New Shells from New Zealand Tertiary Beds.

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Plates 48–51.

THE following forms are described from the new material in the author's collection; many of them are related to Australian species, and others represent genera new to the New Zealand fauna. Notes on some already-described species are also given.

Natica notocenica n. sp. (Plate 49, figs. 2*a*, 2*b*, 2*c*, 2*d*.)

N. zelandica Suter (in many lists of fossils from Miocene localities), not of Q. & G.

Shell small but solid, smooth and polished, exceedingly glossy when well preserved, globosely ovate, with strong funicle in umbilicus. Surface almost quite smooth, growth-lines inconspicuous, curving away from suture; faint spiral scratches occasionally noticeable. Spire low, regularly conical, bluntly pointed. Protoconch paucispiral, depressed, hardly differing from later whorls. Whorls 4½–5, base regularly convex. Suture slightly canaliculate only for two apical whorls, thence inconspicuous, whorls tightly clasping those above without sutural flattening, so that sides of spire are perfectly straight. Aperture semilunar, oblique. Outer lip loop-shaped, very thin and sharp, but rapidly becoming thicker internally, ascending somewhat on penultimate whorl before joining inner lip. Columella oblique, almost straight, slightly excavated posteriorly. Inner lip spreading only slightly as rectangular lip over parietal wall, and as very thick semicircular funicle into moderate umbilicus, often almost filling it, though a deep chink is always left above funicle. Outer edge of umbilicus very bluntly carinate and separated by deep groove from funicle, surface of which is corrugated by strong folds inside, and ends in a wide, concave flattening. Operculum unknown.

Height, 7·5 mm.; diameter, 7 mm. (type). Height, 11 mm.; diameter, 10·5 mm. (largest specimen, from Target Gully).

Type, from Awamoa (blue clays on banks of stream), in author's collection. Common at Ardgowan, Target Gully, and Pukeuri; specimens also from Pareora, Rifle Butts, Kakanui tuffs, Waikaia, and McCullough's Bridge, Waihao—*i.e.*, throughout the Oamaruian.

This species has always been identified as *N. zelandica* Q. & G., but it is totally different in its constantly smaller size, heavier umbilical callosity (though this varies in strength in both species), and especially in shape of spire, which in *N. zelandica* is slightly scalar, due to the infrasutural flattening, but in *N. notocenica* is perfectly conical, except in some senile examples where the whorls bulge out a little. At most Oamaru localities this species is accompanied by the following one, but has a much longer range in earlier horizons. No difference at all can be picked between Waihao and Pukeuri specimens.

Natica consortis n. sp. (Plate 49, figs. 1*a*, 1*b*, 1*c*.)

Shell small, moderately solid, smooth and polished, somewhat vertically compressed, with moderate umbilical funicle. Sculpture and protoconch as in *N. notocenica*. Spire low, subscalar, flattened at apex. Whorls 4½–5, base flatly convex. Suture as in preceding species for first two whorls, but thence quite different, whorls being abruptly turned inwards near suture, forming round it a perfectly flat rather wide platform, so that spire appears staged; this platform widens considerably as growth proceeds. Aperture pear-shaped, narrower above and wider below than in *N. notocenica*. Outer lip forming a wider loop than in that species, thin and sharp, not ascending on penultimate whorl, but extending forwards past columella before joining inner lip. Columella oblique, not nearly so straight as in *N. notocenica*, considerably excavated below before meeting outer lip. Inner lip spreading less, both on parietal wall and into umbilicus, than in the previous species. Funicle cord-like, not strong, marked off by groove below, and leaving wide opening above, much less corrugated than in *N. notocenica*, and ending in a slight convex lump. Operculum unknown.

Height, 8·5 mm.; diameter, 8·5 mm. (type). Height, 10·5 mm.; diameter, 9·5 mm. (largest specimen from Ardgowan).

Type and three others, from Pukeuri, in author's collection. Common at Ardgowan; specimens also from Rifle Butts, Target Gully, and Awamoa (from beach-boulders).

This species has a slight resemblance to *N. maoria* Finlay (*australis* Hutt., not of d'Orb.), but the funicle in the umbilicus at once distinguishes it. From its accompanying but commoner relative *N. notocenica* Finlay it is sundered by its weaker and different funicle, less ovate shape, and especially by its flatly bordered sutures. This last feature and the weak funicle separate it also from *N. zelandica* Q. & G., which has the whorls much more flattened into the sutures than in *N. notocenica*, but much less so than in *N. consortis*. Ardgowan and Target Gully specimens of both these species are always weathered and have lost their gloss; the sutures generally remain unweathered in *N. notocenica*, but in *N. consortis* are generally weathered to a canaliculate form. Unlike *N. notocenica*, this species does not extend to the Waihao horizon, being represented there by the following (probably ancestral) form.

Natica praeconsors n. sp.

This in most details is so similar to the preceding species that a full diagnosis is unnecessary, and only points of difference need be mentioned. The only three examples seen are of smaller size, much thinner, with whorls a little more globose, and base more rounded. Columella very weak, strongly curved, more excavated and S-shaped than in *N. consortis*. Umbilicus about same size, but appearing larger owing to extremely slight development of funicle, which is merely a very thin, subtriangular cord, hardly at all blocking opening, and widely removed from outer edge of pit. Sutures bordered by a flattened space, but not nearly so prominently as in *N. consortis*, outer edge of platform being rounded off into whorl.

Height, 7 mm.; diameter, 6 mm. (type).

Type, from greensands at McCullough's Bridge, Waihao, in Mr. R. S. Allan's collection.

Natica inexpectata n. sp.

This also is so close to *N. consortis* that it is best described by comparison with that species; the type is at present unique,* and further examples may show that it is worth only varietal rank. Early whorls are as in *N. consortis*, but sutural platform not quite so prominent. There are nearly 5 whorls, and on last platform tends to become obsolete, infrasutural outlines approaching those of *N. zelandica* Q. & G., to which species it is brought into nearer resemblance by the relatively large size of shell. Whorls much narrower, however, than in *N. zelandica*, but shape of these and of aperture is in accord with *N. consortis*. Funicle much stronger than in the latter species, three-parts filling the pit, and ending in a lightly convex flattening; very similar to that of *N. zelandica*.

Height, 15 mm.; diameter, 14 mm.

Type, from Clifden, Southland (band 7, Hutchinsonian), in author's collection.

Polinices pseudovitreus n. sp. (Plate 49, figs. 3*a*, 3*b*, 3*c*, 3*d*.)

Polinices amphialus Wats.: Suter (in lists of fossils from Awamoan localities), not of Watson.

Shell small, porcellanous and slightly shining, rather thick, globosely elevated, spire conspicuous and scalar. Fine and close-set growth-lines; traces of very fine and close spirals. Spire rather high, varying from one-half to three-quarters height of aperture, strongly scalar, due to rectangular shape of whorls. Protoconch large, depressed and globose. Whorls $3\frac{1}{2}$–$3\frac{3}{4}$, the last very large and elongated, curving out almost horizontally from suture, then subvertical, finally rapidly contracted to convex and steeply-sloping base. The sudden change of direction from vertical to horizontal is marked by a rounded but bulging shoulder which throws spire-whorls into unusual prominence. Suture strong, often deeply grooved, a little sloping. Aperture pyriform, a little oblique, scarcely pointed above, usually less than two-thirds total height. Outer lip sharp and strong, patulous below. Columella straight. Inner lip expanded as a very definite and rather thick pad over parietal wall, with sometimes a slight tubercle just below outer lip; anteriorly the pad is flattened down over the narrow umbilicus, leaving only a small chink open. Front of columella very slightly flattened back on indistinct circumumbilical ridge.

Height, 8 mm.; diameter, 6·75 mm. (type). Height, 9 mm.; diameter, 7 mm. (largest specimen).

Type and seven others, from Rifle Butts, near Oamaru, in author's collection.

Closely related to *P. vitreus* (Hutt.) (= *P. amphialus* Wats.), but larger though of fewer whorls, sutures more deeply incised, much more exsert spire, and more prominently convex whorls. No specimens of this species have yet been found at the coeval locality of Pukeuri, but Mr. Marwick states that one specimen has been collected at Awamoa. At Pukeuri, Target Gully, and Otiake, however, there occurs another new species of *Polinices*, quite distinct from *P. pseudovitreus* in its larger umbilicus and flattened shoulder.

* Since the above was written the author has visited Otiake and there collected numerous specimens referable to this species, though mostly smaller in size. These show that the best features for differentiation from *N. consortis* are, as mentioned, the rounder sutural platform and the larger funicle, and also the more inflated appearance of the base, due to the more rapid descent of the last whorl.

Austrotriton maorium n. sp. (Plate 48, figs. 1, 2, 3; Plate 51, fig. 4.)

Cymatium minimum (Hutt.): Suter (in many lists of fossils from Awamoan and other horizons), not of Hutton.

Shell of moderate size, of irregular growth, spire staged, canal long. Protoconch of 3½–4 convex whorls, depressedly conic and very symmetrical, last half turn with 3 or 4 faint spiral keels, terminating abruptly in small varix and groove. Adult shells with 6 further whorls, later ones of very irregular growth, considerably swollen directly after a varix but contracted for short distance before one; spire-whorls carinate at about middle, shoulder of varying width (due to irregular growth), sloping at 45°, thence perpendicular to suture below; body-whorl subangulate, vertical space between sharp sutural and basal slopes being very short. Axial sculpture most prominent on this vertical part; usually 7 slight axial ribs between varices on early whorls, raised into prominent sharp tubercles on carina; on lower whorls are typically 5 strong, elongated, peripheral swellings between varices (which occur at about every three-fifths of a whorl), continued as faint ribs over shoulder and base, vanishing on canal. Swellings narrow, high, and blunt, but often tubercular at each extremity; last swelling considerably weaker than others, and on higher level, so that a distinct drop is apparent after each varix. On body-whorl are 4 main spiral cords, two marking peripheral angles and two below these, lowest in line with last denticle on outer lip; below these, strong and weak smooth cords alternate on canal. Between main cords are 3–6 finer cords cut up into elongated granules, shoulder with similar sculpture but cords wider apart just after a varix. Spire shorter than aperture with canal. Aperture suboval, a little oblique, channelled above, produced below into a canal equal in length to aperture and bent backwards to left. Outer lip sharp, with strong thick varix behind, also thickened internally and with 5 tubercles, the lowest at top of canal. Inner lip a little spreading, often with 2 or 3 small plaits on parietal wall. Columella strongly curved, with a few plaits at base, two much stronger than the others. A distinct umbilical chink generally present.

Height, 38 mm.; diameter, 21 mm.; height of aperture and canal, 22 mm. (type). Height, 25 mm.; diameter, 13 mm.; height of aperture and canal, 13·5 mm. (largest paratype).

Type, several half-grown, and many juvenile specimens, from Target Gully, in author's collection; also specimens from the following horizons and localities: Awamoan (Pukeuri, Rifle Butts, Mount Harris); Hutchinsonian (Otiake); Ototaran? (Clifden, bands 4, 6, and 7); Waiarekan? (Chatton).

This is the common "*Cymatium*" of Oamaru localities. Juvenile shells are met with at most of the collecting-grounds there, but the full-grown shell is apparently rare, the type and three more from Clifden being the only ones seen. It is of fairly constant appearance when large, but the canal varies considerably in length, especially in juveniles, which also differ in appearance from adult shell in their finer sculpture and more regular growth. The species has no resemblance to *C. minimum* (Hutt.), and its previous identification with Hutton's species must be attributed to the loss of his holotype. It is, however, very closely allied to the Recent *A. parkinsonianum* (Perry), the general style of shell and sculpture being the same in both. Perry's shell also has the narrow keel, elongated granules, and the 4 main cords, but differs in its shorter canal, almost complete absence of denticles on outer lip and columella, much finer and

closer spiral sculpture (main cords are less prominent and secondary cords are, though wider, lower and separated only by grooves), and coarser axial sculpture (all the early whorls have only 5 intervariceal ribs, and these decrease to 4, and then on the body-whorl only 3, very stout and distant nodules; these show the same abrupt change in size and level as in *A. maorium*). There can be little doubt as to the relationship of this shell to the Recent form on the one hand, and on the other to such Australian Tertiary forms as *C. radiale* (Tate), for which Cossmann proposed the genus *Austrotriton*. Kesteven (*Proc. Linn. Soc. N.S.W.*, vol. 27, 1902, p. 454) has commented on the similarity between *C. parkinsonianum* and this Australian group, and Iredale has on this account referred the Recent shell to *Austrotriton* (*Trans. N.Z. Inst.*, vol. 47, p. 459); the new species provides an interesting link between the two extremes in both its appearance and its geological age. The Australian ally of this shell seems to be *A. tortirostre* (Tate), but this is difficult to judge from figures alone. As in many other genera of the Cymatiidae, however, the limits of this genus seem ill defined, and there are several forms awaiting description which cannot be placed with nearly as much confidence as in the case of *A. maorium*. The author is of opinion that *Austrotriton neozelanica* M. & M. would be better placed in *Charonia*.

Var. **insignitum** n. var. (Plate 51, fig. 5.)

Differs from the species in having one sharp peripheral keel with a rounded base below, and much finer axial sculpture. Early whorls as in the species, but later ones with 9 axial ribs between varices, forming, and often reduced to, sharp nodules on keel. The difference in appearance results mainly from lack of nodules on second main cord. The change in size and level of nodules after a varix is much less marked in the variety, but the specimens are not adult. Several denticles on columella. The variety has a much neater appearance than the species.

Height, 22 mm.; diameter, 12·5 mm.; height of aperture, 11·5 mm. (type).

Type and one paratype, from Target Gully, in author's collection. Not yet found elsewhere.

Austrotriton (?) minimum (Hutt.). (Plate 48, fig. 5.)

The unique holotype of this species, previously supposed to be lost, has been discovered by Mr. Marwick, who kindly lent it to the author for examination. As Hutton's description is so slight, and so many wrong identifications have been made by subsequent workers, opportunity is here taken to redescribe the species. Holotype is in bad condition, lacks canal, protoconch, and much of the shell, and has aperture filled with matrix.

Shell not large, attenuated, aperture small in proportion to spire. About 5 whorls remain; the earlier ones are distinctly but bluntly angled slightly above middle; shoulder sloping at about 45°, thence much more steeply sloping inwards to suture below; on body-whorl this angle is almost obsolete, the whorl being subquadrately convex. Five or six intervariceal nodules per whorl, those just past a varix being considerably stronger and higher; on the lower whorls they project in a blunt point, but on early whorls are often elongated almost into backwardly-sloping axial ribs. The very faint lower keel on base bears only traces of nodules. Spiral cords cross whole surface, are quite prominent, flatly convex, and generally wider than interstices, but both vary considerably and irregularly.

On base an occasional cord seems to be stronger; on account of poor preservation the arrangement of these cannot be accurately described, but seems to be somewhat similar to that of *A. maorium*. No axial threads can be seen, and spirals are apparently not granulated. Five varices remain, about two-thirds of a whorl apart, rather narrow, hardly stouter than nodules, not prominent, and slightly sloping forwards. Sutures undulating, hardly discernible, but margined by a cord stouter than the others. Spire very high (1½–2 times height of aperture without canal). subturreted, giving shell a slender appearance, which in conjunction with its rather regular growth readily distinguishes it from any other New Zealand member of this genus. Aperture (filled with matrix) certainly small; outer lip reflected inwards past varix to form a sharp edge. Canal hidden and broken, but from small size of fracture-area it is evident that the amount lost is very slight, so that complete canal is probably short.

Height, 33 mm.; diameter, 16 mm.; height of aperture, 14 mm.

Type, from Broken River, Trelissick Basin (lower beds, Ototaran), in collection of New Zealand Geological Survey. No other specimens at present known.

The species seems to be characterized chiefly by its high spire; strong, regular, and smooth spiral threads; and rounded tubercles, some of which on early whorls are elongated slantwise, giving shell a *Perissoptera*-like appearance. Hutton at one time thought the species was identical with *C. tortirostre* (Tate), but Tate repudiated this identity (*Trans. Roy. Soc. S. Aust.*, vol. 10, p. 124), and did not compare it with any other species. In attenuated shape it resembles *C. protensum* (Tate), and if canal is long would be very like this species. It is also somewhat like *A. woodsi* (Tate), and this species also has a long canal. On the strength of this last resemblance Hutton's species is here placed in *Austrotriton*, but with much doubt, since the resemblance to the genotype, *A. radiale* (Tate), is but slight, though there do not seem to be essential generic differences. This is one of the "difficult" forms referred to in the remarks on *A. maorium*. It is in some respects like a *Charonia*, but the character of the varices seems to forbid placing it in that genus.

Austrotriton cyphoides n. sp. (Plate 51, figs. 3*a*, 3*b*.)

Shell small, shortly fusiform, with prominent peripheral carina and nodules. Protoconch globular, slightly asymmetrical, of about 4 smooth convex whorls, but tip is lost. Four whorls succeed this, strongly carinated below middle; shoulder straight, slope almost about 40°, thence slanting slightly in below carina to suture below; base rapidly contracted into broad, slightly twisted beak; varices at a little less than every three-quarters of a whorl, very low and inconspicuous, broadly convex towards aperture, but angled and concave away from it. Five strong peripheral nodules between varices, sharp along keel but blunt vertically; they extend to suture below on spire-whorls but hardly at all on shoulder; on body-whorl they vanish just below periphery, their termination being indicated by a spiral cord slightly more prominent than the others; no anterior keel apart from this. Whole surface bears slightly undulating, narrow, flattish spiral cords, interstices much wider on shoulder and base but narrower on keel; rarely one interstitial riblet on base. Extremely dense and fine axial threads (not visible except under good lens) run over whole surface, producing slightly roughened effect. Aperture broken, but evidently lirate-dentate within, inner lip spread thinly over columella,

bearing distinct parietal plait, but only very indistinct traces of tubercles below.

Height, 17 mm.; diameter, 10 mm.

Holotype (unique), from Kakanui Beach (tuffs below the limestone), in author's collection.

This belongs to a group of gibbous, carinate species, typified in the Australian Tertiaries by such forms as *A. radiale* (Tate), *A. gibbum* (Tate), and *A. textile* (Tate). It is closest to *A. cyphum* (Tate), the two being very nearly related. The new shell seems to differ only in its blunter, less vertically compressed nodules and slightly different spirals. In the absence of authentic specimens of the Australian species for comparison, the author prefers to consider it and the New Zealand shell as nearly related rather than identical.

Cymatium revolutum n. sp. (Plate 51, figs. 2*a*, 2*b*.)

Shell rather small, ovate; spire very little distorted by varices, which occur at intervals of less than three-quarters of a whorl. Whorls regularly rounded, no prominent carinae or nodules. Apex, canal, and outer lip missing in all specimens. About 14 narrowly convex spiral cords on body-whorl, 5 or 6 on penultimate, interstices 2–3 times their width, with 1–4 very fine interstitial riblets; less prominent vertical axial ribs (12–15 between varices) cancellate the spirals, raised at intersections into small sharp tubercles. Extremely fine and close secondary axial sculpture reticulates interstitial spiral riblets. Varices not very much wider or more prominent than axial ribs, but less tuberculose, and slant in different direction.

Height (estimated), 16 mm.; diameter, 9 mm. (type—juvenile).

The largest paratype, of which only three anterior whorls remain, is 17 mm. diameter and would reach over 30 mm. in height.

Types (two) and paratypes (two), from Kakanui Beach (tuffs below the limestone), in author's collection.

The species shows some analogy with *C. gemmulatum* (Tate) from Muddy Creek, from which it differs in its less turriculate spire, secondary sculpture, and relatively fewer varices. Another close ally seems to be *Ficus transennus* Sut. This is not a *Ficus*, but very probably a *Cymatium*, of the "*revolutum*" group; if so, it differs from that species in much lower spire and stronger axials in comparison with the spirals. It is also from a higher horizon, for it may be noted that the "*Turbo marshalli* fauna" of the Kakanui tuffs is identical with that from the true Waiarekan tuffs—a significant fact, which will be discussed on another occasion.

Cymatium marwicki n. sp. (Plate 51, figs. 1*a*, 1*b*.)

Shell rather small, fusiform, very little distorted by varices, which occur at intervals of almost three-quarters of a whorl; $3\frac{1}{2}$ post-embryonic whorls, regularly rounded, the 3 peripheral carinae only slightly interrupting their convex outlines. Protoconch apparently large, initial whorls missing, final volution with 4 faint ridges, the upper and lower much more prominent, a distinct break (but no varix) marks it off from true sculpture. This consists on early whorls of 6 low, subequidistant, spiral keels, the lowest close to the uppermost margining the suture. On later whorls the three upper cords always remain much weaker than the others, of which peripheral one becomes strongest, those below on body-whorl gradually falling away in strength. Six cords below peripheral one present on body-whorl down to end of outer-lip varix, below this are about 10 more on neck of canal, stronger and weaker alternating. Interstices between the three main cords occupied

by 6 subequal spiral threads with narrow spaces between, but between lower cords of body-whorl central thread is more prominent, with one or two others between it and the strong cords; these secondary spirals are often minutely catenate. Axial sculpture represented on early whorls by 9 flexuous ribs between varices; they are considerably narrower than their interstices, and points of intersection with spiral cords are raised into nodules. On later whorls axials become irregular, and break up or become obsolete on reaching main spiral cord. Nodules, however, become stronger, so that all the spiral cords on body-whorl (but more especially the three peripheral ones) are strongly bossed with bluntly-conical warts. There are more of these on the second peripheral cord than on the main one, and still more on third and those below. Traces of axial ribbing remain even near canal. Secondary spiral threads not nodulous but finely reticulated by secondary axial threads subequal to spirals and with linear interstices. Whole of sculpture except nodules extends over varices, which form regular, fairly high, convex ridges, running almost parallel to axials. Outer lip with sharp raised edge inside varix, strongly dentate by 9 teeth within. Columella straight, with 5 plaits on lower part and a few rugosities above these. Parietal wall shows basal sculpture plainly, and bears strong plait near outer lip. Canal about half length of aperture, bent to left and slightly backwards. Spire a little less in height than aperture with canal. Sutures not strong, almost straight.

Height, 25 mm.; diameter, 13 mm.; height of aperture with canal, 15 mm.

Type (unique), from McCullough's Bridge, Waihao (Waiarekan), in collection of New Zealand Geological Survey, kindly lent for examination and description through Mr. Marwick.

Closely related to the preceding species, differing in its varices (which are not so flattened, more prominent, slightly wider apart, and without antecurrent lip at suture) and in degree of sculpture, axials being less numerous, the nodules a little blunter but much stronger, and peripheral ribs much more prominent than the others. Secondary sculpture, too, is a little different, both axials and spirals being much wider than their interstices in the Waihao shell, but much narrower in *C. revolutum*. The next species is another ally.

Cymatium **kaiparaense** n. sp. (Plate 48, fig. 8.)

This is so evidently descended from the previous species and so like it in most respects that a full description is unnecessary, the general style of shell and sculpture being the same in both. It differs in having carinate, not convex, whorls, even at an early stage, due to stronger peripheral and weaker shoulder spirals. In this it is intermediate between *C. marwicki* and the species next described. Secondary sculpture more like that of *C. revolutum*, axial and spiral threads being much narrower than their interstices. The most striking difference, however, is that varices are only a little over half a whorl apart instead of three-quarters whorl—*i.e.*, on successive whorls the varices are nearly in line, while in *C. marwicki* and the next species varices occur nearly in line only on alternate whorls. Although there are the same number of nodules in both species, they do not appear any closer on *C. kaiparaense*, but rather the reverse, due to the fact that they are less elongated and more prickly and are not appreciably more numerous on spiral below periphery.

Satisfactory dimensions cannot be given, on account of the fractured state of the type.

Type (unique), from Pakaurangi Point, Kaipara Harbour (Ototaran or Hutchinsonian), in author's collection. The peculiarly close varices make the species somewhat resemble an *Argobuccinum*, but it is so evidently congeneric with the species described immediately before and after it that it is best referable to *Cymatium*.

Cymatium sculpturatum n. sp. (Plate 48, fig. 7.)

Shell of moderate size, turriculate, with several keels and irregular warty tubercles. Protoconch of 3 globose whorls. Four whorls follow, descending rather rapidly, so that spire is considerably elevated (about $1\frac{1}{2}$ times aperture without canal). Whorls quadrately convex, medially keeled, shoulder sloping at about 45°, thence descending vertically to lower suture, between which and peripheral keel is another strong keel. Below these two main keels there is, on body-whorl, a third keel, and below this about 4 strong spiral cords, all more or less prominently nodulose, the shell appearing to bear rather irregularly-dispersed and bluntly-pointed knobs. This irregular appearance is due to two factors—the increase in size of tubercles on peripheral keel as a varix is approached, and simultaneous decrease in size of tubercles on all other ribs, and to the progressive increase in number of tubercles on lower keels. On body-whorl of type, between the last varices, there are 7 nodules on peripheral keel (6 on some of the paratypes), then in succession 9, 11, and 13 on keels below it; increase most rapid near aperture. Irregularly-rounded undulating axial ribs extend from suture towards peripheral nodules, but they are not contiguous with them, and slant in various directions. These ribs render nodulose two weaker spirals intercalated at even distances between peripheral keel and suture above. Besides this characteristic primary sculpture of tuberculate keels there is an even more characteristic secondary sculpture. Interstices between the keels contain about 6 flattish and not prominent spiral riblets, distinctly and beautifully catenate, and alternately stronger and weaker, interstices linear. Crossing these in turn are numerous hair-like axials varying considerably in direction. This secondary sculpture becomes distorted and largely erased on nodules. Outer lip and most of canal missing on all specimens. Varices at a little less than three-quarters of a whorl, Epitoniform, convex, rather high and compressed, crossed by all the spiral and axial sculpture, but without nodules. Columella vertical, with two or three Marginelliform plaits; a few close, strong, elevated plaits on parietal wall. Outer lip evidently strongly lirate-tuberculate inside.

Height (without canal), 25 mm.; diameter, 17 mm.; height of aperture, 11 mm. (holotype). Height (without canal), 37 mm. (?); diameter, 19 mm.; height of aperture, 16 mm. (?) (largest paratype).

Holotype and seven paratypes, from Kakanui Beach (tuffs below the limestone), in author's collection.

The last four species and *C. transennum* (Sut.) form a rather compact group, distinguished by regular growth, prominent and prickly (or tubercular) spiral sculpture of two stronger peripheral ribs and two weaker ones above them on shoulder with regularly diminishing spirals on base, and reticulate secondary sculpture, the spiral part of which is often catenate. The last species represents the extreme development of the warty prickles, and these give it a superficial resemblance to *Austrotriton maorium*, from which, however, it differs markedly in all details. The Australian representative of this group and of this species, and *C. kaiparaense* especially, seems to be *C. intercostale* (Tate). It has the same regular, staged, and prickly aspect as *C. sculpturatum*, and it may be noted that Tate

comments on the short distance the varices are apart, as has already been done here in the case of *C. kaiparaense*. Tate also notes the "obliquely costated posterior slope"; this is also a striking feature in the two species last described.

C. revolutum and *C. transennum* bear a resemblance to *Plesiotriton dennanti* Tate, the type of the genus *Semitriton* Cossmann, but as none of the specimens show the characteristic columellar plaits of that species they are not here referred to that genus.

Cymatium octoserratum n. sp. (Plate 48, figs. 6*a*, 6*b*.)

Shell very small, fusiform, whorls slightly askew but growth otherwise regular, canal short. Protoconch as in *Austrotriton maorium*, of about 4 regularly-convex whorls, conical and symmetrical, with 3 faint equidistant keels indicated at extremity, the true sculpture beginning abruptly and with a varix. Four adult whorls, lightly carinate below middle, but hardly interrupting the straight spire-outlines. Spire higher than aperture with canal. Spire-whorls with regular spiral cords, 5 on shoulder, 4 stronger ones below, strongest being on keel. On body-whorl every third cord below keel is much stronger, but after fourth strong cord (including peripheral one) spirals alternately strong and weak extend over canal. All spirals finely granular, the granules being distant, blunt, and rounded. Eight axial ribs between every pair of varices, thin on shoulder, rapidly swelling out to greatest prominence on keel, where they form small but fairly sharp tubercles, strong between first and second main cords, almost at once dying away below this, but their continuation marked by sharp prickles that serrate all main cords. Extremely dense and fine hair-like axial threads form the only secondary sculpture. Varices at about three-fifths of a whorl, not high, inconspicuous in front, deeply incised and rather abrupt behind, crossed by all sculpture except nodules, parallel to axial ribs. Aperture subrhomboidal, small, produced into a very short canal (about one-third of aperture in length) turned strongly to left and backwards. Outer lip with sharp edge past varix, thickened and with 5 strong teeth within. Columella lightly concave, with 2 denticles anteriorly. Inner lip spreading out to thin sharp edge past columella and on parietal wall, with narrow plait some distance from outer lip. A tiny triangular umbilical chink between strong fasciole and inner lip.

Height, 13 mm.; diameter, 7 mm.; height of aperture with canal, 6 mm. (type).

Type and eight others, from Target Gully, in author's collection. Also from Ardgowan and Awamoa (beach-boulders).

This species is separable from juveniles of *A. maorium*, occurring at the same locality, by its much shorter canal, higher spire, less gibbous growth, and much finer axial sculpture. It does not seem closely related to any other New Zealand species, but seems to be without doubt a member of the Australian "*quoyi*" group, being apparently closest to that species itself and *C. oligostirum* (Tate). One of the paratypes has 10 intervariceal costae, and this brings it still closer to the Australian shells.

Cymatium n. sp.

In the writer's collection is a fragment of a large new species from Clifden, Southland (band 8A—Awamoan ?). It seems to be related to *C. spengleri* (Chemnitz) and also to *C. sculpturatum* n. sp., but since the surface of the shell is everywhere abraded, so that the details of sculpture are obscured, it is best left undescribed.

Cymatium decagonium n. sp. (Plate 48, fig. 4.)

Shell small, of somewhat squat appearance, with prominent spiral cords and distant axial ribs. Apex worn. Spire subequal in height to aperture with canal. About 3 post-embryonic whorls, obtusely angled submedially, each with 2 strong spiral cords on lower half and 2 much weaker ones on wide and sloping infrasutural space. Interstices much wider than cords, bearing 1–3 very fine and distant spiral threads. On body-whorl this sculpture is continued to canal, there being 3 main peripheral cords (the lowest emerging from suture) and 4 slightly weaker ones down to end of outer-lip varix, all equidistant, and below them further cords, alternately fairly strong and weak. Seven intervariceal axial ribs on the average, but only 6 on body-whorl (almost obsolete below third carina) and 9 on antepenultimate whorl. Ribs almost straight, a little sharp and very thin, interstices being many times their width and bearing rather prominent growth-striae; secondary axial sculpture only faintly indicated. Axial ribs bear at points of intersection with the 3 main cords regular and sharp but hardly tubercular serrations, so that an apical view of the shell shows the logarithmic spiral of the whorls neatly divided into about 10 angles per whorl; otherwise spirals and axials have a smooth appearance. Varices at a little less than three-quarters of a whorl, almost parallel to axial ribs, rather high, narrowly convex, and excavated behind between cords. Outer lip with sharp raised edge past varix, thickened and with 7 strong and subequidistant teeth within. Columella lightly concave, with 4 small plaits anteriorly. Tubercle on parietal wall very weak, but basal sculpture plainly shown. Canal very short (but seems to be broken and worn), turned slightly to left and backwards.

Height, 21 mm.; diameter, 13 mm.; height of aperture with canal, 12 mm.

Type (unique), from Waihao Downs, in Mr. R. S. Allan's collection.

This puzzling form does not compare well with any other New Zealand fossil species. It does not seem to be an *Austrotriton;* the 2 strong keels on spire-whorls are not shown by *A. maorium* or other New Zealand species of this genus, but are more reminiscent of the *C. sculpturatum* group. From these, however, it is at once sundered by the absence of prickly knobs, the appearance of the serrations being distinctive. In many respects it resembles the Recent *C. exaratum* (Reeve), axial and spiral ribs being nearly the same in number, appearance, and arrangement, except that main cord, and therefore peripheral keel, on *C. exaratum* is considerably higher up, so that the spire is much more staged. There is the same number of internal teeth on outer lip, and plaits on columella, and the same very weak parietal plait. Whether this resemblance is superficial or ancestral cannot be determined without study of intermediate forms. Neither *C. exaratum* nor any allied form has yet been found fossil in New Zealand.

Charonia clifdenensis n. sp. (Plate 48, figs. 9*a*, 9*b*, 9*c*.)

Shell small for the genus, fusiform, of rather distorted growth, thick and solid. Protoconch of 3 very convex, smooth whorls, the apical ones rather depressed so that shape is not so regular and conic as in *Austrotriton maorium*, &c.; separated from adult sculpture by slight varix. Adult whorls 7, the earlier ones faintly shouldered at lower third by a row of vertically-elongated nodules, 5 or 6 between varices; on lower whorls 3 or 4 nodules past each varix become very strong and sometimes make penultimate whorl biangulate just above suture, but the other nodules

almost disappear so that anterior half of intervariceal areas is lightly convex and smooth except for spiral sculpture. This forms regular, distant, fine and granulate cords over the whole surface, a stronger cord being generally followed by 1–3 weaker threadlets; the number of main cords is difficult to estimate, but there are about 10 on shoulder and below periphery on body-whorl, and 5 or 6 stronger, thicker, and closer ones on neck of canal; spirals are more crowded on upper half of whorl, and are faintly studded with minute blunt and low tubercles, much more than their own width apart. Secondary sculpture characteristic, most prominent near periphery, surface being elaborately cut up by wire-netting-like grooves into a shagreened aspect like a reptilian skin. Apart from more or less distinct growth-lines, greater part of whorl has no axial sculpture, nodules being confined to periphery. Varices not quite in line on alternate whorls, lower ones being somewhat behind upper; they are thick, low, and wide, pressed close to whorl, very gently sloping behind, descending more steeply in front to curved, sharp edge, hardly separated from level of whorl. Where surface of shell is best preserved the combined forms of sculpture give it a satin-like texture and gloss; outer and especially inner lip highly polished. Spire considerably higher than aperture with canal. Suture impressed, very uneven. Aperture relatively rather small, with very thick walls, slightly oblique, ovate, channelled above, produced below into short narrow, but strong recurved canal. Outer lip expanded, especially below, 7 or 8 heavy denticles within, lowest two adjacent; columella much excavated, with about 7 thick ridges extending over most of its length in juvenile shells, but with 4 or 5 thick, low, and close elongate tubercles at base in adults. Inner lip extending some distance past columella with definite boundary, but forming no false umbilicus; very heavy parietal tubercle at junction with outer lip, but otherwise no plaits or wrinkles.

Height, 54 mm.; diameter, 25 mm.; height of aperture with canal, 25 mm. (type). Corresponding dimensions of a paratype, 53 mm., 23 mm., 23 mm.

Type, and one adult and two juvenile paratypes, from Clifden, Southland (band 6A—Ototaran ?), in author's collection.

Closely related to *C. neozelanica* (M. & M.) from Target Gully, but easily distinguished by its more slender shape (diameter less than half height instead of more), relatively much smaller aperture, and, judging from the figure, finer spirals and granules. Except for these points the diagnosis of *A. neozelanica* given by Marshall and Murdoch exactly fits *A. clifdenesis*, so that the Target Gully shell is evidently a descendant of the new species. That these shells belong to *Charonia* and not to *Austrotriton* is shown best by their low and wide adpressed varices and characteristic columellar plication when juvenile, the numerous horizontal plaits over almost all the columella being well shown by juveniles of *C. lampas* (L.). Distorted growth and granulation of the spirals are characters not restricted to *Austrotriton*, and, though it is almost impossible to draw the line of separation between various genera of this difficult family, the two shells here treated are far more in accord with *Charonia* than with *Cymatium* (s. str.) or *Austrotriton*. *C. ovoidea* (Tate), the Australian Tertiary member of this genus, has little resemblance to the New Zealand species.

Two other fossil species of *Cymatium* have been described from New Zealand, and, to complete this account of the family, notes on these and on some Recent species are appended, and, finally, a key to all our species is given.

Cymatium suteri M. & M.

The author is of opinion that this species is a *Xymene*, and so should not be included in the Cymatiidae.

Cymatium pahiense M. & M.

This is a peculiar species, and, as noted by the authors, is unsatisfactorily placed in *Cymatium*. If it belongs to this family at all, the strong posterior notch would seem to bring it nearer to the Bursidae, but the general appearance of the shell is somewhat like that of a Cassid. At present its position must be regarded as quite uncertain.

Charonia lampas (L.).

Septa rubicanda Perry: Suter, *Man. N.Z. Moll.*, p. 303.

Charonia lampas var. **euclia** Hedley.

C. nodifera var. *euclia* Hedley, *Biol. Res.* "*Endeavour*," vol. 2, 1914, p. 65.

Iredale (*Trans. N.Z. Inst.*, vol. 47, p. 458, 1915) has united the species *rubicunda*, *nodifera*, and *sauliae*, and gives the oldest name as *C. lampas* (L.). The author has obtained (by trawling outside Otago Heads in 22 fathoms) one fine adult shell that agrees almost exactly with Hedley's figure and description of the var. *euclia*. All the Australian specimens were dredged in very much deeper water.

Argobuccinum tumidum (Dkr.).

A. argus (Gmel.): Suter, *Man. N.Z. Moll.*, p. 309. (See Hedley, *Proc. Linn. Soc. N.S.W.*, vol. 38, p. 297, 1913.)

Mayena australasia (Perry).

Argobuccinum australasia Suter, *Man. N.Z. Moll.*, p. 310.

Iredale (*Proc. Mal. Soc.*, vol. 12, p. 324, 1917) has proposed the generic name *Mayena* for this species and *gemmifera* (Euthyme). In the same place, however, he noted that Bartsch had classed the South African species in *Eugyrina* Dall. Hedley (*Proc. Roy. Soc. N.S.W.*, vol. 51, p. 66) has reduced *Mayena* to a synonym of *Eugyrina*; but May (*Check-list of the Mollusca of Tasmania*, pp. 64–65, 1921) has employed both genera, retaining *Mayena* for *australasia*, a course which is adopted here. Suter (*Alph. List N.Z. Tert. Moll.*, 1918) records only this species and *C. spengleri* of our Recent species as fossil in the New Zealand Tertiary.

Priene retiolum Hedley (*Biol. Res.* "*Endeavour*," vol. 2, p. 73, 1914).

This rare deep-water species should be admitted to the New Zealand Recent fauna, one broken specimen having been found by the author at Taieri Beach, South Island, washed up on the rocks. It presents an appearance so dissimilar to *Argobuccinum tumidum* (Dkr.), the genotype of *Argobuccinum*, that *Priene* is here given generic rank.

Cymatium parthenopeum (von Salis).

Septa costata (Born): Suter, *Man. N.Z. Moll.*, p. 305.

Iredale (*Trans. N.Z. Inst.*, vol. 47, p. 459, 1915) has advised use of the above name for this shell, and has placed it under *Cymatium* in the subgenus *Monoplex*, referring *C. exaratum* (Reeve) and *C. spengleri* (Perry)

to the subgenus *Cabestana*. There does not, however, seem to be any similarity between the two latter shells, but *C. exaratum*, apart from its much smaller size, seems quite close in all details to *C. parthenopeum*, and is here grouped with it. *C. spengleri* does not closely resemble other New Zealand species. No sectional names are used in this *résumé* of the family; of the six genera admitted, *Cymatium* and *Austrotriton* both need subdivision, but it is so difficult to place many Tritons in even a suitable genus, and the relationships of some of the New Zealand species are so obscure, that no sectional division has here been attempted. One cannot help recalling Kesteven's argument (*Proc. Linn. Soc. N.S.W.*, vol. 27, pp. 443–83, 1902) that no satisfactory grouping of the Tritons can be made. In the key appended, the species *Austrotriton maorium* var. *insignitum* and *Cymatium decagonium* are out of place, but the others are grouped, according to their relationships, into ten more or less distinct groups.

KEY TO THE NEW ZEALAND CYMATIIDAE.

Shell with 3 varices in 2 whorls.

(A.) Shell of distorted growth, due to flattening before a varix and gibbous inflation after it (often inconspicuous in juveniles).

(*a.*) Shell usually rather squat; keel sharp or blunt, tending to prominence with age; of very distorted and gibbous appearance when adult; varices narrow, high, and prominent, even on early whorls, steeply descending on either side; canal usually long .. .. AUSTROTRITON (*a*).

(*b.*) Shell more slender and tapering; keel tending to disappear with age; of less distorted, more graceful appearance; varices broad, low, and often inconspicuous on early whorls, of much gentler incline on either side, especially behind; canal short .. CHARONIA (*b*).

(B.) Shell of almost regular growth, the sculpture being hardly interrupted by the varices, which are like those of *Austrotriton* .. .. CYMATIUM (*c*).

Shell with 4 varices in 2 whorls.

(C.) Shell solid.

(*d.*) Shape fusiform; whorls shouldered, with a strongly nodose carina; varices clevated .. .. MAYENA (*d*).

(*e.*) Shape oval; whorls convex, spirally subnodulosely striated; varices flattened .. .. .. ARGOBUCCINUM (*e*).

Shell with irregular varices, 2, 1, or none to a whorl.

(D.) Shell thin, ovately fusiform; whorls convex, surface neatly reticulated by thin and subequal spirals and axials; varices convex but low .. .. .. PRIENE (*f*).

(*a.*) (Group 1.) Periphery of body-whorl angled.

(i.) No other keels below this; 5 intervariceal nodules .. .. *A. cyphoides.*

(ii.) Three weaker keels below this; 9 intervariceal nodules .. .. *A. insignitum.*

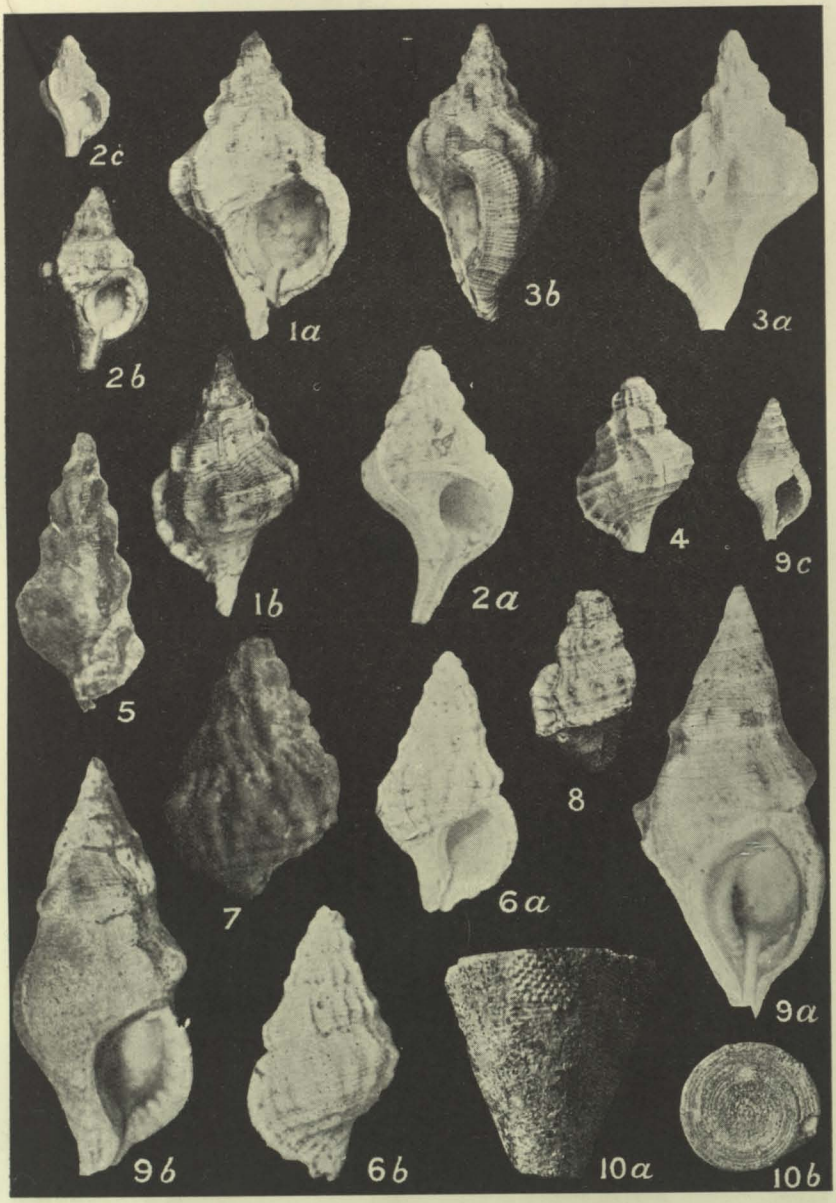
(Group 2.) Periphery of body-whorl subquadrate.

(i.) Shell slender; spire much higher than aperture and canal .. .. *A.* (?) *minimum.*

(ii.) Shell squat; spire subequal to aperture and canal.

1. Aperture almost smooth within; 3 nodules between last two varices .. *A. parkinsonianum.*
2. Aperture strongly denticulate on columella and inner lip; 5 nodules between last two varices .. .. *A. maorium.*

(*b.*) (Group 3.)
(i.) Adult shell very large, with whole of columella and inner lip covered with strong irregular plaits and wrinkles, except for a short distance near outer lip, which is thin and without prominent teeth, early whorls with 4 strong and equidistant tuberculate cords .. *C. tritonis.*
(ii.) Adult shell very large, with the long and narrow parietal plait separated by a smooth space from the columellar plaits, and distant from the outer lip, which is thick, with an internal groove behind it; early whorls with two rows of nodules on the lower half.
1. .. .. *C. lampas.*
2. Shell larger, more slender, and with smaller, closer, and more prominent nodules .. .. var. *euclia.*
(iii.) Adult shell small, with the thick parietal tubercle separated by a considerable smooth area from the columellar plaits and joined to the outer lip, which is thickened, without an internal groove; early whorls with one row of nodules above the suture.
1. Aperture large, width more than half the height .. .. *C. neozelanica.*
2. Aperture smaller, width less than half the height .. .. .. *C. clifdenensis.*
(*c.*) (Group 4.) Shell very small (under 15 mm.), with a peripheral keel and 3 more below it; 8–10 short and prickly axial ribs between varices .. .. *C. octoserratum.*
(Group 5.) Shell with only 2 varices; the upper whorls disc-like (owing to the flat shoulder) and with 2 strong keels; body-whorl with 6 strong cords.
(i.) Shell small; 4 strong axial ribs between varices *C. exaratum.*
(ii.) Shell large; no distinct axial ribs, but about 10 swellings on keels between varices .. *C. parthenopeum.*
(Group 6.) Shell large; sculpture crossed by prominent axial cordlets; aperture large and expanded; outer lip frilled and with a wide sunken, internal groove, crossed by strong, paired ribs .. .. .. *C. spengleri.*
(Group 7.) Shell small; spire-whorls with 2 stronger ribs below, 2 weaker ones above.
(i.) Whorls convex.
1. Surface reticulated by thin and subequal spirals and axials.
(i.) Spire low, axials and spirals subequal .. .. .. *C. transennum.*
(ii.) Spire higher, axials weaker than spirals .. .. .. *C. revolutum.*
2. Main spirals with about 9 strong, prickly tubercles between varices .. .. *C. marwicki.*
(ii.) Whorls angled.
1. Varices almost in line on successive whorls; main cords and tubercles not very strong .. .. .. *C. kaiparaense.*
2. Varices in line on alternate whorls; main cords and tubercles very strong; sculpture warty .. .. .. *C. sculpturatum.*
3. Varices nowhere in line; main cords strong, but without prickles; distant narrow axial ribs .. .. .. *C. decagonium.*
(*d.*) .. .. *M. australasia.*
(*e.*) .. .. *A. tumidum.*
(*f.*) .. .. *P. retiolum.*
(*Inc. sedis*) .. .. *C. pahiense.*



FIGS. 1*a*, 1*b*.—*Austrotriton maorium* n. sp. Holotype, Target Gully.
FIGS. 2*a*, 2*b*, 2*c*.—*Austrotriton maorium* n. sp. Paratypes—(*a*) Target Gully; (*b*) Otiake; (*c*) Clifden: juvenile.
FIGS. 3*a*, 3*b*.—*Austrotriton maorium* n. sp. Paratypes, Clifden: adult.
FIG. 4.—*Cymatium decagonium*. Holotype.
FIG. 5.—*Austrotriton* (?) *minimum* (Hutt.). Holotype.
FIGS. 6*a*, 6*b*.—*Cymatium octoserratum* n. sp. Holotype.
FIG. 7.—*Cymatium sculpturatum* n. sp. Holotype.
FIG. 8.—*Cymatium kaiparaense* n. sp. Holotype.
FIGS. 9*a*, 9*b*, 9*c*.—*Charonia clifdenensis* n. sp. (*a*) Holotype; (*b*) and (*c*) paratypes: adult and juvenile.
FIGS. 10*a*, 10*b*.—*Conus triangularis* n. sp. Holotype.

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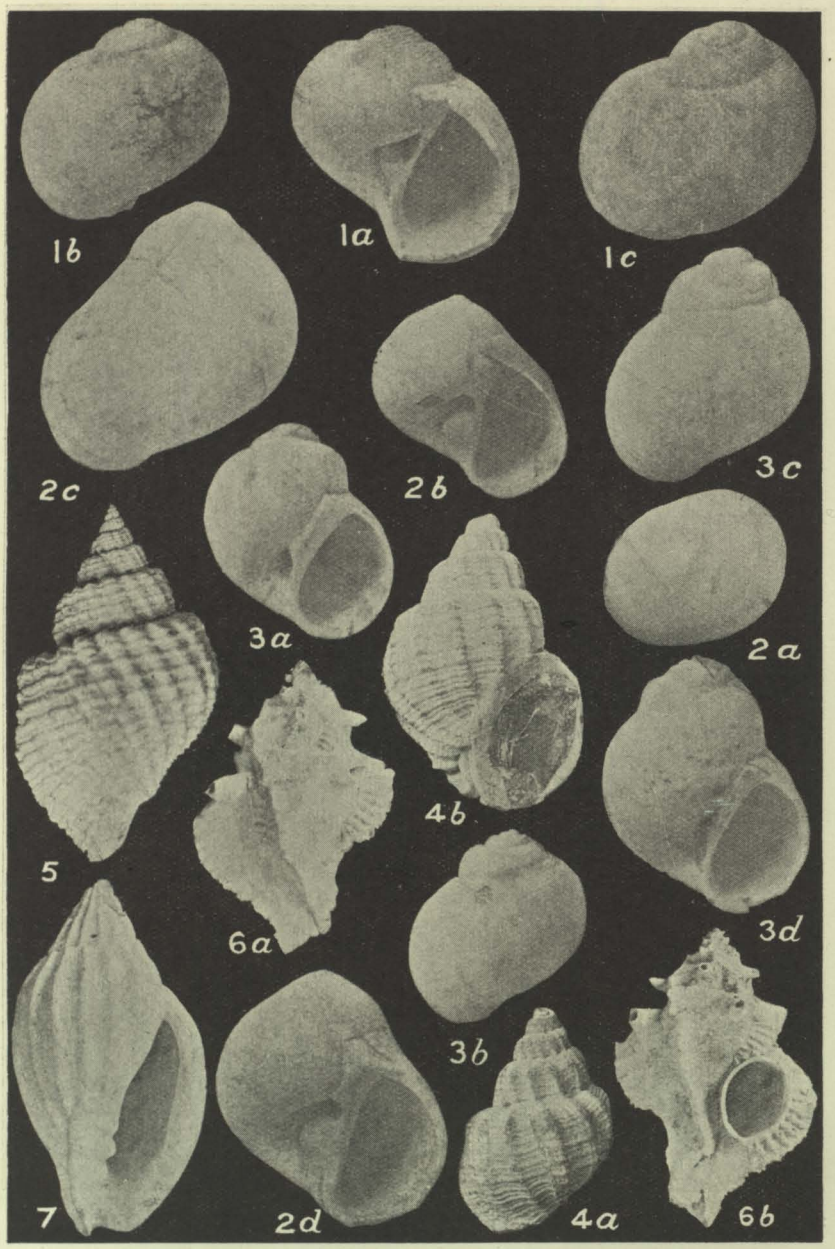
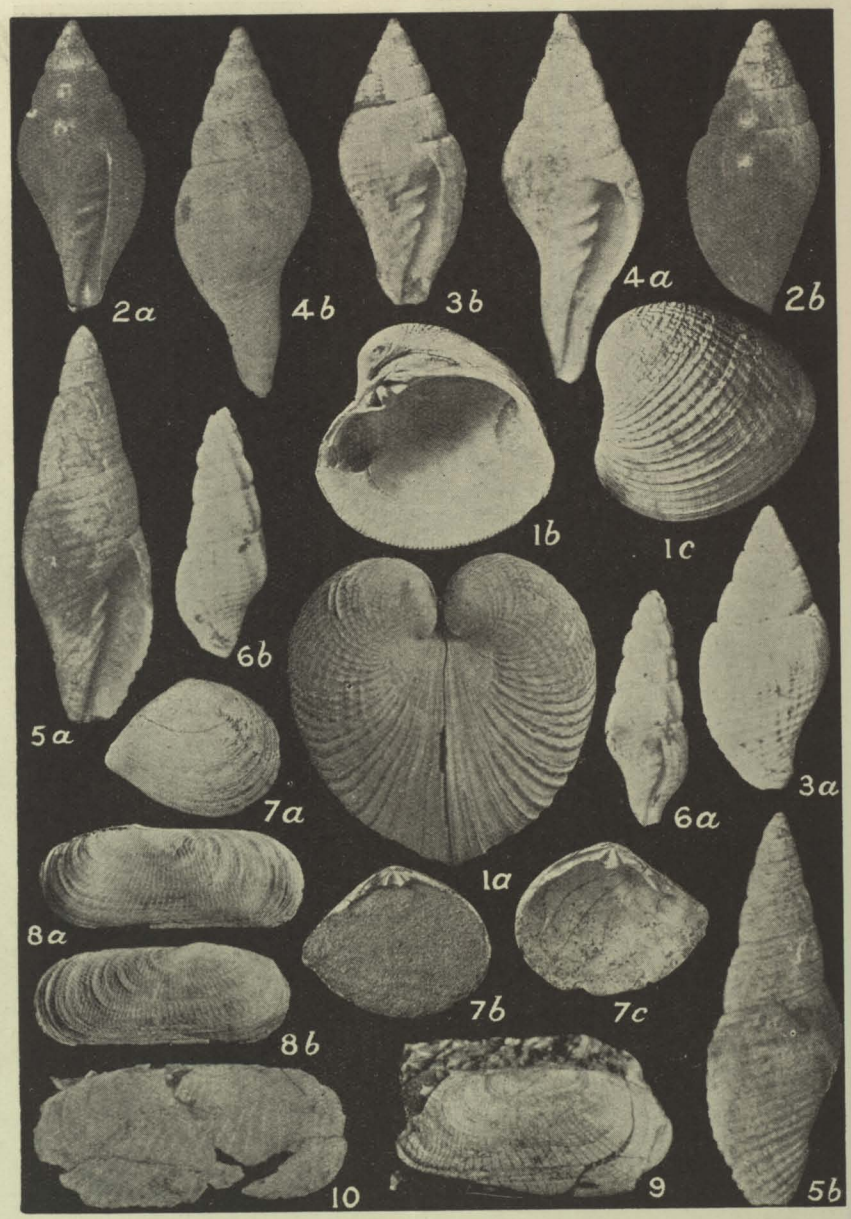
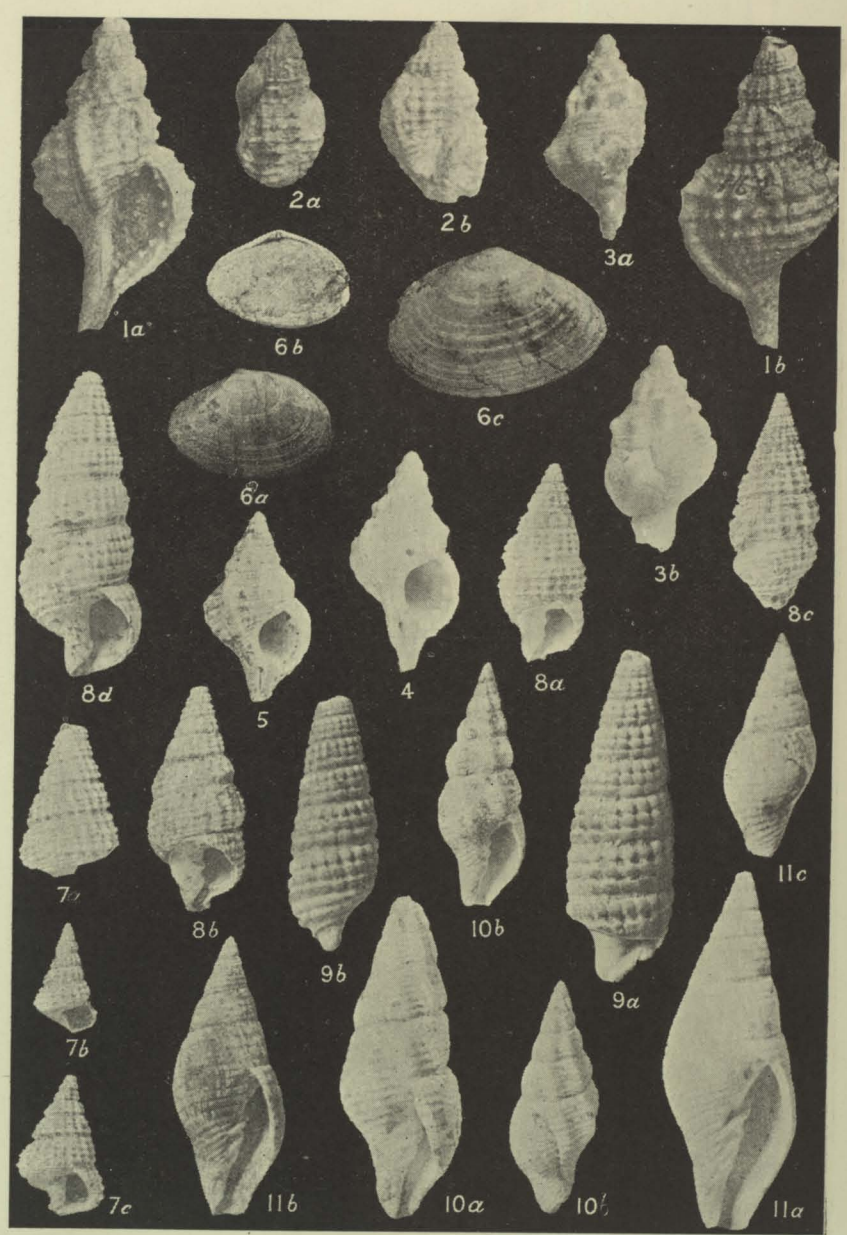


FIGS. 1*a*, 1*b*, 1*c*.—*Natica consortis* n. sp. (*a*) Holotype, Pukeuri; (*b*) paratype, Pukeuri; (*c*) paratype, Rifle Butts.
FIGS. 2*a*, 2*b*, 2*c*, 2*d*.—*Natica notocenica* n. sp. (*a*) Holotype, Awamoa; (*b*), (*c*), and (*d*) paratypes, Pukeuri.
FIGS. 3*a*, 3*b*, 3*c*, 3*d*.—*Polinices pseudovitreus* n. sp. (*a*) Holotype; (*b*), (*c*), and (*d*) paratypes.
FIGS. 4*a*, 4*b*.—*Trigonostoma waikaiaensis* n. sp. Holotype.
FIG. 5.—*Trigonostoma christiei* n. sp. Holotype.
FIGS. 6*a*, 6*b*.—*Typhis francescae* n. sp. Holotype.
FIG. 7.—*Lyria zelandica* n. sp. Holotype.



FIGS. 1*a*, 1*b*, 1*c*.—*Chione crassitesta* n. sp. Holotype.
FIGS. 2*a*, 2*b*.—*Conomitra inconspicua* (Hutt.). Topotype.
FIGS. 3*a*, 3*b*.—*Conomitra othoniana* n. sp. Holotype.
FIGS. 4*a*, 4*b*.—*Mitra* (*Cancilla*) *armorica* Sut. Otiake specimen.
FIGS. 5*a*, 5*b*.—*Mitra elatior* n. sp. Holotype.
FIGS. 6*a*, 6*b*.—*Uromitra etremoides* n. sp. Holotype.
FIGS. 7*a*, 7*b*, 7*c*.—*Barytellina anomalodonta* n. sp. Types.
FIGS. 8*a*, 8*b*.—*Solecurtus bensoni* n. sp. Holotype.
FIG. 9.—*Solecurtus evolutus* n. sp. Holotype.
FIG. 10.—*Solecurtus chattonensis* n. sp. Holotype.



FIGS. 1*a*, 1*b*.—*Cymatium marwicki* n. sp. Holotype.
FIGS. 2*a*, 2*b*.—*Cymatium revolutum* n. sp. Holotype.
FIGS. 3*a*, 3*b*.—*Austrotriton cyphoides* n. sp. Holotype.
FIG. 4.—*Austrotriton maorium* n. sp. Paratype, Target Gully.
FIG. 5.—*Austrotriton maorium* var. *insignitum* n. var. Holotype.
FIGS. 6*a*, 6*b*, 6*c*.—*Macoma robini* n. sp. (*a*) Holotype; (*b*) and (*c*) paratypes.
FIGS. 7*a*, 7*b*, 7*c*.—*Ataxocerithium pyramidale* n. sp. (*a*) Holotype; (*b*) and (*c*) paratypes.
FIGS. 8*a*, 8*b*, 8*c*, 8*d*.—*Ataxocerithium nodicingulatum* n. sp. (*a*) Holotype; (*b*), (*c*), and (*d*) paratypes.
FIGS. 9*a*, 9*b*.—*Ataxocerithium suteri* Marwick. Petane specimens.
FIGS. 10*a*, 10*b*, 10*c*.—*Uromitra etremoides* n. sp. Paratypes.
FIGS. 11*a*, 11*b*, 11*c*.—*Mitra eusulcata* n. sp. (*a*) Holotype; (*b*) and (*c*) paratype.

Of the above twenty-four New Zealand members of this family, ten are Recent species, and all these occur also in Australia. Of them only two are recorded as fossil in New Zealand, and these only from the uppermost Pliocene; one of them (*Mayena australasia*) apparently does not occur fossil in Australia, but the other (*Cymatium spengleri*) is recorded from the later Pliocene (Limestone Creek, Glenelg River). Of the remaining fourteen species and varieties, only two (*Cymatium sculpturatum* and *Austrotriton cyphoides*) appear to have really close allies in Australian early Tertiary beds, though four others (*A. maorium*, *A. minimum*, *C. revolutum*, and *C. octoserratum*) seem to have more or less distant relatives. It seems apparent that, though the general facies of the New Zealand species resembles that of the Australian fossils, specific differences are considerable, and this suggests that the two sets of forms must have been early segregated from a parent stock that gave rise to both. The fact that none of our Tertiary species occur in Australia is all the more significant since all our Recent species occur there. It is not conceivable that the Cymatiidae could cross the present gulf but not one that existed in the Tertiary; the only explanation is that very different conditions were brought about for a short time after the close of the Wanganuian, and allowed the passage of characteristic Australian forms into our waters. Of whatever character this connection was, it must have been far more pronounced than any that occurred during the Tertiary.

Typhis francescae n. sp. (Plate 49, figs. 6*a*, 6*b*.)

Shell of moderate size, rather thick and stout, of rhomboidal outline. Apex worn, 6 adult whorls left. A carinate shoulder a little below middle on spire-whorls, on periphery in body-whorl. Five varices per whorl, contiguous but not in vertical line on successive whorls, forming spirally backwardly-revolving sharp ridges from apex to body-whorl. Front side of each varix grooved and spinously ridged, a thicker and stronger ridge on shoulder, 7 narrow but strong ridges below, down to base of aperture, each with 2–3 raised foliations; below this varices suddenly diminish and become smooth; above shoulder they are also much diminished and bear 4–5 almost obsolete small ridges. On hinder side varices are smooth except for a little crinkling in centre. At intersection of varix and shoulder is occasionally a small, thick spine, but otherwise the varices are not spinose. At about third of distance between every two varices, nearer posterior one, is a prominent thick and backwardly-projecting hollow tube, considerably higher than varices, situated on shoulder but more above than below it. Tube and rest of shell quite smooth except for growth-lines. Spire regularly staged, somewhat shorter than aperture and canal. Suture linear, inconspicuous, rising to each varix. Aperture small, oval, defined by a strongly-projecting thin and continuous rim, narrower below than above. Tubular perforation situated far within. Canal completely hidden, flatly compressed. Umbilicus slight, fasciole raised and strongly foliar.

Height, 34 mm.; diameter, 23 mm.; height of last whorl, 21·5 mm.; height of aperture, 10 mm.

Type (unique), from Clifden, Southland (band 6A—Ototaran ?), in author's collection.

Larger than most New Zealand examples of *T. maccoyi* T.-Woods, and relatively a little wider and of stouter build, but differing mostly in character of varices, which in Tenison-Woods's species are quite smooth

anteriorly and bear several recurved spines. Not related to any other Australian species. The single fine specimen was collected for the writer by Miss Frances Milnes, after whom it is named.

Trigonostoma waikaiaensis n. sp. (Plate 49, figs. 4*a*, 4*b*.)

Shell moderately large, subscalar. Thirteen axial ribs on body-whorl, rounded, rather low and sloping backwards, not obsolete on upper whorls, interstices about twice their width; they extend over the whole whorl, finer and narrower but still strong on base. Axials crossed by rather flattened spiral cords arranged in regular order; stronger and weaker cords alternate, and on periphery a still finer riblet is interposed between a strong and a weak rib; on shoulder spirals are irregular, gradually becoming finer on approaching suture; about 15 of the strong ribs on body-whorl from shoulder to umbilicus, 5 on penultimate whorl. Spire subscalar, a little lower than aperture. Protoconch lost; whorls at least 5, disproportionately increasing, sloping from suture to a rather strong shoulder at upper three-quarters, thence almost perpendicular to suture below; emerging from suture on base is a blunt angulation, below which body-whorl rapidly contracts. Suture wavy, impressed. Aperture oblong-ovate, squarely rounded above and with a slight notch on shoulder-edge; outer lip effuse below, then narrowed in to form with basal lip a short, narrow, and notched canal, strongly bent to the right. Columella slightly curved, inflected to the right. Inner lip strongly callous, thick anteriorly, but thinning and spreading above parietal wall; interior filled with hard matrix, but extremities of three oblique plaits can be seen, the upper two much stronger. Siphonal fasciole prominent, crenulated by axial ribs, strongly curved, leaving a decided umbilical chink between it and inner lip.

Height, 32 mm.; diameter, 20·5 mm.; height of aperture, 18 mm.

The holotype and two other fragmentary shells, from Waikaia, in author's collection.

The inflection of columella and aperture to right indicates a member of Trigonostominae, and for the present the species may be left in the typical genus, though the umbilicus is much smaller than usual in *Trigonostoma* s. str., and the two upper plaits are the stronger, though a third is distinctly present. Possibly the section *Ventrilia* would be a better location. The subfamily Trigonostominae has not previously been recorded from New Zealand. The Australian shell most like this species is *Merica wannonensis* (Tate), which differs generically in having columella bent to left, and otherwise in its regularly rounded outline below shoulder, the fewer, narrower, higher, and more curved axial ribs, slightly different spiral sculpture, weaker umbilicus and fasciole, and much lower spire, the ratio aperture : spire in the New Zealand shell being 1·3 and in the Australian shell 1·9.

Trigonostoma christiei n. sp. (Plate 49, fig. 5.)

Similar in essential details to previous species, but larger, more staged, and with much more numerous axial ribs. Protoconch of 2 slightly bulbous whorls, almost equal in size, but mamillate tip very small; then a brephic stage of ½ whorl with only spiral cords; then 6 whorls with adult sculpture. Eighteen axial ribs per whorl, of similar character to those of last species, but narrower; interstices 1–2 times the width of ribs. Spirals rather stronger than in *T. waikaiaensis*, but otherwise similar in number, character,

and arrangement, except that a small space close to suture is marked only by waved scratches, and there are 5 or 6 spirals on edge of shoulder separated only by linear interstices. Spire markedly scalar, about same height as aperture and canal. Keel on whorls is level with suture, so that shoulder is quite horizontal. Base and suture as in previous species. Aperture imperfect, outer lip being broken away, but from previous rest-marks it is clear that notch on shoulder-edge was practically absent. Columella lightly curved and bent to right, bearing 3 plaits and a few indistinct ridges outside these; plaits progressively more sloping, the two upper ones strong, but the lowest very weak and almost vertical. Inner lip reflected as thin glaze over parietal wall, and as sharp free edge below fasciole, which forms a broad, rounded, and but slightly roughened ridge enclosing a chink-like but distinct umbilicus. Anterior notch evidently weak, much slighter and less reflected than in previous species.

Height, 40 mm.; diameter, 22·5 mm.; height of aperture, 20 mm.

Type and one much broken larger specimen, from Chatton, near Gore (Waiarekan ?), in author's collection. Named after the collector, Mr. E. M. Christie, M.Sc., of Gore High School.

Closely related to and congeneric with the previous species, but differing from it mainly in the horizontal shoulder, much weaker anterior and posterior notches, and much finer axial sculpture.

Conomitra othoniana n. sp. (Plate 50, figs. 3*a*, 3*b*.)

1917. *Mitra armorica* Sut.: Marshall, *Trans. N.Z. Inst.*, vol. 49, p. 461 (not of Suter).
1918. *Mitra armorica* Sut.: Park, *N.Z. Geol. Surv. Bull. No. 20*, p. 102.
1921. *Mitra armorica* Sut.: Suter, *N Z. Geol. Surv. Pal. Bull. No. 8*, p. 82.

Shell small, biconic, pointed at both ends, more sharply posteriorly, with finely tuberculate spiral sculpture, Protoconch small and smooth, apex blunt, the two globose turns being very asymmetrically disposed; pullus rapidly swells, first volution very prominent and askew, decidedly overhanging the lower turn, and half-covering it on one side, the other side being disproportionately exposed; second volution normally in place with spire-whorls, giving place rather abruptly to their characteristic sculpture. Five to seven lowly convex spiral cords on spire-whorls, interstices a little narrower, on body-whorl ribs remain of this character for a short space below the suture, but periphery bears 4–6 similar but much closer ribs, on remaining half of whorl quite a different sculpture is developed, there being about 11 prominent sharp ribs with wide concave interstices narrower near periphery and canal. Axial sculpture in the form of blunt vertical riblets similar in appearance to spirals, as strong as or stronger than spiral sculpture on earlier whorls; interstices are raised as square granules producing a cancellate *Anachis*-like appearance. Axial ribs tend to die out on body-whorl, their place being taken by sinuous irregularly raised growth-lines, but sharp basal ridges continue prickly. Spire about three-quarters height of aperture, pointed, outlines almost straight (angle about 45°); whorls 7 (including apex), very flatly convex, body-whorl gently rounded, rather suddenly contracted to beak; suture distinct, slightly incised. Aperture oblique, bluntly angled above (suture tends to be more incised with age, thus rounding off aperture posteriorly), truncate below, swelled medially, due to strong curve of outer lip, thin and sharp. Columella slightly oblique, twisted below, with 4 thin but strong oblique plaits, anterior pair much closer and feebler; canal short, open, and lightly notched, fasciole rather prominent. Inner lip drawn out to a fine point below.

Height, 14 mm.; diameter, 6 mm.; height of aperture, 8 mm. Height, 11 mm.; diameter, 4 mm.; height of aperture, 6 mm.

Type and many paratypes, from Target Gully, in author's collection. Not yet found elsewhere.

Has been wrongly identified by Suter as *M. armorica*, from which it is separable at sight. The diagnosis and figure of *M. armorica* Sut. (*N.Z. Geol. Surv. Pal. Bull. No. 5*, p. 27, pl 12, fig. 4) do not agree with this shell, even though many important details are omitted in the description. Actual specimens of *M. armorica* Sut. from Otiake (here figured, Plate 50, figs. 4*a*, 4*b*) show that this is a much smoother, more elongate shell, with a distinct polish, absent in *C. othoniana*. Canal is much longer and altogether different; protoconch also different, being larger, blunter, and more globose. An almost smooth peripheral space is present, as in the new species, but sculpture below and above is the same. Moreover, *M. armorica* Sut. is placed in *Cancilla*, while the new species is a *Conomitra*.

Suter remarks on the resemblance of *M. armorica* Sut. to *M.* (*Cancilla*) *atractoides* Tate, and this is certainly justified, the New Zealand shell differing mainly in details of sculpture. An even closer resemblance to an Australian fossil is shown by the new shell, which resembles *C. othone* T.-Woods so closely as to render its separation a matter of doubt. Authentic Australian shells have not been seen, but judging from the figures (*Trans. Roy. Soc. South Australia*, vol. 11, pl. 4, fig. 10) the body-whorl of the new species is sooner contracted, aperture more dilated, and spiral sculpture not so regular. A more distantly related species is *C. dennanti* Tate.

Conomitra inconspicua (Hutt.). (Plate 50, figs. 2*a*, 2*b*.)

1885. *Mitra inconspicua* Hutton, *Trans. N.Z. Inst.*, vol. 17, p. 326.
1887. *Mitra inconspicua* Hutton, *P L.S. N.S.W.* (2), vol. 1, p. 212.
1915. *Mitra inconspicua* Hutton: Suter, *N.Z. Geol. Surv. Pal. Bull. No. 3*, p. 20.

This common Waihao species is very closely related to the Australian *Conomitra complanata* (Tate), differing mainly in its longer beak, and therefore relatively lower spire.

Mitra eusulcata n. sp. (Plate 51, figs. 11*a*, 11*b*, 11*c*.)

Shell narrowly biconic, rather thin, protoconch of 3½ smooth turns, high, regularly coiled, bluntly pointed, and not distinctly marked off from brephic stage. First whorl with 3, following whorls with 4, subequal spirals, increasing, through grooving of main ribs, to 8 unequal ribs on penultimate whorl; body-whorl with about 24 unequal spirals, a few of which are grooved medially. The ribs are low and flattish, with much narrower interstices; finer and wider apart near beak. No axial sculpture; punctures in interstices seem also to be absent, but as both shells are slightly worn this cannot be determined for certain. Spire acutely conical, lower than aperture, outlines straight, very slightly scalar. Whorls about 9, flat, regularly increasing, body-whorl bluntly angled at periphery, thence tapering quickly to beak. Suture straight, slightly oblique; whorls worn in its neighbourhood so that it seems slightly subcanaliculate; it is also uncertain whether it is margined. Aperture slightly oblique, long and narrow, slightly channelled above, with short open and truncated canal below. Outer lip convex, acute, smooth within. Columella subvertical, slightly twisted below, with 3 plaits in young shell, 4 in larger specimen; plaits rapidly decrease in strength anteriorly, the last being very weak, they are truncated

by edge of inner lip, which also stops the spiral sculpture. Fasciole fairly distinct.

Heights respectively 16·5 mm., 11 mm.; diameters, 6 mm., 4 mm.; heights of aperture, 9 mm., 6 mm.

Types (two shells), from Target Gully, in author's collection. Not yet found elsewhere.

Has near allies in the Australian *M. multisulcata* Harris,* and especially *M. alokiza* T.-Woods. Details of sculpture and aperture are practically identical, except for the apparent absence of punctures in the New Zealand shell. The Australian shell, however, seems to differ in its smaller protoconch ("two small, narrow, rounded turns") and in its dimensions, being much more elongate and having a spire higher than aperture. Harris (*Cat. Tert. Moll. Brit. Mus.*, pt. 1, p. 120) gives the dimensions of an Australian specimen as — height, 66 mm.; diameter, 16 mm.; height of aperture, 28 mm. The new species is also not so markedly angulate on periphery.

Mitra elatior n. sp. (Plate 50, figs. 5*a*, 5*b*.)

Shell in form and sculpture so close to the previous species that it is best described by comparison with it. Protoconch narrower and higher and apparently has an extra turn. First whorl with 5 spirals, increasing later to 6 and then 7 on penultimate whorl; body-whorl with about 20 unequal spirals. Interstices vary from one-half to one-third of ribs in width on periphery, but almost as wide as ribs on base; ribs as in previous species. The shells are not worn, and interstices are finely punctate, due to presence of axial threads which do not appear on ribs; thus it is probable that well-preserved specimens of *M. eusulcata* would show punctation also. Shell is noticeably narrower than in that species and more elongate, shape being narrowly fusiform rather then biconic. Whorls are also much more loosely coiled, the tightly-wrapped appearance of *M. eusulcata* being absent. Body-whorl has no blunt angulation, but is very lowly convex and then contracted to beak much lower down than in the other species. The presence of the perfectly straight supra-peripheral area in *M. eusulcata* makes the spire-area almost a plane surface, hardly interrupted by sutures, but in *M. elatior* convexity of whorls makes sutures appear distinctly incised, although outlines of spire remain straight. Spire is also considerably higher than aperture. Internally, columella bears 5 plaits instead of 4, the uppermost being much the strongest and somewhat removed from the others. Very young shells bear 4 narrow but high plaits (the highest remaining farther away) instead of 3 stout ones. Outer lip quite different inside, being strongly lirate with about 9 very narrow but rather high ridges, many times their width apart.

Height, 19 mm.; diameter, 6 mm.; height of aperture, 9 mm.

Type and several paratypes, from Clifden, Southland (band 6c—Ototaran ?), in author's collection.

Uromitra etremoides n. sp. (Plate 50, figs. 6*a*, 6*b*; Plate 51, figs. 10*a*, 10*b*, 10*c*.)

Shell small, elongate-fusiform, with strong discontinuous axial ridges and fine close spirals. Protoconch pupiform, of 3 almost symmetrical smooth whorls, bluntly pointed, distinctly marked off from brephic stage. Spiral ribs very obscure on earlier whorls, 4 on first, 5 on second, and 6 on the

* Dennant and Kitson (*Rec. Geol. Surv. Vict.*, vol. 1, p. 101) reduce this species to a variety of *M. alokiza* T.-Woods.

rest, sometimes 7 on penultimate, 16 spirals on body-whorl; spirals lowly convex, interstices varying in width, seldom linear, usually subequal to ribs, widening near beak. Axial ribs numerous and irregular in brephic stage, but soon following each other regularly, 7–9 per whorl; generally they are in line with those on contiguous whorls, but slope a little backwards, vanishing on lower half of body-whorl; interstices usually slightly wider. Axial ribs very much stouter and more prominent than spirals, which cross them without forming nodules. Growth-lines rather conspicuous, spire narrowly conic, outlines straight, in young shells one and a third times height of aperture, in adult shells more than one and a half times. Whorls 10, body-whorl subangulated below periphery, then suddenly contracted towards beak. Suture impressed, undulating, submargined by narrow band. Aperture narrowly ovate; high, acutely subangled above, produced below into a short oblique canal with straightened base. Outer lip convex, thin and sharp. Columella straight, vertical, with 3 oblique, strong plaits, decreasing in size anteriorly.

Height, 14 mm.; diameter, 4 mm.; height of aperture, 5½ mm.

Type and ten paratypes, from Target Gully, in author's collection.

This *Vexillum* bears comparison with no New Zealand or Australian Tertiary shells; its characteristic sculpture is reminiscent of the Turrid genera *Etrema*, and especially *Pseudoraphitoma*. Young shells are probably confused in existing collections with *Vexillum fenestratum* Sut., to which they bear a deceptive resemblance, but they can at once be distinguished by the different protoconch and strong columellar plaits.

Lyria zelandica n. sp. (Plate 49, fig. 7.)

Shell of moderate size, ovately biconic, thick, and solid. Apex broken off, remaining adult whorls 6, very lightly convex and a little contracted at lower suture, body-whorl regularly convex, gradually contracting to base. Faint indication of shoulder, midway on spire-whorls, a little below suture on body-whorl. Outer lip swollen by prominent low and wide varix. Sixteen vertical axial ribs per whorl, continuous over all whorls, extending from suture to suture on spire, and almost down to fasciole on body-whorl; ribs prominent, narrowly rounded, but not jutting, smoothed off into flattish or concave interstices which are about twice width of ribs. Axial ribs reduced in size on base and curving round from vertical to horizontal direction on fasciole, projecting slightly at upper suture on all whorls as very low blunt points. No spiral or other sculpture except for growth-lines. Suture impressed, slightly sloping, and rapidly undulating. Spire conic, of almost straight outlines, half height of aperture. Aperture oblique, long and rather narrow, widest medially, the two sides approximately parallel, bluntly pointed and with very slight notch above, thickened below, and forming a broad, shallow, slightly emarginate canal, bordered at base by sharp edge. Outer lip thick and solid, with flattish edge, slightly rising on penultimate whorl. Inner lip restricted and with definite boundary, expanded most medially, thence forming raised blunt edge descending vertically to meet columellar margin in a point at base of canal and proceeding round canal as a sharp margin; on parietal wall inner lip thickens into strong callus at junction with outer lip. Columella practically straight, but oblique in same direction as aperture, rather massive, with three strong plaits on lower half and numerous fine ridges above these. Plaits not very oblique, tending to become quite horizontal or even curving upwards on emergence on inner lip; centre plait a little the strongest.

Height, 41 mm.; diameter, 22·5 mm.; height of aperture, 28 mm.

Type (unique), from Clifden, Southland (band 6c—Ototaran ?), in author's collection.

Although several New Zealand Volutes have previously been placed in this genus, they cannot remain there, and up to the present there has been no undoubted record of *Lyria* from this country. The above species is a fairly typical member of the genus, and cannot be confused with any previously described species. It is not nearly related to any Australian shell, but has a distant likeness to *L. harpularia* Tate, also to the European species *L. maga* (Edw.) and *L. harpula* (Lamk.).

Solecurtus bensoni n. sp. (Plate 50, figs. 8*a*, 8*b*.)

Shell thin and fragile, shining, transversely elongate-oblong, gaping considerably at both ends and dorsally, moderately tumid, considerably depressed ventro-medially; inequilateral, posterior end much longer, anterior side not narrower than posterior, but flexed to left in both valves. Anterior dorsal margin perceptibly sloping and faintly curved; posterior dorsal margin straight, but suddenly rising a little to beak; ventral margin with very slight incurvation medially, corresponding in position to depression in tumidity of shell, curving up more abruptly before than behind. Posterior end almost semicircular in outline, anterior squarely rounded. Umbos small, approximate, a little tumid and pointed, interrupting the regular outline of hinge and marked off by a slight shallow groove on either side, projecting slightly but distinctly beyond dorsal margin. Previous outlines of shell thrown into prominence here and there by light and dark bands. Radial ornamentation of very faint and dense scratches, radiating from umbo on each side of a perpendicular dropped from beaks, much more rapidly slanting and diverging on posterior part and producing there distinct faint raying, especially about the blunt posterior ridge limiting median depression in shell. Anterior division divided approximately into halves by another very low and blunt angulation running from umbo to antero-ventral corner; in front of this radial lines form the only ornamentation, but they are not seen without lens; behind this and over the rest of shell surface is cut into many shallow steps, descending posteriorly, by sinuated engraved lines running to ventral margin from a line drawn from umbo to middle of posterior end. On anterior part of shell the slope of the lines is parallel to that of the limiting low angulation; lines posterior to this gradually swing out till on posterior end they slope in reverse direction, though less strongly; on posterior line from umbo they bend back and run at first subparallel to dorsal margin, but the bending-angle becomes more acute the farther it is from beak till at posterior end lines meet the rounding margin almost vertically. Interior polished, especially muscle-scars and pallial line. Anterior muscle-scar slightly larger, subpyriform, posterior rounded trigonal. Pallial line sloping in downward curve from anterior scar, ending abruptly at considerable distance below posterior scar. Pallial sinus linguiform, very deep, reaching halfway between anterior scar and the vertical from beaks. Left valve with a long sharp upturned cardinal tooth just anterior to umbo, and a sloping low and bifid tooth posterior to it. Interior of right valve not seen.

Length, 2·85 mm.; height, 11 mm.; thickness (two valves), 6·5 mm.

Type and several more or less broken paratypes, from Clifden, Southland (band 6a—Ototaran ?), in author's collection. Although the shell is fairly common at this locality, perfect specimens are not easy to obtain, owing

to its fragility. The type is the only perfect and double-valved specimen so far obtained.

Genus and species new to fauna, though it is a very widely spread genus, and three fossil members have already been described from Australia. Of these, *S. legrandi* Tate is very close to the new species, presenting the same type of grooving and differing in only a few details. Tate gives its dimensions as "Height, 40 mm.; width, 17·5 mm."—a ratio of 2·29 : 1; but his figure measures 40·5 × 16·75—a ratio of 2·42 : 1. The ratio in *S. bensoni* is 2·95 : 1, so that this species is relatively longer than *S. legrandi*, which seems to differ also in the absence of ventral incurvation, less prominent umbos, inconstant height (greater posteriorly), recurved posterior dorsal margin, and slightly different slope of sculpture-lines, which dorsally are not initially subparallel to margin, and ventrally do not reverse in direction on posterior end. From *S. dennanti* Tate and *S. ellipticus* Tate the new species is easily distinguished by the character of grooves. This elegant New Zealand species is with much pleasure dedicated to Dr. W. N. Benson, friend and former teacher of the writer.

Solecurtus evolutus n. sp. (Plate 50, fig. 9.)

Evidently a direct descendant of the previous one, occurring at the same locality in beds geologically a little younger. It agrees with it in all main features, but is slightly more solid, decidedly shorter (especially the posterior end), and higher, with slightly less numerous but stronger and more conspicuous grooves. On anterior end grooves cease with one or two much shorter but not closer grooves, instead of, as in *S. bensoni*, several long grooves close together. The species seems also less flattened medially.

The best-preserved specimen, chosen as holotype, is still considerably fractured, so that its dimensions are somewhat hypothetical: its greatest length is 31·5 mm., greatest height 15·5 mm., and greatest width (one valve) 4·5 mm. If one measures from the largest perfectly intact growth-line the dimensions are 22 mm., 10 mm., 2·5 mm.

Type, a right valve, from Awamoa beach-boulders (Awamoan), in author's collection. Other small fragments were obtained here, at Pukeuri, and at Target Gully. Also some larger fragments from Clifden (band 7c —Hutchinsonian?) which differ from *S. bensoni* of a lower band in the same respects as does the type. That this genus has not been recorded previously is due probably more to the fragility of the shell than to its rarity; the sculpture, however, is distinct and characteristic on even tiny fragments. The present species has the ratio length : height a little over 2·2 : 1, and this brings it even closer than the previous species to *S. legrandi* Tate. The author's thanks are due to Mr. Chapman, of the National Museum, Melbourne, for comparing a photograph of the type and some fragments of the shell with the type of Tate's species; he agrees with the author that the two forms are distinct, though very closely related.

Solecurtus chattonensis n. sp. (Plate 50, fig. 10.)

At once distinguished from the two preceding species by its proportions and the different character of grooves. Anterior side relatively much longer, being over three-quarters the length of posterior side, while it is under two-thirds in the other species. The shell is also still shorter in regard to height than *S. evolutus*. The grooves are only half as numerous and have a different disposition: there are only 17 grooves altogether in the type, while *S. bensoni* of similar size has about 35 and adult shells

have at least 50; the type of *S. evolutus* at a stage comparable to *S. chattonensis* has 26. There are no shorter or closer grooves at first, the transition from the smooth anterior area to strong equidistant grooves being abrupt. Grooves oblique in same direction as initially over most of surface, instead of rapidly swinging round to reverse direction, and the bending-angle above posterior ridge is very slight, the lines remaining always steeply inclined to dorsal margin. All the grooves are stronger, and do not get closer posteriorly, but indeed considerably wider apart, and do not become weaker. Shell is much flatter, especially anteriorly; medial depression not so marked, but valve more flatly depressed postero-dorsally. Growth-lines and rest-periods are much fainter.

Length, 16 mm.: height, 7·5 mm.; width (one valve), 1·5 mm.

Type (unique), from Chatton, near Gore (Waiarekan?), in author's collection.

Although the single specimen is juvenile and incomplete, it differs strikingly from the other two species. The ratio of length to height is only 2·13 : 1. The ratio of anterior to posterior side in the three species described may be tabulated as follows:—

Species.	Anterior Side.	Posterior Side	Ratio.
S. bensoni	10 mm.	18·5 mm.	1·85 : 1
S. evolutus	8·5 mm.	13·5 mm.	1·6 : 1
S. chattonensis ..	7 mm.	9 mm.	1·3 : 1

Barytellina anomalodonta n. sp. (Plate 50, figs. 7*a*, 7*b*, 7*c*.)

Shell rather small but very thick and solid, in shape like an obliquely truncated ellipse, no anterior lateral teeth, right valve with a large posterior cardinal tooth. Beaks contiguous, sharp, but not prominent, dorsally flattened, directed slightly backwards. Anterior end slightly longer; starting from beaks a regular elliptical curve is described until nearing posterior end, when ventral border shows a slight sinuation due to external posterior fold. Posterior end straight, making an angle of about 120° with antero-dorsal edge; it meets upcurved ventral border at angle of about 80°, apex being narrowly rounded off; is flexed to left in right valve, and *vice versa*. External surface appears at first sight smooth and polished, but under lens shows roughening due to extremely fine and dense growth-lines; there are also very inconspicuous narrow and flattish radial riblets with interstices of quite variable width; these riblets are so little raised as to appear more like rays on surface, and, combined with shape of shell, give it a superficial resemblance to *Leptomya perconfusa* Iredale. There is a strong posterior fold in each valve; this grades gently on anterior side into a wide and shallow sinuation which occupies most of posterior end in right valve but is narrow and subobsolete in the more convex left valve; on posterior side it is bounded by a much narrower, cord-like secondary fold from which there is a vertical drop to the straight dorsal margin. A flat lanceolate area is thus formed when the two valves are in conjunction, bearing a strong resemblance to the escutcheon of a *Nuculana*. In left valve an additional slight fold traverses this area close to ligament, which is fairly deep-seated, the well-developed nymphs easily visible from exterior. Interior very uneven, suddenly thickened below pallial line, also in places near hinge. Adductor-scars deeply impressed, especially the posterior, which is subrhomboidal; the anterior elongated, pyriform. Pallial sinus

linguiform, reaching anterior scar and occupying more than half of body-cavity. Margins smooth, sharp. Right valve with two cardinals, the anterior a thin lamina subparallel to dorsal margin; the posterior a large elevated trigonal mass, projecting far above hinge-level and into interior, obsoletely grooved on top; it has the appearance of a Mactrid resilium. Posterior lateral also very large and prominent for the genus, forming a short stout ridge, far removed from cardinal teeth. No anterior lateral tooth in this valve, hinge forming a plain bevelled surface, overhung by dorsal margin; left valve with two cardinals, the anterior moderately strong, elevated, posterior weaker, a trigonal lamina. Posterior lateral very large, trigonally raised, in shape reminiscent of laterals of *Lasaea*. Traces of an anterior lateral are indicated by a very slight ridging of the dorsal margin.

Length, 26 mm.; height, 21 mm.; width (one valve), 6 mm. Length, 24 mm.; height, 20 mm.; width (one valve), 5 mm.

Types (two vales), from Rissington, Hawke's Bay (Pliocene), in author's collection — collected by Dr. Benson. Also paratypes from Glengaree, Napier.

This shell is unlike any previously described from New Zealand, and, on account of its dental peculiarities (very large posterior cardinal and lateral of right valve, and absence of anterior lateral), Mr. Marwick has created for it and a related species the new genus, *Barytellina*, with the Nukumaruian *B. crassidens* Marw. as type (*Proc. Mal. Soc.*, vol. 16, p. 25, 1924.)

Macoma robini n. sp. (Plate 51, figs. 6*a*, 6*b*, 6*c*.)

Shell trigonally oval, thin, inequilateral, much compressed, with fine sharp concentric sculpture. Beaks behind middle, raised and very sharp, pointing inwards and backwards. Anterior end longer, semi-elliptical, dorsal margin very lowly convex and slowly descending; posterior end attenuated, trigonal, dorsal margin slightly concave and obliquely a little truncated just before meeting the broadly and regularly rounded ventral margin, slightly flexed to right in right valve and *vice versa*, the right valve most inflated anteriorly, left posteriorly. Sculpture consisting of fine close sharp concentric ribs, about 5 per millimetre at 20 mm. from beak. Sculpture very distinct, ribs appearing linear, but examination with lens showing that there is great variation in their width, some being comparatively flattish with sublinear interstices, but all having a sharp dorsal edge. Right valve has 2 rather weak folds with a narrow separating groove very near posterior dorsal margin; left valve has 2 similar but narrower folds; on all these the concentric riblets are strongly raised and quite irregular. Right valve with 2 cardinals, posterior bifid, a strong lateral rather distant from anterior cardinal and a weaker one below nymph; left valve with a weak anterior cardinal and rudimentary posterior one, laterals obsolete. Ligament fairly long, strong, Interior filled with matrix.

Height, 25 mm.; length, 39 mm.; width (two valves), 6 mm.

Type and four paratypes, from Otiake (Hutchinsonian), in the author's collection. Collected by Mr. R. S. Allan, whose name is attached to the species.

The shell has some resemblance in shape to *Tellina gaymardi* Iredale, but this has anterior end shorter and a smooth appearance. The nearest relative seems to be *Macoma edgari* Iredale, and it is on account of its relationship with this species, especially in hinge, that it is placed in

Macoma rather than in *Tellina*. It differs, however, from the Recent species in its finely ridged appearance, less inflation and elongation, and unstraightened basal margin. It has also some resemblance to the Australian *T. albinelloides* Tate.

Genus ATAXOCERITHIUM.

Ataxocerithium pyramidale n. sp. (Plate 51, figs. 7*a*, 7*b*, 7*c*.)

Shell small, regularly conical, with nodulous cancellate sculpture and sharply angled periphery. Protoconch of about 3 smooth but apparently worn conical whorls (nucleus lost), marked off from brephic stage by a slight varix; the following 1¼ whorls have only gradually strengthening concave axial riblets, about their own width apart; from this point spiral sculpture begins and rapidly gains prominence. Three main spirals on all whorls (interstices variable but generally much wider), but sooner or later weaker interstitial ribs arise between lower or both pairs of main ribs, and a very faint rib may develop just below suture. Just below periphery on body-whorl an additional rib arises out of suture, and immediately below this there is another rib (exceptionally two faint ribs); both these crenulated. About two-thirds across base a small smooth rib encircles columella, interstices between all basal ribs concave. Axial ribs continue concave and blunt for short distance, but soon become straight and sharply angled, interstices thus appearing wider. They are not quite continuous over the whorls, number about 23 on last whorl, and at intersections with spirals form sharp nodules; they cease just below periphery. Spire about 1½ times aperture with canal, angle about 40°, outlines quite straight. Whorls, apart from protoconch, about 6, regularly increasing, flat, body-whorl sharply angled at periphery, base flattish. Suture canaliculate. Aperture subrhomboidal, interrupted below by a narrow small canal, bent backwards and strongly to left. Outer lip broken. Columella vertical with strong fold margining canal and weaker subparallel one a short distance above it. Inner lip highly callous, spreading over parietal wall and a short distance beyond columella, sharply limited.

Height, 6·5 mm.; diameter, 4 mm.

Type and several paratypes, from Target Gully (Awamoan), in author's collection. Also occurs at Ardgowan; Pukeuri; Awamoa Beach; Clifden, Southland (band 6c—Ototaran ?); and Pourakino, Riverton.

Subspecies **robustum** n. subsp.

Differs in its rather wider spire (angle about 45°) and less cancellate appearance, due to weaker spirals but stronger axials. These are slightly blunter and fewer (about 18 on body-whorl), so that interstices are wider. Otherwise there is no difference.

Height (estimated), 7 mm.; width, 4·5 mm.

Holotype (upper whorls lost and columella damaged), from Taradale Bridge (Hawke's Bay—Pliocene), in the author's collection.

Ataxocerithium nodicingulatum n. sp. (Plate 51, figs. 8*a*, 8*b*, 8*c*, 8*d*.)

Shell moderately small, irregularly conical, with nodulous cancellate sculpture and rounded periphery. Protoconch, obliterated in most specimens, of a few conoidal turns, several whorls follow, ornamented only with flexuous axial ribs. At initiation of cancellate sculpture are 2 bold spirals, quickly increasing by intercalation on later whorls to 3, 4, and up to 9 or

11 subequal spirals on body-whorl and extending over base; interstices wide while the ribs are few but narrower when they are many; towards canal ribs become fainter and smoother. Axial sculpture consists on the upper whorls of rather bluntly rounded ribs (about 20 per whorl) with considerably wider interstices, intersections with spirals raised into vertically compressed nodules, but on body-whorl axials quickly diminish in size and prominence and crowd together, becoming of same strength and width apart as spirals so that a much finer cancellation is produced. At same time whorls become slightly discontinuous, body-whorl appearing greatly narrowed, so that shell presents a characteristic appearance near aperture. Spire more than twice height of aperture, sharply pointed; angle about 35°, but this is variable, spire being slightly concave above, then swelling out, then contracting on body-whorl, and suddenly diminished on base; the different changes in outline and direction impart a somewhat Eulimelloid appearance to shell. Whorls (apart from protoconch) about 8 or 9, early ones flat, later ones convex, body-whorl regularly rounded to convex base. Suture deeply incised, often canaliculate. Aperture subovate, angled and channelled above, produced below into a short deep canal, twisted backwards and to left. Outer lip regularly and strongly convex. Columella vertical, with strong plait margining canal and generally another strong one medially, not parallel to lower one, and sometimes almost obsolete. Strong plait on parietal wall near outer lip, which bears a series of teeth some distance within aperture; these, however, are not well developed unless outer lip is thickened. Inner lip spreading as a well-defined callus over parietal wall, part of base, and beyond columella, forming there a distinct cavity but no umbilicus.

Height, 7·5 mm.; diameter, 3 mm. (holotype). Height, 11 mm.; diameter, 4 mm. (paratype).

Type and many paratypes, from Target Gully, in author's collection. Also from Pukeuri, Ardgowan, and Awamoa Beach.

In sculpture this shell is almost the same as *A. pyramidale*, and there is the possibility that it is only the gerontic form of this species. This might explain such differences as rounded periphery, change of ornament near aperture, &c.; but the inconstant spire-angle and direction, more slender shell, and different implanting of upper columellar plait seem to remove it from the other species. Moreover, the two forms, though occurring together in the same localities, are so readily distinguishable in all stages by shape of periphery that it seems best to treat them at present as distinct species.

Ataxocerithium quadricingulatum n. sp.

Shell fairly small, with nodulous cancellate sculpture and bluntly angled periphery. Apical whorls and outer lip lost. Four narrow and blunt spirals per whorl, interstices wider; another rib emerges on base from suture and two more at equal distances below this, finer riblets appear on neck of canal, and between each pair of main ribs there is near aperture a finer interstitial riblet. Narrow and rather sharp axial ribs (about 25 on body-whorl) cross spirals and are raised at intersections into blunt tubercles. Only the four main riblets on body-whorl are prominently tuberculate, the next one is much less strongly nodulous, and remainder almost smooth. Angle of spire apparently about 35°. Suture incised. A strong columellar plait margins canal, which is long and twisted.

Height, ?; width, 5 mm.

Type, from Petane, in collection of New Zealand Geological Survey.

This shell was included by Suter amongst specimens of *A. suteri* Marwick and labelled "*Newtoniella* n. sp." It has strong affinity with *A. nodicingulatum*, from which it is probably descended, just as *A. pyramidale* subsp. *robustum* may be the successor to *A. pyramidale*. It is distinguishable, however, by its less prickly nodules, unchanged body-whorl sculpture, differently shaped canal, and apparent absence of an upper columellar plait. It also has analogy with *A. huttoni* Cossm., though this has different spiral sculpture.

Besides the four new species or varieties of *Ataxocerithium* described above, four others have been named from the New Zealand Tertiary. These are *A. huttoni* Cossm., *A. perplexum* M. & M., *A. suteri* Marwick, and *A. tricingulatum* Marwick.

A. huttoni Cossm. is readily distinguished by its low and convex spirals with narrow interstices, the spirals being practically confined to base and spaces between axial ribs. Axials numerous, sloping forward, sharply convex, and without nodules, interstices a little wider. There are 5 spirals per whorl and about 7 more on base; axials number about 30 on body-whorl. Shell is fairly large and relatively wide, angle of spire about 45°. Locality, Castlecliff. The type, which was stated by Suter to be apparently lost, has been rediscovered amongst the Geological Survey material, and is now in that collection. The writer agrees with a manuscript remark by Mr. Marwick regarding this species: "The locality, Hampden, given by Hutton and Suter should be deleted, as Dr. Marshall's extensive collections have given a better idea of that fauna." The Hampden record is possibly based on a fragment of the somewhat similar *Alectrion socialis* (Hutt.), which does occur there.

A. perplexum M. & M., described by Marshall and Murdoch* from Nukumaru, is really a *Cerithidea*, very close to *C. bicarinata* Gray, and is possibly only this species with the keels rubbed off. Many specimens of *A. perplexum* M. & M. have been found during the last year, but all are highly polished and worn, and until the discovery of better-preserved specimens Marshall and Murdoch's species should stand, as *Cerithidea perplexa* M. & M.

A. suteri Marwick: This species is described on page 195 of this volume. It comes from Okawa Creek shell-bed, Ngaruroro River (Geol. Surv. loc. 1063), and also from Petane, and is a very distinct form. Its exceptionally tall spire (angle about 20°) characterizes it at once; there are 3 coarsely-nodulous cinguli per whorl, and 3 more on base, nodules are in line on successive spirals, and roughly indicate axial ribs as strong as spirals, interstices between spirals and axials are sublinear. A figure of this species (Plate 51, figs. 9*a*, 9*b*) is given in order that its characteristic sculpture may be contrasted with that of the other species described.

A. tricingulatum Marwick, from the same locality (Okawa Creek), is also described in this volume (p. 194). It is very similar to the previous species in sculpture, but axial ribs are more distinct and numerous, nodules smaller and finer, and the three basal ribs almost smooth. It is at once distinguished by its shape, the spire being much less acute (angle about 35°) and suture much more deeply incised. Besides the type, only two specimens from Nukumaru (in author's collection) are known.

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* P. MARSHALL and R. MURDOCH, Some New Fossil Species of Mollusca, *Trans. N.Z. Inst.*, vol. 51, p. 254, 1919.

KEY TO THE NEW ZEALAND SPECIES OF ATAXOCERITHIUM.

Shell acicular, spire more than three times height of aperture ..	*A. suteri.*
Shell not so elongate, spire not more than twice height of aperture.	
(1.) Axial ribs smooth, much more prominent than spiral ribs which are confined to base and interstices ..	*A. huttoni.*
(2.) Axial ribs nodulous.	
(A.) Periphery sharply angled.	
Spirals equally nodulous.	
Axials rather weak and narrow ..	*A. pyramidale.*
Axials strong and wide	*A. pyramidale* subsp. *robustum.*
(B.) Periphery convex.	
(AA.) Four or more spirals per whorl.	
(*a.*) Periphery regularly rounded, rather finely cancellate appearance	*A. nodicingulatum.*
(*b.*) Periphery subangled, rather coarsely cancellate appearance	*A. quadricingulatum.*
(BB.) Three spirals per whorl	*A. tricingulatum.*

Chione (s. str.) **crassitesta** n. sp. (Plate 50, figs. 1*a*, 1*b*, 1*c*.)

Shell trigonally ovate, extremely swollen and solid, radial and concentric ornament prominent. Beaks very prominent, inflated, situate at anterior third of length. Anterior end shorter, angularly ovate, dorsal margin twice strongly sinuated. Posterior end subangled in two places, obtusely dorsally and relatively much more acutely ventrally; basal margin flatly rounded. Lunule heart-shaped, fairly distinct, short but extremely wide. No escutcheon. Strong squarely rounded radial ribs cross the whole surface, becoming subobsolete posteriorly (about 30 can be counted on the type; in *C. stuchburyi* (Gray) they reach 40 or more). Very prominent foliaceous concentric ribs decussate the radial sculpture, are rather narrow (interstices two to three times their width), and are most strongly developed antero-medially. (In *C. stuchburyi* (Gray) concentric ribs are much finer, sharper, and more numerous.) Margins finely crenulate except posteriorly, crenulations regular, but indications of development of coarser ridges on posterior ventral part; this has taken place in *C. Stuchburyi* (Gray). Hinge very solid and strong; similar to that of *C. stuchburyi* (Gray) except that anterior cardinals in each valve are more nearly vertical, other cardinals are relatively stouter and more deeply cleft, and hinge-line projects farther into shell beneath median tooth. Nymphs very strong and prominent. Posterior adductor-scar slightly larger, but the anterior more sunken. Pallial line distinct, distant from margin, sinus short and acutely trigonal.

—	*C. crassitesta* nov.	*C. stuchburyi* (Gray), Normal Form.	*C. stuchburyi* (Gray) var. Auckland Islands.
Length	47 mm.	47 mm.	65 mm.
Height	43 mm.	40 mm.	50 mm.
Width (two valves) ..	43 mm.	20 mm.	36 mm.

Holotype, from Clifden, near Cape Kidnappers (Pliocene), in author's collection—collected by Dr. Benson. Paratypes in Otago University School of Mines collection.

The nearest Recent relative to this shell is the massive variety of *Chione stuchburyi* (Gray) found at the Auckland Islands. From this it is easily distinguished by its different dimensions, lunule, sculpture, and pallial sinus. Mr. Marwick has collected, in the Hawke's Bay District, great numbers of a form which in thickness is intermediate between *C. stuchburyi* (Gray) and the present species, but otherwise is nearer the Recent shell. Since typical forms of *C. stuchburyi* are found fossil in the Greta beds, which are older than those at Clifden, *C. crassitesta* is probably not ancestral but an offshoot from the *C. stuchburyi* line.

Conus (Lithoconus) triangularis n. sp. (Plate 48, figs. 10*a*, 10*b*.)

Shell small, apparently rather thin and fragile. Protoconch lost in both specimens seen, but apparently projecting above perfectly flat spire. Whorls at least 6, with linear sutures hardly distinguishable from sculpture-lines, horizontal above, but acutely keeled at periphery of body-whorl, forming an almost perfect angle of 65°, then rapidly sloping to canal, but slightly indented in two places—just below keel and a little above canal. Spire-whorls, and that part of body-whorl above keel, bear 4 strong spiral cords, of which inner and outer are wider and flatter than middle pair; the rest of body-whorl covered over whole surface with rather strong and closely-set spiral cords, low and rounded, a little less than their own width apart. Aperture filled with hard matrix, but evidently very narrow; columella twisted in front. Posterior sinus, as indicated by lines of growth, is apparently extremely shallow, and removed from suture.

Height, 16 mm.; width, 15 mm. The paratype has the corresponding dimensions 17 × 16½ mm.

Type and one paratype, from Kakanui (on the beach near the quarry, from tuffs below the limestone), in author's collection.

This is the second representative of *Lithoconus* that has been found in New Zealand. *Conus* (*Lithoconus*) *abruptus* Marshall occurs at Pakaurangi Point, but the Kakanui shell is not related to it except subgenerically, differing in its squat shape, much more acute keel, and totally different sculpture. Here, again, the nearest ally is Australian, *Conus* (*Lithoconus*) *dennanti* Tate, of Balcombian and Janjukian beds, and these two are very closely allied. The crown of *C. dennanti* is a little concave, that of the New Zealand shell almost perfectly plane. Harris (*Cat. Tert. Moll.*, pt. 1, p. 33) comments on the sharpness of the keel of *C. dennanti*; that of our shell is sharper still and the angle somewhat smaller. The Australian shell is rather elongate (33 × 20 mm.), approaching more the shape of *C. abruptus* Marshall (20×11 mm.), the ratios of height to width being—*Conus abruptus* Marshall = 1·82; *Conus dennanti* Tate = 1·65; *Conus triangularis* Finlay n. sp. = 1·07. The sculpture, keel, and spire of *C. dennanti* Tate, however, remove it from the vicinity of *C. abruptus* Marshall, but indicate its very close relationship to *C. triangularis* Finlay n. sp., the differences being in degree alone.