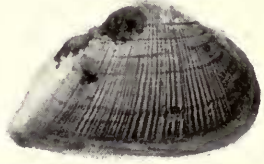
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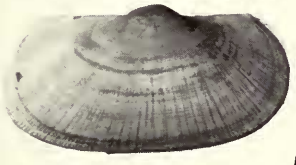
3a



3b



4



5a



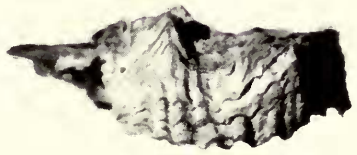
5b



6



7



8



9a



9b

PLATE 9

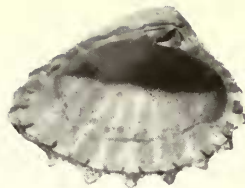
- FIG. 1. *Glans (Bendeglans) costaeirregularis* (Newton). Lectotype (L.48324). × 2. Left valve.
- FIG. 2. *Glans (Bendeglans) costaeirregularis* (Newton). Syntype (L.48325). × 2. Right valve.
- FIG. 3. *Glans (Amekiglans) costaenodulosis* (Newton). Syntype (L.48364). × 2. Left valve.
- FIG. 4. *Glans (Amekiglans) costaenodulosis* (Newton). Syntype (L.48365). × 2. Right valve.
- FIGS. 5a, b. *Glans (Divergidens) triparticostata* (Newton). Syntype (L.48322). × 2. 5a : left valve.
- FIG. 6. *Glans (Divergidens) triparticostata* (Newton). Syntype (L.48321). × 2. Right valve.
- FIG. 7. *Glans (Divergidens) triparticostata* (Newton). Lectotype (L.48319). × 2. Left valve.
- FIGS. 8a-c. *Fragum (Africofragum) newtoni* sp. nov. Holotype (L.48416). × 2. 8a : right valve. 8b : left valve. 8c : right valve.
- FIGS. 9a, b. *Tivelina newtoni* sp. nov. Syntype (L.48498). × 2. Left valve.
- FIGS. 10a, b. *Tivelina newtoni* sp. nov. Syntype (L.48499). × 2. Right valve.
- FIGS. 11a-c. *Pitar amekiensis* sp. nov. Paratype (L.48245). × 1. Left valve.
- FIG. 12. *Pitar amekiensis* sp. nov. Holotype (L.48253). × 1. Right valve.
- FIG. 13. *Kitsonia eocenica* (Newton). Lectotype (L.48192). × 4. Right valve.
- FIG. 14. *Kitsonia eocenica* (Newton). Syntype (L.48193). × 5. Left valve.



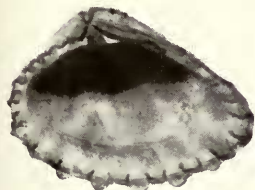
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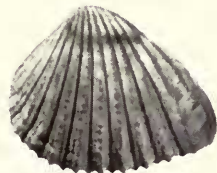
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3



4



5a



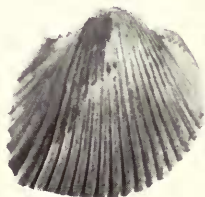
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6



7



8a



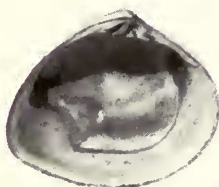
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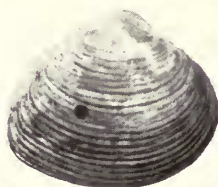
8c



9a



9b



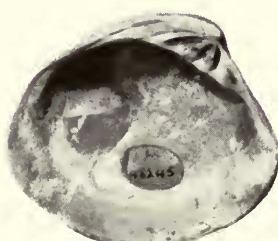
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10b



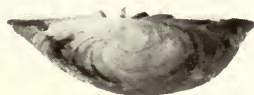
11a



11b



12



11c



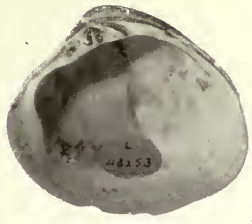
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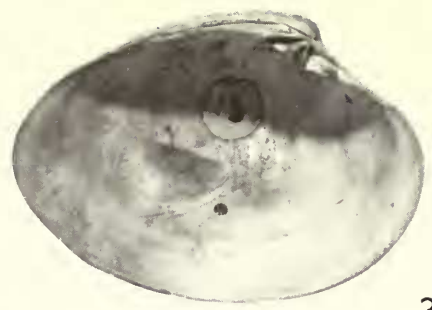
14

PLATE 10

- FIG. 1. *Pitar amekiensis* sp. nov. Holotype (L.48253). × 1. Right valve.
- FIGS. 2a, b. *Chionella (Microcallista) kitsoni* (Newton). Lectotype (L.48069). × 2. Right valve.
- FIG. 3. *Chionella (Microcallista) kitsoni* (Newton). Syntype (L.48071). × 2. Left valve.
- FIG. 4. *Sinodiopsis coxi* gen. et sp. nov. Holotype (L.48250). × 1. Left valve.
- FIG. 5. *Sinodiopsis coxi* gen. et sp. nov. Paratype (L.48249). × 1. Right valve.
- FIGS. 6a, b. *Spisula (Crepispisula) amekiensis* sp. nov. Holotype (L.48224). × 2. Left valve.
- FIG. 7. *Spisula (Crepispisula) amekiensis* sp. nov. Paratype (L.48219). × 2. Right valve.
- FIGS. 8a-c. *Varicorbula amekiensis* sp. nov. Holotype (L.48264). × 2. 8a: right valve.
8b: left valve.



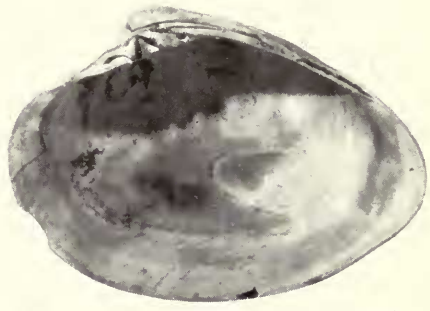
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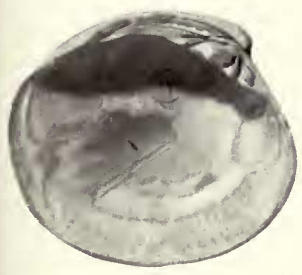
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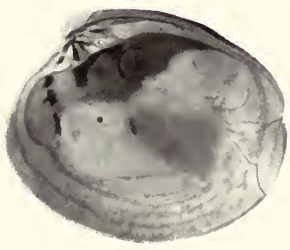
2a



2b



4



5



7



6a



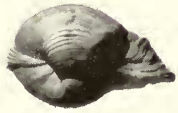
6b



8a



8b



8c