Some Foraminifera from the Awamoan of the Medway River District, Awatere, Marlborough, New Zealand.

By Walter J. Parr, F.R.M.S.

Introduction.

In October, 1933, Mr L. C. King, M.Sc., of Victoria University College, Wellington, forwarded to me some washings containing foraminifera from the mudstone exposed on the Medway River, 200 yards above Colonel Gully Junction, near Awatere, Marlborough. The foraminifera of this part of New Zealand have not been described previously, and, as the fauna presents several unusual features, the following notes have, at Mr King's suggestion, been prepared. For an account of the general geology of the area, reference should be made to Mr King's paper on the subject (King, 1934). Some alterations have been made to the list of foraminifera there given, viz.:

For *Ammodiscus* sp. aff. *incertus*, read *A. finlayi*, sp. nov.

Haplophragmoides sp. cf. *canariensis*  
Cyclamina *paupera*  
Textularia sp. nov.

Haeuslerella *pukeuriensis*, gen. et sp. nov.

Gaudryina *reussi*  
*G*. sp. nov.

Quinqueloculina sp. nov.

Flintia sp. nov.

Spiroloculina *subaequalis*, sp. nov.

Nodosaria *obliquata*  
Ellipsoglandulina *gümbei*  
Cibicides *ungerianus*  

*H. subglobosus* (G. O. Sars)  
*C. medwayensis*, sp. nov.

*G. medwayensis*, sp. nov.

*G. kingi*, sp. nov.

*Q. costata* d'Orbigny.

*S. costata* d'Orbigny.

*N. striatissima* Stache  
*E. bensoni*, nom. nov.

*C. pseudoungerianus*  

(Cushman)

Mr King has informed me that the age of the deposit in which the foraminifera occur, judged on the mollusca also present, is Awamoan (Miocene), a conclusion which is supported by the evidence provided by the foraminifera.

In addition to the species listed below, examples of a number of others were met with. These include two new species, one of *Bolivinita* and the other of *Globorotalia*, and what is probably a new genus, but the material at present available is insufficient for their description. The two new species occur elsewhere in the Awamoan, so their description may be left to another occasion. The remainder of the forms omitted are each represented by one or two poorly preserved specimens, and identification in such cases has not been possible.

The species recorded follow in systematic sequence. Where references have been omitted, they may be found in Frederick Chapman's monograph on the Cretaceous and Tertiary foraminifera of New Zealand.

The type and other figured specimens as well as examples of the other species recorded have been deposited in the collection of the New Zealand Geological Survey.
Super-family SPIRILLINOIDEA
Family NODOSARIIDAE
Sub-family NODOSARINI

Genus LENTICULINA Lamarck, 1804

Lenticulina bucculenta (Stache).
Cristellaria bucculenta Stache, 1864, p. 238, pl. xxiii, figs. 17a, b. Chapman, 1926, p. 59, pl. iv, figs. 17a, b (after Stache).
Cristellaria bufo Stache, 1864, p. 239, pl. xxiii, figs. 18a, b. Chapman, 1926, p. 59, pl. iv, figs. 18a, b (after Stache).

The principal point of difference between the two forms described by Stache from Whaingaroa under the names of Cristellaria bucculenta and C. bufo is the larger number of chambers to a whorl in the latter. It is now known that the number of chambers to the whorl in the genus Lenticulina may vary greatly in the one species, the number depending on whether the example is megalospheric or microspheric and also whether it is juvenile or adult. Having regard to this and to the otherwise close resemblance of the two forms as well as to their association at the type locality, they are here regarded as identical, and the species-name having priority is retained.

L. bucculenta is represented by several examples from the Medway River mudstone, the best measuring 1·2 mm. in diameter and closely matching the type figure of the species.

Lenticulina calcar (Linné).
Nautilus calcar Linné, 1767, p. 1162; 1788, p. 3770.
Robulus calcar (Linné) : Cushman, 1929a, p. 83, pl. xii, fig. 18.
Cristellaria calcar (Linné) : Macfadyen, 1931, p. 86, pl. iii, figs. 17a, b.

Two examples with short spines. Similar specimens have been figured by Cushman from the Tertiary of Venezuela and by Macfadyen from the Miocene of Egypt.

Lenticulina dicampyla (Franzenau). Plate 19, fig. 1.
Cristellaria dicampyla Franzenau, 1894, p. 13, pl. i, figs. 8a, b. Macfadyen, 1931, p. 84, pl. ii, figs. 14a, b.
C. clericii Fornasini, 1895, "Cristellaria clericii, n. sp.," Bologna (text-fig.).
Robulus clericii (Forn.) : Cushman, 1929a, p. 84, pl. xii, figs. 16, 17.

There are five typical examples, one of which is figured. This species is readily recognised by its sharply reflected septa. It is known from the Miocene of Europe, Africa, and South America, and I have had it from several localities in the Awamoan of New Zealand.

Lenticulina falcifer (Stache).
Cristellaria falcifer Stache, 1864, p. 240, pl. xxiii, figs. 19a, b.

This species, described by Stache from Whaingaroa, is represented by several examples, the largest of which measures 2 mm. in diameter. It has a comparatively thick test, with a narrow, heavy keel, umbilical bosses, and numerous, recurved chambers; the suture lines are raised. Stache gives the diameter as 1·25 mm.
Lenticulina gyroscalprum (Stache).

Cristellaria gyroscalprum Stache, 1864, p. 243, pl. xxiii, figs. 22a, b.

Several examples, the largest measuring 1.5 mm. in diameter. This species is well distributed in the Tertiary of New Zealand, with a range of from Eocene to Miocene.

Genus Saracenaria Deprance, 1824

Saracenaria italicca Deprance.

Saracenaria italicca Deprance, 1824, p. 177; 1827, p. 344; Atlas Conch., pl. xiii, fig. 6.

Cristellaria italicca (Depr.): Cushman, 1923, p. 125, pl. xxxv, figs. 2, 5-7.

There is one example of this widely distributed species.

Genus Dentalina d’Orbigny, 1826

Dentalina inornata d’Orbigny.

Dentalina inornata d’Orbigny, 1846, p. 44, pl. i, figs. 50, 51.

Two broken specimens.

Genus Nodosaria Lamarck, 1812.

Nodosaria sp. aff. raphanistrum (Linné).

There is one fragment of a large, coarsely costate form of Nodosaria similar to the above-named species, which has already been recorded from several localities in the Tertiary of New Zealand.

Nodosaria striatissima Staché.

Nodosaria striatissima Staché, 1864, p. 198, pl. xxii, figs. 25a-f.

The specimens are fragmentary, but agree with Staché’s figures and descriptions of this species in regard to the shape of the chambers, which are broader than high, and the number of costae (16–20). Staché states that the greatest length of the specimens he had was 1.2 mm. This was a complete test. The Medway River examples were, when complete, a good deal larger; one broken shell with six chambers measuring 1.5 mm. in length.

Family Buliminidae

Sub-family Bulimininae

Genus Bulimina d’Orbigny, 1826

Bulimina ovata d’Orbigny.

There is one specimen which closely agrees with topotype examples of this species from the Miocene of the Vienna Basin.

Sub-family Uvigerininae

Genus Uvigerina d’Orbigny, 1826

Uvigerina pigmea d’Orbigny.

Examples are fairly common. This species is common in the Tertiary of New Zealand.
Family **ELLIPSOIDINIDAE**
Genus **ELLIPSOGLANDULINA** A. Silvestri, 1900

**Ellipsoglandulina bensoni**, nom. nov. Plate 19, figs. 2a, b.

*Dentalina guembeli* Hantken (non *Dentalina guembeli* Schwager, 1865), 1876, p. 32, pl. iv, fig. 1; 1881, p. 38, pl. iv, fig. 1.

Description.—Test short and comparatively stout, initial end well rounded, apertural end slightly tapering, consisting of four or five chambers, the length of each being about the same as its diameter, arranged in a straight or slightly curved series, increasing in size as added, slightly inflated; sutures somewhat depressed; surface ornamented by numerous longitudinal costae increasing in number with the size of the test, 36–40 on the last-formed chamber of the adult, continuous from one chamber to another; the apertural end in the mature shell is usually smooth; aperture a small slightly curved slit at the base of a slight depression.

Length, about 1 mm.

This species occurs in the Awamoan of both North and South Islands. The New Zealand specimens agree closely with topotype examples of von Hantken’s species from the Oligocene of Hungary. In naming his species, Hantken was apparently not aware that Schwager (1865, *Jahres. Verl. Nat. Württemberg*, vol. xxi, p. 101, pl. ii, fig. 20) had previously described another *Dentalina guembeli*, a different form, from the Jurassic. It is therefore necessary to rename Hantken’s species, which is here named in honour of Dr W. N. Benson, Professor of Geology at Otago University.

The generic placing of this form has been a matter of some difficulty, but, as far as I can make out, from the examination of nearly 30 specimens from Hungary and New Zealand, the aperture is a short slit, which is slightly curved. I have therefore placed the species in *Ellipsoglandulina*.

Family **ROTA LIDAE**
Sub-family **DISCO BINA E**
Genus **GYROIDINA** d’Orbigny, 1826

**Gyroidina soldanii** (d’Orbigny).

Four examples. This is a very common species in the Tertiary of New Zealand.

Sub-family **ROTA LIDAE**
Genus **EPONID ES** Montfort, 1808

**Eponides umbonatus** (Reuss). Plate 19, fig. 3a, b.

*Rotulina umbonata* Reuss, 1851, p. 75, pl. v, figs. 35a-c.
*Pulvinulina umbonata* (Reuss.): Chapman, 1926, p. 84, pl. xvii, fig. 3.
*Truncatulina tenera* Brady, 1884, p. 665, pl. xrv, figs. 11a-c. Chapman, 1926, p. 79, pl. xv, figs. 14a, b.

**Eponides umbonatus** (Reuss.): Cushman, 1931, p. 52, pl. xi, figs. 1-3.

Typical examples are common. This is a widely distributed species, originally described from the Oligocene of Germany, and still living.
Genus Rotalia Lamarck, 1804

Rotalia clathrata Brady.
This is one of the most characteristic species of the New Zealand foraminiferal fauna, first appearing in the Upper Eocene and still living on the coast of New Zealand. The Medway River examples are small and not common.

Sub-family Siphonininae
Genus Epistomina Terquehm, 1883

Epistomina elegans (d'Orbigny).
Rotalia (Turbinulina) elegans d'Orbigny, 1826, p. 276, No. 54.
Rotalina partschiana d'Orbigny, 1846, p. 153, pl. vii, figs. 28-30; pl. viii, figs. 1-3.
Pulvinulina elegans (d'Orb.) : Chapman, 1926, p. 82, pl. xvi, fig. 11.
Epistomina elegans (d'Orb.): Cushman, 1927, p. 182, pl. xxxi, xxxii.
The numerous examples are all of the E. partschiana type and cannot be distinguished from topotypes of that form from the Miocene of Baden near Vienna. Cushman, who has examined very large suites of specimens, has expressed the opinion (loc. supra cit.) that E. partschiana cannot be satisfactorily distinguished from the earlier described E. elegans. Chapman gives the geological range of the species in New Zealand as being from the Upper Cretaceous to the Miocene.

Family Chilostomellidae
Sub-family Alломorphinellinae
Genus Pullenia Parker and Jones, 1862

Pullenia quinquelaoba (Reuss).
Nonionia quinquelaoba Reuss, 1851, p. 71, pl. v, figs. 31a, b.
Pullenia quinquelaoba (Res.) : Brady, 1884, p. 617, pl. lxxxiv, figs. 14, 15.
Cushman, 1924, p. 42, pl. viii, figs. 5-9, 11.
One small example, somewhat crushed.

Sub-family Sphaeroidininae
Genus Sphaeroidina d'Orbigny, 1826

Sphaeroidina bulloides d'Orbigny.
One example.

Family Anomalinidae
Sub-family Cibicidinae
Genus Cibicides Montfort, 1808

Cibicides pseudonungerianus (Cushman). Plate 19, figs. 4a-c.
Truncatulina ungeriana Brady (non Rotalina ungeriana d'Orbigny), 1884, p. 664, pl. xciv, figs. 9a-c.
T. pseudonungeriana Cushman, 1922, p. 97, pl. xx, fig. 9.
Cibicides pseudonungerianus (Cushm.) : Cushman, 1931, p. 123, pl. xxii, figs. 3-7.
This species is represented by many examples similar to those Recent specimens figured by Brady and by Cushman. The types were from the Oligocene of the United States.
The average diameter of the Medway River examples is 1 mm.
Super-family AMMODOISCOIDEA

Family AMMODISCIDAE

Sub-family AMMODISCINAE

Genus AMMODISCUS Reuss, 1861

Ammodiscus finlayi, sp. nov. Plate 19, figs. 5a, b.

Ammodiscus sp. aff. incertus (d'Orbigny): Parr, 1934, p. 142.

Description.—Test free, in the megalospheric form consisting of an ovoid proloculum, followed by a long undivided chamber wound in from four to six convolutions, all closely coiled except the last which is sometimes partly uncoiled; central portion of each face somewhat depressed; suture distinct, depressed; wall thick, conspicuously arenaceous; aperture semicircular. Diameter up to 4-3 mm.; greatest thickness 0-7 mm.

Holotype from Awamoan, Medway River, where the species is common.

Observations.—This is the same species as that recorded by the writer under the name of Ammodiscus sp. aff. incertus (d’Orb.) from the Tertiary of Chalky Island. A. incertus is regularly planospiral and shows no trace of uncoiling. The New Zealand species also differs in the less regular coiling, the variation in the shape of the test, which may be anything from circular to oval in outline, and the more roughly finished exterior. Dr Cushman (1919, p. 597, pl. 74, figs. 1, 2) has described another very large species of Ammodiscus, A. mestayeri, from off the Poor Knights Islands, east coast of New Zealand, which may be compared with the present form. Unlike A. finlayi, A. mestayeri, in its megalospheric form, has a very large proloculum followed by only one and a-half coils. In both megalospheric and microspheric forms it is distinguished by the test being thickest in the central portion.

The species is named in honour of Dr H. J. Finlay, who has done so much work on the mollusca of New Zealand. It is a common form in the Awamoan and occurs in the earlier Tertiary deposits in New Zealand.

Ammodiscus sp.

There are several fragments of a microspheric form of Ammodiscus, but, in the absence of better material, specific identification has not been attempted. The test is irregularly oval, and there are ten whorls visible in one specimen. The species does not appear to be the microspheric form of A. finlayi, as the wall is composed of very fine sand grains, set in abundant white cement, which gives a smooth surface to the shell. The largest specimen, when complete, measured over 3 mm. in diameter.

Family LITUOLIDAE

Sub-family HAPLOPHRAGMIINAE

Genus HAPLOPHRAGMOIDES Cushman, 1910

Haplophragmoides subglobosus (G. O. Sars).

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Haplophragmium latidorsatum Brady (non Nonionina latidorsata Bornemann), 1884, p. 307, pl. xxxiv, figs. 7, 8, 10, 14 (1), (non 9). Chapman, 1926, p. 28, pl. vi, fig. 11.
Haplophragmoides subglobosus (G. O. Sars): Cushman, 1920, p. 45, pl. viii, fig. 5 (gives references).
Examples of a species of Haplophragmoides are very common, but they are in nearly every case crushed or otherwise badly distorted. The three or four apparently perfect specimens are similar to H. subglobosus, the test being subglobose, with five or six slightly inflated chambers to the whorl in the adult, and an elongated aperture. The largest specimen measures 1.6 mm. across.
Chapman has recorded this species under the name of Haplophragmium latidorsatum from several localities in the Upper Eocene of New Zealand.

Sub-family Lituolinne
Genus Cyclammina Brady, 1876

Cyclammina medwayensis, sp. nov. Plate 19, figs. 6a, b; text-fig. 1.
Description.—Test compressed, planospiral, involute, composed of about 2½ coils, periphery subacute, very slightly lobulated, somewhat depressed in the umbilical region; ten or eleven chambers to the adult whorl; sutures distinct, usually slightly depressed, radial; interior of shell a mass of sand grains without any trace of subdivision, except that there is a narrow, irregular cavity, in the form of a broken spiral, extending along the inside margin of each chamber throughout the test; wall composed of sand grains of varying sizes well cemented, rather smoothly finished; aperture an elongated, curved slit at the base of the last-formed chamber. Diameter, 1 mm.
Holotype from mudstone, Medway River.

Text-fig. 1—Cyclammina medwayensis, sp. nov. Section. × 23.
Text-fig. 2—Spiroloculina subaequalis, sp. nov. a, b, opposite sides of young specimen, apparently of microspheric form, which has not passed the quinqueloculine stage. × 35.

Observations.—In the washings from the mudstone of the Medway River, this species is abundant. The specimens are extremely variable in shape, but the majority conform fairly well with the description given above.
This species was at first identified as *C. paupera*, described by Chapman (1904, p. 229, pl. xxii, fig. 6) from the Upper Oligocene of Brown’s Creek, West of Cape Otway, Victoria, but I have since been able to examine the type specimen and other examples of Chapman’s species from the type locality, and am now satisfied that the two forms are distinct. Externally, the Medway River species differs from *C. paupera* in the nature of the wall, which, in *C. paupera*, is made up of very small sand grains of even size, the surface of the test being also more smoothly finished than that of *C. medwayensis*. Internally, the two are very different, *C. paupera* being beautifully subdivided to form the labyrinthic structure found in the most typical species of *Cyclammina*, while *C. medwayensis* is practically structureless (Text-fig. 1). It should be noted, however, that in unsectioned specimens of *C. medwayensis* mounted in Canada balsam, the labyrinthic nature of the shell-wall is made apparent by the presence of numerous rounded light-coloured areas, which represent cavities in the wall.

The only other species of *Cyclammina* known from New Zealand is *C. incisa*, described by Stache under the name of *Haplophragmium incisum* (*Cyclammina* was not described until 1876), from Whaingaroa. Stache had only one specimen, a misshapaten one, with nine chambers to the whorl, and with a maximum diameter of 2.1 mm. Stache described at the same time another species, *Haplophragmium maoricum*. This appears to be the same as *C. incisa*, but this can only be decided by an examination of the type specimen in Vienna. Several topotype examples of *C. incisa*, which Professor J. A. Bartram of Auckland University has kindly sent to me, show the species to be a large one, reaching 4 mm. in diameter, with a thick shell wall composed of very fine sand grains (this seems to be a constant character in *C. incisa*), and a rounded margin to the test. These features will enable *C. medwayensis* to be readily distinguished from *C. incisa*.

**Family Textulariidae**

**Sub-family Textulariinae**

**Genus Haeuslerella**, gen. nov.

Description.—Test in the early stages regularly biserial, becoming loosely biserial; aperture in the early stages textularian, becoming semicircular and sub-terminal in the adult chambers.

Observations.—This genus has been erected for the accommodation of the following species, which does not appear to conform with any known generic type. It is an isomorph of the genus *Lozostomum*. Its relationships are clearly with the Textulariidae, between the genera *Textularia* and *Bigenerina*, differing from both in having a number of loosely biserial chambers following the textularian series. The generic name is given in honour of the late Rudolf Haeusler, the Swiss worker on the foraminifera, who lived in New Zealand for the latter part of his life.
Fig. 1—Lenticulina dicampyla (Franzenau), side view. × 35. Fig. 2—Ellipsoglandulina brensoni, nom. nov. a, side view; b, apertural view. × 35. Fig. 3—Eponides umbonatus (Reuss). a, dorsal view; b, ventral view. × 46. Fig. 4—Cibicidus pseudoungerianus (Cushman). a, dorsal view; b, ventral view; c, peripheral view. × 46. Fig. 5—Ammodiscus finiyi, sp. nov. (holotype). a, side view; b, peripheral view. × 14. Fig. 6—Cyclammina medowayensis, sp. nov. (holotype); a, side view; b, peripheral view. × 23. Fig. 7—Haeuslerella pukeuriensis, gen. et sp. nov. (holotype). a, side view; b, edge view of last two chambers, showing position of aperture (marked A). × 35.

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Fig. 1—Gaudryina kingi, sp. nov. (holotype). a, front view; b, side view; c, apertural view. X 23.
Fig. 2—Gaudryina medwayensis, sp. nov. (holotype). a, front view; b, side view; c, apertural view. X 23. (The apertural end is imperfect.)
Fig. 3—Karrerella siphonella (Reuss). a, front view; b, side view of last-formed chamber showing aperture. X 23.
Fig. 4—Quinqueloculina costata d'Orbigny.

a, b, opposite sides; c, apertural view. X 23.
Fig. 5, 6—Spiroloculina subaequalis, sp. nov. 5 (holotype). a, front view; b, side view. 6. Section through another specimen. All X 23.
Haeuslerella pukeuriensis, sp. nov. Plate 19, figs. 7a, b.

Description.—Test elongate, composed of numerous chambers, early portion compressed, regularly biserial, remaining portion of test typically rounded in section, loosely biserial, with chambers nearly as high as broad, each chamber running further towards and finally reaching the other side of the shell; chambers in the early stages indistinct, later inflated and separated by deep sutures; wall finely arenaceous, rather smoothly finished; aperture in the early stages textularian, becoming semi-circular and sub-terminal in the adult chambers. Length up to 1·8 mm.

Holotype from Awamoan, Pukeuri, collected by Dr C. R. Laws.

This species is common in the washings from mudstone of the Medway River, but, as the specimens are not as well preserved as those from Pukeuri, the type specimen has been chosen from the latter locality, where this form is of frequent occurrence.

Family Verneulinidae
Genus Gaudryina d’Orbigny, 1839

Gaudryina kingi, sp. nov. Plate 20, figs. 1a-c.

Description.—Test in the adult about twice as long as wide, triangular in section throughout, the angles acute and with flattened to depressed faces; triserial and biserial portions of the test of approximately equal length, the former trihedral, biserial portion with parallel sides, initial end of test pointed, apertural end truncated; chambers distinct; sutures depressed; wall composed of fine sand grains set in abundant cement, surface smoothly finished and frequently glistening; aperture a semicircular slit at the base of the last-formed chamber. Length up to 1·5 mm.

Holotype from mudstone, Medway River.

This species is one of the G. reussi Stache group, several species of which were described and excellently figured by Stache from Whaingaroa, but differs from any of Stache’s forms in having a very neatly built test, with a greater number of lower chambers. It is common in the material from the Medway River. It is noticeable that many of the specimens have not passed the triserial stage. These are clearly immature, as they are not more than half the size of the gaudryine specimens.

I am glad to be able to associate the name of Mr L. C. King, M.Sc., with this very distinct new species in appreciation of his kindness in forwarding to me the material here described.

Gaudryina medwayensis, sp. nov. Plate 20, figs. 2a-c.

Description.—Test in the adult about 2½ times as long as wide, roughly triangular in section, triserial portion shorter than the biserial; triserial portion trihedral, with blunt angles, biserial portion with sides roughly parallel and margins rounded; initial end rounded, apertural end obliquely truncated; chambers generally indistinct and sutures lines not clearly visible; wall composed of medium-sized sand grains, firmly cemented; surface of test rough; aperture a semi-circular slit at the base of the last-formed chamber. Length up to 1·6 mm.
Holotype from mudstone, Medway River, in which it is common. This species is more closely related to *G. reussii* Stach than the preceding, and is apparently a descendant of Stache's species. It is smaller than, and lacks the well-defined margins and sutures of, *G. reussii*.

**Family Valvulinidae**

**Genus Karreriella Cushman, 1933**

*Karreriella siphonella* (Reuss). Plate 20, figs. 3a, b.

*Gaudryina siphonella* Reuss, 1851, p. 78, pl. v, figs. 40-42. Chapman, 1907, p. 28, pl. iii, fig. 65.

*Karreriella siphonella* (Rss.) : Cushman, 1933, p. 34, pl. iv, figs. 3-4.

Beautifully preserved examples are common. This species was described by Reuss from the Oligocene of Germany. Hantken has recorded it from the Oligocene of Hungary, and Chapman (loc. cit.) from the Miocene of Victoria. The Medway River specimens agree with examples of the species from Hungary and Victoria.

The form figured by Chapman (1926, pl. viii, fig. 8) as *Gaudryina siphonella*, from the Miocene of Mount Harris, appears to be identical with the species I have described in the present paper under the name of *Haeuslerella pukeuriensis*.

**Family Miliolidae**

**Genus Quinqueloculina d’Orbigny, 1826**

*Quinqueloculina lamarckiana* d’Orbigny.

*Quinqueloculina lamarckiana* d’Orbigny, 1839, p. 189, pl. xi, figs. 14, 15.

*Miliolina cuvieriana* Brady *(non Quinqueloculina cuvieriana d’Orbigny)*, 1884, p. 162, pl. v, figs. 12a-c. Chapman, 1926, p. 26, pl. vi, fig. 4.

The numerous examples attributed to this species are not as sharply angled as usual, but are otherwise typical. The specimen figured by Chapman under the name of *Miliolina cuvieriana* from the Upper Pliocene (?) of Wanganui is exactly similar to those from the Medway River.

*Quinqueloculina costata* d’Orbigny. Plate 20, figs. 4a-c.

*Quinqueloculina costata* d’Orbigny, 1826, p. 301, No. 3. Schlumberger, 1893, p. 69, text-fig. 20; pl. iii, figs. 75, 76. Fornasini, 1905, p. 62, pl. ii, figs. 6a-c.

Description.—Test about twice as long as wide, oval in outline, slightly compressed; chambers distinct, of uniform diameter, arranged on a quinquelocular plan; periphery rounded; sutures distinct, very slightly depressed; surface costate; aperture large, with a bifid tooth. Length of New Zealand examples up to 2 mm.

Examples of what appears to be this species are common in the mudstone from the Medway River. In some of the specimens the costation is very slight, and is entirely lacking on the penultimate and last-formed chambers. Sidebottom, in his work on the foraminifera of the Eastern Mediterranean, notes a similar occurrence in his material of this species.
Genus *Spiroloculina* d’Orbigny, 1826

**Spiroloculina subaequalis**, sp. nov. Plate 20, figs. 5a, b; 6; text-figs. 2a, b.

Description.—Test elliptical, about one and a-half times as long as wide, broadest in the centre; in end view the periphery much the thickest part of the shell; central portion of each face depressed, usually more so on one side than on the other; chambers relatively few, rapidly thickening as added; periphery of the chambers in end view broadly rounded and the sides keeled; chambers evenly curved, the final chamber projecting at both ends, the apertural end with a projecting, narrow, cylindrical neck, at the termination of which is the circular aperture bearing a single narrow tooth; wall smooth. Length, 2 mm.; breadth, 1·3 mm.; thickness, 0·6 mm.

Holotype from mudstone, Medway River, where the species is common.

This species is a variable one in certain respects, and is unusual in its tendency to asymmetry. The latter is illustrated by the figured section of a megalospheric example. The proloculum is large, measuring 0·5 mm. in diameter. It is followed by a smaller chamber in a different plane from the remaining chambers, which are arranged as in the genus *Spiroloculina*. These spiroloculine chambers in this specimen increase in width more quickly on one side of the test than on the other, resulting in an inequilateral shell, with the two faces of different widths. Most of the specimens, while inequilateral, have all of the chambers in the one plane, and I have accordingly placed the species in *Spiroloculina*. There are, however, two or three specimens in which the shell is quinqueloculine in the early stages. One of these, apparently juvenile, has not passed the quinqueloculine stage (Text-figs. 2a, b). Another, an adult shell, is similar to *Massilina*. These possibly represent the microspheric form of the species, but, with the material available, it has not been possible to decide this point with certainty.

Genus *Sigmoilina* Schlumberger, 1887

**Sigmoilina celata** (Costa).

*Spiroloculina celata* Costa, 1857, p. 128, pl. i, fig. 14.
*Sigmoidina celata* (Costa) : Chapman, 1907, p. 21, pl. ii, fig. 41.
Cushman, 1929, p. 48.

The specimens are of the form figured by Chapman (*loc. cit.*) from the Tertiary of Victoria. The species is common in the Awamoan of New Zealand.

Genus *Triloculina* d’Orbigny, 1826

**Triloculina tricarinata** d’Orbigny.

*Triloculina tricarinata* d’Orbigny, 1826, p. 299, No. 7; Modèles, No. 94.
Cushman, 1929, p. 66, pl. xiii, figs. 3a-c.
*Mitocolina tricarinata* (d’Orb.) : Chapman, 1907, p. 18, pl. ii, fig. 31.

The specimens resemble those from the Tertiary of Victoria in being very large and in having the angles of the test less acute than in the typical form of the species.
Transactions.

Genus Pyrgo Defrance, 1824

Pyrgo depressa (d’Orbigny).

*Bioculina depressa* d’Orbigny, 1826, p. 298, No. 7; Modèles, No. 91.

*Pyrgo depressa* (d’Orb.) : Cushman, 1929, p. 71, pl. xix, figs. 4, 5.

The present specimens are strongly compressed with a keel encircling the periphery. The aperture is an elongated slit. In external characters they are therefore similar to the typical form of the species.

Pyrgo murrhina (Schwager).

*Bioculina murrhina* Schwager, 1866, p. 203, pl. iv, figs. 15a-c.

*Pyrgo murrhina* (Schw.) : Cushman, 1929, p. 71, pl. xix, figs. 6, 7.

Several typical examples. This species was described from the Pliocene of Kar Nicobar, in the Andaman Islands, and is still living. It is now a deep-water species with a very wide distribution.

Pyrgo elongata (d’Orbigny).

*Bioculina elongata* d’Orbigny, 1826, p. 298, No. 4.

*Pyrgo elongata* (d’Orb.) : Cushman, 1929, p. 79, pl. xix, figs. 2, 3.

One large example.

Pyrgo fornasinii, nom. mut. Chapman and Parr MS.

*Bioculina bradyi* Schlumberger (*non* B. *bradyi* Fornasini), 1891, p. 170, text-figs. 15-19; pl. x, figs. 63-71. Chapman, 1907, p. 13, pl. 1, figs. 7, 8.

The present specimens are of the form described and figured by Schlumberger from the Gulf of Gascony, in 1850 metres, under the name of *Bioculina bradyi*. In naming the species, Schlumberger overlooked the fact that the same name had been applied by Fornasini five years earlier to a different form (*vide* Bull. Soc. Geol. Ital., vol. v, 1886, p. 261). It has therefore been renamed by F. Chapman and myself in a paper on some foraminifera from the Great Australian Bight which is awaiting publication.

*P. fornasinii* has been recorded (as *Bioculina bradyi* Schl.) by Chapman from the Tertiary of Victoria. The New Zealand examples attain a length of 2 mm.

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