

Sea Shells of New Zealand

C. E. R. BUCKNILL

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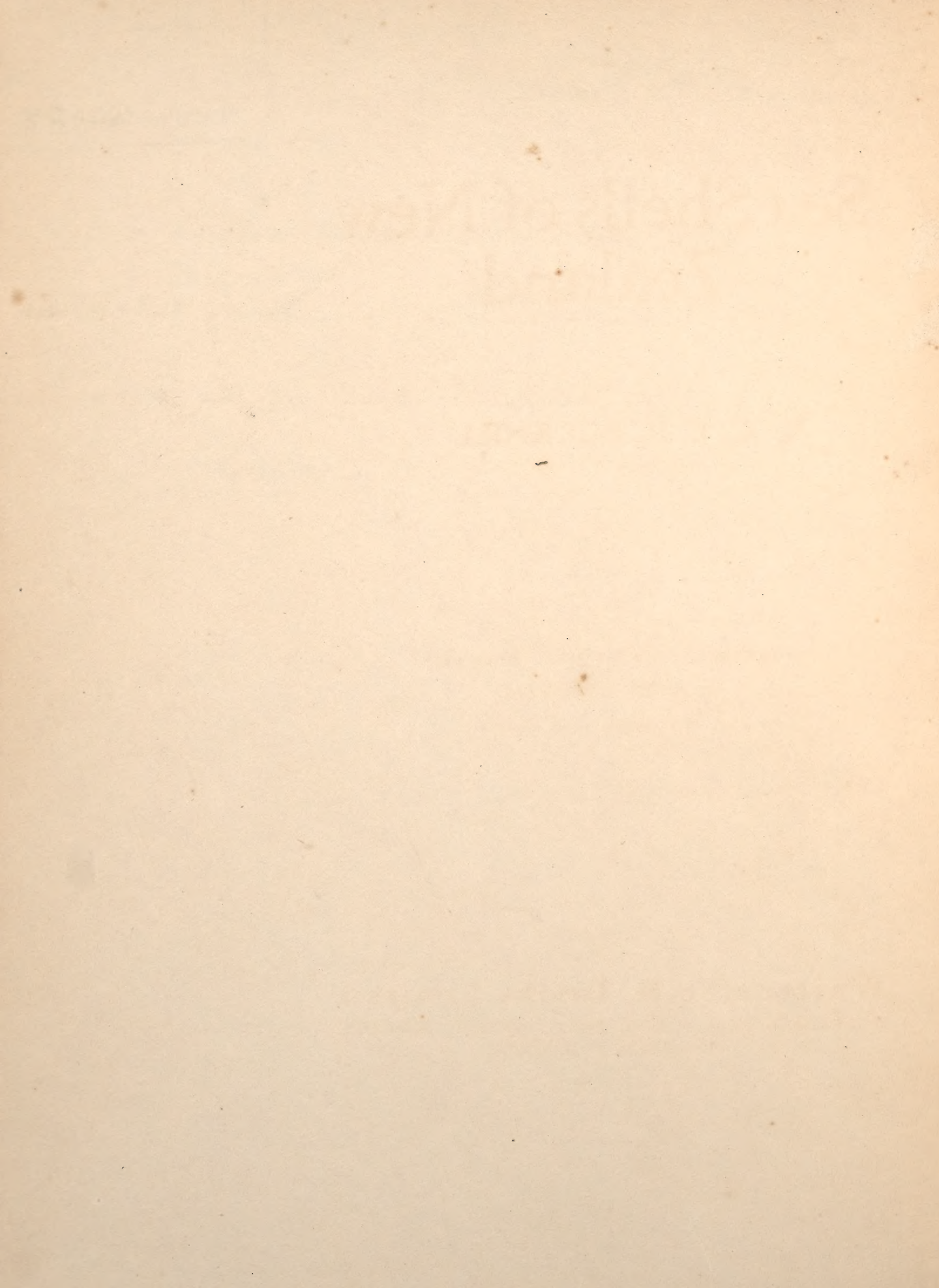
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Remembrance of your many kindnesses

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C. R. Bucknill

November 18. 1924.



Sea Shells of New Zealand

by

C. E. R. BUCKNILL
(L.M.S.S.A., LOND.)

Illustrated with Original Drawings

by A. W. B. POWELL

and Photographs from Nature

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Sea Shells of New Zealand

C. E. R. ROCKWELL

Illustrations by
W. A. W. KOWELL
and Thomas A. Jones

Whitcombe & Tombs Limited
Wellington Christchurch Dunedin
Melbourne Sydney

'Nature hath made nothing so base, but can read some
instructions to the wisest men'

—*Aleyn*



'Each shell, each crawling insect, holds a rank
Important in the plan of Him who framed
This scale of beings; holds a rank which, lost
Would break the chain, and leave a gap
Which Nature's self would rue.'

—*Thomson*



'Every form of the beautiful contains the beginning and
the end of its beauty in itself, nor has praise any part in it
whatsoever'

'Traverse therefore this little moment of time at peace with
Nature and reach thy journey's end in all content.'

—*Marcus Aurelius*

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INDEX

Acmaea	cantharus	11	Chamostrea	albida	115
"	daedala	11	Chione	spissa	105
"	fragilis	12	"	stutchburyi	106
"	Helmsi	12	"	yatei	107
"	parviconoidea	12	Cochlodesma	angasi	114
"	pileopsis	13	Cominella	huttoni	64
"	rubiginosa	13	"	lurida	64
"	septiformis	13	"	maculata	65
"	stella	14	"	maculosa	65
"	" corticata	14	"	nassoides	65
Amphibola	crenata	81	"	virgata	66
Ampullina	undulata	47	Corbula	zelandica	111
Ancilla	australis	75	Crepidula	costata	46
"	" var pyramidalis	76	"	crepidula	46
"	bicolor	76	Cymatium	exaratum	53
"	depressa	76	"	spengleri	53
"	mucronata	76	Cytherea	oblonga	105
Anomia	Walteri	85	Dentalium	nanum	84
Arca	decussata	86	Diplodonta	globularis	96
Architectonica	lutea	56	"	zelandica	96
"	reevi	57	Divaricella	cumingi	96
Argobuccinum	argo	54	Dosinia	anus	104
"	australasia	54	"	lambata	104
Argonauta	argo	116	"	subrosea	104
"	tuberculata	117	Drillia	novae zelandiae	77
Astraea	heliotropium	34	Emarginula	striatula	21
"	sulcata	35	Epitonium	bucknilli	57
Atrina	zelandica	94	"	jukesianum	57
Barnea	similis	113	"	philippinarum	58
Bathytoma	cheesemani	77	"	tenellum	58
Bullaria	australis	79	"	zelebori	58
Bullina	scabra	78	Ethalia	zelandica	36
Calliostoma	pellucidum	31	Euchelus	bellus	33
"	punctulatum	32	Euthria	linea	63
"	selectum	32	"	littorinoides	63
"	tigris	32	"	martensiana	63
Calyptraea	maculata	45	"	vittata	63
"	scutum	45	Fulguraria	arabica	74
Cantharidus	dilatatus	27	"	" var. elongata	74
"	opalus	27	"	" var. jaculoides	74
"	pupillus	28	"	gracilis	75
"	purpuratus	28	Fusinus	spiralis	60
"	rufozona	29	Gadinea	nivea	83
"	sanguineus	29	Gibbula	suteri	31
"	tenebrosus var.	29	Glycymeris	laticostata	87
"	huttoni	29	"	modesta	87
Cardita	calyculata	95	Haliotis	australis	20
Cerithidea	bicarinata	39	"	iris	19
"	subcarinata	40	"	virginea	20
"	tricarinata	40	Haminea	zelandiae	79

Sea Shells
of New Zealand

<i>Helcioniscus denticulatus</i>	14	<i>Myodora boltoni</i>	115
" <i>ornatus</i>	15	" <i>striata</i>	115
" " <i>var. inconspicuus</i>	15	<i>Mytilus canaliculus</i>	87
" <i>radians</i>	15	" <i>planulatus</i>	88
" " <i>var. argenteus</i>	16	" <i>magellanicus</i>	88
" " " <i>flavus</i>	17	<i>Natica zelandica</i>	47
" " " " <i>olivaceus</i>	17	<i>Nerita melanotragus</i>	37
" <i>redimiculus</i>	18	<i>Nucula hartvigiana</i>	84
" <i>stelliferus</i>	18	<i>Ophicardelus australis</i>	80
" <i>strigilis</i>	18	<i>Ostrea angasi</i>	93
<i>Hemithyris nigricans</i>	118	" <i>glomerata</i>	94
<i>Janthina balteata</i>	49	<i>Panopea zelandica</i>	112
" <i>exigua</i>	50	<i>Paphia costata</i>	107
" <i>globosa</i>	50	" <i>intermedia</i>	107
<i>Lamellaria ophione</i>	48	<i>Pecten convexus</i>	91
<i>Latirus huttoni</i>	60	" <i>imparvicostatus</i>	91
<i>Leptomya lintea</i>	99	" <i>medius</i>	92
<i>Lima bullata</i>	93	" <i>zelandiæ</i>	92
<i>Lima lima</i>	93	<i>Phalium labiatum</i>	55
<i>Lithophaga truncata</i>	90	" " <i>var. pyrum</i>	55
<i>Litorina cincta</i>	37	<i>Phasianella huttoni</i>	36
" <i>mauritiana</i>	37	<i>Philine constricta</i>	80
<i>Macrocallista multistriata</i>	104	<i>Pholadidea spathulata</i>	112
<i>Mactra discors</i>	101	" <i>tridens</i>	113
" <i>elongata</i>	101	<i>Photinula nitida</i>	30
" <i>ovata</i>	102	<i>Placunanomia zelandica</i>	86
" <i>scalpellum</i>	102	<i>Planaxis braziliana</i>	38
<i>Malletia australis</i>	85	<i>Polinices amphialus</i>	47
<i>Mangilia sinclairi</i>	78	<i>Protocardia pulchella</i>	109
<i>Marginella mustelina</i>	76	<i>Psammobia lineolata</i>	110
" <i>pygmaea</i>	77	" <i>stangeri</i>	110
<i>Marinula filholi</i>	80	<i>Pupa gracilis</i>	81
<i>Megalatractus maximus</i>	59	<i>Resania lanceolata</i>	103
<i>Mesodesma australe</i>	99	<i>Risellopsis varia var. carinata</i>	38
" <i>subtriangulatum</i>	99	<i>Rissoa zosterophila</i>	39
" <i>ventricosum</i>	100	<i>Rissoina rugulosa</i>	39
<i>Mitra carbonaria</i>	61	<i>Rochefortia reniformis</i>	97
<i>Mitrella choava</i>	73	<i>Saxicava arctica</i>	111
" <i>paxillus</i>	73	<i>Scutus ambiguus</i>	21
<i>Modiolaria impacta</i>	89	<i>Seila chathamensis</i>	40
<i>Modiolus ater</i>	89	<i>Septa costata</i>	51
" <i>australis</i>	89	" <i>rubicunda</i>	51
<i>Monilea egena</i>	31	<i>Serpulorbis siphon</i>	41
<i>Monodonta æthiops</i>	23	<i>Siliquaria weldii</i>	41
" <i>atrovirens</i>	24	<i>Siphonalia caudata</i>	61
" <i>coracina</i>	24	" <i>dilatata</i>	62
" <i>corrosa</i>	24	" <i>mandarina</i>	62
" <i>excavata</i>	25	" <i>nodosa</i>	62
" <i>lugubris</i>	25	<i>Siphonaria obliquata</i>	82
" <i>morio</i>	26	" <i>zelandica</i>	82
" <i>nigerrima</i>	26	<i>Solemya parkinsoni</i>	84
" <i>subrostrata</i>	26	<i>Soletellina nitida</i>	111
<i>Murex angasi var. eos</i>	66	<i>Spirula spirula</i>	116
" <i>octogonus</i>	66	<i>Spisula aequilateralis</i>	102
" " <i>var. umbilicatus</i>	67	<i>Struthiolaria papulosa</i>	43
" <i>ramosus</i>	67	" <i>vermis</i>	44
" <i>zelandicus</i>	68	" <i>var. tricarinata</i>	45
<i>Myllita stowei</i>	97		

Submarginula intermedia	21	Trophon ambiguus	68
Tellina alba	98	" cheesemani	69
" deltoidalis	98	" corticatus	69
" disculus	98	" curtus	70
" spenceri	99	" plebeius	70
Terebratella rubicunda	117	" rugosus	71
" sanguinea	118	Turbo granosus	33
Terebra tristis	78	" smaragdus	33
Thais haustum	71	Turbonilla zelandica	59
" scobina	72	Turritella carlottae	41
" " var. albomarginata	72	" fulminata	42
" striata	72	" pagoda	42
" succincta	73	" rosea	42
Tonna variegata	56	Venericardia australis	96
Trichotropis clathrata	48	Venerupis elegans	108
Trivia australis	50	" reflexa	108
Trochus oppressus	22	" siliqua	108
" tiaratus	22	Vexillum rubiginosum	61
" viridis	23	Xenophora corrugata	45
		Zenatia acinaces	103



Introduction

SIXTEEN YEARS have now elapsed since a book has been published in New Zealand for the amateur collector, and Time has wrought some changes, even in such an apparently immutable science as conchology, though the changes have been of no greater moment than the altering of a name, some slight modification in the classification of species, or the discovery of some small and hitherto unknown Mollusc.

Some books have the disadvantage of being too technical and profuse for the person of average education; others again are so simple and sketchy in dealing with the subject that they are most unsatisfactory to those wishing to gain a working knowledge of conchology; so I have tried to strike a happy mean in the following pages, and hope my efforts will not have been in vain. While endeavouring to confine myself to plain terms, the defining of subtle differences in varieties or species is, at times, a matter of some difficulty. In avoiding the Scylla of scientific terminology, so exact and precise, yet exasperating to the novice, one has to be equally chary not to steer into the Charybdis of too much simplicity, and thereby fail to portray features that are so distinctive as to claim immediate recognition when once pointed out. Most of us may remember the story of a Frenchman who, when working on a dictionary, described the crab as "A little red fish that runs backwards." Cuvier, or perhaps it was Buffon, in criticising the work, said: "The crab is not a fish, it is not red, nor does it run backwards; otherwise the definition may serve." So I am hoping this little book, imperfect though it be, will find favour as guide, philosopher and friend to those who see beauty and refinement and grandeur in Nature, scattered with a lavish hand by an all-wise

Creator, who saw, and still sees, that everything that He had made was very good.

As for me, if I can persuade my readers—or, let me say, my friends—to view, with kindly eye, objects that so far may have appealed but faintly to their sense of beauty, then shall I be amply rewarded; for the joys of life are ever present, even in the simplest forms, and, once we realise this, we can fully appreciate the immortal words of Keats—

“A thing of beauty is a joy for ever.”

Marine Shells of New Zealand

THERE is a hackneyed aphorism, worthy of Chesterfieldian reproof, but that we can risk, that "there is no accounting for taste." Here I venture to differ. I think that where a lack of taste is plainly manifest, we shall find what Oliver Wendell Holmes calls a "mental astigmatism." More probably there is no mental error of refraction (or if there be, it may be carefully corrected), but merely a wrong viewpoint is taken, even as an indifferent three-quarter face, from another aspect, may prove a lovely and perfect profile. Mediocrity, of course, we shall always have, and even for that we can be grateful; otherwise, how should we be able to value the best? Tastes and inclinations are often merely moods, acquired through environment and nurtured by temperament. "Some men there are love not a gaping pig; others go mad if they behold a cat, a harmless, necessary cat." And Shakespeare understood human nature like no other man, either before his time or since.

You will be wondering, what in the world has this to do directly or indirectly with conchology? And I will tell you how the viewpoint affects everything. Now, one of the shells to be mentioned later on has been described by a man, well read, cultured and broadminded, as a "battered, uneven shell," and, according to this meagre description, I found it, for a long time, impossible to identify this particular species. And at last, what did I find? To my agreeable surprise a shell that conjured up a delightful vista of thought, reaching far away back to Tyndall's "dim twilight of antiquity," when dragons of tons weight hurtled through the air, and huge saurians wallowed and fought and loved and died in the seething flood flowing through the primeval forest. Then the very roughness of the shell suggested to my mind the old linen-fold panelling of Jacobean mansions, courts and palaces; the colouring, too, is reminiscent of the most luring inspirations of Leighton, soft blendings of tones and delicate draperies; while the

sculpture of the spire—which, by the way, is a technicality, poetical rather than prosaic, yet practical withal—recalls the classical drawing and wealth of architectural detail so dear to the lover of Grecian art. And for this “feast of reason and flow of soul” I tender my humble and devout thanks to one poor battered, uneven shell, a stone, as it were, rejected of the builders. Well may the words of the Lakeside bard recur to us:—

“A primrose by the river’s brim
A yellow primrose was to him,
And it was nothing more.”

Another unassuming little shell, ebony black in hue, calls up from memory’s deeps visions replete with elephants richly caparisoned, diamonds and rubies, sunshine, joy and radiance. Is not this all worth while? Are not life’s most precious gifts somewhere within our grasp? Some of us, mostly of maturer years, have travelled, maybe, a little nearer to the Delectable Mountains and have a clearer view of the peaks of that glorious range, but we none the less love to linger beside the track, and hold sweet converse with those who are nearest. And these are the pleasures of memory, with its association of ideas.

To those too young to have stored up many years of memories there is always that *joie-de-vivre* which is the divine right of Youth, and we must see to it that they come to their rightful heritage. We must encourage in every way the faculty of seeing all that is good and beautiful in this best of all possible worlds; of hearing music in every sound, from the gentle lapping of the tide to the roaring of the surf, and not forgetting the words of the wisest of all wise men—“A merry heart doeth good like a medicine.”

Some captious critics tell us that our New Zealand shells are not to be compared to those from tropical waters; and, perhaps, in some respects they are right. A riot of colour and a tendency to the flamboyant appeal to some, while to others they are far too stimulating, not to say aggressive, in appearance, and a more subdued mode is to be preferred. But whatever shape, decoration, or colour scheme is displayed, there is always something to be admired, even in the lowliest of shell-fish. There is no single species in all the seven seas but presents some superlative quality. It may be its highly-glazed or enamelled surface; its iridescent and pearly interior; the symmetry and detail of its sculpture; the solidity or delicate fragility of the shell; the dazzling white, or the intense black, that appeals. Everything is of the best, for Nature has no second grade,

and any imperfections are rated with those of the unfit which do not survive. Even as the most æsthetic tastes can always be gratified, so can the physical appetite, for we have a range of edible shellfish unsurpassed in any other quarter of the globe. The Auckland Rock Oyster is, without fear of contradiction, second to none, and is quite equal to, if it does not excel, the famous Colchester native, prized by the Romans, and to this day considered worthy of a Lucullian feast, held annually at the opening of the oyster season, and attended with great ceremony by a large and distinguished company.

Now, as regards collecting specimens and preparing them for the cabinet, we must hold to one cardinal rule—always to look out for the best; failing that, the next best. Do not throw away a specimen, whether imperfect or dead, until you can replace it with a better one, and remember that good specimens are always worth keeping, even as duplicates, for exchange with fellow collectors.

If the shells contain the living fish, you may either boil them or not, but my experience is that, whenever it is possible to avoid boiling them, it is better to do so. Some persons think that there is something horribly cruel in the idea of boiling live creatures, and hold, with the gentle Isabella, that "the beetle feels as great a pang as when a giant dies," though personally I can assure you that this is contrary to all fact. For instance, the Harp shells inhabiting the Indian and Pacific Oceans, but not represented in New Zealand waters, have the extraordinary faculty of self-mutilation, pressing the sharp outer lip of the shell upon the hind portion of the foot and severing it to divert the attention of their enemies. On the other hand, the human race, including giants, prefer to perform primary amputations upon the enemy, when any little diversions of the kind are called for; which goes no small way to prove that their sensory nervous system is more highly organised than it is in the case of the mollusca. None of the bivalves require boiling, unless one should be pressed for time, and then only the pure white or yellowish white ones should be subjected to a high temperature. Species like the *Venericardia Australis*, with its beautiful rose interior, the violet Sunset shell, the *Protocardia pulchella*, and a few other exquisitely tinted bivalves should be allowed to open naturally—as they will in a few days,—when they can be cleaned quite readily, and rinsed in cold fresh water; then you will find the natural colour will be retained by the valves for a considerable time. For small shells up to half

and three-quarters of an inch in diameter, a good plan is to immerse them in methylated spirit for twenty-four hours or more, according to size. The alcohol removes the water from the tissues of the animals' bodies, and by destroying all putrifactive organisms renders them perfectly inodorous. Slightly warm the shells after removing from the spirit, when they will dry very rapidly, and may be placed in the cabinet almost immediately. It is surprising, too, how clean these shells become if left for some weeks in spirit. The green stains which are so common are entirely dissolved out, and the Nulliporites (vegetable concretions) are softened to such an extent that they can be scraped or picked off without difficulty.

Now for those shells of an inch and upwards in diameter, I am afraid the only commendable course is to boil them for a quarter of an hour or so, and then, with a sharp, curved skewer, using a twisting movement, carefully unscrew the animal out of the shell. You may manage to extract the body intact, and possibly you may not; a large portion of the tail or hinder end often being left behind in the spire of the shell. In that case the only plan is washing out vigorously every day with fresh water until the part begins to macerate, when it may be easily jerked out. With some species, boiling seems to injure the epidermis, and the colour suffers in consequence. It will be as well, under these circumstances, to save a few specimens and place them in a wooden box, perforated at the ends, so that, while blowflies, ants, and scavenger beetles may have free access to them, they are at the same time protected from the sun and rain. Wash them daily, but dry the shells every time water is used. Do not omit to keep the operculum for two or three specimens, as well as for your duplicates. When perfectly sweet and clean, the shells may be stuffed with cotton wool, and with a dab of liquid glue the operculum may be secured in its proper position. In order to remove barnacles, mussels, and other parasites, a piece of sharpened wood is the best thing to use, or a penknife; but the knife requires gentle manipulation, lest it damage the shell irretrievably. Some incrustations are best attacked with spirits of salts diluted with equal parts of water, but be sure to have a bowl of water at hand in which to dip the shell from time to time before corrosion proceeds too far. Then a rag, with a pinch of fine sand sprinkled on it, may be carefully rubbed over the shell, which should be examined every now and then to see how you are getting on; perhaps giving another touch of acid here and there to obstinate spots, but always with extreme caution. As this acid is corrosive in its action,

do not drop any on your clothes, nor get it on your fingers. The latter you can dip in the water, but the clothing, if touched, will be instantly and permanently stained. When the shells are cleaned to your entire satisfaction—and only a few may require the acid treatment,—rub them over with a vestige of sperm oil. This brings up the colour better than anything else, and is incomparably better than varnish, which I advise you to leave severely alone. Applying varnish to a shell is about as iniquitous a proceeding as daubing it over Chippendale or old oak furniture—a vandalism not to be dreamed of.

And now a few words as to the description of the shells. I have not attempted to give any classification whatever, nor have many words of thunderous length been permitted to escape from the glossary; each species has a plain and, I hope, a fairly accurate account of it drawn up, which, taken with the illustrations, should make identification reasonably easy.

You may readily surmise that there is a difficulty in the diversity of names when you come across one species which has no less than six different ones. Take, for instance, the *Bathytoma Cheesemani*; it is known as the *Drillia Cheesemani*, *Pleurotoma Cheesemani*, *Surcula Cheesemani*, *Bathytoma Zelandica*, and the *Pleurotoma Zelandica*. Truly its name is Legion! But I have described it only under the name by which it is to be found in Henry Suter's *Manual of New Zealand Mollusca*. This book, and the atlas of plates illustrating it, forms a most valuable work, and one that no true collector can dispense with. But, while recommending this work, it must be borne in mind that many of the names employed have since been found to be merely synonyms, and some of the species, and even genera, have been entirely deleted on purely anatomical grounds. A critical analysis of Suter's *Manual*—particularly in regard to nomenclature—has been embodied in a paper written by Iredale, communicated to the New Zealand Institute and published in the *Transactions and Proceedings of that Society* for the year 1914 in Vol. XLVII. This volume can be purchased by the public, but as the review in question contains neither figures nor descriptions, it will be understood that the *Manual* is, certainly in the first instance, the book to buy. Then, if the study of it prove sufficiently engrossing to make it desirable to adopt the newer or more correct nomenclature, the collector can take Iredale's paper and make all the necessary alterations in the labelling and arrangement of his specimens. Speaking

of labelling, reminds me that the amateur should be quite as careful to record the locality of his specimens as he is in getting the correct name; otherwise he may find his collection will possess little scientific value. It will be noticed that I adhere to the old term Conchology, instead of Malacology, as both words have precisely the same meaning (*vide* Webster, Nuttall, and others), and include the study of the animals, as well as of the shells they inhabit.

Without wishing to detract in the slightest degree from the painstaking and scientific accuracy of the conchologists, deserving as it is of the highest praise, one cannot peruse their works without being forcibly reminded of the amazed rustics in the "Deserted Village" when the parson and the schoolmaster engaged in their controversial bouts. Even the colours of the shells are labelled with obsolete and awkward terms. Who but Dr. Dryasdust would speak of rufous, fulvous and luteous when reddish, tawny-yellow, and clay-coloured serve the same purpose equally as well, and, moreover, are good old English besides? With the use of simple Anglo-Saxon words, such as Shakespeare and John Bunyan used, one could graphically depict a gorgeous sunset by Turner, and do justice to a glowing Cuyt. However, we need not concern ourselves further with these verbal idiosyncracies, but proceed forthwith to the consideration of our shells.

Before reading the text of this book, be sure to study the diagrams illustrating the terms applied to univalves and bivalves, and do not fail to refer to the glossary when you come across a word unfamiliar to you, and not explained in the letterpress.

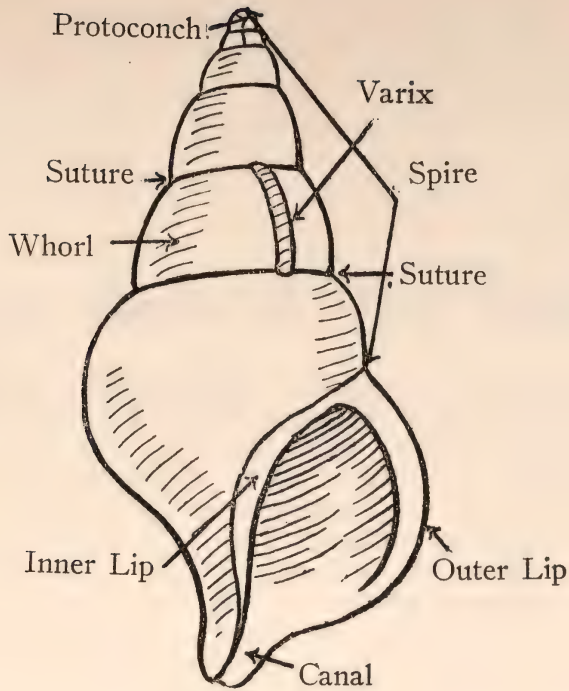


Diagram of
Spiral
Univalve
Shell

LEFT VALVE

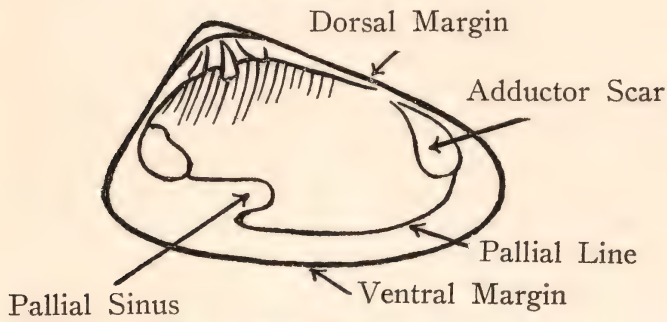
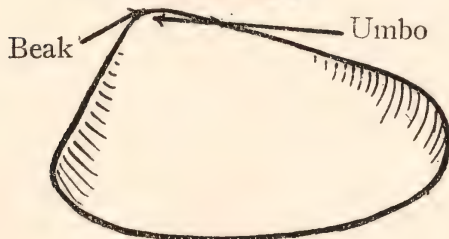


Diagram of
Bivalve
Shell

RIGHT VALVE



Marine Shells of New Zealand

ACMAEA CANTHARUS (*akme*, a point; *kantharos*, a shallow two-handled tankard, a pot).—A small oval limpet, about half an inch in length, with a thin, comparatively smooth shell, having the apex, which is a hooked beak, situated in the anterior or front quarter. The front of the shell has a concave slope, and the posterior, or hind slope, is a convex one. The sculpture, or external moulding, though more often than not obscured by incrustation, consists of fine concentric growth lines and fine striæ (literally, scratched lines) radiating from the apex; these can only be seen with a good lens. In colour the shell is brownish, flecked with white, and the interior is "light blue, occasionally light brown; central area chestnut brown, the sharp margin often banded or dotted with yellowish brown." (Suter).

Found at Oamaru; Dunedin; Preservation Inlet; Herne Bay, Auckland Harbour.

Note.—Although this *Acmaea* has been given a specific name, it is recognised now as the juvenile form of *Acmaea Pileopsis*. In collecting shells it is always advisable to procure a fair number of them, as the colour variation is likely to prove confusing if you content yourself with a pair only. For instance, in twenty-seven specimens of the *Acmaea Cantharus* which I obtained from small and sheltered rock pools near high-water mark at Herne Bay, there were only three out of that number that were really blue internally; the others were of an indeterminate blue, one a bluish white, and the remaining twenty ranged from yellowish browns and light browns to purplish browns. The marginal bands also showed considerable variety, the blue interior being bordered with black, the others being for the most part parti-coloured.

ACMAEA DAEDALA (*akme*, a point; *Daedalus*, a mythical Greek sculptor).—A small oval limpet of a pale yellowish colour, marked with a network of fine brown lines. The apex is pointed and curved forward. The

Plate V
No. 9

interior shows the outside network on a ground of greenish tint. Margin smooth. About a quarter of an inch in length, it is found between tide marks attached to the under side of loose boulders.

Auckland Harbour; Mount Maunganui; Wellington Harbour; Sumner; Lyttelton; Greymouth.

Plate V
No. 5

ACMAEA FRAGILIS (*akme*, a point; fragile).—A small limpet, almost transparent, oval in shape, remarkably flattened, with the apex close up to the front margin, and coloured green and brown in alternate concentric bands. Internally the prevailing colour is bright green, not exactly an emerald green as usually described, but the beautiful opaque green seen on antique bronzes. Like all the acmaea family the *A. fragilis* is not iridescent internally. It is slightly over half an inch in length, and is found by turning over smooth loose boulders between tide marks. It is better not to use a knife in removing them, as the shells are almost sure to suffer; but, after sprinkling them with a little water, gently slide them off with the finger and thumb.

Found in the North and South Islands: Smugglers' Bay; Whangarei Heads; Mount Maunganui; Chatham Islands.

Plate V
No. 8-8a.

ACMAEA HELMSI (*akme*, a point; named in honour of Mr. R. Helms).—This little acmaea bears a strong family likeness to the *A. Daedala*, having similar sculpturing, and colour marking externally; but the shell is rather rounder in outline, the *A. Daedala* being slightly more of an elongated oval. The *A. Helmsi* has an opaque central area, and a semi-transparent border rayed with dark brown, radiating streaks.

Found on boulders between tide marks, Picton, South Island.

Plate V
No. 4-4a.

ACMAEA PARVICONOIDEA (*akme*, a point; *parviconoidea*, like a small cone).—These delicate little limpets are found on the rocks in company with the *Modiolus ater*, the well-known small black mussel, which clusters so densely on the piles of wharves and piers. The shell is oval, and usually highly conical, with the apex near to the anterior third, sharply pointed and more or less curved forward. Although this shell is generally incrustated or eroded, occasionally one finds specimens showing the radiate ribs and threads, but identification is easily established by the brown and yellow stripes which are seen round the lower third of the exterior and are also invariably shown on the

interior. The central area is dark brown, as a rule. About three-eighths of an inch long.

Found in the North and South Islands: Mount Maunganui; Bay of Islands; Chatham Islands.

ACMAEA PILEOPSIS (*akme*, a point; *pilos*, a cap; *opsis*, like).—An ovaly-rounded limpet of smooth exterior with a hooked apex near the front margin. It is of a greenish-brown colour with a number of white or pale greenish-white spots, the worn apex being black. The inside is white or bluish white with a dark coffee-coloured patch in the middle (this portion being known as the central area) and a narrow band of brownish black round the margin. The *A. pileopsis* of medium size shows the radiate ribs and grooves well developed, in marked contrast to the adult shell and the juvenile (*A. cantharus*), both extremes being apparently smooth. It is found high above high-water mark, reached only by the spray. About an inch in the longest diameter—quite the largest species of *acmaea* we have.

Plate V
No. 6

Mount Maunganui; Kawhia; French Pass; Lyttelton.

ACMAEA RUBIGINOSA (*akme*, a point; *rubiginosa*, somewhat red, pinkish).—An oval limpet of a reddish colour with white ribs, though generally incrustated thickly with nulliporites—a marine growth of vegetable origin. The interior is smooth, porcellanous, white, with radiating pink rays, or entirely tinged with pink. The margin is slightly crimped. Often found attached to the outside of Pawa shells, and also on the under surface of smooth rocks and loose boulders at extreme low tides. It attains a length of three-quarters of an inch.

Plate V
No. 7

Bay of Islands; Mount Maunganui; West Coast of the South Island; Lyttelton; Shag Point; Chatham Islands; Taumaki Island.

ACMAEA SEPTIFORMIS (*akme*, a point; *septiformis*, having the form of an enclosure, or septum).—A small rounded oval limpet, somewhat flattened, with the apex close up to the anterior margin. The sculpture consists of radiate ribs chequered with green and white, though the colouring is usually obscured with incrustation. The interior shows well-marked whitish rays on a brown background, extending almost from the centre to the margin; the margin having a band of smaller short rays of yellow and dark brown, also radiately arranged. It is slightly over half an inch in length, and is found at Chicken Island, West Coast of Manukau, Motutara, Dunedin, Greymouth, Auckland and Campbell Islands.

Plate V
No. 3

Plate V
No. 1-1a.

ACMAEA STELLA (*akme*, a point; *stella*, a star).—A strongly-ribbed, somewhat flattened whitish limpet, with a lacinate or fringed margin, or one in which the free ends of the ribs project beyond the general outline. The apex is situated towards the front. Roughly speaking, there are about three main ribs extending from the apex to the margin in front and four behind, while there are one, two, or more shorter ribs between them, extending from the margin, but not reaching the apex. The interior is bluish white with a brown centre and a ring of brown, or dotted brown bordering the margin; the tips of the ribs are white. The colours are more or less blurred, and, being highly glazed, the interior has all the appearance of artistically decorated porcelain. It is about one inch in length by three-quarters of an inch across. Found on surf-beaten rocks.

Mount Maunganui; Wellington Heads; Island Bay; Cook Strait; Taumaki Island.

Plate V
No. 2-2a.

ACMAEA STELLA var. CORTICATA (*acme*, a point; *stella*, a star; *corticata*, having a cortex, rind or band resembling bark).—This variety is distinguished from the species by the smaller size and the disappearance of the seven primary ribs, all the ribs being of equal strength, though differing in length as the apex is approached. The margin is not lacinate or fringed. The internal colours are practically similar.

No doubt it is precisely the same animal that produces both the shell of the species and of the variety, for when one has made careful observation of the growth and environment of the many kinds of limpet it will be found that rough rocks almost always tend to foster the growth of rough shells, and smooth rocks smooth shells.

North and South Islands: Mount Maunganui; Dunedin; Chatham Islands.

Plate II
No. 6

HELCIONISCUS DENTICULATUS (*helcion*, a breast collar; *denticulatus*, furnished with little teeth).—A large, solidly-built and highly-decorative limpet of a dark brown colour, with about twenty-two strongly-marked principal ribs reaching almost to the apex. A similar number of somewhat smaller ribs alternate with them and extend upwards from the margin for about three-quarters of the distance. All the ribs are crossed by concentric flounces, more marked at the margin and gradually becoming smaller as the apex is approached. Internally the central area is of a uniform bright chestnut colour, the remaining portion being of a bluish grey with a slightly metallic lustre. This

colouring and iridescence is present in all except the older shells, which have a tendency to become milky. They may attain a length of close upon two and a-half inches and a height of nearly an inch and a-half, but these are exceptionally large specimens; one of about a couple of inches in length is a very fair size. They are usually found fairly high up between tide marks.

Mount Maunganui; East Cape; Cook Strait; Dunedin; Chatham Islands.

HELCIONISCUS ORNATUS (*helcion*, a breast collar; *ornatus*, ornate).—Rather a beautiful limpet, about an inch and a quarter in length, the shell having conspicuous granules, white and black, on the intermediate ribs. The larger ribs are about eleven in number, and the apex is situated at the front third, or perhaps rather nearer to the front margin. The interior is silvery and dark brown, with eleven radiating silver streaks in a coffee-brown border. The central area is of a blackish brown, merging to cream colour in the depth of the apex.

Plate II
No. 8

Throughout New Zealand; Mount Maunganui.

HELCIONISCUS ORNATUS var. INCONSPICUUS.—This limpet differs from the species in the absence of the black and white dots on the intermediate ribs externally, and in the height of the shell being equal to more than half the length. Inside, the colour is a lighter brown, and the silvery bars are more numerous. In many specimens the silver may be in broad bars, with pairs of narrow brown bars disposed at intervals round the margin, or the silver and brown may be more equally distributed. It is a common shell, and is to be found always with the species. Mount Maunganui.

Plate II
No. 9

When one is thoroughly acquainted with this sub-species or variety, and the species, noting their situation on the rocks, and the aspect of the rocks, whether exposed to heavy seas or not, the size and marking of the shells, inside as well as out, together with all the intermediate grades, there will be no hesitation in arriving at the conclusion, now generally accepted, that the *H. ornatus* var. *inconspicuus* is an aged form of the *H. ornatus*.

HELCIONISCUS RADIANS (*helcion*, a breast collar; *radians*, having rays).—A limpet, oval in shape, somewhat flattened or depressed, thin, slightly narrower in front than behind, with about twenty-five well-marked radiate ribs extending from the apex to the margin, with one or two

Plate II
No. 2-2a.

smaller ribs in the interspaces, all crossed by concentric growth lines. The colour is universally dark bluish grey, the ribs being of a darker shade. The markings, however, show considerable variation and are often handsome, sometimes black bifurcating broad streaks on a creamy ground. The apex is at the anterior third or fourth. The interior is silvery, showing the external colour markings, of course in thin shells only; the central area is brown or olive green. Margin somewhat crenulated in outline—that is to say, notched or wavy in a minor degree. The markings, being so varied, have given rise to a subdivision of this species into seven sub-species. Since this classification was announced further research has recently resulted in four of these varieties being discarded, one so-called sub-species being only met with in Australian waters, while the other three are so ill defined that it is impossible to isolate them as separate varieties. Some of Hutton's remarks, appended to his descriptions of the limpets—such as, “probably a small variety of the last . . .” “this species passes into the next,” . . . “perhaps a variety of the last”—give one some idea of the perplexing modifications presented by the patellae, even to scientific observers. How, then, shall the amateur decide? His simplest plan is to obtain typical specimens of the varieties hereafter described, label them and keep them apart; then to make a large collection of all the other limpet species, noting their peculiarities, where they differ from each other, and, above all, how they coincide. A tray of fifty *Helcioniscus radians*, carefully spaced and displayed, make a delightful collection, and should comprise all ages and sizes, shapes and colour markings.

The typical shell is about an inch and three-quarters long, by an inch and a quarter wide. It is a common species, and is found throughout New Zealand. Mount Maunganui.

Plate II
No. 4

HELClONISCUS RADIANS var. ARGENTEUS—(*helcion*, a breast collar; *radians*, having rays; *argenteus*, silvery).—This variety or subspecies is named from its silvery interior. Outside it is similar to the species in having twenty to twenty-five ribs, interspersed with smaller ones. The central area is “greyish white or cream colour, rusty in old specimens.” (Suter). The shell is said to be more elevated than in the species, but this is not always so; the reason why some of the limpets are highly conical while others of the same species are more depressed or flattened may be readily accounted for by noting the nature of the rock upon which they are found. If from the rugged

surface the limpet has no room for lateral expansion, the creature, on increasing its growth, naturally takes the line of least resistance, and grows in height. This is specially noticeable in the *H. ornatus*, some specimens of which are very broad and flat, while others again have a relatively small base and a high sharply-pointed apex like a dunce's cap. So you see, one has to be careful to note the characteristics of a limpet shell, such as age, colour, size, shape and sculpture, before venturing to determine the species.

The silvery variety of the *H. radians* is found throughout New Zealand. Mount Maunganui; Lyttelton.

HELCIONISCUS RADIANS var. FLAVUS (*helcion*, a breast collar; *radians*, having rays; *flavus*, yellow).—This is the yellow variety of the species, the interior being cream colour or bright orange, yellowish white and old gold, varying very much according to age. Young specimens are more brightly coloured, while the older shells show a paler tint, the formation of pigment being, as in all animal life, a vital process declining with age. This subspecies is found at Napier, living on the "red sandstone cliffs, into which it makes hollows, so that it is difficult to detach them without cutting the rock away." (Iredale). "Small shells are, as a rule, depressed, but adult specimens have mostly a high conical form." (Suter). Both of which statements go to prove that the alteration of shape is due to the nature of the bed.

Found at Napier; Gisborne; East Cape; Kaikoura; Stoneyhurst; Chatham Islands.

HELCIONISCUS RADIANS var. OLIVACEUS—(*helcion*, a breast collar; *radians*, having rays; *olivaceus*, olive coloured).—This variety is described as having about seventy ribs, fine and uniform in size, but the external variation is not always characteristic enough to enable one to identify the shell without examining the interior. Some have thick and large ribs with finer ribs between them, while others have only fine ribs, smaller or larger as in the species; but it should be noted that the thicker and heavier shells are those which have the larger ribs, pointing to a reinforcement of the strength of the structure, often observed where limpets are attached to rocks exposed to the full force of heavy breakers. Internally the olivaceous subspecies is olive green in the central area, with a broad white porcellanous band, and a very narrow black edging at the extreme margin. It is rather a rare shell.

Found at Sumner and along the East Coast of the South Island to Preservation Inlet.

Plate II
No. 5-5a.

Plate II
No. 3

Plate II
No. 7

HELACIONISCUS REDIMICULUS (*helcion*, a breast collar; *redimiculus*, a chaplet, or fillet).—This limpet and the *H. strigilis*, after being recognised as two distinct species for quite a long period, were recently declared to be identical with each other, one being held to be the adult, the other the juvenile form. Now they have once more been separated and duly restored to their respective specific rank, a decision which anyone with a number of specimens at hand to study cannot fail to endorse.

The *H. redimiculus* is an oval flattened limpet having twenty to twenty-five large rounded ribs, with rather wide intervals, each containing a low, inconspicuous riblet. The colour is greenish to grey, the ribs brownish, with a few white patches scattered promiscuously about. Internally, the central area is yellowish brown, paler at the apex or cream colour, bordered with olive behind; the margin is rayed with yellow and coffee-coloured brown. The extreme edge is broadly and slightly toothed. Fine growth lines are to be observed in the intervals between the ribs.

Found at Waikouaiti; St. Clair.

Plate II
No. 1

HELACIONISCUS STRIGILIS (*helcion*, a breast collar; *strigilis*, a scraper).—A fairly large limpet, about two inches in length, sculptured with twenty to thirty rather large and roughish ribs, each interval having a smaller rib, the former of which reach from the margin to the apex, the latter extending only half the distance. It is of a dark brownish colour; internally iridescent, brownish grey with dark rays corresponding to the ribs. The central area is cream or pale brown. The whole shell is thickly built.

Found at Shag Point, and at the Auckland Islands.

Plate II
No. 10-
10a.-10b.

HELACIONISCUS STELLIFERUS (*helcion*, a breast collar; *stelliferus*, star-bearing).—A limpet rather flattened in shape, with ten to twenty ribs cut up into granules by slight concentric furrows. In colour it is reddish brown or ash grey, with white rays at the apex forming a star, the points of which extend even to the margin in some instances. The interior is iridescent with a brilliant platinum lustre; the central area is chestnut brown, showing the star when held up to the light. Numerous radiating grooves are seen internally, corresponding to the external ribs, and there is a narrow edging of dark brown bordering the margin. As this species can only be obtained at extreme low tide, it is usually found covered with dense incrustations, but clean specimens may be prepared by soaking the shells in methylated spirits for several weeks,

when the nulliporites can be gently removed with a needle. Bleached and dead shells picked up on the beach are of a bright orange chestnut colour, but, of course, they are not desirable specimens for the cabinet. It is about an inch and a half long, and is found at Cape Maria van Dieman, Bay of Islands, Mount Maunganui, Island Bay, Lyall Bay, Cook Strait, Nelson.

HALIOTIS IRIS (*halios*, marine; *otus*, the ear; *iris*, a rainbow).—This species is mostly known by its Maori name—Pawa,—but it is also called the Sea Ear, the Mutton Fish, and Venus' Looking Glass. The *H. iris* is the largest of the New Zealand family, and may be distinguished by its peristome, or border of the mouth, being continuous, and not winding its way into the interior of the shell, as in the other species. The sculpture is generally obliterated, being worn down by the attrition caused by moving sand, or it is covered by incrustations, barnacles, limpets, etc. The internal colouring is usually of a metallic blue and green, highly iridescent, with some red, purple and yellow, the first two predominating. It is well to collect a series of these singularly beautiful shells, for not only do they make a very handsome display when a good number are grouped together and carefully graded, but there is a notable variation of colour incidental to every age. The smallest of all, half an inch long, are quite transparent, perfectly sculptured, so thin that they will bear only the most gentle handling, while the faint iridescence gives but little promise of the glories of the maturer shell. Valves of an inch in length show the sculpturing and general form to the best advantage, as there is little or no extraneous growth on the exterior. The interior is brilliant with deep rose and green. When two or three inches in length, the Pawa is, if anything, slightly paler inside, but very iridescent; rose pink and gold are the prevailing hues, with golden green and a suggestion of sky blue, the margin exhibiting a narrow edging of opaque slate blue. The adult shell is Prussian blue and bright green, with a metallic lustre; the red appears to have vanished, or may, as in one specimen I have, blend with blue to make an intense violet. This is, however, an exception, and generally the shell settles down literally to a green old age. The brightest of the rosy shells were prized by the Maori of the olden days. They were specially chosen to give a fierce expression, or a baleful glare, to the eyes of his carved wooden figures, and were known as Mura-ahi, meaning "a blaze of fire." The green variety was more suitable for fishing spinners, the lures that prove so deadly to the sporting

Plate II
No. 20

Kahawai. Some old shells, not necessarily of large size, are very much thicker than usual, the interior showing irregular lumps and nodes of green pearl, while the row of holes diminishes in number, some having only three holes, instead of the usual seven, and occasionally an ancient individual will be seen with only one hole with which to carry on the enfeebled functions of his declining days.

It is about five inches in length, and may attain to as much as six or seven inches. Found about a foot or so below low-water mark on rocks, usually in sheltered positions. North and South Islands; Mount Maunganui.

Plate II
No 22

HALIOTIS AUSTRALIS (*halios*, marine; *otus*, the ear; *Australis*, southern).—In some respects this shell is a prettier one than the Pawa. On the outside are corrugations which are always well marked. They radiate from the apex to the row of holes, but do not extend beyond. Between the row of holes and the rim of the shell are several, three or four, strongly-marked ribs, also two on the lip, one on the outer side and one on the inner. The interior is very iridescent and silvery, red, blue and green in colour, the red or pink being the most noticeable; the fact of the surface being sculptured by the corrugations, crossed by spiral cords, or rather their impressions from the outside, adds considerably to the play of colours. It is about half the size of the Pawa, as a rule. The animal has a yellow foot, in distinction to the black foot of the Pawa, by means of which it attaches itself to rocks, and is enabled to move its quarters.

Found throughout New Zealand; Mount Maunganui.

Plate II
No. 21

HALIOTIS VIRGINEA (*halios*, marine; *otus*, the ear; *virgo*, the Virgin).—In this species of Sea Ear the corrugations of the shell are by no means conspicuous, and are limited to the upper half. It is also rather thin, narrower and longer in comparison to the *H. Australis*, and the apex is almost terminal—that is to say, quite close up to the end of the shell, and the dark brown outside is marked with more or less distinct V-shaped streaks of green, the initial letter or sign of the Virgin. The sculpture consists of a number of spiral ribs, small and well defined, of which there are about forty between the apex and the row of holes. In consequence of the absence of large corrugations, the interior lacks the chequered appearance of the *H. Australis*, though the colouring is much the same, more silvery and delicate in tone, perhaps, with a preponderance of pink. About two or three inches in

length. It lives in deeper water than the other two species.

North and South Islands. Mount Maunganui; Oamaru; Chatham and Stewart Islands.

EMARGINULA STRIATULA (*emarginula*, diminutive of *emarginata*, notched at the margin; *striatula*, dim. of *striata*, striated or lined; marked with lines or scratches).—This is the Slit limpet, an oval-shaped greenish-white shell, sculptured with concentric ribs, more strongly-marked ribs crossing them and radiating from the apex. The apex is white, rather beak-like, and directed backwards. There is a decided fissure or slit extending upwards from the middle of the anterior or front margin for about one-third of the distance to the apex, reminding one of a cloven foot. The interior is smooth and glossy, and either white or pale grey, or greenish. The largest are nearly an inch in length. Some of the shells are much higher at the apex than others, and the shape is then suggestive of the Phrygian cap, or Cap of Liberty, worn by leaders of the French Revolution.

Found at New Brighton; Hauraki Gulf; Mount Maunganui.

Plate V
No. 10

SUBEMARGINULA INTERMEDIA (*subemarginula*, slightly notched at the margin; intermediate).—A rather narrow, oblong, white or brownish-white limpet-like shell, with the apex situated at a point three-quarters of the entire shell from the front. The hinder part is slightly wider than the front, and the sculpture consists of fine radiate ribs crossed by numerous small and crinkly growth lines. The margin is finely crenated or notched, like the teeth of an extremely tiny saw. There is also a very slight notch in the centre of the front margin, sometimes scarcely noticeable, though in typical specimens sufficient to warrant the generic appellation—*subemarginula*. The shell is about an inch and a quarter in length, sometimes a trifle more. It is found on sea-weed or adhering to the under surface of boulders just below low-water mark.

Great Barrier Island; Mount Maunganui; Banks Peninsula.

Plate II
No. 18

SCUTUS AMBIGUUS (*scutum*, a shield; *ambiguus*, vague, doubtful).—This is the Duck-billed limpet, so named on account of the shell resembling the bill of a duck. It is also known as the Parmophorus, from *parme*, a shield and *phoreus*, a bearer. It is a white, dense, oblong shell, shaped like a Roman shield, straight at the lateral margins, which are parallel to each other, slightly incurved at

Plate II
No. 16

the front margin, and rounded at the posterior margin. The shell is somewhat raised in the centre and is sculptured with concentric ribs, which run completely round the entire shell, leaving a small elevated portion in the middle with a beak pointing backwards. The margin is thick, rounded and smooth. In length it may attain to two and a-half inches; in breadth a trifle over one and a-quarter inches. The animal bearing this shell is a somewhat unpleasant-looking creature of slug-like nature, large in comparison to the size of the shell, blue black in colour, and adhering firmly to the under surface of overhanging rocks, hiding beneath the seaweed. One naturalist describes it as "an apathetic animal," and no one familiar with their habits can imagine them affecting the strenuous life. I particularly remember one individual strongly attached to two full-grown *Acanthochites porosus*, commonly known as butterflies, under a secluded fringe of weed. They all came away together with the exercise of a little force. As the *Scutus* is by nature a vegetable feeder, he could have had no sinister designs on his companions, and mere sociable feelings being out of the question, we can only assume that sheer indifference to the presence of the *Chitons* accounted for the strange gathering.

Found in both Islands; Mount Maunganui.

Plate VII
No. 25

TROCHUS OPPRESSUS (*trochus*, a hoop; oppressed).—This little shell is a quarter of an inch in diameter and almost of equal height. In colour it is "dark olive brown, or greenish" (Suter), or "purplish black" (Hutton). Sculpture consists of fine and numerous spiral striations, closely set together so that the intervening ribs are rounded and narrow. There are five or six whorls; the body whorl is slightly waisted, and has also a pronounced shoulder below the suture. The umbilicus is open and funnel-shaped, partitioned off from the aperture by a bowed and expanded columella. The ribs on the base are somewhat granular.

Found at Takapuna; Mount Maunganui; East Cape; Lyall Bay; Taumaki Island.

Plate VI
No. 15

TROCHUS TIARATUS (*trochus*, a hoop; *tiaratus*, like a tiara or Papal crown).—This shell, commonly known as a Top shell, is somewhat conical, of a pale yellowish-grey colour, sculptured with finely-beaded cords spirally wound round the whorls; some of the beads marked with dark brown, alternating with white and pale brown patches. The shell has in consequence a speckled or pepper-and-salt

appearance, though in many instances the colour is uniformly greyish brown. The under surface is fairly flat, similarly sculptured, but with a more regular disposal of the brown-coloured spots, which are entirely confined to the ribs or cords. In the centre of the base is a deep conical or funnel-shaped excavation, which is typical of the species. The interior is pearly. Found just below or near low-water mark. It is five-eighths of an inch high and rather more in width.

North and South Islands: Hauraki Gulf; Mount Maunganui; Chatham Islands.

TROCHUS VIRIDIS (*trochus*, a hoop; *viridis*, green).

—This Top shell is almost a perfect cone, with a base nearly flat. It is of a greyish green or old putty colour; some of the juvenile shells having the two or three upper whorls of the spire of bright rose pink. The sculpture consists of ropes of beading which wind round the entire shell; large beads at the top of each whorl and round the angle of the base, with smaller beaded rows in between. The under surface is yellow, with numerous ribs, large in the middle, and gradually becoming smaller and less distinct towards the outer edge. The interior is pearly. It is about three-quarters of an inch in height, and the same in width. Found living on rocks at extreme low water.

Plate VI
No. 16

North and South Islands. Mount Maunganui; Chatham Islands.

MONODONTA AETHIOPS (*monos*, one; *odous*, *odontus*, a tooth; *Aethiops*, Ethiopian, black).—This is a thickly-built purplish-black spiral univalve, tessellated or chequered with white between the grooves, which run spirally round the whorls. The upper whorls are rounded and large in proportion to the whole structure, resulting in a top-heavy appearance. The interior of the mouth is white, thinning off to nacreous or pearly; the outer lip is black, the mouth reinforced with an extra thickness of white shelly material, spoken of as callus. The shell has three coats, the outer one black, the internal lining nacreous, and the middle one a rich malachite green; though why it should be so is difficult to say, as the green colour is completely hidden, and can only be seen on a very worn specimen or one that is broken. The columella has a tubercle or tooth-like eminence upon it, which accounts for the generic name monodonta, and is to be seen more or less marked in all the species. The *M. Aethiops* is a common member of the family, and is found on rocks between tide marks. It is

Plate VI
No. 8

about an inch or more in height, and the same in transverse diameter.

Throughout New Zealand; Mount Maunganui.

Plate VI
No. 7

MONODONTA ATROVIRENS (*monos*, one; *odous*, *odontos*, a tooth; *atrovirens*, blackish green).—A greenish-black solidly-built spiral univalve, very similar to the *M. Aethiops*, except for the absence of the white tessellations and having small yellowish dots scattered irregularly over the whorls. As these latter are by no means conspicuous, they must not be regarded as a trustworthy feature of the species. The outer lip is sharp, edged with black, followed by a broad silvery band. The inner lip is always bordered with a green streak. Full-grown specimens may be as much as an inch and an eighth in height, with a diameter of a sixteenth less.

On rocks between high and low-water marks.

Tasman Bay; west coast of North Island; Hauraki Gulf; Mount Maunganui; Lyttelton; Dunedin.

Plate VI
No. 5

MONODONTA CORACINA (*monos*, one; *odous*, a tooth; *korax*, a crow).—A small black, lustreless univalve, with spiral grooves, about ten, on the body whorl, and fine deeply-marked growth lines crossing them, which form of sculpture gives the shell its dead black appearance, and incidentally its specific name as being black as a crow; the outer lip is sharp, with a well-marked black band lining it, followed by a broader white nacreous band descending to the base and forming the margin of the columellar lip. It then ascends and widens somewhat at the top of the aperture, forming a complete circuit of pearl, by which you may distinguish this species from several closely-allied species. The white opaque columella is prolonged into a tail-like process to the inner side of the pearly band at the base of the outer lip. The interior is pearly, alternately ribbed and grooved. At the base are a few, three or four, spiral rows of whitish dots, where the spiral grooves and growth lines have become worn. Found on rocks and boulders above low-water mark. About half an inch in height and a trifle less in width.

St. Heliers' Bay; Mount Maunganui; Kawhia; Wellington and Lyttelton Harbours; Sumner; Chatham and Auckland Islands.

Plate VI
No. 4

MONODONTA CORROSA (*monos*, one; *odous*, *odontos*, a tooth; *corrosa*, corroded, or eaten away).—This species is much like the other members of the genus mono-

donta, being small, of a dark purplish colour, and pearly internally. "Colour dark purple, overlaid with a more or less eroded, yellowish-white layer, leaving sometimes zig-zag bands of purple on the last whorl." (Suter). Adams describes it as "of a dirty blue." The characteristic feature is a narrow band of yellow on the inner margin of the outer lip, followed by a narrow strip of black. This monodonta is very similar to the *M. subrostrata*, but may be distinguished from that species by the colour band on the outer lip. Found on mud flats of the South Island.

Portobello; Dunedin; Christchurch.

MONODONTA EXCAVATA (*monos*, one; *odous*, a tooth; *excavata*, excavated or hollowed out).—A small conical spiral univalve, with an excavated or concave base, sculptured with indistinct spiral grooves and distinct growth lines. It is coloured a pale yellowish green, or greenish grey, crossed with oblique wavy dark-green bands or bars. The lower and widest part of the body whorl is angled, so that the whole shell lies flat upon its base. The mouth is large and oblique, pearly inside, with the light and dark bars of the body whorl showing distinctly through the thin shell by transmitted light. The outer lip shows the usual thin sharp edge of the monodontas, and has a more or less indistinct narrow black edging inside, with an opaque white band next to it. The inner lip is white and, with the umbilical tract, takes up almost the whole of the base not occupied by the aperture. It is a small shell, about a quarter of an inch in diameter, slightly less in height, and is met with on the lowest parts of rocks, close to the sand, between tide marks.

Plate VI
No. 9

Found on the east coast at Mount Maunganui, on the west coast of both Islands, and at the Chathams.

MONODONTA LUGUBRIS (*monos*, one; *odous*, *odontos*, a tooth; *lugubris*, sad, mournful in colour).—A dense ebony black univalve shell, with rows of very pronounced beading running spirally round the whorls. The interior is white with a narrow band of pearl just within the outer lip and continued round the mouth for about three-quarters of its circumference. On the outside surface may be seen occasionally a few spots of yellow which give the shell the appearance of having been carved out of a solid piece of tortoise shell. The whorls are not very distinctly marked off from each other, and the base of the body whorl, being more or less flat, and angular at the outer border, the entire shell takes the form of a flattened cone. It is not common, and attains a diameter of half an inch or more. Found

Plate VI
No. 6

under stones and among loose boulders between tide marks.

Bay of Islands; Mount Maunganui; down to Stewart Island.

Plate VI
No. 3

MONODONTA MORIO (*monos*, one; *odous*, a tooth; *morion*, a steel helmet).—This shell is so named on account of its shape resembling the old mediæval steel cap or helmet without a visor, and called a morion, of French or Spanish origin. It is a deep black in colour, with a few small white specks dotted about irregularly, and is sculptured with small spiral grooves, about ten of them on the first whorl above the aperture. The mouth is very silvery, with a greenish lustre. The columella has a well-marked tooth; the outer lip is sharp, with a narrow black band, followed by a strip of pearl merging into white callus. It is about three-quarters of an inch in height and the same in diameter. Found in the same localities as the *M. Aethiops*. Mount Maunganui.

Plate VI
No. 11

MONODONTA NIGERRIMA (*monos*, one; *odous*, *odontos*, a tooth; *nigerrima*, very black).—A small black spiral univalve, of a rusty black, purplish black, or intense, polished, jet black, with sculpture consisting of numerous well-marked striations running spirally round the whorls, which are rounded in outline and distinct. The upper part of the spire is usually worn and pearly. The mouth is wide, with a thin outer lip, sharp, and having a very narrow strip of black inside, much smaller than in the case of the *M. coracina*, followed by a narrow band of pearl, and a broad opaque white band of callus, sometimes very iridescent. The inner lip is bordered with light brown or white on the outer side. The lines of growth, although well marked, are not so deeply incised as in the *M. morio*, in which shell the depth of the incremental lines gives it a dead or crape-like finish. It is fairly common, and is found on rocks about low-water mark.

West coast of the North Island; Oamaru.

Plate VI
No. 10

MONODONTA SUBROSTRATA (*monos*, one; *odous*, a tooth; *sub*, under, slightly; *rostrata*, beaked).—A solidly-built, small, conical univalve of a yellowish colour with spiral ridges, which are crossed by axial undulating dark purplish lines, the yellow and purple spotting being continued from the base at the upper part of the mouth, and disappearing into the interior. The outer lip is sharp, and has a narrow band inside of yellow dotted with black, followed by a band of opaque white; the interior is pearly.

How this species comes to be specifically labelled "slightly beaked" I have no idea, for there is nothing in the shape of the shell remotely resembling a beak. Common on rocks between tide marks, along the Northern coasts of New Zealand, as far south as Tauranga. Omokoroa; Mount Maunganui.

Note.—Although none of the *Monodontas*, at first sight, are particularly attractive, they are well worth attention, and there are no species that I would sooner commend to the notice of beginners than this group. In the first place, they are all fairly plentiful, and being found invariably between tide marks, at all seasons, are the easiest shells to collect. Seven of the nine native species occur among the rocks at Mount Maunganui alone, and they are equally numerous in other parts of the Dominion. The minor differences that mark the species are definite enough, once they are known, and the lesson in observation entailed in recognising and separating the various kinds may prove so interesting and instructive that the casual collector may, through his experience with these shells, graduate unconsciously into a scientific naturalist.

CANTHARIDUS DILATATUS (*kantharis*, an iridescent beetle; *dilatatus*, dilated, expanded).—A smooth, rather solidly-built, spiral univalve, about three-eighths of an inch in height, of a conical shape, with a pointed spire, and the body whorl somewhat dilated or splayed outwards as the aperture is approached. The mouth is almost round and the outer lip is fairly thick. In colour it is pinkish, or brownish pink, or brownish purple, sometimes adorned with short white streaks in the region of the suture. The suture, by the way, is the line of union between two adjoining whorls. In some specimens, white zigzag bands are longitudinally arranged on the last few whorls. The interior is highly iridescent and of a vivid and fiery green, or a flashing blue. The sculpture consists of numerous and very fine spiral striations close together, but on the base a little further apart. Found on seaweed in rock pools in rather sheltered situations and in association with its somewhat more prolific relative, the *C. sanguineus*.

East and west coasts of the North Island. Hauraki Gulf, Mount Maunganui; Auckland Harbour.

Plate VII
No. 4

CANTHARIDUS OPALUS (*kantharis*, an iridescent beetle; *opalus*, an opal).—A tall spiral univalve with almost straight outlines, and the body whorl at the base roundly or bluntly angled. The colour of the body whorl, and that immediately above it, is lilac, with purple zigzag markings

Plate VII
No. 3

in the long axis of the shell, while the upper whorls are of a reddish, or brick red, or brownish red colour, with darker colour markings; the topmost whorls being generally eroded, show their green pearly nature. The mouth is comparatively large, has a thin outer lip with a ring of white callus just inside. The interior is brilliantly iridescent, red and green predominating. This shell may be treated with dilute hydrochloric acid until the coloured coat is entirely removed, leaving a lovely green and blue iridescent surface, the body whorl being paler with a pinkish golden lustre. It attains a height of one and three-quarter inches. Found on seaweed.

From the Kermadecs to the Chathams. Mount Maunganui.

Plate VII
No. 6

CANTHARIDUS PUPILLUS (*kantharis*, an iridescent beetle; *pupillus*, dim. of pupa, a chrysalis).—A small, somewhat depressed conical spiral univalve, with flat and broad spiral ribs, having deep grooves between them. The whorls are convex in outline. "Ash-coloured or white with broad red spots on the upper whorls and below the suture on the last whorl, the remainder being adorned with blood-red dots." (Suter). "Ash-coloured with dark greenish on the ribs." (Gould). The outer lip is thick, with a white callus inside. About five-sixteenths of an inch in height. There is a minute umbilicus present. One of the main features of this species, by which it may be distinguished from the *C. sanguineus*, independent of the colour, is that in the former case the shell is what is described as "depressed and conical," while in the latter it is "elevated and conical." Taking a specimen of each kind, each seven millimetres in diameter, the *C. pupillus* will be eight millimetres in height, whereas the *C. sanguineus* will be nine millimetres. Now, this at first sight does not appear to be a very striking difference, but if one considers that the proportion is exactly the same as between a man of five feet four inches in height and another of six feet, the contrast will at once be apparent. As a mnemonic or artificial aid to memory, we may bear in mind that the "sanguine" temperament has a far greater inclination to "elevation" of spirits than to depression, and thus the chance of confusing these two species is reduced to a minimum.

The *C. pupillus* is found at Russell; Hauraki Gulf; Manukau Heads; East Cape; Mount Maunganui; Lyall Bay, Lyttelton.

Plate VII
No. 2

CANTHARIDUS PURPURATUS (*kantharis*, an iridescent beetle; *purpuratus*, of a purple colour).—A pointed

spiral univalve of a greenish white, or greyish white, the top of the spire being rose pink or pinkish green, with a few oblique longitudinal paler pink streaks. It is sculptured with four or five flattened and rounded spiral ribs on the whorls, which are not only finely striated, but also crossed by closely-set growth lines. The interior is iridescent. Found on seaweed, or on the under sides of boulders in sheltered places below low-water mark. Dead and beach-worn shells are invariably of a brilliant rose-pink colour, as are also those live ones washed ashore from the neighbourhood of pumice rocks on ocean beaches remote from the outlet of rivers.

From Ngunguru Harbour in the North to Banks Peninsula; Makatu; Mount Maunganui.

CANTHARIDUS RUFOZONA (*kantharis*, an iridescent beetle; *rufozona*, with red ribs or belts).—This pretty little spiral shell is very similar to the *C. tenebrosus* var. *Huttoni*, but, instead of being bluish or purplish black, it is of a white or pale fawn colour, with the spiral riblets crimson, reddish or pinkish brown, and polished. The interior is pearly and iridescent. It is about a quarter of an inch in height. Although I have collected the other five Mount Maunganui species living in the natural haunts, the *C. rufozona* has been found almost invariably in the empty or dead condition, washed ashore after a rough sea.

Spirits Bay; Hauraki Gulf; Mount Maunganui; Lyall Bay.

Plate VII
No. 5

CANTHARIDUS SANGUINEUS (*kantharis*, an iridescent beetle; *sanguis*, blood).—A small spiral univalve of a greenish-white colour with blood-red spots; in clean specimens a glowing red, as in a fiery opal, and with white spots just below the suture. It is sculptured with cinguli, or belts, spirally arranged, separated by narrow grooves. There are from ten to fourteen on the body whorl, five of which are on the base. The aperture is fairly round, as in other members of the genus, and the interior is highly iridescent. The outer lip is somewhat thick and rounded, and edged with a narrow band of reddish brown, or whatever the prevailing colour of the body whorl may happen to be. It is about three-eighths of an inch in height, and is not common. Found on seaweed in rocky pools near low-water mark.

East coast of the North Island to Cook Strait. Mount Maunganui; the Chatham Islands.

Plate VII
No. 7

CANTHARIDUS TENEBROSUS var. **HUTTONI** (*kantharis*, an iridescent beetle; *tenebrosus*, dark, gloomy;

Plate VII
No. 1

Hutton, the conchologist).—A small spiral univalve, conical in shape, about half an inch in height, of a bluish-black colour, with darker raised, fine and polished riblets, winding spirally round the shell. There are from seventeen to twenty ribs on the body whorl, and eight to eleven on the one immediately above it. The body whorl is angled at the base, the mouth is fairly round, and slightly iridescent internally. The inner lip is white and expanded, and has a free edge shutting off the open umbilicus from the aperture.

Found on seaweed and rock pools after the tide has receded. Throughout New Zealand. Howick; Auckland Harbour; Mount Maunganui.

Note.—Most of the *Cantharidus* family are found upon seaweed in sheltered pools, shut off from the ocean by huge boulders, where the water is always tranquil, the tide gently gurgitating, perhaps through narrow crevices, and so not disturbing the placid surface of the pool. In one such place, with an area of a couple of hundred square feet and a depth of two or three feet, I found many *Cantharidus opalus* and *C. purpuratus* living on the *Macrocystis*, and scores of *C. pupillus*. The other inhabitants of the pool were *Haliotis iris*, *Helcioniscus stelliferus*, with a few other limpets, and some sea urchins; altogether, a peaceable community of irreproachable habits.

Plate VII
No. 11

PHOTINULA NITIDA (*photinula*, dim. of *phos*, light; *nitida*, shining).—A very small spiral univalve about three-tenths of an inch across. The whorls are slightly rounded, the body whorl somewhat angled at the base. The colour varies considerably, and may be greenish yellow, with longitudinal streaks of purple and red; orange and black, olive yellow or purplish brown, bluish black or black. The spire is short, a little higher than the height of the aperture, rather depressed—that is to say, not elongated—and the shell itself is thin, smooth and shining. The sculpture consists of small spiral striations of about a hair's breadth, of which there are about ten on the whorl immediately above the body whorl, and eight or nine on the base. The columella is bowed, forming the left half of the rounded aperture; it is white and has a fairly deep groove running up the middle, leading to the umbilicus, which is a round, open funnel-shaped hole extending up towards the apex of the shell. The outer lip is sharp, strengthened inside by a narrow band of callus; the interior is highly iridescent, red predominating. The whitish spiral striations and the breaking of the colour into squares are almost invariable features of the *Photinula* decoration. The grooved columella and open umbilicus are also typical. Found on rocks

and in crevices at low-water mark; it is local in distribution.
North and South Islands. Mount Maunganui.

GIBBULA SUTERI (*gibbula*, dim. of *gibbus*, a hump; Suter, the conchologist).—A very small and thin univalve, found living on seaweed. It is of a grey, brownish-grey, or pinkish colour, with patches of blue iridescence in some specimens, sometimes varied and chequered with white, especially on the periphery or widest part of the body whorl, which may have conspicuous and equidistant patches of white. Suter states that the colour markings are very often like those of *Photinula nitida*. The sculpture consists of very fine spiral lines, crossed by equally fine growth lines. The outer lip is thin and sharp, lined with a narrow band of silvery callus. It is about three-sixteenths of an inch in height, and the same in diameter.

Plate VII
No. 8

Lyttelton; Akaroa Harbour; Lyall Bay; Island Bay, Wellington.

MONILEA EGENA (*monilea*, a necklace; *egena*, destitute).—A small spiral univalve, about five-sixteenths of an inch in diameter, of an ashy-grey-white colour, with longitudinal streaks of light brown, which form zigzag bands on the body whorl. The sculpture consists of deep spiral grooves between well-defined sharp ribs, four on the body whorl and three on the whorl above; the two upper ribs of each being slightly beaded. The under surface of the shell is white, and shows a widely-open funnel-shaped umbilicus surrounded by a beaded brownish band. The protoconch is sharply pointed, brown in colour, smooth and polished; while the upper whorls of the spire are usually worn and show the pearly nature of the shell. It is nowhere common, and lives below low-water mark in sandy places. Washed ashore after stormy weather.

Plate VII
No. 18-18a.

Bay of Islands; Hauraki Gulf; Mount Maunganui; Lyall Bay; Stewart and Chatham Islands.

CALLIOSTOMA PELLUCIDUM (*kalos*, beautiful; *stoma*, the mouth; *pellucid*).—A slightly-waisted, sharply-pointed, and rather thin spiral univalve, of a pale yellow colour, mottled with reddish chestnut, disposed in oblique longitudinal irregular bands or blotches. Sculptured with numerous small finely-beaded spiral ribs. The body whorl is distinctly angled at the base, which is rather flattened; the columella, which is pearly, ends at the extremity in a slight tubercle or knob. The interior is pearly. It attains a height of one and a-half inches and is of similar dia-

Plate III
No. 3

meter. A rare shell, found among rocks at extreme low water.

Cape Maria van Diemen; Whangarei; Hauraki Gulf; Mount Maunganui; Cook Strait.

Plate III
No. 4

CALLIOSTOMA PUNCTULATUM (*kalos*, beautiful; *stoma*, the mouth; *punctulatum*, having dots scattered over the surface).—A spiral univalve with well-rounded whorls, of a dark chestnut brown colour, covered with white granules in regular rows round the whorls, the granules and intervals being equally spaced. The aperture is rounded, the interior ribbed and nacreous. The shell is of hard texture; consequently, when washed ashore it is rarely broken. To the touch, the surface is very similar to shagreen, a leather prepared from sharkskin, and at one time much used for spectacle cases and other small articles, such as handles of swords, etc. It attains a height of one and a-half inches and a diameter of the same.

North and South Islands. Mount Maunganui; Stewart Island; The Shares.

Plate III
No. 2

CALLIOSTOMA SELECTUM (*kalos*, beautiful; *stoma*, the mouth; *selectum*, select, choice).—This is a fairly large shell, conical, with the outlines almost straight, of a very pale fawn colour, with pale reddish-brown spots on the spiral ribs. The refined or subdued tone of the colour scheme in this species no doubt gave rise to the specific name, *selectum*. The spots of darker colour, on the slightly granular ribs are elongated, in a spiral direction. The columella is arched and pearly, and, like the interior, is nacreous. Large specimens are two and three-quarters inches wide by two and a-half inches high. It is not a common shell, and is to be found washed ashore on sandy beaches after heavy winter storms.

North Island coasts. Mount Maunganui.

Plate III
No. 1

CALLIOSTOMA TIGRIS (*kalos*, beautiful; *stoma*, the mouth; *tigris*, a tiger).—This is a handsome and rather rare univalve shell of a bright and rich red-brown colour, with more or less tiger-like markings. The principal feature is the waisted tapering form of the spire, which is high and finely pointed. The interior is beautifully iridescent and pearly; the outer lip is sharp, with a narrow band of chestnut bordering the inner margin. The inner or columellar lip is pearly, and the sculpturing consists of numerous very finely-beaded ribs, spirally arranged round the whorls. The largest-sized shells are about two and a-half inches in height and two inches in diameter. From below low-

water mark, among boulders, in sheltered positions.

Bay of Islands to Cook Strait. Mount Maunganui; Chatham Islands.

EUCHELUS BELLUS (*eu*, well; *chele*, a claw; *bellus*, beautiful).—A small, globular, spiral univalve, about three-sixteenths of an inch in diameter, of a brownish or bluish-black colour; or deep dove-grey with mouse-coloured splashes down the shell, in very clean specimens. The shell is pearly where the epidermis is worn off. There are only about five whorls, and the sculpture consists of rounded and well-beaded ribs, spirally arranged round the shell. The aperture is rounded, the outer lip thick, bevelled off to a fine edge, and marked with grooves corresponding to the external ribs. The inner lip is characterised by two rounded knob-like teeth at the lower end, separated by a rounded or semi-circular notch, suggesting slightly a pair of claws. The interior is pearly. The creature lives under boulders about low-tide mark, and is usually almost entirely covered with sponge. As this sponge grows rather extensively on the boulders, the *Euchelus bellus* is very apt to be overlooked.

Bay of Islands; Mount Maunganui; Cook Strait; Chatham Islands.

Plate VII
No. 9

TURBO GRANOSUS (*turbo*, a whipping top; *granosus*, granulated).—This rare shell is a spiral univalve of a purplish-red or purplish-brown colour, sculptured with spiral strings of beads, smaller strings alternating with larger ones. Round the largest circumference of the body whorl and below it are three spiral ribs in which the beading has almost disappeared, varied, however, with alternate patches of purplish brown and white. The beading again becomes more pronounced, but of small size on the base. To the outer side of the columella is a band of pink. The mouth is almost circular; the spire is much shorter than the height of the aperture. Internally, the shell is pearly and the operculum is white and shelly. Specimens are usually covered with nulliporites, but after soaking in cold water for an hour or so the growth may be easily removed with the point of a small penknife or a needle. It attains a diameter of two and a-half inches. Found washed ashore after gales.

Bay of Islands; Mount Maunganui; Cook Strait; Stewart and Chatham Islands.

Plate II
No. 12

TURBO SMARAGDUS (*turbo*, a whipping top; *smaragdus*, an emerald, a bright green stone).—A large rounded

Plate II
No. 11

greenish-brown spiral univalve, commonly known as the Cat's-eye shell. The external surface is fibrous in appearance, due to the well-marked growth lines; the interior is pearly, smooth and glistening. The operculum is a round and thick shelly structure, beautifully coloured green and white. It is found on rocks between tide marks, and sometimes attains a diameter of two and a-half inches. The young Turbo of this species differs considerably from the adult form, and was at one time described as a distinct species. It has a thick, smooth, pale or dark olive-green shell, with three prominent keels or ridges running spirally round the body whorl, and a single row of rather flattened beaded sculpture round the upper surface of the whorls of the spire. Very juvenile shells have the whole of the ribs completely furnished with small hollow spines, jutting outwards and horizontally forwards in the direction of the aperture. This sculpture is generally worn off in all specimens over half an inch in width, and rarely persists in half-grown shells. Many juveniles also show two spiral ribs on the base in addition to the typical three. Quite infantile shells are flat—that is to say, all the whorls are on the same plane. It is interesting to collect all sizes of the Turbo smaragdus, not overlooking dead shells, so that the various stages of growth may be studied, when it will be readily seen how the third and lowest rib becomes obsolete, what becomes of the middle one, and how the remaining rib loses the pristine beauty of youth. Young shells are invariably more beautifully coloured and sculptured than older ones, which, through the attrition caused by sand constantly washing over them, lose some of their epidermis—a somewhat make-shift term for periostracum,—and so become encrusted with coralline growths and other foreign matter. Further disfigurement is due to the work of boring worms, sponges, and shell-boring molluscs.

Between the years 4500 B.C. and 5000 B.C. the operculum of the Turbo was pierced for wearing as a charm or amulet, by the Egyptians, for protection against injuries and diseases of the eye.

The Turbo smaragdus is quite common, and is found throughout New Zealand. Mount Maunganui.

Plate II
No. 14-14a.

ASTRAEA HELIOTROPIUM (*Astraea*, Star-maiden, the goddess of Justice; *heliotropium*, of heliotrope colour).—The Circular Saw shell. A comparatively rare and beautiful spiral univalve, also known as a Calcar (Latin, a spur), from the hollow spines springing from the periphery of the body whorl, which give the shell a resemblance to the rowel of a spur. The colour of the young shell is

somewhat of a dull heliotrope tint, or it may be of a misty blue-grey; the base is yellowish and decorated with spiral rows of beading. The umbilicus is widely open, and the apex of the shell may be seen through the opening. What particular function the umbilicus has is rather difficult to say offhand, but probably it is a provision of Nature to give lightness and strength to the shell by hollowing out the columellar pillar, a principle well known to engineers—that a hollow pillar is relatively stronger than a solid one of similar dimensions. The whorls are also spirally beaded, and the spurs are to be seen on the upper whorls of good specimens, though the shell is usually so coated with coralline growth that they are hidden. The interior is pearly. Large specimens may be as much as four inches across.

Captain Haultain informs me that fifty years ago, when trawling and dredging were not carried out to any extent, a good pair of these shells would fetch £60 in the London salerooms. At the present day it is doubtful whether they are worth as many pence.

Found washed ashore after gales on sandy beaches; the best are only to be obtained by dredging in about twenty fathoms.

Bay of Islands; Mount Maunganui; Tasman Bay; Stewart and Chatham Islands.

ASTRAEA SULCATA (*Astraea*, Star-maiden, goddess of Justice; *sulcata*, furrowed).—A rather rough-looking shell with a wide base, reddish brown in colour, and without lustre. Juvenile shells, of about half an inch in diameter, present a row of short, sharp teeth projecting outwards horizontally around the periphery or widest circumference of the base. It has rounded ribs with intervening rounded sulci, or furrows (hence the specific name), disposed obliquely down the whorls. The operculum is thick and shelly, with a remarkable resemblance to a human ear, the rim opaque and most of the remaining portion semi-transparent. A specimen shell may be cleaned by removing with a penknife, or acid, the external laminations, leaving a beautiful white pearly surface, but as this is not the natural condition, the shell so treated can only be regarded as a “fake,” suitable to garnish those curious mid-Victorian contrivances known as what-nots, but quite out of place in a collectors’ cabinet.

Plate II
No. 13

About three and a-half inches across; it is found on the coasts of both Islands, on rocky ground near low-water mark, or in a few fathoms.

Mount Maunganui; Chatham Islands.

Plate VIII
No. 13

PHASIANELLA HUTTONI (*phasianella*, dim. of *phasianus*, a pheasant; Hutton, the conchologist).—The shell of this species is a perfect little gem, though Hutton's laconic description of it as "smooth, red, generally with oblique white rays," gives but scanty idea of its wonderful beauty. The Pheasant shells are all richly coloured and occur in many parts of the world; the Australian species being particularly fine, both in colour and size, but our solitary native species is the most beautiful of all. It is an elongated narrow spiral of about a quarter of an inch in length, of a deep rose or ruby colour, highly polished, almost transparent, and usually adorned with short half-moon splashes of white, hanging down, as it were, from the suture. The mouth is rounded below, and there is no canal. On my first acquaintance with this species, I could not help thinking of the quaint remark of that pious old gourmet, Dr. Boteler, in the XVII. century, who, referring to the strawberry, said: "Doubtless God could have made a better berry, but doubtless God never did."

Takapuna Beach; Taupo Beach, Whangarei; Bay of Islands; Mount Maunganui.

Plate VI
No. 23-23a.

ETHALIA ZELANDICA (*Æthalia*, the Island of Elba; *Zelandica*, New Zealand).—A smooth and rather thin, flattened univalve of about one inch in diameter, more often less. It varies much in colour, from a purplish tint to bronzy browns, yellows and pink, with small darker rays of a similar hue. The body whorl is rounded on the outside edge, and the under surface shows a pad of callus round the umbilicus, which is white in the lighter pinkish shells. Juveniles, about a quarter of an inch in diameter, show the rays distinctly marked like the spokes of a wheel, which accounts for one of the synonyms—*Rotella*, Latin for a wheel. It inhabits the laminarian zone, or the seaweed belt, extending downwards from low-water mark, but my friend, Mr. A. W. B. Powell, of Auckland, has recorded enormous numbers of the live molluscs at Marsden Point, being met with in the litoral zone, *i.e.*, between tide marks, when he was privileged to observe their active habits and mode of progression—a unique occurrence. (*N.Z. Jour. Sc. Tech.*, 25/8/21).

Although myriads of these shells are washed ashore on sandy beaches by almost every tide, I have only found a single live specimen in the litoral zone. They may be dredged in a few fathoms of water.

Throughout New Zealand. Kawhia; Mount Maunganui; Spirits Bay.

NERITA MELANOTRAGUS (*Nerites*, a sea nymph; *melas*, black; *tragus*, a portion of the ear).—A thick, solidly-built univalve of an intense ebony black, with fine grooves or striations winding spirally down the shell. It has a remarkably flat spire, forming only a small portion of the whole structure. The aperture is D-shaped, and has two or three small teeth on the middle of the inner lip. The outer lip is bordered internally with a strip of black, while next to it is a thick band of white callus. The operculum is shelly, almost transparent, like amber on the outer surface, ornamented with two bands of purple and studded with minute eminences. There is also a process jutting out from the inner side which fits round the toothed columellar lip; so that, when the animal retires into its shell, it is fairly safe from the attentions of its numerous flesh-eating neighbours, always on the *qui vive* for a good meal. It is found between tide marks upon rocks, and attains a length of one and a-quarter inches. The animal is much esteemed by some people as an article of food, and is said to resemble the English periwinkle in flavour.

Found in the North Island. Mount Maunganui.

Plate III
No. 18

LITORINA CINCTA (*litorina*, inhabiting the seashore; *cincta*, belted or girdled).—This is a small periwinkle, a trifle over half an inch in length, found on rocks, in crevices or sheltered parts, usually in association with the small black mussel, and rather near to high-water mark. It is of a brown colour, with yellowish-white grooves winding spirally round the whorls, the sculpture being most indistinct. The columella is deep violet, and the interior of a still deeper shade, with short stripes of yellow on the inner margin of the outer lip, and a broad patch at the lower border of the aperture. The mouth is more or less rounded below, and above is slightly angled.

Throughout New Zealand, more common in the South. Mount Maunganui.

Plate VII
No. 23

LITORINA MAURITIANA (*litorina*, inhabiting the seashore; *Mauritiana*, from the Island of Mauritius).—This is also a species of periwinkle, about three-eighths of an inch in height, found on rocks at, and above high-water mark, and, although furnished only with gills, is to a certain extent amphibious. The shell, which is a spiral univalve, is coloured a pale bluish white, with a broad band of a beautiful bright blue, spirally winding round the body whorl, like the blue ribbon of the distinguished order of the Garter. The interior is white. Like all the periwinkles, this creature is a vegetarian.

Plate VII
No. 22

Throughout New Zealand. Mount Maunganui; Australia; Mauritius; Ceylon.

Plate VI
No. 21-21a.

RISELLOPSIS VARIA var. **CARINATA** (*rusilla*, a wrinkle; *opsis*, like; *varia*, spotted, striped; *carinata*, having keels).—This minute spiral univalve, the largest being no more than a quarter of an inch in diameter, is met with on rocks about high-water mark, usually in beds of the small black mussel. It is of a dingy yellow colour, mottled with dark brown, and somewhat flattened; the most conspicuous feature being two well-marked keels at the outer edge. As the upper whorls and the base are both considerably flattened, the whole shell may be said to be of tabloid form. The shell is particularly liable to be overlooked, not so much on account of its small size, but from the fact that the rounded keels of a light colour are presented edgewise to the observer, and, being on a parallel plane to the mussels amongst which they are hiding, it is difficult at first to distinguish between the pale curve of the *Risellopsis* and the high light upon the shining black circular margins of the mussels; an interesting example of protective colouring in nature.

Throughout New Zealand. Mount Maunganui; Chatham Islands.

Note.—The species *Risellopsis varia* is said to be found in the same localities as the variety or sub-species, just described, but up to the present I have not been fortunate enough to come across a single specimen.

Plate VI
No. 20

PLANAXIS BRAZILIANUS (*planus*, smooth; *axis*, a stem or axis; of Brazil).—A small, very solidly-built spiral univalve of amphibious habits; the shell is covered in the recent state with a buff-coloured periostracum. When this is worn off the shell is seen to be quite smooth, polished, almost white, and devoid of all sculpture except a few fine grooves round the neck at the base. The neck is indicated only slightly. The spire is rather higher than the height of the aperture, which latter is more round than oval, with a thick rounded outer lip, and a small notch-like canal at the base. Suter states that the specific name is a misnomer, as the shell "does not occur on the coast of Brazil," but as the name was applied in the first instance by Lamarck, who described it in the year 1822, and no one is likely to be misled by it, there is no real necessity to alter it. It is about five-eighths of an inch in height, and is found at the Bay of Islands; Australia; Lord Howe Island.

RISSOA ZOSTEROPHILA (Risso, the naturalist; *Zostera*, the Seawrack, grass-like seaweed; *philos*, loving).—Commonly known as the Spire shell, this species, like all the Rissoas, is a very minute spiral univalve, one-sixteenth of an inch in height. The shell is horn-coloured or dark brown, with a broad white band below the suture, and the mouth, which is circular, is slightly to one side. It is found under stones between tide marks, or on the beds of seaweed, such as one sees growing on mud flats and in shallow water. This species is the only minute one included in these pages, for most people consider such small creatures as beneath notice; but as the *Rissoa Zosterophila* is fairly common, and easy to find, it is to be hoped that its introduction here may lead to the further study of these fascinating little molluscs.

Auckland Harbour; Tauranga Harbour; Cook Strait; Lyttelton; Taumaki.

Plate VIII
No. 14

RISSOINA RUGULOSA (*Rissoina*, dim of *Risso*, the naturalist; *rugulosa*, having *rugae* or wrinkles).—A narrow tapering and elongated spiral univalve, about a quarter of an inch high, and less than an eighth of an inch in diameter. There are seven or eight whorls, and the shell is yellowish white, yellowish brown, or white in colour; hence they are familiarly known as “grains of rice.” The sculpture consists of axial ribs or wrinkles, fifteen or sixteen on the whorl above the body whorl. The ribs on the body whorl extend about half-way towards the base, or may be merely indicated just below the suture. The aperture is approximately a half-oval, and is about one-third the height of the entire shell. The upper end of the mouth is slightly channelled, and there is a small notched canal in the rounded base of the outer lip. Found on the under side of boulders at low tide.

Bay of Islands; Hauraki Gulf; Mount Maunganui; Banks Peninsula; Stewart and Chatham Islands.

Plate VIII
No. 15

CERITHIDEA BICARINATA (*ceration*, a small horn; *bi*, two; *carinata*, keeled).—A narrow tapering spiral univalve, the largest specimens being a little over one inch in length; of a blackish-brown or blackish-purple colour. The sculpture consists of prominent ribs, arranged longitudinally, with finer ribs, at right angles to them, occupying the intervening spaces. The name *bicarinata* is due to the two spiral carinae or ridges winding round the base of the last whorl. It is found in harbours and estuaries on mud banks, and is usually much encrusted and eroded. So much is this the case that the protoconch, or extreme tip of the spire, has never been seen except in juveniles of

Plate VIII
No. 21

about a third of an inch in length. Common in the North Island. Bay of Islands; Mount Maunganui.

Plate VIII
No. 22

CERITHIDEA SUBCARINATA (*ceration*, a small horn; *sub*, under, or less than; *carinata*, keeled).—A small dark-brown or black spiral univalve of about half an inch in length, sculptured with longitudinal rounded ribs, and without any other decoration excepting a small groove running across the upper third of the ribs of each whorl. It is found in small rocky pools just below high-water mark.

Throughout New Zealand. Mount Maunganui; Chatham Islands.

Plate VIII
No. 23

CERITHIDEA TRICARINATA (*ceration*, a small horn; *tricarinata*, having three keels).—A somewhat similar shell to the last. It is a small, dark-brown, almost black, sharply-pointed, elongated spiral univalve, possessing about nine or ten whorls, sculptured with longitudinal ribs, of which there are about thirteen on the body whorl, and spiral grooves, about four on each whorl, which cut the ribs up into squarish granules or beads, giving the shell quite a decorative effect. On the base are three well-marked smooth ribs, or keels, spirally disposed. It attains a height of half an inch, and is to be found nestling amongst the small seaweed on rocks a foot or so above low-water mark.

Whangarei; Tiri Tiri; Hauraki Gulf; Mount Maunganui; Lyttelton; Chatham Island.

Plate VI
No. 22

SEILA CHATHAMENSIS (*seila*, a torch; *Chathamensis*, from the Chathams).—A small pointed, elongated, spiral univalve, resembling the Screw shell in general appearance with its straight outlines, but only three-eighths of an inch in height, and one-eighth in diameter at the base. It is of a dark brown or bronze colour, and sculptured with fine and very distinct, smooth ribs, separated by deep grooves. There are five or six ribs on the body whorl, and four on the whorl above, the number gradually diminishing towards the summit of the spire, which terminates in a protoconch of one smooth rounded whorl. The suture is somewhat inconspicuous, being merely indicated by a slightly wider space between the ribs. The aperture is described as sub-quadrangular—that is to say, although the mouth is round, there is a suggestion of a four-sided figure about it. There is scarcely any canal to speak of, but a small and decided notch at the lower end of the basal lip. An uncommon species, it is found on the under sides of boulders at ex-

treme low water and down to fifteen or more fathoms.

Hauraki Gulf; Mount Maunganui; Foveaux Straits; Chatham Islands.

SERPULORBIS SIPHO (*serpo*, to creep; *orbis*, a circle; *sipho*, a small pipe).—A white, cream-coloured, or light brown calcareous tube, curled up, like a snake in repose, or disposed in more or less contorted coils. The shell is sculptured with longitudinal ribbing crossed by fine growth lines, the intersections resulting in a fine bead-like effect. Although, from the appearance of the shell, one might suppose it to be inhabited by a worm-like creature, the *Serpulorbis sipho* is a gasteropod animal, possessing a mantle and foot. The shell is adherent, and may be cemented to a dead shell or to a rock, or embedded in the roots of kelp.

Plate II
No. 17

Found between tide marks to about twenty fathoms.

North and South Islands. Mount Maunagnui; Chatham Islands.

SILIQUARIA WELDII (*siliqua*, a pod; Weld, a noted savant).—Commonly known as a Worm shell, this creature is unique in possessing a tubular corkscrew-like shell, tapering to a fine point at the apex; the twist at the small end of the tube is more or less regular for about four turns, but towards the large end it is coiled loosely, eventually becoming straight, giving one the impression that the curl has come undone. Those of us who have not forgotten our Lewis Carroll may see in these quaint shells delightful reminders of the days when the "slithy toves" and the "mome raths" were very real playmates in the wonderful world of make-believe.

Plate II
No. 19-19a.

The sculpture consists of growth lines round the shell, and there is a longitudinal slit, closed above, but open below. Found parasitic in sponges. A very fine specimen was given to me by my friend Mr. la Roche. It comprises upwards of fourteen individual shells visible on the outside, closely packed together in a mass of sponge. The shells are so disposed that the twisted spirals all point in the same direction, forming the apex of a pyramid, the wide ends of the tube-like molluscs constituting the base. About two inches in length.

Cape Colville, in twenty fathoms. Hauraki Gulf; Chatham Islands.

TURRITELLA CARLOTTAE (*turritella*, dim. of *turris*, a tower; *Carlottae*, of Charlotte).—A Screw shell, long, tapering, narrow, of a darkish-brown colour, and

Plate VIII
No. 26

having about fourteen whorls. Wonderfully like the largest Screw shell, it differs from the *T. rosea* in having a spire angled at fifteen degrees, in marked distinction to the other of twenty degrees, well shown in the illustrations. The specific name is derived from Queen Charlotte Sound, whence the species was dredged in ten fathoms of water, during the Challenger Expedition. It appears to thrive in a muddy situation, and is about one and a-half to two inches in length.

North and South Islands. Manukau Harbour; Mount Maunganui.

Plate VIII
No. 25

TURRITELLA FULMINATA (*turritella*, a little tower; *fulmen*, lightning).—A narrowly-tapering Screw shell of slender proportions, characterised by having two prominent spiral cords on each whorl and somewhat wavy longitudinal streaks of a fawn-brown colour arranged down the whole length of the shell. Each whorl is flattened in outline from above downwards, and bevelled off sharply above and below, so that the suture is plainly defined. The specific name, *Fulminata*, is suggested, no doubt, by the resemblance of the coloured zigzag streaks to the popular conception of forked lightning. It will be noted that when a species is named, like this one, on account of some outstanding feature, it is quite easy to remember the name, however difficult it may appear at first sight. If we memorise a church steeple during a thunderstorm, we can visualise the *Turritella fulminata* at once when we read of it, and all the salient points can be indelibly fixed in the mind. It is about an inch and a-quarter in length.

Great Barrier Island; Auckland Harbour; Hauraki Gulf; Bay of Islands; Mount Maunganui.

Plate VIII
No. 28

TURRITELLA PAGODA (*turritella*, a little tower; *pagoda*, a Chinese tower).—A small Screw shell with a most appropriate name, each succeeding whorl being splayed outwards as it descends, and then becoming sharply contracted inwards towards the suture, after the fashion of a Chinese pagoda. It is narrow and slender, whitish in colour, splashed with yellowish markings and attaining a height of seven-eighths of an inch.

Found off the Great Barrier Island; Bay of Islands; Cuvier Island; Hauraki Gulf.

Plate VIII
No. 27

TURRITELLA ROSEA (*turritella*, a little tower; *rosea*, rose-coloured).—This Screw shell is the largest and most plentiful of the genus, and attains a length of two and a-half or three inches. Though very similar in shape to the *T. Carlottae*, it is of stouter build. Of two speci-

mens of the same length, the diameter of the body whorl of the *T. Carlottae*, compared to that of the *T. rosea*, is in the ratio of nine to twelve. The colour is brown or yellowish brown, and not pink or red by any possible manner of chance, in spite of being called *rosea*. The sculpture consists of polished darker spiral cords, pretty much all of the same size, though two of them are slightly more pronounced than the others, there being about twenty such raised lines on the body whorl. The spire tapers regularly with straight outlines to quite a sharp-pointed apex.

North and South Islands. Mount Maunganui; Matakana, Tauranga Harbour, where very fine specimens are to be obtained.

STRUTHIOLARIA PAPULOSA (*struthio*, an ostrich; *papulosa*, furnished with papules or small knobs).—A handsome and rather large spiral univalve with a high turreted spire, the shoulders of the whorls bearing a number of white-tipped nodules or papules, disposed in one spiral row. The colour varies considerably; it may be straw-colour, darker yellow, chestnut brown, or purplish brown, each specimen being decorated with stripes of a much paler shade, the wavy lines corresponding in contour to the growth lines. The mouth has a thick white lip almost continuous round the aperture, the outer lip having an external band of the prevailing colour. The operculum is thin, dark brown, and horny in structure, small in comparison to the size of the animal, and furnished with a formidable-looking spike at the lower end. As the foot of the creature can be protruded to a considerable distance from the shell, and the animal is quick in its movements, it is supposed that this spike is provided as a weapon of defence. The shell is about three and a-half inches in height and is popularly known as the Ring shell, from the peristome or ring-like border of the mouth, which the Maoris string on flax for wreaths and ornamental purposes. It derives its name, *struthiolaria*, from the mouth of the shell being supposed to resemble the foot of an ostrich. As for these flights of fancy indulged in by naturalists, in the naming of genera and species, we may, without doing any grave injustice to our conscience, adopt the philosophic humour of Polonius, despite the carping criticism of Hamlet:—

Ham.: Do you see yonder cloud that's almost in shape of a camel?

Pol.: By the mass, and 't is like a camel, indeed.

Ham.: Methinks it is like a weasel.

Pol.: It is backed like a weasel.

Ham.: Or like a whale?

Pol.: Very like a whale.

Plate IV
No. 18

The *Struthiolaria papulosa* is very common, and is found throughout New Zealand. Mount Maunganui.

Plate IV
No. 16

STRUTHIOLARIA VERMIS (*struthio*, an ostrich; *vermis*, a worm).—This somewhat rare shell is of an orange-brown colour and rather smaller in size, but otherwise of similar shape to the foregoing species. There are no nodules; the incremental lines, or lines of growth, are well defined, and the distinguishing feature is a deep and well-marked groove at the suture, which may, to the imaginative mind, suggest the track of a worm. In the event of your finding one of these shells without the thickened ring round the aperture, with the free edge of the outer lip unbroken and corresponding in outline with the preceding growth lines, you will know the shell to be that of a young animal, an exception to the general rule that most of the other varieties of shellfish have a completely-finished shell at every period of life. Why the *Struthiolarias* should differ from the others in this respect one cannot say. We can only surmise that it is a proof that organic differences are evolved from simpler forms, and mentality is a matter of evolution, just as physical or organic differences are evolved from simpler forms, and that here we have an instance of the dawn of reason, the germ of forethought mutely expressed by a creature to which we allow a limited faculty, we call instinct, and grudgingly of that. Can we not imagine the tiny speck of incipient brain communing within itself as to why it should go to the trouble of building an elaborate doorway to its home when it would only have to be removed the following Spring, or whenever building operations are resumed? For my part, I have little patience with the followers of Rousseau, who wonder “whether birds confabulate or no.” While Pope and his well-known growling swine can only raise a smile in our most tolerant moods, we cannot fail to be impressed by the noble and majestic thoughts of Milton, when Raphael, conversing with Adam in the Paradise not yet lost, says of the animals:—

Know'st thou not
Their language and their ways?
They also know and reason not contemptibly.”

As Darwin speaks of the cuttlefish “having considerable mental powers,” we cannot be far wrong in attributing similar endowments to a humbler member of the same great tribe of mollusca.

The *Struthiolaria vermis* is found in Auckland Harbour; Manawatu; Tasman Bay; Mount Maunganui; Queen Charlotte Sound.

STRUTHIOLARIA VERMIS var. **TRICARINATA** (*struthio*, an ostrich; *vermis*, a worm; *tricarinata*, thrice-ribbed or keeled).—This shell resembles the species very closely, but the suture is not so well marked or deeply excavated, and there are three pronounced keels, or carinae, spirally running round the body whorl, the lowest one arising from the suture. From careful examination of many specimens, and critical analysis of the descriptions given by Hutton and Suter, I have come to the conclusion that this so-called sub-species is merely a juvenile or immature form of the species. Moreover, it is only to be found in the same localities as the adult form.

Plate IV
No. 17

XENOPHORA CORRUGATA (*xenos*, strange; *phoreus*, a bearer; *corrugata*, corrugated).—Commonly known as the Carrier shell, this species is the most extraordinary of all the New Zealand mollusca, for it has a habit of cementing the valves of other animals to its own shell, together with fragments of stone, until it is almost entirely hidden. The shells used are mostly those of bivalves, which are fixed on the shoulders of the whorls between the peripheral spines, with the inner surface invariably facing upwards. Some specimens have sponges attached to them, which have grown upon the dead shells. The *Xenophora* resembles the *Astraea sulcata* in general shape, but as it is always met with in the camouflaged state there is not the slightest difficulty in identifying it. About two and a-half inches high, and two and three-quarter inches in diameter; obtained only by dredging in about twenty to twenty-five fathoms of water.

Plate IV
No. 1

Hauraki Gulf; Bay of Islands; Tiri Tiri Island; Hen and Chickens; Little Barrier Island.

CALYPTRAEA MACULATA (*calyptra*, a lady's cap; *maculata*, spotted).—A somewhat round limpet-like shell, about an inch and a-half in diameter, covered with a bright and silky-looking epidermis and commonly known as the Bonnet limpet, or Cup and Saucer limpet. When the shell is denuded of its epidermis, it is seen to be white with pale purple or bluish tints. There is a spiral twist to the shell, and the apex is eccentric. The under surface is usually white, and has about half its area covered in with a thin plate-like process. There is also a purple patch extending into the interior.

Plate VI
No. 1

Found throughout New Zealand. Mount Maunganui; Chatham Islands.

CALYPTRAEA SCUTUM (*calyptra*, a lady's cap; *scutum*, a shield).—A small limpet-like, brown or purplish,

Plate VI
No. 2-2a.

round shell with a raised apex more or less in the centre. There is a spiral twist, and a small portion of the under surface is covered over with a thin plate-like structure. The upper surface is marked with spiral lines, the apex is smooth and whitish in colour; the under surface smooth and glossy, similar in colour to the upper surface. It is about four-fifths of an inch in diameter.

Found throughout New Zealand. Hauraki Gulf; Little Barrier Island; Mount Maunganui; Lyttelton Harbour; Stewart Island.

Plate VI
No. 13

CREPIDULA COSTATA (*crepidula*, a small sandal; *costata*, ribbed).—The Slipper limpet is a strongly built, boat-shaped shell with well-marked rough and regular ribs running from the rear of the shell, which is narrow, to the front, becoming wider and spreading out in conformity to the general outline. Nearly half of the under surface is covered in with a thin deck-like structure. The shell is arched, and may be yellowish brown, light or dark, chestnut or almost white in colour. About two and a-half inches in length by one and a-quarter inches wide. The Slipper limpets have a partiality to fixing themselves to the valves of the large Horse mussels, and to rocks at low-tide mark.

Found throughout the North Island. Mount Maunganui.

Plate VI
No. 14

CREPIDULA CREPIDULA (*crepidula*, a small sandal).—This is another Slipper limpet, with a very thin white shell, rather oval in shape, curved on the flat, supposed to resemble a finger nail, and having a small pocket on the underside. The under surface is very smooth and glossy, the upper surface matt or dull. These limpets are found mostly upon the Turbo smaragdus or Cats'-eye shell, and in the aperture of the Siphonalia or Spindle shells. In the former case they are narrow and boat-shaped, with a fine beak-like prow or apex; in the latter, more flattened and broader, varying in shape according to the contour and surface of the shell upon which, or in which, they happen to reside, a condition common to all species of the limpet-like molluscs. The naming of this shell has been commented upon as being a "silly reduplication recently substituted for *Crepidula unguiformis*," but this is not the case. The name *Patella crepidula*, literally the slipper limpet, was assigned to it in the year 1764 A.D. by Linné (Linnaeus), the renowned Swedish naturalist. Lamarck, sixty years later, described the same species as *Crepidula unguiformis*, which is correct, so far as the first or generic

name is concerned, for it is not a true patella, but a crepidula. At the same time he was not justified in altering the second or specific name. To rectify matters and still pay due honour to Linné's memory, while giving him proper credit for his work, scientists reverted naturally to the old original name, which consequently became *Crepidula Crepidula*.

Found throughout New Zealand from low-water mark to about forty fathoms. Mount Maunganui.

NATICA ZEALANDICA.—A highly-polished, smooth, yellowish or brown globular spiral univalve, with arrow-head markings of dark brown colour, arranged in spiral rows, the upper whorls of the spire having a bluish tint. It has a white porcellanous operculum of such size as to fit the aperture just within the outer lip. The shell is about an inch in diameter, and although found in great numbers washed up on sandy beaches, the animal and the operculum are very rarely met with. The spawn coils are curious objects, occasionally met with on sandy beaches; they are broad sandy straps standing on edge, coiled in a single turn with the ends slightly overlapping, but not united. The eggs are incorporated with sand, the whole cemented together with a substance secreted by glands in the reproductive organs of the animal. The small round holes, beautifully countersunk in the shells of so many small mollusca, are the work of the *Natica*; the animal is carnivorous, and evidently goes to much labour to obtain its natural food. It is also blind, but does not appear to be specially handicapped in the struggle for existence, judging by the wonderful fecundity of the species. The common name for the *Natica* is the Necklace shell.

Plate III
No. 20

Hauraki Gulf; Mount Maunganui; Stewart, Chatham and Great Barrier Island.

POLINICES AMPHIALUS (*Polynices*, a son of Oedipus; *amphialus*, sea-girt).—A small spiral shell, globular in form, resembling in shape the *Natica Zelandica*, but only about a quarter of an inch in its largest diameter. The spire is small and very slightly elevated, the greater part of the shell being occupied by the body whorl. The sculpture is barely noticeable, there being merely a few growth lines to be seen. In colour it is of a translucent milky white, smooth and polished. The shell is unusually solid or thick for its size.

Plate VII
No. 21

Found at the Chatham Islands and Stewart Island.

AMPULLINA UNDULATA (*ampullina*, dim. of *ampulla*, a globular flask; *undulata*, wavy).—This

Plate VII
No. 10

species is an exceedingly rare one, resembling the *Natica Zealandica* in general shape, being globular, with a relatively large body whorl and a small spire. The outer lip is thin and sharp, and the interior is white and glistening, the inner lip with the columella and parietal wall forming an S, which accounts for its specific name, *undulata*. There is a thick white callus on the inner lip, which quite seals up the umbilicus. Suter remarks in his book that he has "seen no recent specimen, the description being taken from a fossil shell from Wanganui." Fortune must have smiled upon me one morning, when I came across an empty shell in excellent condition, washed up on the ocean beach at Mount Maunganui after a south-easterly gale. The shell, which is about an inch in diameter, is a singularly beautiful one, of a pure snow-white, very thin, fragile, pellucid, sculptured only with the very faintest or growth lines, which are crossed by equally delicate spiral striations. The simplicity of design and the subdued scheme of decoration, instead of detracting from its charming appearance, render it the more alluring. As Thomson says:—

"For loveliness
Needs not the foreign aid of ornament,
But is, when unadorn'd, adorn'd the most."

Cape Maria van Diemen; Mount Maunganui.

Plate V
No. 24

LAMELLARIA OPHIONE (*lamella*, a thin plate; *Ophion*, one of the Titans).—An extremely thin, fragile, pellucid, small, white univalve. The aperture is large and widely open, almost the size of the entire shell, and, although a spiral, the whorls are coiled quite loosely; that is to say, the columella is not central and vertical, and, looking at the interior, one sees the whole of the internal surface. It is oval in shape, highly arched in the middle, somewhat after the fashion of the Pawa shell, and rather less than half an inch in length. The only sculpture is that of spirally-arranged growth lines. The animal is large, and the shell is invested in the mantle, a condition common to most other extremely thin and colourless shells, such as the Bubble shells and the *Philine constricta*.

Auckland Harbour; The Snares; Mount Maunganui;
Cook Strait.

Plate VIII
No. 1

TRICHOTROPIS CLATHRATA (*thrix*, a hair; *tropis*, a keel; *clathrus*, a lattice).—A small ash-coloured, yellowish white or brown spiral univalve, about half an inch in height. Living shells are covered with an epidermis, fringed or hair-like at the keels, or ridges; and the sculpture consisting of spiral and axial ribs crossing each other at right

angles, gives rise to the specific name, *clathrata*, from its lattice-like arrangement. The upper whorls are turreted, rising tower-like in successive tiers or steps, rather square at the shoulders, the spire being comparatively small, and terminating in a sharp apex, the body whorl large in proportion to the whole shell, and having a large mouth, with a crinkly and sharp outer lip. There is a decided umbilicus. It is found throughout New Zealand between tide marks (Iredale) and in deep water.

Mount Maunganui; Chatham Islands; Bounty Island, and The Snares.

JANTHINA BALTEATA (*janthina*, violet-coloured; *balteus*, a belt).—This is one of the beautiful Violet Sea snails, commonly called Storm shells. There are three species native to these waters, but as they are all pelagic in their habits—that is, inhabiting the open sea—they can only be procured when washed ashore on an ocean beach. A curious feature connected with them is that they construct an unsinkable raft of clear, colourless, gelatinous material enclosing air bubbles. This raft, which is made by both sexes, is utilised by the female to carry her eggs. It can be detached when no longer required, but the animals are often caught unawares, and the raft is then the means of their undoing, for they are driven ashore in great numbers when gales are blowing. It has been stated that these animals float with the base of the shell upwards, and this is given as the reason why the colouration of the shell is so much lighter on the spire. In the case of the *J. balteata*, the upper portion of the spire is certainly much paler than the base; in fact, it is almost white, and it is well known that absence of sunlight will decrease the production of pigment in shells, as well as in other forms of animal life. That is why our New Zealand mollusca are, as a rule, possessed of more sombre-hued shells than are the shellfish peculiar to tropical seas. Seeing, however, that there is not the same difference in colour in the other *Janthinidae*, the theory is not altogether convincing. One day, during a pronounced storm, I picked up about forty *J. balteata*, alive, and each one equipped with a raft; and, on arriving home, placed them in a bowl of water. They certainly floated, but, contrary to my expectations, they floated with the mouth directly upwards, and, consequently, the base and the spire were both equally exposed to the sunlight; so we may safely assume that there are factors other than sunlight concerned in the formation of colour. The specimens in question were found in company with numbers of small jellyfish, a species of *Velella*, beautiful little crea-

Plate V
No. 18-18a.

of its kind found on the coasts of the Dominion. It is almost identical with the species met with on the south coast of England. The shell is small, fairly rounded, and about five-eighths of an inch in length, sculptured entirely with numerous small ribs, with intervening grooves, commencing from the inner surface of the lips and extending up and round the outside of the shell, meeting in the middle line. At either end these grooves and ribs tend to diverge from the centre and become more horizontal. The colour is pale pinkish yellowish white, with two or three irregular spots of pinkish brown on the back, and a small patch of the same colour at each end. At the Bay of Islands a variety has been found which is of a pure translucent white, almost smooth, and with a pink tint at either end, but with no spots on the back. This I believe to be merely a juvenile form of the species.

Worn as a charm against witchcraft and a protection from the evil eye, the Cowrie shell had a great vogue in Egypt in the days of the Pharaohs, and from remote times it has been used as currency among different native races in Africa. The *Trivia Australis* is quite an uncommon shell, and has been recorded from Cape Maria van Diemen, Bay of Islands, Ahipara Bay, Hauraki Gulf, Mount Maunganui, Cook Strait.

SEPTA COSTATA (*septa*, plural of septum, a partition; *costata*, ribbed).—A rather large, bright brown spiral univalve, with strong nodulous spiral ribs, two on the upper whorls and fourteen on the body whorl. There is a varix or extra large rib on the body whorl, disposed axially or in the longitudinal axis of the shell; this varix is coloured dark brown in the grooves, and pure white on the nodules. The outer lip also has a strong varix on the outer side, of white and brown. The inside of the outer lip is ridged and grooved, dark and light brown, respectively. The columellar lip is very dark brown, with numerous small white ribs transversely arranged upon it. The mouth is channelled above, and ends below in an open canal. It is not a common shell, and is found washed up on ocean beaches after heavy gales. In the recent state it is covered with a horn-coloured, thick, hairy epidermis.

Found on the northern coasts of New Zealand. Hauraki Gulf; Bay of Islands; Mount Maunganui.

Plate IV
No. 2

SEPTA RUBICUNDA (*septa*, plural of septum, a partition; *rubicunda*, somewhat red).—This shell is one of the largest of our New Zealand univalves, and is commonly known as the Triton shell. It is fusiform shape—that is

Plate IV
No. 3

to say, spindle-shaped, or bulging in the middle and tapering towards either end. The spire is sharply pointed, and the body whorl is large and globular, heavily built and sculptured with nodulous ribs, two on each of the spire whorls; the lower of the two being partially covered by the succeeding whorl. There are many strong spiral ribs on the body whorl, and the colour is yellowish brown with white patches on the nodes, the intervals being mottled with darker brown or a rich brown with puce spots. There is a large, rounded varix on the exterior of the outer lip, and another on the body whorl on the opposite side of the shell. This varix is elevated and sharp. The interior is white or pale purple; the outer lip is marked with long, dark brown-coloured bars or teeth, arranged in groups of twos and threes, especially at the upper part; the inner lip forms a thin coating upon the columella, and is of a pale dun colour, extending upwards as a thick glaze upon the body whorl. There is a short open canal below; the upper end of the mouth is distinctly channelled, and here there is, on the inner lip, a large plait or ridge, while at the lower end of the columella are several white teeth. It may attain a length of nine inches, though seven or eight inches is the usual size. It is found during the summer at low tide in boulder-strewn localities where there is a muddy bottom, and occasionally may be seen in fair numbers. Those amongst the boulders are usually decollate, a conchological term which means truncated, beheaded, or minus the apex; also, they are much encrusted and stained, so that the sculpture and colour cannot be properly discerned. Live shells, which come up from deep water, as they will in hot, sunny weather, are better specimens, and good ones may then be procured for the cabinet.

The eggs, which are laid in the winter, are reddish pink, translucent, elongated, and club-shaped. They are deposited in close contact with each other and in a single layer upon the under surface of boulders.

The *Septa rubicunda* has a wide distribution, being found at the Scilly Islands, in the British Channel, and the Mediterranean, where it was used by the ancient Romans as a trumpet shell. In Spain at the present day this Conch shell is still blown by fishermen when hawking their fish in the streets of coastal villages. In New Zealand it is found at Whangarei, Mount Maunganui, and as far south as Napier, on the east coast, and Kawhia, on the west.

Another Triton shell, the *Septa Tritonis*, is also partial to warm latitudes. It is more slender in shape than the foregoing, but attains a much greater length, New Zealand specimens being as much as fourteen inches long. It was

used by the Maoris in the old days as a war trumpet, good examples of which are to be seen in the Auckland Museum. Captain Cook refers to this shell being used by the natives, "called Triton's trumpet, with which they make a noise not unlike our boys sometimes make with a cow's horn." Not quite so awe-inspiring as a blast from the "ponderous Sea horn . . . a signal deep and dread as those the storm-fiend at his rising blows," sung of by Thomas Moore in "Lalla Rookh." One description by a scientific explorer, the other by a melodious poet. All the Tritons, as well as the Tun and Helmet shells, are said to secrete sulphuric acid, which the animals use in dissolving the outer lip when making an addition to the shell.

CYMATIUM EXARATUM (*cyma*, a wave; *exaratum*, ploughed up, or engraved).—Rather a small spiral univalve, less than two inches in height, of an orange-brown colour, with light-brown nodules. The whorls of the spire are flat-shouldered, with well-marked ribs, crossed by axial ribs, nodulous where the crossing takes place; on the body whorl are five prominent spiral ribs, and a number of fine ones below. There are two high varices on the body whorl, one of which is to the outer side of the aperture. The mouth is white, oval, toothed on the inner side of the outer lip, and ending below in a straight, narrow, open canal, which is bent somewhat backwards. It is rather a rare shell, found at Mount Maunganui, and not recorded from any other locality in New Zealand. Washed ashore after heavy gales, these shells are invariably empty, though the finest specimen I have seen was to all intents and purposes a live shell, for it was covered with epidermis, long, dense and hairy, and the interior was violet-tinted, smooth and glossy.

Plate IV
No. 12

Since writing the above notes, a live specimen has been dredged from the vicinity of the Hen and Chickens in twenty-five fathoms of water—a notable find, as the animal had not been seen before, and so has never been described.

CYMATIUM SPENGLERI (*cyma*, a wave; Spengler, the naturalist).—This is a much larger shell than the *C. exaratum*, being about five inches in length. It is of a pale yellowish-brown colour, with darker brown in the grooves. The shoulders of the whorl are straight and sloping downwards and outwards. There are eight to ten rather broad ribs on the body whorl; the shoulders bearing large nodules. The shell is furnished with high varices, several on the spire, and two on the body whorl, the last being on

Plate IV
No. 11

the edge of the outer lip, which is somewhat expanded. The mouth is white, with two rows of teeth separated by a deep furrow on the inner side of the outer lip. It is channelled above, has one tooth on the upper part of the inner lip, and ends below in a short, open canal.

Throughout New Zealand. Mount Maunganui; Chatham Islands.

Plate IV
No. 4

ARGOBUCCINUM ARGUS (*Argo*, the ship "Argo"; *buccina*, a trumpet or Triton shell; *Argus*, a Greek myth with a hundred eyes).—Commonly known as a Frog shell, this is a solid, greyish or yellowish-brown spiral univalve, with flattened varices upon the whorls on opposite sides of the shell. The sculpture consists of beaded spiral ribs, three or four of these on the upper and widest part of the body whorl, having the appearance, in recent shells, of reddish or chestnut glass beads strung on a bluish cord. The mouth, which is a trifle longer than the height of the spire, is deeply channelled above, and ends below in a short, open canal. The outer lip has a varix on the outer side, and the inner side has a row of teeth. The interior is white. It is not a common shell; as it lives on rocky ground, the shells, when washed ashore during stormy weather, are frequently broken. About four inches in length.

Throughout New Zealand. Mount Maunganui; Chatham Islands; Auckland Island.

Plate IV
No. 5

ARGOBUCCINUM AUSTRALASIA (*Argo*, the ship "Argo"; *buccina*, a trumpet or Triton's shell).—This is another of the Frog shells, and the reason why they are so called is that when these shells are placed on a flat surface the bulging body whorl and the slant of the aperture suggest the figure and attitude of a frog squatting upon its haunches.

This species is a dark brownish or yellowish-chestnut spiral univalve with nodulous varices on the shell, diametrically opposed to each other. Each whorl on the spire has a row of prominent white nodules on the shoulders, and there are two such rows on the body whorl at its widest part. The mouth is very white, hence one of the synonyms, *Leucostoma*, which signifies a white mouth. The outer lip has a varix on the outer side, white and dark brown, and on the inner side a double row of well-marked teeth separated by a deep groove. The upper end is channelled; there is a single tooth at the top of the inner lip; the lower part ends in a short, open canal, also toothed. It may attain a length of four inches.

Found in the North Island. Whangarei Heads; Mount Maunganui; Cook Strait.

PHALIUM LABIATUM (*phalos*, part of a helmet; *labiatum*, lipped).—This species and the sub-species, *P. pyrum*, both commonly known as Helmet shells, present so many similarities, or rather there is such considerable overlapping in their essential characteristics, that it is advisable to collect a large number of shells and carefully study each one, noting the general shape and proportions, the colour, the sculpture, the outer lip, the inner lip, or, as it is sometimes called, the columellar lip, and the size and shape of the open umbilicus. No doubt interbreeding will account for the many varied types, but pure thoroughbreds are exceedingly rare.

Plate IV
No. 19

The *Phalium labiatum* is much the rarer of the two, and it is probable that out of several score specimens collected not more than one or two will be the true species. In the first place the spire whorls are smooth, and the nodules, which are so conspicuous on the body whorl of the *P. pyrum*, are absent or only slightly indicated. The outer lip is solid and thick, with a sharp edge on the outer side, while it is slightly toothed on the inner side towards the base. The colour is pale tawny or yellowish ash, and there are spiral rows of whitish spots on the body whorl. The inner lip is bent round the columella, leaving only a small chink-like opening for the umbilicus. A large specimen may be as much as three inches in height. The species lives on a rocky ground.

Ohmaha; Whangarei Heads; Mount Maunganui.

PHALIUM PYRUM (*phalos*, part of a helmet; *pyrum*, a pear).—This Helmet shell differs from the species in being much thinner and lighter in weight, in having the shoulders of the whorls angular, the upper whorls spirally striated, the body whorl with nodules on the shoulder, and the inner lip forming a doubled plate, expanding or jutting out beyond the columella, leaving the umbilicus as a wide triangular opening. In addition to these differences, the spire is shorter and the whole shell more plump in shape; and here I must whisper that your true conchologist bears no love for the "well of English undefiled." To him no shell is plump; it is ventricose, globose, globulose, globulous, globous, or, as when Homer nods, it may be merely globular. In colour there is also a distinction, the sub-species being of a "bay, or pale dun colour, with wavy spiral bands of chestnut brown." (Suter). A varix is sometimes found on this shell, like a rounded cord vari-

Plate IV
No. 20-20a.

gated with the colours of the shell itself, placed longitudinally upon the body whorl, or there may be reduplications of the outer lip, as though the creature, through forgetfulness, had omitted to dissolve the thickened lip, before proceeding to form a new portion of shell to accommodate its increasing bulk. The shell may attain a height of three and a-half inches. This sub-species lives in a sandy ground.

Found at Mount Maunganui, Hawkes Bay, and other places in the North Island; St. Martin's Bay, South Island.

Plate II
No. 15

TONNA VARIEGATA (*tonne*, anglo-saxon, a butt, or large cask; variegated).—The Tun shell is a very large, rounded, handsome univalve, comparatively thin for its size, and consequently often broken when met with on the seashore, where it is to be seen occasionally after heavy winter storms. It is of a rather pale, though bright yellow colour, with rich dark brown spots, and sculptured with alternate ribs and grooves of equal size, spirally winding round the whorls. The spire is very short, being only about one-fourth the height of the aperture. The mouth is large, and the animal has no operculum. Internally, the shell is yellow, very glossy, and marked with smooth ribs and grooves, which correspond respectively with the grooves and the ribs on the outside. Live shells have been found at Matakana Island, on the ocean side, but one of the best specimens I have seen, six and a-half inches long, by five and a-half inches wide, was picked up on the beach at Mount Maunganui.

Found from the North Cape to Tauranga. Whangarei Heads; Great Barrier Island.

Plate VII
No. 20

ARCHITECTONICA LUTEA (*architectonica*, skilled in architecture; *lutea*, yellow or clay-coloured).—A very small, smooth, polished spiral univalve, of about one-third of an inch in diameter, conical, with a flattened base, of an opaque yellowish-fawn colour, or bright bay, with a double row of small reddish-brown dots running round the suture. At the widest part, or circumference, of the body whorl there are two rounded ribs or keels, where the coloured dots are more pronounced. At the centre of the base the umbilicus is open; it is a deep, funnel-shaped cavity, bordered with a sharply-defined margin of white, toothed at the free edge; this frill-like edging may be seen winding its way spirally upwards towards the apex of the shell. The species is by no means common, and occurs only in most restricted areas.

Whangarei Heads; Hauraki Gulf; Mount Maunganui; Wellington; Chatham Islands.

ARCHITECTONICA REEVI (*architectonica*, skilled in architecture; Reeve, the conchologist).—A rare spiral univalve about an inch in diameter, and five-eighths of an inch in height, flatly conical in shape, of flesh colour, and sculptured with a finely-beaded rib above and below the suture. There is also a pronounced rib round the angle at the base, with one accompanying it above and below. A narrow band of white round the suture is continued on the rib of the basal angle. Well-marked brown spots are arranged in bands just below the suture, and also above the angle of the base. The mouth is squarish in shape, the outer lip thin, and the columella straight and vertical. The base is flat and presents in the centre a widely-opened umbilicus with a white-toothed border winding its way, like a staircase, up to the apex of the shell. The *Architectonica* is also known as a *Solarium*, or sundial, no doubt on account of its geometrical outlines and the dark spots spaced off at regular intervals. Hitherto only recorded from Whangarei Heads, two dead shells have been found at Mount Maunganui (Miss Mirrielees). It has also been found on the Tasmanian and Australian coasts.

Plate VII
No. 19

EPITONIUM BUCKNILLI (*epitonos*, back stay of a mast; Bucknill, found by the writer).—This is quite a new species of shell, recently discovered at Mount Maunganui, resembling the other *Epitoniidae* in its general shape, mode of sculpture, and pure white polished surface. The angle of the spire is 30 degrees, which distinguishes it at a glance from the more slender *E. Jukesianum*, with its spire of 20 degrees, which it most resembles superficially. Between the ribs it should be observed that there are minute striations, which are to be made out only with the aid of a good lens. It is about two-thirds of an inch in length, and is found washed up with coarse pumice sand at high-water mark. The discovery of this species emphasizes the importance of carefully searching the sandy beach for shells from time to time.

Plate VII
No. 16

Since the above lines were written, several specimens have been collected from Whangaroa. (*W. la Roche*).

EPITONIUM JUKESIANUM (*epitonos*, the backstay of a mast; Jukes, the naturalist).—A small, delicate Wentletrap shell, so called from the Dutch word wentletrap, meaning a staircase. Pure white in colour, it is about half an inch in length and an eighth of an inch in diameter at the widest part of the body whorl. It has about ten whorls, gradually diminishing in size to the sharply-pointed apex. The whorls are rounded and sculptured with fine plate-

Plate VII
No. 13

like ribs arranged longitudinally down the shell. On the body whorl the ribs are twenty in number, and the spaces between them are perfectly smooth. The aperture is round, and about one-third the height of the spire.

Whangarei Heads; Auckland Harbour; Mount Maunganui; Gisborne; Cook Strait.

Plate VII
No. 15

EPITONIUM PHILIPPINARUM (*epitonos*, the backstay of a mast; Philippi, the conchologist).—This Wentletrap in most respects resembles the *E. Jukesianum*, but is slightly larger, being about five-eighths of an inch in length, and rather more than three-sixteenths of an inch in width at the base. These dimensions, although only varying so little, give the shell a more stocky appearance, which is at once obvious when a specimen is placed side by side with the more slender *E. Jukesianum*. The distinguishing feature, however, is that there are only ten ribs on the body whorl, and, consequently, the smooth interspaces are much more conspicuous. It is a pure white, very translucent, and polished. The mouth is slightly oval. Rather a rare species.

Bay of Islands; Mount Maunganui; Waiwera; Rangitoto Channel.

Plate VII
No. 14

EPITONIUM TENELLUM (*epitonos*, the backstay of a mast; *tenellum*, dim. of *tenuis*, thin).—This Wentletrap may be readily identified by its colour, being of a pale horn tint, with a narrow brown band just below the suture and continued round the base. There is also a similar coloured band winding spirally round the large circumference of the body whorl. It is a much thinner shell than the other species, and is sculptured in a like manner, with longitudinal ribs, of which there are about twenty on the body whorl, the intervals being quite smooth. It is about seven-sixteenths of an inch in height, and has eight or nine whorls. A rare species.

Found at the Bay of Islands, Auckland Harbour, Mount Maunganui, Ohiwa.

Plate VII
No. 12

EPITONIUM ZELEBORI (*epitonos*, the backstay of a mast; Zelebor, the naturalist).—Although this Wentletrap, popularly known as the Curly, is the commonest of the five species found in New Zealand, it is by far the most beautiful of these charming little shells. About an inch long, it is of an opaque snowy white, sculptured with longitudinal ribs and small transverse ribs in the intervals. The whorls are rounded, and they diminish gradually in size to the finely-pointed apex, the suture being well defined.

The mouth or aperture is round and perfect—that is to say, the lip is a thickened rim running continuously round the mouth, and not interrupted by a notch or canal, as in most of the spiral univalves. The animal, like all the Wentletraps, is a carnivorous feeder. It is found just below low-water mark, and is often washed ashore on sandy beaches.

Bay of Islands; Great Barrier Island; Mount Maunganui; Chatham Islands.

TURBONILLA ZEALANDICA (*turbonilla*, dim of turbo, a whipping-top; N.Z.).—A minute slender white spiral univalve, tapering to a sharp point, not unlike a thorn. It is three-sixteenths of an inch in length, and slightly under a sixteenth across the body whorl. There are eight whorls, with almost straight outlines, there being a sloping step-like shoulder to each one just below the suture. The sculpture consists of small and numerous ribs longitudinally arranged, which, on the body whorl, terminate at a small spiral thread, winding round from the top of the aperture, leaving the rounded base smooth. The sculpture and the curious little protoconch, perched, as it were, edge-wise on the top of the spire, should be examined with a good magnifying glass. It may be picked up on sandy beaches at high-tide mark, among disintergrated pumice, but, on account of its diminutive size, can be easily overlooked. They are not often met with, but when a favourable sea does wash them ashore one may collect several dozen of them.

Plate VI
No. 24

Found in shallow water to fifty fathoms throughout New Zealand. (Suter).

Mount Maunganui; Stewart Island; The Snares; Bounty Island.

MEGALATRACTUS MAXIMUS (*megale*, great; *atractus*, a spindle; *maximus*, greatest).—A fine, large, narrow, turretted spiral univalve, of picturesque design, with the whorls strongly angled at the middle, the slope of the angle being straight and the angle a right angle. It is of a light brown colour, sculptured with fine small spiral ribs and intervening threads or riblets. At the angles of the whorls are a number of large flattened and sharp nodules projecting outwards, there being about ten on the body whorl. The mouth is narrowly oval, angled above, and also at the shoulder; below, drawn out into a long, open, narrow canal, curving first slightly to the left and then slightly to the right, at the same time having a very decided curve backwards. The outer lip is thin, sharp and crinkly; the

Plate III
No. 5

interior somewhat smooth, shiny and whitish. About seven inches in length; mostly found in deep water.

Hauraki Gulf; Mayor Island; Whale Island; Mount Maunganui; Cape Runaway; New Brighton.

Plate VII
No. 17

FUSINUS SPIRALIS (*fusis*, a spindle; *spiralis*, spiral).—A very rare shell, fragile, and of the most elegant proportions, not unlike a Chinese pagoda. The protoconch is smooth, and consists of two bead-like whorls, the upper one rather larger than the lower one. The spire whorls are acutely angled at the shoulders, and increase regularly in size to the body whorl. The sculpture shows three fine, raised, equally-spaced ribs, spirally arranged, on the upper surfaces of the whorls, and a single row of blunted saw-like teeth projecting straight out from the keel of each whorl and ending at the outer lip. The mouth is triangular, and terminates below in an unusually long, open, slender and straight canal. In colour, the shell is yellowish white with wavy streaks of a deeper shade longitudinally disposed. About two inches in length, or rather more.

Found at the Great Barrier Island; Mount Maunganui; Cook Strait.

Note.—The protoconch is the commencement of all spiral univalves, and is composed of one or more solid whorls at the extreme tip of the spire. It is, perhaps, best seen in the Volutes and Spindle shells. In many juvenile spirals, consisting of body whorl and protoconch only, this structure being of the same size as in the full-grown mollusc, appears out of all proportion to the shell, and may give rise to doubts as to its identity, until a series has been collected and examined.

Plate VI
No. 12

LATIRUS HUTTONI (*Lathyrus*, Ptolemy Soter II.; Hutton, the conchologist).—This is the mollusc correctly described in Moss's book as the *Taron dubius*, the above name, employed by Suter in his Manual, proving to be a synonym. It has a small black or dark brown fusiform or spindle-shaped spiral shell, and is found between tide marks in crevices of rock and on the dark under surface of overhanging boulders in sheltered positions. The shell is sculptured with narrow rounded spiral ribs, and also broadly-rounded ribs disposed vertically down the whorls. The columella is white, the protoconch usually purple, the interior dark purple, and the inner side of the canal flesh-coloured or brownish. The distinguishing feature of the animal is its bright red salmon-coloured foot, which makes identification easy, even though the sculpture and colour of the shell be almost entirely obscured by a thick coating

of nulliporites, a condition not infrequently met with. It attains a height of three-quarters of an inch.

Auckland Harbour; Bay of Islands; Mount Maunganui; East Cape.

MITRA CARBONARIA (*mitra*, a mitre; *carbonaria*, black).—This is one of the Mitre shells, so called from its resemblance to a bishop's mitre. The specific name, *carbonaria*, as well as the synonyms, *Mitra niger* and *M. melania*, allude to its black colour; but it is probable that as only empty shells have been found, the name was based upon a dead one. Some I have seen in a collection were decidedly dead shells, stained black, the same as one notices in old, worn and mud-stained pipis and scallops, etc. The true colour is dark olive brown, dark chestnut, or cinnamon colour. It is solidly built, has a smooth polished surface, and is about three times as high as its widest diameter. The mouth is less in height than the spire, and the outer lip is rounded and thick. There are five oblique plaits on the columella. The finest specimen I have seen is two and a-half inches long, an empty shell washed ashore at Mount Maunganui. It is quite rare.

Bay of Islands; East Cape.

Plate III
No. 10

VEXILLUM RUBIGINOSUM (*vexillum*, the Roman flag or standard; *rubiginosum*, reddish).—A small purplish-black, or reddish-brown fusiform; sharply-pointed spiral univalve of about a quarter of an inch in height with white spiral band on the periphery of the body whorl; the base is orange red. The aperture is long and narrow; the columella has four plaits, and the canal has a notch at the base. It is found under loose boulders in sheltered situations from low-water mark down to fifty fathoms.

Mount Maunganui; Stewart Island; Chatham Islands.

Plate VIII
No. 10

SIPHONALIA CAUDATA (*siphon*, a hollow tube, a reed; *cauda*, a tail).—A rare spiral univalve, about one and a-half inches in height, of a pale yellowish colour, sculptured with fine spiral ribs of a reddish-brown tint, and having from fifteen to twenty broad ribs vertically arranged on the body whorl, becoming obsolete below the periphery, or, in other words, thinning off and becoming lost just below the wide part of the whorl. The aperture is ovally rounded, and ends below in a somewhat lengthy canal. The whorls are rounded in outline and well defined. Two living specimens were recently found on the ocean beach at Mount Maunganui, after a strong easterly gale. The animal has a bright scarlet foot. Also found in the

Plate III
No. 8

Hauraki Gulf, and dredged at the East Cape in twenty fathoms.

Plate III
No. 7

SIPHONALIA DILATATA (*siphon* a hollow tube, a reed; *dilatata*, dilated).—A solidly-built large spiral univalve, one of the Spindle shells, sculptured with numerous fine raised brown ribs or lines, varying in thickness, spirally winding round the whorls. The shoulders of the whorls are angled, and bear rather large nodules. The interior is greenish in colour, the mouth angled at the shoulder, channelled above, and terminating below in a rather long canal. It is about five inches in length, and found in rocky situations.

Bay of Islands; Mount Maunganui.

Plate III
No. 6

SIPHONALIA MANDARINA (*siphon*, a hollow tube, a reed; *mandarin*, a Chinese dignitary).—This Spindle shell is somewhat similar to the last one, but of more slender and graceful proportions. It is of a greyish greenish or purplish stone colour, with fine raised spiral cords and lines; the whorls are not angled, but well rounded, and the canal at the base of the aperture is long, open, and curved to the left. In perfect and half-grown specimens the protoconch is conspicuous, and of a waxen white. I have seen this species suspended from the lower end of a large cluster of egg-capsules, attached to the under surface of a overhanging rock, and about a foot above the level of the water at a low spring tide. Among the surrounding boulders, shells of all sizes can be obtained at different seasons of the year, so that it is possible in time to form an instructive series ranging from about three-sixteenths of an inch, consisting of protoconch and body whorl only, up to the full-grown specimen of five inches, comprising nine or ten whorls.

Auckland; Mount Maunganui; Banks Peninsula; Queen Charlotte Sound.

Plate III
No. 9

SIPHONALIA NODOSA (*siphon*, a hollow tube; *nodosa*, with nodes).—A somewhat thin, translucent brown and white shell, each whorl sloping down to the shoulder, then becoming vertical down to the suture, where it meets and joins the next whorl below. At the point of the shoulder there is a row of small and sharp nodules winding spirally round the shell from the apex to the aperture: the body whorl being ornamented with two; the second one at the lower border of the broad brown-colour band. About two and a-half inches high. It is common on sandy beaches, and is found throughout New Zealand, "as far

south, but not below Banks Peninsula." (Suter).
Mount Maunganui.

EUTHRIA LINEA (*eu*, well; *Thriae*, the Parnassian nymphs, nurses of Apollo; *linea*, marked with lines).—A fusiform or spindle-shaped spiral univalve, belonging to the rapacious Whelk family. It has a strong and thickly-built shell of a greyish or yellowish colour, with slightly raised dark-brown or black stripes running spirally from apex to base. Although not exactly a handsome shell, it has a decidedly smart appearance. About one and three-quarter inches in length. Found among rocks at low tide.

Plate V
No. 27

North and South Islands. Mount Maunganui.

EUTHRIA LITTORINOIDES (*eu*, well; *Thriae*, Parnassian nymphs, nurses of Apollo; *litorina*, inhabiting the sea-shore; *oidos*, like).—This species is a most variable one, but may be usually recognised by the fact of the whorls of the spire not being so conspicuously defined from each other as in the other members of the genus. It is rather small, solidly built, fairly round at the periphery of the body whorl, of a pale slaty or bluish-grey colour, with well-marked narrow purple or black spiral stripes, which stand out in very slight relief. It is about an inch in height and is found on rocky ground among loose boulders near to low-water mark.

Plate V
No. 28

North and South Islands. Makatu; Mount Maunganui; Chatham and Auckland Islands.

EUTHRIA MARTENSIANA (*eu*, well; *Thriae*, Parnassian nymphs, nurses of Apollo; *Martens*, the conchologist).—An elongated, gracefully-shaped, rather thin spiral univalve, with the sutures of the spire whorls well defined, and the aperture much shorter than the height of the spire. The colour is a uniform yellowish brown. It is sculptured with a few very fine spiral ridges, almost indistinguishable, and numerous axial or vertical rounded ribs from the apex to below the middle of the body whorl. The base is contracted, the outer lip of the aperture thin and sharp.

Plate V
No. 26

Island Bay, Wellington; Dunedin Harbour; Lyttelton Harbour; Preservation Inlet; Auckland Islands.

EUTHRIA VITTATA (*eu*, well; *Thriae*, Parnassian nymphs, nurses of Apollo; *vittata*, garlanded, or filleted).—A small spindle-shaped univalve about three-quarters of an inch in length, of a pale yellowish-brown or greyish-white colour, with a broad band of dark purple on the whorls of the spire, and two on the body whorl. The three

Plate V
No. 29

upper whorls of the spire are sculptured with a number of small vertical ribs, the remainder of the shell being spirally striated, the most noticeable striations being on the base. The mouth is oval, often channelled above, and ends below in a short, open canal, curved to the left and distinctly notched at the base.

The largest *E. vittata*, obtained at Mount Maunganui, on Stony beacon, are 25 millimetres (one inch) in height, and are either lacking in the purple bands or have them indicated only by the very faintest of shadows. The typical parti-coloured specimens are mostly under 20 millimetres. All the shells examined were taken from the rocks alive, and were not beach-worn individuals. As the plain variety is always more solidly built, with well-marked teeth bordering the inner margin of the outer lip, and a strong plait on the upper part of the inner lip, features mostly wanting in the striped kind, it would appear that the plain shelled specimens are decidedly the more robust of the two.

The *Euthria vittata* is found at the Bay of Islands; Hauraki Gulf; and the Chatham Islands.

Plate VI
No. 17

COMINELLA HUTTONI (*cominella*, dim. of comes, a companion; Hutton, the conchologist).—A small pale brown or whitish spiral univalve, spotted with reddish brown, the colouring being either marbled or having the appearance of woven basket work, when the colour is disposed in straight ribbons, spirally and more or less interruptedly, round the whorls. The ribs on the spire extend from suture to suture, and on the body whorl from the suture to more than half-way down to the base. This arrangement gives an impression of the shell being much more ribbed than any of the other *Cominellas*. It is also more slender than the *C. lurida*, which it resembles most in shape. Rather less than one inch in height.

Found from Cape Maria van Diemen to the East Cape. Mount Maunganui.

Plate VI
No. 18

COMINELLA LURIDA (*cominella*, dim. of comes, a companion; lurida, purple).—This spiral univalve, which is to be seen in great numbers on mud flats when the tide is out, is seldom to be met with, except in a dirty and disreputable condition. The colour varies considerably, the spire being dark, almost black, and the lowest whorls whitish grey, a yellowish white above, with two narrow lines of brown spirals, then a broad dark brown, brownish purple or purplish band round the centre, with half a dozen or so fine yellowish-brown lines below. The interior is purple.

Sculpture is composed of prominent ribs, rounded above, and cut off straight at the suture of each whorl, those on the body whorl being shouldered, in fact almost nodular at the top, and sloping down to the level of the shell wall near its greatest diameter.

I have seen them in scores ascending the mouths of rivers floating upside down on the flowing tide at night, returning to their usual haunts. They invariably sink to the bottom when touched. The *Cominellas* are carnivorous creatures, and may be regarded as the leading scavengers on the mud flats. They can always be found feasting upon any dead animal matter on the black slimy ooze, which is their happy hunting-ground.

The *C. lurida* attains a length of an inch and a quarter. Found throughout New Zealand. Tauranga Harbour.

COMINELLA MACULATA (*cominella*, dim. of comes, a companion; *maculata*, spotted).—A fairly solid, spotted spiral univalve with a broad shouldered body whorl, greyish or cream colour, dotted with chocolate or purplish-brown spots arranged in spiral bands round the whorls; light yellow to orange internally. It is fairly smooth, the whorls of the spire are sculptured with rounded ribs placed axially. It attains a height of over two inches, and is found in harbours, on mud banks.

Plate IV
No. 22

Hauraki Gulf; Mount Maunganui; Auckland Harbour; Wellington Harbour.

COMINELLA MACULOSA (*cominella*, dim. of comes, a companion; *maculosa*, rather spotted., *i.e.*, a degree less than *maculata*).—A very similar shell to that just described, but more slender, and graceful in form. The mouth is yellow and brown, the interior purplish and dark. The outer lip is smooth and sharp, sinuous or wavy in outline; the columella is yellow and brown, not unlike tortoise-shell.

Plate IV
No. 24

Found in harbours on mud banks, frequently in the vicinity of the *C. maculata*.

From the Bay of Islands to Banks Peninsula; Mount Maunganui; Chatham Islands.

COMINELLA NASSOIDES (*cominella*, dim. of comes, a companion; *nassa*, a fish or eel trap; *oidos*, like).—This species may be readily recognised as a *cominella*, by reason of its general shape, and the widely open and notched canal at the base of the shell. Its resemblance to basketwork is to be noted in the sculpturing of the numerous spiral and longitudinal ribs crossing each other at right angles. The axial ribs reach almost down to the base. Just below the

Plate IV
No. 23

suture is one rather deep and broad groove winding spirally along near the top of the axial ribs, giving them the appearance of being crowned with separate tubercles or little knobs. The same formation being carried out to the top of the spire, lends a turretted effect to the shell. In colour it is greyish or pinkish white, and attains a height of about an inch and a-half. Exceptionally large specimens may be as much as two inches high.

Found in the South Island only. From Cook Strait to Stewart Island. Auckland, Chatham and Campbell Islands.

Plate IV
No. 21

COMINELLA VIRGATA (*cominella*, dim. of comes, a companion); *virgata*, striped).—An opaque ash grey or light brown spiral univalve with seven or eight rather fine raised brownish spiral lines on the body whorl. The columella is bright reddish orange. Found in rocky pools at low tide. This shell must not be confounded with the *Euthria linea*, in which the spiral stripes are wider and more conspicuous, flatter and more numerous.

Found from the Bay of Islands to the East Cape. Mount Maunagnui.

Plate V
No. 17

MUREX ANGASI var. EOS (*murex*, a pointed rock; Angas, the naturalist; Eos, the goddess of Dawn).—This delicate little Murex is a spiral univalve of about three-quarters of an inch in length, of rosy coral pink or flesh colour, and characterised by three varices disposed at equal distances apart and running longitudinally from the apex of the shell to the base. These varices are thin and lamellar, drawn out into hollow spines pointing upwards, of which there is one on the shoulder of each whorl. Besides these spines, there are also frilly ornamentations lying in the angles between the lamellae and the whorls, further strengthening the thin outstanding plates. The whorls are sculptured with low spiral ribs and whitish polished rounded nodules on the shoulders of the whorls. The mouth is small, rounded above, angled at the shoulder, and drawn out below into a somewhat prolonged and narrow open canal, curving at first to the left, and then to the right. There is also a well-marked canal at the upper and outer angle of the aperture, directed upwards and outwards. This shell, which is much prized on account of its beautiful sculpturing, elegant shape, and exquisite colouring, is a rare species. It has so far only been recorded from the Bay of Islands, and is restricted to a very limited area at that place.

Plate IV
No. 13

MUREX OCTOGONUS (*murex*, a pointed rock; *octogonus*, eight-sided).—A spiral univalve, sculptured with

spiral ribs, set closely together, and longitudinal varices, which on the body whorl are formed by the spiral ribs being produced as hollow and recurved spines. There are eleven to thirteen of these varices, so that one must not expect to find eight angles or sides to the shell, but quite ten or twelve. However, as an octagon is the usual form for decorative purposes in the popular mind, the name is near enough to be taken as appropriate. The spines are more pronounced as they approach the outer lip. The longest spines are those on the shoulder or keel of the whorl. The shell is of a brownish colour; the mouth is rounded above, more pointed below, terminating in a deep canal, narrowly open and curved to the left. The outer lip is crinkly and sharp, the inner lip a thin plate of callus on the columella, extending beyond it as a thin free edge. The interior is white, bluish white, purplish or brownish. About one and a-half to two and a-quarter inches in height.

Bay of Islands; Mount Maunganui; St. Helier's Bay; Cook Strait.

MUREX OCTOGONUS var. **UMBILICATUS** (*murex*, a pointed rock; umbilicated).—This sub-species differs only from the species in having a wide umbilicus, causing the basal spines to be spread further apart. It is also larger in size. Found at Mount Maunganui.

Plate IV
No. 14

MUREX RAMOSUS (*murex*, a pointed rock; *ramosus*, ramified, full of branches).—This is a large and showy univalve, white tinged with light brown on the varices and spines, with the mouth of a tender soft pink, and extremely smooth, gradually shading off to a pure white. It is sculptured with numerous fine spiral ribs, but the hollowed and frilled spines form the main scheme of decoration. This mollusc, which has a wide distribution, is met with on the east coast of Africa, in the Pacific Archipelago, and in great abundance in the Red Sea. It was formerly used in the making of the ancient Tyrian purple, the dye being obtained from a vein in the neck of the animal. As the quantity was, of course, only limited one readily understands that the "wearing of purple and fine linen" was the exclusive privilege of the aristocracy of those days. The saying "born in the purple" also owes its origin to this interesting gasteropod.

Plate III
No. 17

One looks in vain for any reference to this large univalve in the official Handbook of the New Zealand Mollusca, although two specimens have been found in the Waikareao Estuary, westward of the town of Tauranga. The larger of the two, eight inches and a-half in length, and

referred to in Moss's book, is in the possession of Mrs. T. M. Humphreys, and is a very fine specimen. It contained the living fish when found, which accounts for its splendid condition. Moss calls it an Island shell, and appears to claim a place for it in our native fauna. Although thoroughly authenticated, this species cannot be included among the New Zealand mollusca, for not a single specimen, nor even a fragment of one, has since been discovered. When one considers the many ways in which the live eggs of shellfish may be transported for long distances at sea, it is not so much a matter of surprise that an essentially tropical creature should be found in these waters, but that similar occurrences should be of such rarity.

Mrs. Humphreys kindly presented me with one of these specimens, and I am glad of the opportunity of including a description of this rare visitor to our shores, though I know most of my scientific friends still regard it as an alien and a vagrant.

Plate IV
No. 15

MUREX ZELANDICUS (*murex*, a pointed rock; *Zelandicus*, of N.Z.).—This is the well-known Spider shell, so called from its slender elongated spines bearing a fancied resemblance to the legs of a spider. It is a spiral univalve, varying in colour from a yellowish white to a light brown, and a trifle over two inches in length. The shell is rather thin, and is sculptured with six varices, bearing long semi-tubular spines, those on the shoulder of the body whorl being the longest. The aperture is pear-shaped, rounded above, and ending below in a rather long and open canal, recurved and bent to the right. The outer lip is angled above and ornamented with the hollow spines of the last varix. The inner lip is fairly thick, and below forms the sharp margin to the canal. Often found washed ashore on sandy beaches after a gale; and, although one may not infrequently pick up living specimens, the spines are generally worn down by the action of the sand. The best are to be obtained only by dredging.

Great Barrier Island; Hauraki Gulf; Mount Maunganui; Cook Strait.

Plate VIII
No. 9-9a.

TROPHON AMBIGUUS (*trophe*, a turning; *ambiguus*, doubtful).—An uncommon univalve, with a turretted spire, large body whorl, and a narrow, prolonged base. It is of a greyish yellowish white, and the sculpturing consists of well-marked spiral ribs, two on each of the upper whorls; they are crossed at right angles by almost equally pronounced longitudinal ribs, forming little hollow squares, through which a small spiral thread runs. At the crossing of the longitudinal and the spiral ribs is a more or less

raised nodule. The shoulders of the whorls are almost flat and slope slightly downwards. The interior is usually light brown, marked with darker spiral bands corresponding to the outside ribs. The mouth is fairly rounded above, and terminates below in a rather long and open canal, which is curved to the left. Small juvenile shells show the sculpturing much better than the adults do, for in the older shells the longitudinal ribs become less conspicuous. This species lives below low-water mark, but live specimens may be often met with that have been washed ashore on sandy beaches, and small shells are much favoured by Hermit crabs. It may attain a length of two and a-half inches.

Bay of Islands; Mount Maunganui; Makatu; Wellington; Lyttelton and Akaroa Harbours; Stewart Island.

TROPHON CHEESEMANI (*trophe*, a turning; *Cheesemani*, in honour of T. F. Cheeseman).—This small spiral univalve has the appearance of being composed of rather rough glazed white earthenware. It is about three-quarters of an inch in length, with sculpture consisting of broadly-rounded ribs, one on each of the spiral whorls, and five on the body whorl, which latter are separated by narrow and deep grooves. On close examination these grooves are seen to be bridged across with numerous little plate-like bands corresponding with the growth lines. The interior is bright purple in the fresh shell, but eventually the colour assumes a brown tint. The outer lip is sharp, and marked with four or five teeth, caused by the impressions of the outer grooves.

Found on the west coast of the North Island, and not at all common.

TROPHON CORTICATUS (*trophe*, a turning; *corticatus*, resembling the bark or rind of a tree).—Not more than half an inch in length, this small spiral univalve is found on the rocks just above low-water mark and, as a rule, covered with nulliporites, like a very thick coating of whitewash. With a little patience and a needle fastened into a penholder, this may be entirely removed. The application of dilute spirits of salts is also useful, and shells so treated will be found in most cases to be absolutely perfect, even to the protoconch and the minutest detail of the sculpture. It is fusiform in shape, with the whorls shouldered and adorned with rounded ribs disposed longitudinally. These are nodular at the angle of the shoulder. There are twelve such ribs on the body whorl, giving rise to one of its synonyms, *T. duodecimus* (*duodecim*, twelve). The spire is sharply pointed, the mouth somewhat oval,

Plate VIII
No. 5

Plate VIII
No. 8

terminating below in a short, open canal, curved slightly to the left; the outer lip is sharp and crinkly within.
North and South Islands. Mount Maunganui.

Plate VIII
No. 6

TROPHON CURTUS (*trophe*, a turning; *curtus*, short).—A rather short and small, slender spiral of six whorls, a trifle over a quarter of an inch in length, and of a whitish or brownish-white colour. The sculpture consists of about ten longitudinal ribs and about eight smaller spiral ones on the body whorl, crossing each other at right angles and forming distinctly characteristic nodules at the points of intersection. The spire is rather higher than the height of the mouth, and is turreted. The aperture is oval, and ends below in a narrow canal. The outer lip is sharp and slightly toothed inside.

Found in both Islands, but not common. Mount Maunganui.

Plate VIII
No. 4

TROPHON PLEBEIUS (*trophe*, a turning; *plebeius*, common, vulgar).—This is a small spiral shell of about three-fifths of an inch in length. The colour is grey or brown, though if examined through a lens, and the specimen is a good, clean one, the tints will be seen to be variegated. The sculpture consists of beaded spiral ribs, two on each of the spire whorls, the uppermost yellowish or amber and semi-transparent, the lower one reddish; in fact, in clean young specimens the shell looks as though garlanded with alternate strings of amber and garnet beads. Now, I do not want the reader to run away with the idea that I am exaggerating the beauties of Nature, merely to make things appear more attractive than they really are; but the aim of all study, beyond its material benefit, is to train the senses and cultivate the understanding. Which reminds one of Turner's reply to a lady who was criticising the rich splendour of his colouring, saying that she never saw sunsets such as he painted. "No, madam," he said, "but do you not wish that you could?"

To return to the *T. plebeius*. The outer lip is grooved, crenulated or crimped, the inner lip smooth; the aperture is angled above, and drawn out below into a short, open canal, curving to the left; the interior is brownish purple, of very light brown, with dark bands corresponding to the dark ribs on the outside; the inner lip is light brown.

Quite a number of specimens may be picked up, inhabited by Hermit crabs, and as these animals, at low tide, hang about the base of small rocks cropping out of the sand, the shells are usually scoured so clean that the sculpturing and colour are beautifully displayed.

Common throughout New Zealand, between tide marks, and in the laminarian zone. Mount Maunganui.

TROPHON RUGOSUS (*trophe*, a turning; *rugosus*, wrinkled; *rugosa*, a wrinkle).—A solidly-built, rather small greyish or yellowish-white spiral univalve, sculptured with prominent and comparatively large rounded spiral ribs, seven on the body whorl, the whorls of the spire having one large rib, with two smaller ones above it. These ribs are crossed by longitudinal folds, which give rise to rounded nodules at the points of intersection. The shell is also covered with fine hair-like raised longitudinal lines. The spire is sharply pointed; the mouth angled above, and drawn out below into an open and moderately long canal, curving to the left and backwards. The outer lip is abruptly bevelled off to a sharp edge, which is sinuous or wavy, corresponding to the ends of the large ribs. The interior of the mouth is glossy, and white at the margin, toothed within, and rapidly becoming a beautiful rich purple. The inner lip is much paler in colour, and sharply defined from the body whorl. About an inch and a quarter in length, it is found on rocky ground between high and low-water marks.

Plate VIII
No. 7

Bay of Islands; Auckland Harbour; Mount Maunganui.

THAIS HAUSTRUM (*Thais*, the wife of Ptolemy Soter I.; *haustrum*, a scoop).—Seeing these rather homely-looking shells for the first time, and none of the *Thaisidæ* are remarkable for beauty, either of colour or form, one is inclined to wonder why they should be named in honour of the frail and beauteous Athenian whose charms are immortalised in the lines;—

Plate IV
No. 7

Lovely *Thais* sits beside thee,
Take the good the gods provide thee.

It is all very well for poets to acclaim the efficiency of wine in stimulating the imagination, but the tang of the sea air seems to shed the divine afflatus on all who come within its breezy influence. Mariners, ancient and modern; fishermen, even scientific conchologists, each and all seem powerless to resist the magic spell, and so Romance and Poetry flow from them as freely as the water comes tumbling down at Lodore.

The *Thais haustrum*, commonly called a Dog Winkle, is a large, dark or purplish-brown univalve, about three inches in length, with a somewhat square or flattened high shoulder to the body whorl. The mouth is large, widely

open and rounded at the upper end; the outer lip is sharp and crinkly; the inner lip smooth. At the upper end of the aperture and on the interior is a large brown patch. The spire is short, and only about one-third the height of the aperture. This species is not so common as the *T. succincta*, and is found in the same localities, on rocks between tide marks.

Throughout New Zealand. Mount Maunganui; Chatham Islands.

Plate IV
No. 8

THAIS SCOBINA (*Thais*, the wife of Ptolemy Soter I.; *scobis*, sawdust).—A small, rough, thick brown or stone-coloured Dog winkle with sharp nodules profusely scattered over the surface, which give it the appearance of being sprinkled with sawdust. The interior is purple or chocolate, and there is a narrow white band edging the margin of the outer lip. About an inch long, it is very common on rocks near to high-water mark. Some of the young shells are black and white, with a sharp apex to the spire, and the growth lines have a flounced effect.

North Island as far as Cook Strait. Mount Maunganui.

Plate IV
No. 9

THAIS SCOBINA var. ALBOMARGINATA (*Thais*, the wife of Ptolemy Soter I.; *scobis*, sawdust; *albomarginata*, with a white margin).—About the same size or, if anything, a little smaller than the species, and having no hollow spines or sharp nodules. The shoulders of the whorls are more rounded, and, in place of the spiral ribs, are alternate spiral threads or bands of black and white, or pale stone-colour and black. The white margin to the outer lip, being common to both species and variety, cannot be regarded as a characteristic feature, notwithstanding the name.

St. Helier's Bay; Auckland Harbour; Mount Maunganui.

Plate IV
No. 10-10a.

THAIS STRIATA (*Thais*, the wife of Ptolemy Soter I.; *striata*, striated).—A white or yellowish Dog winkle, about one and a-half inches long, thickly built, with a small pointed spire of about the same height as the aperture (or, in some specimens, only half that height), sculptured with well-marked, rounded spiral ribs, of which there are nine on the body whorl and four on the whorl immediately above it. The nine ribs are peculiar to the species. The aperture is fairly large, oval, faintly angled above, and ends below in a short, open narrow canal, notched at the base, and directed to the left. The outer lip is bevelled off to a sharp edge, rather crinkly and toothed inside. The in-

terior is white or brown, shining and smooth. On rocks near low-water mark.

Found from Cook Strait southward. Dunedin; Campbell, Auckland and Chatham Islands.

THAIS SUCCINCTA (*Thais*, wife of Ptolemy Soter I.; *succincta*, tucked or girded up).—This Dog winkle is a larger species than the *T. haustum*, and is white or very light brown in colour. The high shoulder of the body whorl is round, rather than square, and the thick, prominent ribs running spirally round the shell make it a simple matter of identification. There is considerable variation in the sculpturing, the majority having eight pronounced and cord-like ribs spirally arranged on the body whorl, with deep spaces between them, while others have larger and smaller ribs, or small ribs only; but, whatever the size of these ribs, there are never, by any chance, more than eight principal ribs—a point to remember. The aperture is of a rich golden cream colour, shading off to white in the interior of the shell. Found among rocks near to low-water mark.

Throughout New Zealand; Mount Maunganui; Chatham Islands.

Plate IV
No. 6

MITRELLA CHOAVA (*mitrella*, dim. of *mitra*, a bishop's mitre; *choana*, a funnel).—This small spiral univalve—a quarter of an inch high—is of a dark brown colour, thin, with a sharp spire, a few spiral grooves on the base, and very fine growth lines. The colour variation is considerable. It may be plain dark brown, with or without a pale band below the suture of each whorl, or with triangular white spots, or the whole shell may be yellowish or greenish white, with wavy brown lines arranged longitudinally. The aperture is about equal to the spire in height. Found under stones and on seaweed near to low-water mark.

Throughout New Zealand. Mount Maunganui; Chatham Islands.

Plate VIII
No. 2

MITRELLA PAXILLUS (*mitrella*, dim. of *mitra*, a bishop's mitre; *paxillus*, a peg).—A small, sharply-pointed, slender, smooth spiral univalve of about six whorls, the two uppermost comprising the protoconch, which is almost black and highly polished; the spire is about one and a-half times the height of the aperture. The sculpture is almost negligible, there being little more than growth lines to be seen, and perhaps a few spiral grooves at the base. The mouth is rather oval, channelled above slightly, and

Plate VIII
No. 3

terminates in a shallow notch at the base, which takes the place of a canal. It is just under a quarter of an inch in height, and is of a "light brown, reddish brown, or almost black colour." (Suter).

Whangaroa and Manukau Harbours; Mount Maunganui; Kawhia; New Plymouth; Lyttelton.

Plate III
No. 11-11a.

FULGURARIA ARABICA (*fulgur*, lightning; Arabic).—A handsome shell of a yellowish or pale chestnut brown, with tracings of narrow blackish-brown lines, arranged longitudinally down the body whorl, in somewhat erratic zigzag fashion, like the graphic records on a temperature chart. These lines become thicker, and are closer together at certain levels on the body whorl, and so present an appearance of three dark bands spirally disposed. The shape is graceful, the large body whorl being elongated and the spire tapering to a fine point. A row of nodules on the shoulder of the whorls give an ornamental finish, the same decoration being carried out almost to the apex of the spire. The mouth shows four or five large oblique plaits on the columellar lip. Some specimens may be found with a predominance of the dark tracings; others vary in the mode of sculpture, the nodes being sometimes merely rudimentary or, on the other hand, standing out boldly and extending a little distance down the whorl as vertical ribs. Specimens have been known to reach nine inches in length, but usually five or six inches is the average size. It is found on sandy beaches, washed ashore after storms.

North and South Islands. Mount Maunganui; Foveaux Strait.

Plate III
No. 13

FULGURARIA ARABICA var. ELONGATA (*fulgur*, lightning; Arabic; elongated).—Similar to the species, but much more rare. It has no nodes on the whorls, which are not shouldered, and the shell is more elongated. The colouring is the same as in the species, perhaps more often yellowish or maize colour. The generic name, *fulguraria*, is in allusion to the dark zigzag tracings, giving the impressionist idea of forked lightning.

North and South Islands. Mount Maunganui.

Plate III
No. 12-12a.

FULGURARIA ARABICA var. JACULOIDES (*fulgur*, lightning; Arabic; *jaculum*, a dart, a javelin; *oidos*, like).—A new sub-species recently dredged in deep water, and distinguished by its most elegant design. Its highly classical outlines recall the ancient amphora, or two-handed wine jar, such as one sees in Pompeii, made of clay, tall and narrow, with a pointed base in place of a foot. The

shell is about four or five inches in height, and the columella is straight and sharp at the lower end, suggesting the point of a javelin, at the same time lacking the plate-like expansion which is present in the species. The spire is high and conical, and the colour rather brighter, though of a deeper shade. The only specimens so far reported have been obtained by dredging from a depth of forty to fifty fathoms in the vicinity of Whale Island in the Bay of Plenty. I am much indebted to Mr. Powell for a pair of these shells, which he is duly recording and describing.

FULGURARIA GRACILIS (*fulgur*, lightning; *gracilis*, graceful).—This Volute is very similar to the others just described, but is much smaller in size, and the markings are not so pronounced. The nodules on the shoulders, if present, are not so prominent, but are elongated, and may be more or less in the form of ribs, not well defined. The colour of the shell is tawny yellow or buff, and there is no polish. The fine tracings on the body whorl are not so dark in colour as in the *F. Arabica*, and form a design of perfect triangular figures, with the apex pointing in the direction of the mouth. It is not common, and attains a length of about two and a-half inches.

Bay of Islands; Great Barrier Island; Mount Maunganui; Manawatu Coast; Queen Charlotte Sound.

Plate III
No. 14-14a.

ANCILLA AUSTRALIS (*ancilla*, a maid servant; *Australis*, southern).—The New Zealand Olive. A beautifully glossy, smooth, barrel-shaped univalve, with a short spire coming abruptly to a sharp point; contracted somewhat at the base. The spire is coloured dark brown, with paler spiral stripes, the body whorl being bluish brown, or rather chocolate colour, blurred with blue, bounded with a narrow white band above, and below with a double white line. A large pad of callus extends from the columella upwards, dividing into two as it descends, covering the spire more or less. It is about an inch and a-half long, and may be found during the hot weather in large numbers on sandy beaches buried in the sand. At low tides one may sometimes see hundreds of these mollusca crawling about on the sandy or muddy bottom in a foot or so of water. The animal has an enormous foot, dark bluish grey in colour, which is folded over both sides of the shell; this is capable of being compressed and retracted entirely within the shell, the aperture being partially closed with a small, thin, yellow horny operculum. The tentacles, unlike the horns of most mollusca, are devoid of eyes.

Mount Maunganui; Manawatu Coast; Sumner; Timaru.

Plate V
No. 12

ANCILLA AUSTRALIS var **PYRAMIDALIS** (*ancilla*, a maid servant; *Australis*, southern; pyramidal).—Very similar to the species, but smaller in size, with the callus much thinner, the spire more sharply pointed, and the body whorl considerably narrower. Practically the same colouring as the species.

Hauraki Gulf; St. Helier's Bay; Cook Strait; Nelson.

Plate V
No. 14

ANCILLA BICOLOR (*ancilla*, a maid servant; *bicolor*, of two colours).—A rare and small shell, similar to the species in shape, but only about three-quarters of an inch long, and of a fawn colour, banded with white and darker brown.

Bay of Islands; Great Barrier Island; Manukau Harbour; Mount Maunganui; Queen Charlotte Sound.

Plate V
No. 11

ANCILLA DEPRESSA (*ancilla*, a maid servant; depressed).—This species is about the same size as the *A. bicolor*, but coloured more like the *A. Australis*. Being very wide at the shoulder of the body whorl, it is not of such elegant proportions; in fact it is of quite a dumpy figure, to use a homely expression.

Whangaroa Harbour; Hauraki Gulf; Mount Maunganui; Cook Strait; Manukau Harbour; Banks Peninsula.

Plate V
No. 13

ANCILLA MUCRONATA (*ancilla*, a maid servant; *mucro*, a sharp point).—This species, which is larger than any of the other native members of the family, has a fawn-coloured body whorl, banded with white and pale brown. The spire is slightly waisted or contracted about midway between the apex and the top of the aperture, which gives the shell a somewhat pointed or mucronate appearance. The largest specimen I have seen is two and a-quarter inches in length. Some from Devonport, in Auckland Harbour, have quite a blunted spire on account of an exceptionally liberal deposit of callus, so much so that the mucronate character is conspicuous by its absence.

Cape Maria van Diemen; Hauraki Gulf; Mount Maunganui; Cook Strait; Cape Farewell; Queen Charlotte Sound.

Plate VIII
No. 16

MARGINELLA MUSTELINA (*marginella*, a little rim; *mustelina*, colour of a weasel).—A small, highly-polished univalve, so glossy, indeed, that it has the appearance of being made of coloured glass. It is elongated, barrel-shaped, with a rounded shoulder to the body whorl, which tapers slightly towards the base, and a domed spire which is very low; the colour is yellowish white, with a broad

band of brownish yellow or dark brown, obliquely arranged round the middle, two narrow bands of the same colour above, separated by white, and another narrow band of brownish yellow or dark brown winding spirally round the base. The mouth is long and narrow, about seven times the height of the spire, the aperture being very narrow above and more widely open at the base, which is rounded. The columella has four plaits upon it. The shell is about a third of an inch long, and a little over a fifth of an inch wide.

Bay of Islands; Whangarei; Great Barrier Island; Mount Maunganui.

MARGINELLA PYGMAEA (*marginella*, a little rim; *pygmaea*, a dwarf).—This is a charming little shell of about a quarter of an inch in height, with a wide, high shoulder to the body whorl, and shaped remarkably like the oil jars of ancient times, such as those in which Ali Baba, of the "Arabian Nights," must have concealed his fellow scamps. It is milk white, and glistening as a dew-drop, resembling in general features the Fulgurarias or Volutes. There are about four whorls, and four plaits on the columella. The spire, like the lid of the oil jar, is very short, about one-fourth the height of the aperture; the body whorl tapers down gracefully to the base, the aperture being narrow above and wide below.

Bay of Islands; Whangarei Heads; Hauraki Gulf; Mount Maunganui; Foveaux Strait; Chatham Islands.

Plate VIII
No. 17

DRILLIA NOVÆ ZELANDIÆ (*drillen*, to bore, hence a drill; N.Z.).—A small, somewhat slender, spindle-shaped spiral univalve, found throughout New Zealand, but nowhere common. Of a delicate pink or pale rose colour, it is about one inch in length, the body whorl rounded, with a typical notch at the extreme base. There is also a notch in the outer lip, just below the suture, at the upper part of the aperture. The spire terminates in a fine point, and the sculpture consists of spiral grooves and fine longitudinal ribs. Some specimens are nearly white.

Takapuna; Mount Maunganui; Wanganui; Wellington Harbour; Chatham Islands.

Plate VIII
No. 20

BATHYTOMA CHEESEMANI (*bathys*, deep; *tomos*, a cutting; dedicated to T. F. Cheeseman).—Pale brown or purplish in colour, and about one inch in length, this small spiral univalve has a globular body whorl and tapering spire, the entire shell being fusiform or spindle-shaped.

Plate VIII
No. 19

The surface is very smooth and glossy; the sculpture consists of a spiral groove at the upper part of each whorl, and a second one at the lower part; while there are quite a number of grooves at the base, beginning just below the widest part. At the outer lip is a well-marked notch, typical of the genus.

Bay of Islands; Takapuna; Mount Maunganui; Lyttelton; Chatham Islands.

Plate VIII
No. 18

MANGILIA SINCLAIRI (*mangana*, a wine cask; Sinclair, the naturalist).—A small spiral shell of about three-fifths of an inch in length or a trifle more. The spire is turreted to a slight extent, and the colouring is of a neutral tint with a broad spiral band of pale yellowish brown. The outstanding feature of the shell is the axial or longitudinal ribbing, which is most conspicuous. It extends down almost to the base, where the ribs are crossed by a few well-marked smaller ribs. At the upper part of the outer lip is a slight rounded notch, and at the lower part of the aperture is a very short open canal. The inner lip is very narrow. Found under boulders near low-water mark.

Throughout New Zealand. Mount Maunganui; Bay of Islands; Chatham Island.

Plate VI
No. 19

TEREBRA TRISTIS (*tereбра*, an awl; *tristis*, sad-coloured).—A small, finely-pointed spiral univalve of about seven-tenths of an inch in length. It is chocolate, light brown, or bluish grey in colour, with a light yellow band above the suture and on the body whorl just below its widest part. The sculpture consists of numerous axial or longitudinal ribs, separated by spaces of about the same width; there are from sixteen to eighteen of these ribs on the body whorl. The canal at the lower part of the aperture is widely open and slightly notched at the base.

Throughout New Zealand. Whangarei; Hauraki Gulf; Mount Maunganui; Banks Peninsula.

Plate V
No. 16

BULLINA SCABRA (*bullina*, a small bubble; *scabra*, rough).—A rare spiral univalve, ovoid in shape; or, as Suter plainly puts it, obese. It is small, with a very short spire, a large body whorl, and an aperture about two-thirds the height of the entire shell. The sculpture consists of small flat and numerous spiral ribs separated by fine grooves. The colouring, however, is the most noticeable feature of the shell. It is pure white, with thin crimson lines, two spirals, rather wide apart, on the body whorl, with longitudinal lines crossing them at right angles, and dividing the surface into squares, reminding one of parallels of latitude and meridians of longitude on a globe,

giving the shell a very pretty effect. One that we found at Mount Maunganui is five-eighths of an inch in height, a fine specimen, comparing it with the one recorded from the Bay of Islands, which is a quarter of an inch shorter.

It has been found in the Hauraki Gulf, and also at the South Sea Islands; Japan; Mauritius; South Africa; Australia and Tasmania; a mollusc partial to warm seas.

BULLARIA AUSTRALIS (*bullā*, a bubble; *Australis*, southern).—An oval cylindrical univalve of apparently one whorl, smooth, and shining, with a mouth extending higher than the spire; the term "spire" might almost be regarded as a misnomer, as it does not exist, at least not to the naked eye; its place is indicated by a sunken depression, with a hole or umbilicus in the centre. Of course, there must be whorls, for one finds shells of a quarter of an inch, ranging up to specimens of an inch and a-half in length; but the growing animal constructs its new premises round the older and smaller ones, all on the same plane, a procedure which can be at once understood by breaking open a few different-sized shells and comparing the number of turns or whorls in each one. The mouth is widely open below, the lower portion of the outer lip being broadly rounded; the upper portion narrowly rounded. The colour is of a vague greyish-yellowish hue, marbled with light brown, with one or two darker bands transversely arranged, which, however, may not be present. The sculpture consists of very minute microscopic spiral striations, only to be seen in good specimens, and about ten equally-spaced spiral striations round the base from the outer to the inner lip. Growth lines are also to be seen.

Plate III
No. 19

Found in the North Island. Bay of Islands; Howick; Auckland.

HAMINEA ZELANDIÆ (*hamus*, a hook; N.Z.)—An exceedingly thin, white or greyish-white horny univalve, aptly known as the Bubble shell, or Glass shell, covered in the recent state with a thin yellowish periostracum. It is fairly plentiful on some harbour beaches, and is found on the Sea wrack. When the periostracum is worn off, as it usually is when the shell is washed up on the beach, the clear glassy appearance of the Haminea has a striking resemblance to a bubble of water. The animal is a very soft jelly-like creature of a dark slaty-grey colour, and has a mantle which almost entirely invests the shell. Not a common species.

Plate VI
No. 25

Bay of Islands; Howick; Hauraki Gulf; Mount Maunganui; Pelorus Sound.

Plate V
No. 23

PHILINE CONSTRICTA (*phila*, a broad, flat, shallow cup or bowl; *constricta*, drawn together).—A very small, thin white pellucid ear-shaped shell, very similar to the *Lamellaria Ophione*, but differing entirely from that species in regard to the structure of the animal. It belongs to the same family as the *Haminea Zelandiæ* or Bubble shell, and has a large open mouth, with the upper end of the lip projecting beyond the spire. About three-eighths of an inch in length, sculptured with fine spiral grooves, with broad interspaces, and crossed with very fine growth lines. The interior is faintly iridescent. The largest specimen recorded appears to be only about half an inch in length, but one found at Mount Maunganui, and now in my collection, measures one inch and an eighth in length. I have learned since that one of precisely the same dimensions was dredged in twenty fathoms during the Southern Cross Expedition, recorded and figured by E. A. Smith.

The animal is not provided with organs of sight, and is of carnivorous habits. It is itself devoured by starfish and sea anemonies, its lack of vision rendering it an easy prey to these apparently harmless and quiescent creatures.

Found at the Great Barrier Island; Mount Maunganui.

Plate VIII
No. 11

OPHICARDELUS AUSTRALIS (*ophis*, a snake; *cardelus*, a little heart; *Australis*, southern).—A short, somewhat rotund spiral univalve of a brownish horn colour, in general appearance more suggestive of a terrestrial than a marine shell. It has a rather sharply-pointed spire; its broadest diameter is about midway between the apex and the rounded base of the outer lip. The growth lines are well defined, and there is no other form of sculpturing present. On the body whorl of some specimens are to be seen well-marked spiral stripes of darker brown; the columella has two distinct plaits projecting horizontally towards the middle of the aperture, which is a narrow oval, angled above and rounded below. It is a common shell, and attains a length of about three-eighths of an inch.

Found about high-water mark, among stones and in the vicinity of mud. (Powell).

Rangitoto Island; Mount Maunganui; also northern part of the South Island; Tasmania; Australia and New Caledonia.

Plate VIII
No. 12

MARINULA FILHOLI (*marinula*, dim. of *marinus*, from *mare*, the sea; *Filhol*, the naturalist).—A brown or purplish-brown small spiral univalve, with the body whorl very large in proportion to the whorls of the spire. The sculpture consists of oblique growth lines only. The mouth

is pear-shaped, rounded below and channelled above. The most striking feature of this little shell is the presence of three plaits on the inner side of the mouth, the smallest one below, a medium-sized one above it, both on the columella, and a third one higher again, sloping downwards and reaching half across the aperture. It is about one-third of an inch in height.

Massacre Bay; Bay of Islands; Auckland; Mount Maunganui; Banks Peninsula; Chatham Islands.

PUPA GRACILIS (*pupa*, a chrysalis; *gracilis*, graceful).—An elongated pure white spiral univalve with an exceptionally tall body whorl and a short spire. The sculpture consists of fine striations disposed spirally, with rather broad and flat intervening spaces. The aperture, which is not quite the same height as the spire, is narrow above and broad below. The outline of the body whorl is almost straight except for a slightly waisted middle, wherein this species differs from the two other species, which have a decided outward bulge. The columella shows a strong double plait winding down to the basal lip, which is rounded and sharp. It is about three-quarters of an inch in height. The only place from which this species has been recorded hitherto is Wellington, but we have found five or six washed up at different times on the sandy beach at Mount Maunganui.

Plate V
No. 15

AMPHIBOLA CRENATA (*amphibolos*, equivocal, having a double meaning; *crenata*, notched).—This is a pulmonate or air-breathing univalve, and occupies a unique position in the molluscan world. In colour one finds an artistic blending of yellows, browns and purples. It is globular in shape, rather like that objectionable pest, the garden snail, somewhat thin, with a small pointed spire, and there is a typical notch in the outer lip, corresponding to the angle of the body whorl. The inner lip is purple; the aperture is oval, the operculum thin and horny, the only instance where a pulmonate mollusc is found possessing that structure. It lives in brackish water or salt water on mud flats, in sea grass, at river mouths, in New Zealand. The animal feeds on vegetable matter contained in mud, large quantities of which are passed through the alimentary tract. In the breeding season one may find almost every shell surrounded by a broad flat ring of sandy mud. These casts are the spawn coils, curved on the flat, rounded above and slightly concave on the under surface. They contain the eggs, which may be examined by teasing out portions of the nest in sea water under a magnifying

Plate VIII
No. 24

glass. The shellfish are eaten by Maoris, but are considered too muddy in flavour by the fastidious European.

Most estuaries in New Zealand. Tauranga Harbour.

Plate III
No. 15-15a.

SIPHONARIA OBLIQUATA (*siphonaria*, having a siphon; *obliquata*, oblique).—A large limpet, one and a-half inches long by one inch wide, with the siphonal groove well shown on the right side, and the apex towards the rear of the shell and slightly to the left of the middle line. There are about twenty or twenty-five bifurcating ribs, though usually the shell is heavily incrustated and the sculpture obscured; the ribs are often seen forming a narrow variegated band on the outer side round the margin. Internally the colouring is light brown or flesh colour to orange in recent specimens; in older specimens it may be described as light brown marbled with buff and dark brown patches, blending with milky blues and whites; the inner margin shows a paler band, dark at the extreme edge, and dotted with white, the whole surface highly glazed. Altogether the interior has the appearance of very choice Whielden pottery. The reason this species, although having such a strong superficial resemblance to limpets, is not classed with the Patellidae, is due to the animal having a very much higher anatomical organisation, shown chiefly in the breathing apparatus.

Cook Strait; Banks Peninsula; Sumner; Dunedin; Chatham and Auckland Islands.

Plate III
No. 16-16a.

SIPHONARIA ZEALANDICA (*siphonaria*, having a siphon; New Zealand).—A small limpet, about three-quarters of an inch long, with a deep siphonal groove on the interior, which shows externally as an extra large bifurcating rib. It is on the right side, and projects conspicuously beyond the margin. The sculpture consists of primary ribs reaching from the margin to the apex, which is more or less centrally situated, and secondary ribs extending from the margin to about half-way up towards the apex. The colour is ash brown or grey, the ribs rather lighter. The interior is shining, chestnut brown or very dark brown, the tips of the ribs at the margin being white or creamy white. Margin grooved within; undulating, crenulated, or notched, and sharp. It is common throughout New Zealand, on rocks, and especially on old piles. There is a shell, called the *Siphonaria Australis*, which is confined to the South Island, though it has been reported erroneously from Tauranga. Its only claim to be considered a variety, much less a different species, lies in the fact

of its being a few shades darker or lighter, merely a question of food and locality.

The *S. Zealandica* is found at Howick; Auckland; Mount Maunganui.

GADINEA NIVEA (*gados*, a fish; *nivea*, snowy).—A small white limpet-like oval shell with the apex almost central, or slightly placed to the rear. The sculpture consists of radiate ribs, of which there are about forty, with concentric growth lines fairly well defined. There is a wonderful variety in the shape of the shell. It may be depressed and almost flat, or it may be highly elevated. Some are shaped like the flatly conical straw hats of the Japanese coolies; others, more elevated, are either the counterpart of ancient Roman helmets or like little models of sou'-westers, with a rounded crown and a wide brim, each individual limpet differing from its neighbour, according to the amount of room available for expansion. Again, some are as thin as a visiting card, and others are quite six times that thickness. The thick ones are to be found among those hampered for room, and so crowded together that the margins press against each other, and as a result assume a hexagonal form, exactly as the cells of a honeycomb which, instead of being circular, become six-sided by reason of the remarkable ingenuity of the bee in economising space. The thick six-sided shells of the *Gadinea nivea* have been selected from a huge colony of these creatures at Mount Maunganui and recorded as the *Hipponyx hexagonus*, a mistake which would never have been made had the proper precaution of studying a long series been adopted. As a matter of fact, the *Hipponyx* does not occur in New Zealand at all, and the name must be deleted from our native fauna.

Plate VIII
No. 30-30a.

If exposed to particularly rough seas, and living upon rugged and uneven surfaces, the shells are most irregular in shape and outline, a fact clearly proved on comparing some west coast specimens with those obtained from Tauranga.

The interior is smooth, shining, and white, and there is a well-marked siphonal groove running upwards from the front border towards the apex. The muscle scar, which is roughened, is horseshoe-shaped, with the toe directed backwards and the two free ends clubbed. The margin of the shell is crenulated or crimped inside. It is rather a rare shell, about five-eighths of an inch long and half an inch wide. Found on rocks, between tide marks, generally in dark and almost inaccessible places, in the same localities as the Slit limpets.

Plate VIII
No. 29

DENTALIUM NANUM (*dentalium*, dim. of dens, a tooth; *nanus*, a dwarf).—Commonly known as the Tusk shell or Elephant Tooth. It is small, curved, tapering and pointed like an elephant's tusk. At the anterior, or larger and open end, the tube is ten-sided, the sides being flat, but towards the middle of the shell these flattened sides gradually become grooved; proceeding further towards the point, the grooves are more pronounced and are separated by rather sharpish ridges, the ridges and grooves becoming about equal in size. The shell is light horn colour, or whitish, and about three-quarters of an inch in length. A species of *Dentalium* shell was much esteemed as a charm by the ancient Egyptians, and infants wearing this amulet were supposed to be immune to the trials of teething.

Found at the Great Barrier Island; Manukau; Raglan; Poverty Bay; Stewart Island; The Snares.

Plate X
No. 12

SOLEMYA PARKINSONI (*solen*, a razor; *mya*, a mussel).—A narrow, elongated bivalve, the length being about three times the depth. The dorsal and ventral margins are straight and parallel to each other; the ends, both anterior and posterior equally rounded. It is extremely fragile, and covered with a very glistening, thin, rich brown epidermis which extends well beyond the free borders of the shell like a fringe. The glaze of the surface is unusually brilliant, so much so that when a specimen in the dried state is seen for the first time, one is generally asked if the valves are varnished. There are dark bands of colour radiating from the dorsal margin to the ventral, distinctly showing through the epidermis. It may be as much as two inches in length, but an inch and a half specimen is a good one. They are found in thick mud, six inches below the surface, but it is preferable to find them on the beach after a rough sea.

Throughout New Zealand. Tauranga Harbour.

Plate IX
No. 4-4a.

NUCULA HARTVIGIANA (*nucula*, dim. of nux, a nut; Hartvig, the naturalist).—A small white, or very pale olive-coloured bivalve, only a trifle over a quarter of an inch in diameter, most asymmetrical in shape, with a rounded ventral border, and sculptured with deep concentric grooves: The interior is a glistening pearly white, with a number of teeth arranged in two rows; one on either side of the hinge; there are about eight behind and fourteen in front of the beaks. Commenting on the diversified means by which Nature gains the same ends, Darwin says: "Bivalve shells are made to open and shut, but on what

a number of patterns is the hinge constructed, from the long row of neatly interlocking teeth in a *Nucula* to the simple ligament of a mussel!"

It is fairly common.

Auckland and Wellington Harbours; Great Barrier Island; Chatham Islands; Mount Maunganui.

MALLETTIA AUSTRALIS (*malleus*, a hammer; *Australis*, southern).—This rare shell is an elongated bivalve, ark-shaped, asymmetrical, with the beaks situated about the anterior third or, in plain words, one-third the length of the shell from the front end. The anterior end is rounded, and the posterior end terminates in the form of a fish tail with a notch in the middle, the dorsal lobe being much larger than the lower lobe and having a decided upward turn. There is also a shallow groove curving upwards from the notch towards the beaks. The colour is pale olive green, and the sculpture consists of well-defined concentric ribs equally spaced and following the general outline of the valves. The ventral margin is fairly straight, curving upwards at either end; the interior is shining and of a bluish-white tint. It attains a length of an inch and a half, and a depth of half an inch. Dredged in about sixteen to twenty fathoms.

Great Barrier Island; Auckland Harbour; Opotiki; Wellington Harbour; Stewart Island.

Plate IX
No. 20-20a.

ANOMIA WALTERI (*anomia*, unequal; dedicated to Th. Walter).—One of the Saddle oyster or Window shells; sometimes called the Bitter Oyster, on account of its being unpalatable. The valves are very thin and fragile. Concentric laminae form the sculpture, crossed by radiate ribs, though neither are regular or pronounced. The right valve is flat, and has a rounded hole near the hinge for the passage of a cartilaginous foot, by which the shells are attached to rocks, etc. The left valve is deep. Young shells vary in colour according to the locality or the depth at which they are found. Bay of Island specimens up to an inch and a half in diameter, obtained in shallow water, are famed for their beautiful golden honey-coloured valves, the left being always the richer of the two. Some dredged on the Coromandel coast in twenty fathoms are extremely thin, almost transparent, and scarcely coloured at all. Others again, taken from the old piles of Hobson Wharf in Auckland Harbour, are of the palest greenish white, with the merest tinge of gilding on the left valve, showing how the turbid waters of the port are incapable of producing such brilliant hues as the purer and clearer seas of

Plate XII
No. 1

the sunny North. Full-grown specimens of three inches by two lose their golden sheen and are mostly green, the interior of the left valve being a palid silvery green. The interior of the right valve is much darker, the lower portion like jade, the upper part, surrounding the round hole, being an opaque white thickened callus, adding to the strength of the shell. This reinforcement is all the more necessary, for the frame of the "window" is not united at the top.

Plate XII
No. 2

PLACUNANOMIA ZELANDICA (*plakous*, a thin cake; *onomia*, unequal; New Zealand).—This is also a Saddle Oyster or Window shell, very like the *Anomia Walteri*, but with a stronger shell, and a much larger hole in the right valve. The most important difference between them, and which absolutely distinguishes one from the other, is the fact that in the *Anomia Walteri* there are three muscle scars in the left valve, whereas in the *Placunanomia Zelandica* there are but two. These scars are to be seen almost in the middle line and rather close up to the beak. The beard, or foot, as it is often called—though it is not an organ of locomotion,—is a calcified plug projecting through the large oblong opening and firmly attached to rock or other object. Surrounding the hole is an area of thick, smooth white callus, strengthening the part, beyond which the remaining portion of the right valve is of a light olive greenish brown; the interior of the left valve is dark olive green, or the colour of greenstone. Externally, the valves are radiately ribbed, but not markedly so. The species does not appear to be common. During the last two years I have only collected one single specimen, which was attached to the outside of a large Fan mussel from a sand-bank in Pilot Bay at Mount Maunganui.

Found also in the Hauraki Gulf; at Wellington; Shag Point; Lyttelton; Foveaux Strait; Stewart Island; The Snares.

Plate X
No. 16

ARCA DECUSSATA (*arca*, an ark; a chest; *decussata*, crossed).—The Noah's Ark shell, rather a solid elongated bivalve of a light brown colour, pale or white in the middle, rounded at one end, and more or less pointed at the other (posterior). The sculpturing is composed of fine ribs radiating from the hinges, crossed or decussated by fine concentric ribs. The interior is pale purplish brown of a rather dingy hue, marked with radiating ribs and polished round the margin. In the recent state the external surface is covered with long hair-like epidermis, brownish black in colour; hence one of the synonyms, *barbatia*, sig-

nifying bearded; this is usually worn off in shells found on the beach. It attains a length of one and a-half inches, and in an uncommon shell. Found attached to boulders by a beard, about low-water mark, in sheltered positions.

Throughout New Zealand. Bay of Islands; Hauraki Gulf; Mount Maunganui; Chatham Islands; also the Pautotu Islands, in the Lowe Archipelago.

GLYCYMERIS LATICOSTATA (*glukos*, sweet; *meris*, bitter; *latus*, wide; *costa*, a rib).—The large Dog cockle or Comb shell. A thick, solid bivalve, brown or brown and white, with strongly-marked, rounded, radiate ribs, somewhat square at the dorsal margin on either side of the beaks, and furnished with two sets, each of six lateral teeth, symmetrically placed on a broad and flattened hinge plate. The interior is porcellanous, and the lower half of the margin is crenated. An average shell is two and a-half inches in height and two and three-quarters long—that is to say, from anterior to posterior border. The largest I have found were three and three-eighths inches in height.

Plate X
No. 6

Throughout New Zealand. Hauraki Gulf; Takapuna; Mount Maunganui.

GLYCYMERIS MODESTA (*glukos*, sweet; *meris*, bitter; modest).—This is the lesser Dog cockle or Comb shell. A small, thick, circular bivalve, about an inch in diameter, of a yellow, light or dark brown colour, either splashed with white or simply plain; generally lighter towards the hinge, with very fine striations radiating from the hinge to the ventral border, and six or eight teeth regularly arranged on either side of the beaks. A common shell, often washed ashore on ocean beaches.

Plate IX
No. 21-21a.

Throughout New Zealand. Hauraki Gulf; Mount Maunganui.

MYTILUS CANALICULUS (*mytilus*, Greek for sea mussel; *canaliculus*, dim. of *canalis*, a water pipe, a channel).—This mussel is the largest of the family, and is held in high esteem by the Maoris, and other people of robust digestion. It is wide from the middle to the posterior margin. The beaks are small and pointed. Sculpture consists of concentric growth lines, coarse in the middle, but much finer towards the hinges and the posterior margin; these are crossed by fine radiate striations, inconspicuous, but readily seen under a lens. The colour is yellowish green, or dark brown at the posterior end, or bright green, lighter at the hinges, and brownish in the middle. The

Plate X
No. 14

epidermis is somewhat shiny and turned in or reflected at the margin, giving a narrow and very vivid grass-green or dark-brown edging to the interior. Inside, the shell is purplish white and iridescent. Large shells may be as much as six or even eight inches in length. These mussels, when dredged from deep water, are thin and pale in colour, while those from the litoral zone (between tide marks) and just below low-water mark are much thicker and heavier in build, besides being considerably darker in colour. The increase in colour is due to the greater amount of light they receive, and the extra thickness is a provision of nature to enable the shells to withstand the full force of the breakers.

Throughout New Zealand. Mount Maunganui. It is also found on the Tasmanian coast.

Plate X
No. 15

MYTILUS PLANULATUS (*mytilus*, Green name for sea mussel; *planus*, smooth; *latus*, wide).—Smaller than the *M. canaliculus* or Horse mussel, though similar in shape and greatly superior to that species, both in delicacy of flavour and tenderness. Regarding the shell, it differs mostly in the number of teeth at the hinge, and in the colour. It is of a blackish blue, brown towards the hinges, and internally bluish white, and not iridescent, as is the case in most of the other mussels. The colour deepens towards the margin, and at the extreme edge there is a narrow black polished band. It is about three inches long, as a rule, but may be as much as three and three-quarter inches. Specimens from the Bay of Islands are short and broad, with a very pronounced curve. This mussel, until quite recently, was supposed to be exactly the same species as *M. edulis*, or the true edible mussel which is in such demand in the North of England, where tons of them are annually consumed. It is found throughout New Zealand, but is more common in the South Island.

Great Barrier Island; Auckland and Campbell Islands.

Plate X
No. 13

MYTILUS MAGELLANICUS (*mytilus*, Greek for sea mussel; Magellan, the navigator).—A mussel which can be readily identified by the sculpturing of strongly-marked ribs, some of them bifurcating, extending from the beaks to the margins. The valves are much thicker and stronger than we find in the case of any of the other mussels, and the beaks are sharply pointed, long and narrow from side to side. The colour is black or purplish maroon, the beaks white. Young shells are of a light brown colour. The interior is white or very pale purple, and is slightly iridescent. It is about three inches in length, and is found

mostly in the South Island; Oamaru; The Chatham, Auckland and Campbell Islands.

It has also a very wide distribution in the Southern Hemisphere, and has been recorded from the Falkland Islands, Chili, Peru, South Africa and Fiji. This so-called circum-austral distribution can be better understood by referring to a physical map of the world and taking note of the direction of ocean currents in the Southern Hemisphere. The figurehead of a wooden sailing vessel, wrecked off the Falklands, drifted during the course of some months to the western coast of Australia, and, although no details appear to have been reported of any marine life carried by this particular piece of wreckage, it is easy to surmise how different living forms can be transported for great distances by similar agencies. It is an interesting fact that it is mostly in colder latitudes of these islands that this species of mussel is met with.

MODIOLUS ATER (*modiolus*, a small measure, a drinking vessel; *ater*, black).—A small black and very smooth, shiny mussel with blunt beaks, sculptured with concentric growth lines. The epidermis is thick and folded inwards at the margins, making a narrow black polished edging to the interior. Inside, purplish or bluish white, and iridescent. Found in great numbers covering rocks between tide marks, on groins, jetties, piers, wharves, and all timber permanently standing in water. Generally only one inch in length, it may attain twice that size.

Found throughout New Zealand. Mount Maunganui; Auckland Islands.

Plate X
No. 8

MODIOLUS AUSTRALIS (*modiolus*, a small measure, a drinking vessel; *Australis*, southern).—A chestnut-brown mussel with a leathery epidermis, produced into a scanty and bristly fringe at the posterior end of the valve, which is the part furthest away from the hinge. The interior is cream colour, the dorsal portion of a brownish purple, sometimes not shading off into the cream-coloured portion, but presenting a decided and sharp line of demarcation. The region of the ligament is coloured a dark bluish purple, bound on either side with a narrow strip of pearl. It attains a length of four inches, usually much less. On rocks below low-water mark, but procurable at spring tides.

Throughout New Zealand. Mount Maunganui.

Plate X
No. 9

MODIOLARIA IMPACTA (*modiolus*, a small measure, a drinking vessel; *impacta*, fixed or pressed together).—A thin bivalve of unusual shape, not unlike a hazel nut,

Plate IX
No. 14

the hinge towards one end. For the size of the shell, it is highly convex and has strongly-marked radiate ribs at either end, extending from the hinge and spreading out towards the ventral border, leaving a comparatively smooth space in the middle. It is a beautifully coloured shell, being of a pale yellowish green at the hinge, while the ribbed portions and the smoother central portion are of a rich olive green. The interior is iridescent, with a lovely play of colours, and an underlying tinge of brown. It is about an inch and a half in length. The *M. impacta* is found from low water to a depth of twenty-five fathoms, and live specimens may be obtained by carefully searching among boulders at low spring tides. A cluster of perhaps a dozen of all sizes may be seen hidden in a dense mass of tangled and matted beards or byssus threads. So closely are the mollusca packed, and so dense the dark-brown beards which bind the colony together and secure it to the rock, that it might easily be mistaken for some vegetable growth, and thus escape the notice of the inexperienced collector. When dried, the mass of byssus threads has the appearance of soft and fine brown wool.

North and South Islands. Mount Maunganui; Chatham Islands.

Plate X
No. 10

LITHOPHAGA TRUNCATA (*lithos*, stone; *phago*, to eat; *truncata*, cut off, or lopped at the top).—Commonly known as the Date shell, this species is a rock-borer; a thin, polished, elongated bivalve, more than twice as long as it is broad, and exactly the same colour as the date fruit. The sculpture consists of concentric striations, with a few indistinct radiate lines from the ventral border towards the hinge, which, however, they fail to reach. The fresh shell is slightly iridescent internally and bluish white, purplish at the posterior end. This borer is attached to the rock by a beard when young, like the mussels. The tunnel formed by the animal is of the same shape as the shell, there being no rotary movement, and consequently the valves are practically smooth. Most rock-borers rotate their shells, and in order to perform this manœuvre are provided with roughened and rasp-like valves. Of course, the result is the same, but in the case of the Date shells the tunnels are excavated by the foot, whereas the other rock-borers use their valves as cutting and boring implements, the foot supplying the motive power. When in soft sedimentary rock and above low-water mark, they may be obtained by chopping out blocks with a tomahawk, and fine specimens *in situ* can thus be secured. The rock should be trimmed to a suitable size and shape, and the

whole immersed in methylated spirit for a week. The animals are preserved, and dry rapidly when removed from the spirit. The advantage of this method is that they may be kept intact with the animals still in their burrows, attached by the beard; being rendered aseptic, there is no risk of the specimen becoming offensive.

Found in the North and South Islands. Narrow Neck, Auckland Harbour; Mount Maunganui.

PECTEN CONVEXUS (*pecten*, a comb; convex).—

This Scallop is not at all common, and in size is somewhat larger than the little Fan shells. It is distinguished from the other species by having five pronounced corrugations on each valve, in addition to the numerous small ribs which are distributed over the entire surface. The usual colour is reddish, purplish, or white mottled with pink. One specimen I have is a beautiful apricot colour, and another one maize colour. The valves are almost equal in size and shape, both being convex, with the right just a trifle fuller than the left. In colour the right is always much paler of the two. The interior is purple or pinkish in the left valve; paler, or in fact almost white, in the right valve. The lugs or ears are unequal, the anterior ones being much larger than the posterior. In order to determine the right valve from the left, hold the open shell in front of you, internal surfaces upwards, hinges touching, with the two large ears nearest to you; the right valve is in your right hand. Observe, also, that the scar for the adductor muscle which closes the valves—only one muscle in the case of the Scallops—is situated towards the further or posterior end; it is nearly circular, and rather large, but only faintly defined. The margins of the shell are crenated or finely notched. It is found among rocks below low-water mark, attached by a byssus, but is usually dredged in waters up to twenty-five or thirty fathoms. Although the *Pecten convexus* has a beard, it does not remain attached to one spot, for it has been observed by Captain Bollons to swim about in the water quite freely.

Plate XI
No. 3

Bay of Islands; Hauraki Gulf; Mount Maunganui; Cook Strait; Stewart Island.

PECTEN IMPARVICOSTATUS (*pecten*, a comb; *imparvicostatus*, with small ribs).—This small Scallop differs from the other *pectens* in having a striped colour effect. The right valve has the principal ribs, ten in number, of a pale purplish, almost white colour, with the intervening spaces deep purplish brown, alternating with reddish brown. The shell is symmetrical, and longer from the

Plate XI
No. 5

dorsal to the ventral margin than in the transverse diameter, accentuated by the stripes, a design which always gives an apparently lengthened effect to any object so decorated. This shell is typically heraldic in shape, and is suggestive of the scallops worn by pilgrims or palmers returning from the Holy Land in Mediæval times. They are to be found under rocks and boulders, just below low-water mark, and attached by a beard.

Cape Maria van Diemen; Bay of Islands; Hauraki Gulf; Mount Maunganui; Nelson; Chatham Islands.

Plate XI
No. 2

PECTEN MEDIUS (*pecten*, a comb; *medius*, middling, common).—The large Scallop, sometimes six inches across. The right valve is highly convex, holding the animal's body; the left valve is quite flat. The shell is very symmetrical, and the sculpture consists of flatly-rounded ribs radiating from the beaks, with narrow spaces between adjacent ribs. The ears, or lugs, are equal and straight across the dorsal margin. The colour varies; it may be white or purple, brown, yellow, mottled, or concentrically marked with bands of darker colour on a paler background. An excellent shellfish for the table, this mollusc ranks second only to the oyster in the Old Country, though in New Zealand it is scarcely known as a food. The Maoris never seem to indulge in them, and the valves are seldom seen in the old kitchen middens. The reason why this delicacy is neglected can only be that dredging in deep water is generally needed to procure them. A point of interest in the scallops is that these creatures are endowed with splendid vision. Their eyes, or ocelli, are seen as little black dots on the outer border of the mantle, and the rapidity with which the valves can be snapped together when the animal is approached shows the keen eyesight it possesses. This is quite different to most other bivalves, which have no organ of sight whatever. These Scallops do not spin a beard, and are free swimmers, their progress through the water being accomplished by the alternate opening and shutting of the valves.

North and South Islands. Mount Maunganui; Chatham Islands.

Plate XI
No. 4

PECTEN ZELANDIÆ (*pecten*, a comb; New Zealand).—The most brilliantly coloured of all the scallops, this beautiful little species, commonly known as the Fan shell, is from half an inch to an inch and a-half in height—that is, from the dorsal to the ventral border,—and in colour may be red, brown, orange, canary yellow, purple, sometimes variegated puce and purple, etc. The lugs are re-

markably unequal, and the shell is occasionally crumpled, as though the animal had received some injury to the mantle during the making of the shell. It is found among rocks and loose boulders, or on the roots of seaweed and sponges, attached by a byssus.

Throughout New Zealand; Mount Maunganui; Chatham Islands.

LIMA BULLATA (*lima*, a file; *bullata*, inflated, bubble-like).—A rare bivalve of very elegant shape, almost symmetrical, and having the valves of equal size. It attains a diameter of one and a-half inches from the hinge to the ventral margin, and is about three-quarters of an inch across. It is widest about the middle, as well as being thicker through from valve to valve, and tapers gracefully upwards towards the hinge and downwards to the rounded ventral margin. The beaks are high and narrow, with an ear extending in almost a straight line outwards on either side. The sculpture consists of numerous radiate ribs, well marked over the middle portion of the shell, and absent on the sides. There are also fine concentric growth lines. The radiate ribs are visible on the inside, and the margins are lightly toothed. The Lima bullata is pure white.

Cape Maria van Diemen; Bay of Islands; Mount Maunganui; Stewart Island; Chatham Islands; The Snares.

Plate IX
No. 15

LIMA LIMA (*lima*, a file).—This bivalve is commonly known as the File shell, and is rather like a scallop. It is a pale whitish-yellow colour, sculptured with eighteen stout rounded scaly ribs, which are of a honey colour, and translucent. The valves are not symmetrical, being rounded in outline at the posterior end, and straight at the anterior end, as though a fan-shaped section, one-sixth of the entire shell, had been cut off. The interior is pure white, and shining; the external ribs showing as well-defined grooves. The ventral margins are toothed by the ends of the ribs, these teeth interlocking with each other after the fashion of the cockles. About two inches in its longest diameter, which is from the hinge to the ventral border. It is a rare shell, and occurs only in the South Island and Stewart Island.

Plate XI
No. 16

OSTREA ANGASI (*ostrea*, an oyster; Angas, the conchologist).—This is the Stewart Island oyster, otherwise known as the mud oyster—an appropriate name, for the creature lives in mud, has a complexion suggestive of that

Plate X
No. 5

substance, and by the side of its near relative, the Rock oyster, amply bears out Shakespeare's ideas about comparisons. It has a rounded shell, the right valve flat, the left valve hollowed out for the animal's body. Sculpture consists of concentric laminations on the flat valve, the deep valve having also a number of short, rounded ribs at the ventral margin. The hinge plate is triangular, and there are no teeth. The interior is of a pale greyish white, blending with greyish green, slightly pearly and iridescent. About three and a-quarter inches long by two and three-quarter inches across.

North and South Islands. Mount Maunganui; Foveaux Straight; Stewart Island.

Plate X
No. 4

OSTREA GLOMERATA (*ostrea*, an oyster; *glomerata*, aggregated or massed together).—This is a case where one might be excused for saying it is too well known to need description, but it is as well to describe a few outstanding features which make it easy to distinguish from the other members of the oyster family. The two valves are right and left; the right being the uppermost one, which is concentrically laminated, or perhaps it would be better understood were we to say the valve is composed of more or less rounded plates of diminishing size placed one above the other in a rather irregular fashion. It is generally fairly flat, and the margin is toothed or frilled with purplish-black projections fitting very closely into corresponding wavy scallops on the left valve. The left valve is deeply hollowed out and firmly cemented to the rock, or shell of another oyster. The hinge is rather square, and flattened, with a row of granular teeth extending on either side, nearly half-way towards the ventral margin. The interior is greenish white, marked with blackish purple at the border, slightly pearly, and there is one muscle scar in each valve situated towards the posterior end of the shell. To determine the ends of the shell, hold the flat valve in the right hand and the deep one in the left, with the hinges pointing towards each other, the internal surfaces uppermost. The anterior end is nearer to you, the posterior end further away.

Northern parts of New Zealand. Hauraki Gulf; Bay of Islands; Mount Maunganui.

Plate X
No. 7

ATRINA ZELANDICA (*atrina*, dim. of *ater*, *atra*, black, a dismal black, in contra-distinction to *niger*, a glossy black).—The Fan mussel. A long, large, wedge-shaped, fragile bivalve, the anterior end coming to an acute point, the posterior end somewhat rounded and wide. The dorsal

margin is quite straight, and gives attachment to the ligament; the ventral margin, with a large curve outwards at the posterior end, merging to concave at the anterior end, forming an Ogee, or what Hogarth termed the "line of beauty," especially noticeable in the young shell. The sculpture is composed of ribs radiating from the point fanwise, with hollow spines at the broad end. The colour is dark brown, inclined to purple, the interior being iridescent and shiny. Immature shells, up to about three inches in length, are transparent, exceedingly thin and fragile, of a pale horn colour or grey. The adult shell attains a length of eleven inches. Buried in muddy sand, point downwards, and with from half an inch to several inches of the posterior end of the valves exposed, it is found just below low water to a depth of twenty fathoms or more. The animal spins a beard composed of fine silky filaments, situated near the anterior end, and which is attached to numerous fragments of shell. This mass of broken shell forms sufficient anchorage to prevent the mollusc being washed out of its bed, and the hollow spines also serve the same end. Another interesting point to be observed in the Fan mussel is the extreme length of the ligament, necessitated by the fragility of the shell; the fragility again giving rise, in the inquiring mind, to a curious problem as to whether the thinness of the shell causes the animal to bury itself for protection, or whether the shells were originally of more solid build, and the burying habit of the mussel in the course of time brought about this relative thinness. Here we are faced with a knotty point, like the owl in Froude's Essays, which acquired an aspect of profound wisdom through constantly pondering over the question as to whether the first owl came out of an egg, or the first egg came out of an owl!

The *Atrina Zelandica* is found throughout New Zealand. Mount Maunganui.

CARDITA CALYCVLATA (*kardium*, the heart; *calyculus*, a small bud).—A small, solidly-built bivalve of very asymmetrical shape, ornamented with twelve or more scaly ribs radiately arranged, very broad, and well marked in comparison to the size of the shell. In colour it is "white, yellowish pink, or dirty white" (Hutton). It is also known as the Mytilicardia, from having a beard like the mussels, and in general appearance bearing a superficial resemblance to the cockles. It attains a length of one and a quarter inches by three-quarters of an inch. Found below low-water mark to about fifty fathoms.

Bay of Islands; Mount Maunganui; Island Bay; Chatham Islands.

Plate IX
No. 13

Plate X
No. 17

VENERICARDIA AUSTRALIS (*Venericardia*, the heart of Venus; *Australis*, southern).—A thick, strong, large-ribbed cockle, brownish white, tinged with pink, and, towards the beaks, speckled or mottled with brown. The margins markedly crenated, the teeth of one valve fitting in between those of the opposing valve. The interior is white, porcellanous, washed with a rose pink, deepening to a bright purple. In order to remove the animal from the shell, do not resort to boiling, or the beautiful internal colouring will vanish. Simply leave the specimens for a few days until the animals die, then clean out and wash in cold water; scrubbing the external surface with sand and water will remove the sponge which is almost invariably attached to the posterior end. The sponge, attached to the shell in the same manner as the large seaweed is to the Horse mussel, is the direct cause of these shellfish being forcibly torn up from their beds by the fury of the ocean during the winter storms.

The *Venericardia Australis* is about an inch and three-quarters long.

Throughout New Zealand. Mount Maunganui; Chatham Islands.

Plate X
No. 11

DIVARICELLA CUMINGI (*di*, two, double; *varicella*, a little varix, or rib; *Cuming*, the naturalist).—A beautifully-shaped shell of very attractive appearance, commonly called the Lace shell. It is a translucent, pure white bivalve, almost circular in shape, very slightly flattened, with the hinge or dorsal border somewhat square. It owes its beauty not only to its graceful outlines and snowy whiteness, but to the unusual design of the sculpture, which takes the form of numerous fine raised ribs or lines shaped like chevrons with the points directed upwards towards the beaks. They are not arranged quite symmetrically, but always a little to the anterior side of the middle line. The ligament is, as in the majority of bivalves, situated on the posterior side of the beaks. About one and a-half inches in diameter. It is found on sandy beaches after storms.

Whangarei; Hauraki Gulf; Mount Maunganui; Great Barrier Island; Chatham Island.

Plate IX
No. 9

DIPLODONTA GLOBULARIS (*diplodonta*, double-toothed; globular).

Plate IX
No. 8

DIPLODONTA ZELANDICA (*diplodonta*, double-toothed; New Zealand).

These two bivalves, both commonly known as double-tooth shells, are so much alike in appearance that I con-

sidered it advisable to describe them in parallel columns, so that by comparing them step by step identification may be simplified.

DIPLODONTA

GLOBULARIS:

Colour, pellucid white.
Very rare.
Very thin.
Globular.
Sculpture, very fine concentric growth lines.
Slightly over an inch across and conspicuously less from hinge to ventral border.
Mount Maunganui; Banks Peninsula; Oamaru; Stewart Island.

DIPLODONTA

ZELANDICA:

Opaque white.
Not rare.
Fairly solid.
Less globular.
Rather coarse concentric growth lines.
About seven-eighths of an inch across and practically the same in length.
Bay of Islands; Hauraki Gulf; Auckland Harbour; Banks Peninsula; Mount Maunganui; Chatham Islands.

MYLLITA STOWEI (*melletes*, a loiterer; Stowe, the naturalist).—An uncommon and beautiful little bivalve, white or greyish white, thin and translucent; half an inch in length from the anterior end to the posterior end, and slightly more than half that measurement from the beaks to the ventral margin. It is almost symmetrical in shape, and both valves are alike. The sculpture consists of distinctly raised ribs, narrow above and broader below, arranged chevron fashion, the apex of each chevron being in the same straight line, descending from the beaks to the centre of the ventral margin. The intervals between the ribs are wider than the ribs themselves, and are completely stippled with minute pits, which can be made out with a good hand lens. As the sides of the chevrons are curved gracefully inwards and prolonged into a sharpened point above, the whole effect is decidedly pleasing. The interior is shining and white, showing the impression of the external ribs as grooves. The margins are crimped by the ends of the ribs.

Hauraki Gulf; Bay of Islands; Mount Maunganui; Cook Strait; Foveaux Strait.

Plate IX
No. 12

ROCHFORTIA RENIFORMIS (Rochefort, the naturalist; *reniformis*, in the form of a kidney).—A small bivalve, scarcely exceeding a quarter of an inch across, of a light brown or whitish colour, with well-marked distant and equally-spaced concentric ribs crossed by fine radiate

Plate IX
No 19

threads. It is somewhat kidney-shaped, and possesses a triangular resilifer, or cartilage-bearing process under the beaks in the interior. Found on the under surface of boulders at extreme low tides and to a depth of thirty fathoms of water.

Hauraki Gulf; Mount Maunganui; Cook Strait; The Snares; Chatham Islands.

Plate XI
No. 13

TELLINA ALBA (*tellina*, Greek name for a kind of mussel; *alba*, white).—The white Tulip shell. A very thin, semi-transparent bivalve, marked with minute concentric striations externally, which give the shell a satiny sheen. It is a pure white outside, and of a bluish and glossy white inside. One end, the anterior, is rounded in outline, while the posterior end is angular and bent. It is about an inch and an eighth high, and an inch and five-eighths long,

Found washed up on sandy beaches. North and South Islands. Mount Maunganui.

Plate XI
No. 14

TELLINA DELTOIDALIS (*tellina*, Greek name for a kind of mussel; *Delta*, the Greek letter Δ ; *oidos*, like).—A more solid, rather large, white or yellowish-white Tulip shell, which is more chalky than translucent; the anterior end is semi-circular in outline, the posterior end angular. Towards the hinges the valves are of a rather yellowish tinge. The sculpture consists of the concentric striations, and there is a well-marked groove on the left valve and a ridge on the right, towards the posterior angle. It is about two and a-quarter inches long by two inches in height; practically as broad as it is long. Found on sandy spits in harbours.

Bay of Islands; Hauraki Gulf; Mount Maunganui; Wellington and Dunedin Harbours.

Plate XI
No. 15

TELLINA DISCULUS (*tellina*, Greek name for a kind of mussel; *disculus*, dim. of *discus*, a quoit, a flat round plate).—A moderately thick yellowish or greyish-white bivalve, translucent, but not so much so as the *T. alba* or the *T. deltoidalis*. In outline the valves are fairly rounded, but the anterior end is more semi-circular, while the posterior end is somewhat angled, with a groove on the left valve and a ridge on the right. The umbones are coloured a bright orange yellow, which is also present on the interior surface. It is an inch and three-eighths long by an inch and a quarter high.

Mount Maunganui; Banks Peninsula; Chatham Islands.

TELLINA SPENCERI (*tellina*, Greek name for a kind of mussel; C. Spencer, the conchologist).—A thin, translucent bivalve, elongated and flat, with the posterior end drawn out into a narrow point and showing a very well-marked fold descending from the beaks, which are situated almost in the middle of the dorsal margin. The anterior end is semi-circular. In length it is a trifle under two inches, and about one inch from the dorsal to the ventral border, so its comparatively narrow and elongated shape causes it to be readily distinguished from any other Tulip shell. It is rather rare.

Plate XI
No. 12

Akaroa Harbour; New Brighton; Mount Maunganui; Hicks Bay; Mercury Bay; Opotiki.

LEPTOMYA LINTEA (*leptos*, thin; *mya*, a mussel; *linteria*, from *linum*, flax).—A thin white semi-transparent, somewhat oval bivalve, about an inch long. At one time, from its general appearance, it was described as one of the Tellinidæ, but now it is placed in a separate genus. It is more swelled out in the middle of the valves, and has the anterior end rounded and the posterior slightly angled. The most characteristic features are the almost central position of the beaks, and the sculpturing, which takes the form of fine concentric striations crossed at right angles by fine radiate striations. This mode of sculpture accounts for one of its synonyms, *Tellina decussata*—really an appropriate name, so far as the specific one is concerned.

Plate IX
No. 7

Hauraki Gulf; Manukau Harbour; Mount Maunganui; Petone; Banks Peninsula; Stewart Island.

MESODESMA AUSTRALE (*meso*, middle; *desma*, a ligament; *Australe*, southern).—One of the two Maori Pipsis. A rather long, oval yellowish bivalve with a heavy, thick shell. The epidermis is thin and horn-coloured, extending a little beyond the free edge of the margins. A trifle wider at the posterior end, and evenly rounded; the anterior end also rounded, but slightly, though noticeably, smaller. The beaks are small, and situated about the middle of the dorsal margin. The sculpture consists of fine concentric striations somewhat coarser at the posterior end. About two and a-half inches to three inches long. Found on sandy flats between high and low-water marks.

Plate XII
No. 11

Mount Maunganui; Matakana Island; Chatham Island.

MESODESMA SUBTRIANGULATUM (*meso*, middle; *desma*, a ligament; *subtriangulatum*, almost triangular).—A strong, thick, solidly-built bivalve of a fairly smooth greyish-white exterior, concentrically striated. The posterior end is rather straight, and forms an obtuse angle

Plate XII
No. 13

with the dorsal border, which is quite straight. The hinge is at the posterior end of the shell, causing it to be very asymmetrical. The anterior end is rounded and flattened, like the thin end of a wedge, from which the strong, triangular, and fleshy foot protrudes. The interior is smooth and porcellanous. The largest specimens are about two and three-quarter inches in length. Sometimes they may be seen rapidly digging themselves into the sand on ocean beaches as the tide comes in, this manœuvre being accomplished by means of the powerful foot. When the animals are buried a little beneath the surface of the sand, and are washed by the incoming tide, the tips of the siphons can be seen just exposed, the larger one with a kind of fringed extremity, being that by which the animal draws in water whence it obtains its food, and the small plain one that by which the waste water is expelled. Although this mollusc is commonly known as the Pipi by Europeans, especially fishermen, it is not the pipi of the Maori, that name being used by them to denote the *M. Australis*, as well as the *Chione Stutchburyi*. The native name for the *M. subtriangulatum* is Tuatua and Kahitua.

Found in both Islands. Mount Maunganui; Chatham Islands.

Plate XII
No. 12

MESODESMA VENTRICOSUM (*meso*, middle; *desma*, a ligament; *ventricosum*, swelled out).—This is the well-known Toheroa, a large thick, solidly-built bivalve of a somewhat dingy greyish or yellowish-white colour, wedge-shaped, being thin at the anterior end, which is evenly rounded in outline. The beaks are close together and near to the posterior end. Sculpture consists of irregularly sized and spaced concentric striations, more pronounced at the ventral margin and at both ends, and exceedingly fine and inconspicuous radiate striations. Usually about four or five inches in length; specimens have been recorded of seven inches. At first sight the resemblance between the Toheroa and the *M. subtriangulatum* is remarkable, so much so that specimens of one and a-half inches of both species may be easily confounded by the uninitiated. You must observe, however, that the Toheroa, size for size, is considerably the thinner and lighter of the two, although both are technically described as solid shells. The Toheroa is, moreover, slightly wider at the anterior or thin end; the ventral or lower border is more distinctly curved, and that portion of the valve just below the beaks is more swelled out—hence the name, *ventricosum*. On examining the interior of the shell, a hollowed-out spoon-like process is to be seen, one in each valve, close to the

hinge, and which is known as the resilifer. This pit is also well developed in the *M. subtriangulatum*, the *Mactra discors*, and the *Cochlodesma Angasi*. In the recent state it is filled with a dark brown cartilaginous material, which is termed the *resilium*. When these shellfish are boiled, the valves spring apart, due to the adductor muscles (which adduct or draw together the valves during life) losing their contractile power, and the resilium, like a piece of india rubber, being no longer under pressure, expands to its normal size, and so causes the valves to be pushed apart. In those bivalves not possessing a resilium, the ligament acts as a "C" spring, always in tension, the adductor muscles drawing and holding together the shells; so we find that, although the opening of a bivalve during life is primarily controlled by the will of the animal, the movement consists of two distinct, yet perfectly blended acts—namely, voluntary relaxation of the adductor muscles, accompanied by involuntary and automatic expansion of the hinge cartilage.

The Toheroa is a favourite dish with some people, and makes a remarkably good soup. It is found buried in the sand between tide marks.

North and South Islands. Muriwai, on the west coast. Mount Maunganui.

MACTRA DISCORS (*mactra*, a kneading trough; *discors*, different).—This species, known as a Trough shell, is a large round, rather smooth, white or greyish-white bivalve, almost symmetrical, with a light brown epidermis, more or less persistent, near to the ventral margin. The sculpture consists of minute concentric striations, absent on the beaks, which are white and smooth, gradually becoming more marked as they approach the ventral border, where they appear as step-like ridges. The interior resembles beautifully glazed white porcelain. It is about three and a-half inches across. Living specimens are washed ashore on sandy beaches after heavy gales, when they are eagerly gathered by the Maoris.

North and South Islands from the Bay of Islands to Preservation Inlet. Mount Maunganui.

MACTRA ELONGATA (*mactra*, a kneading trough; *elongata*).—An elongated oval, thickly-built, yellowish-brown bivalve, speckled with darker brown spots round the ventral portion of the shell, but white where denuded of the epidermis. The anterior end is small and rounded, and the posterior end largely rounded; sculptured with fine concentric ribs towards the ventral margin; smooth near

Plate XII
No. 5

Plate XII
No. 6

the beaks. The margins are smooth and fairly thick, and the shell has both valves in contact all round when closed. The interior is yellowish white, polished and dense, with a large triangular pit at the hinge for the reception of the resilium. This Trough shell is large, and may attain a length of four and a-half inches by two and three-quarter inches in height. The shell is more compressed than the *M. discors*—that is to say, it is flatter from valve to valve.

Found in the North and South Islands, but “nowhere common. Washed up occasionally after gales.” (Suter).
Mount Maunganui.

Plate XII
No. 7

MACTRA OVATA (*mactra*, a kneading trough; *ovata*, oval).—Another Trough shell, large, rotund, thin, asymmetrical, and yellowish white in colour. It is bluntly rounded at the anterior end, and more sharply rounded at the posterior end. Sculpture consists of small concentric striations of varying sizes. The valves gape at the posterior end. The interior is white and slightly polished; the margins are thin and sharp. It inhabits muddy estuaries, mangrove saltwater swamps, and is three inches in length and a little over two inches in height. This shell must not be confused with the *M. discors*, which it somewhat resembles. The latter is thicker and heavier, has a smooth interior, and the valves fit closely all round.

North and South Islands. Auckland Harbour; Pilot Bay, Mount Maunganui.

Plate IX
No. 16

MACTRA SCALPELLUM (*mactra*, a kneading trough; *scalpellum*, dim of *scalprum*, a knife).—This mollusc is also a Trough shell, but so different to the other species already described that one would scarcely believe it to be a *Mactra*. It is a small, fan-shaped, thin, flattened bivalve, smooth, white and polished. It is readily recognised on account of its shape, being most symmetrical, with the beaks in the middle of the dorsal margin, which slopes away equally on each side, enclosing an angle of 130 degrees. The ventral margin forms a broad, circular sweep. The sculpture consists of very fine and lightly-marked concentric striations. It is barely an inch in length, and is found in sand and disintegrated pumice washed up on ocean beaches.

Great and Little Barrier Islands; Hauraki Gulf; Mount Maunganui; Cuvier Island.

Plate XII
No. 8

SPISULA AEQUILATERALIS (*spisula*, dim. of *spissa*, thick; *aequilateralis*, having equal sides).—A rather large, solidly-built, equal-sided triangular bivalve of a white

or yellowish-white colour, bluish purple near the beaks. Sculpture consists of concentric striations, prominently marked at the anterior end, and at the ventral margin. Young specimens have quite thin shells in comparison, are coloured bluish pink to purple, and are much smoother than adults. About three inches in length by two and a-half inches high. Washed ashore after gales.

North and South Islands. Mount Maunganui.

ZENATIA ACINACES (*Zenas*, gift of Jupiter; *acinaces*, a scimitar).—Commonly known as the Otter's shell. A thin greyish or yellowish-white or brown bivalve, with the hinge almost at the extreme anterior end. The dorsal and ventral margins are parallel and almost straight, the valves being shaped not unlike the blade of a table knife, rounded at the anterior end, and pared away very slightly at the posterior end of the ventral margin. The outside of the shell is covered with an opaque brownish olive-green epidermis, which is rather thick and rough, thinning off towards the hinges. The sculpture consists of concentric striations or growth lines. The interior is bluish white, iridescent to a slight extent, and glossy. Being a very thin shell for its size, it is reinforced by a thickened ray of callus radiating from the hinge, one in each valve. In length it is about three inches, or four inches in large specimens. The animal has a large retractile siphon; the foot is large and of a vivid rose-pink colour. Found washed up on sandy beaches after storms, or dredged in deep water. It is a rare species, though every few years good numbers of them are met with in restricted areas a day or two after a severe gale.

Plate XII
No. 9

New Brighton; Bay of Islands; Mount Maunganui; Opotiki.

RESANIA LANCEOLATA (*Resania*, dim. of *rasus*, polished; *lanceolata*, in the shape of a lance).—A thin white bivalve, covered with a smooth, glossy, pale-yellow periostracum; rather narrow and flattish, shaped like a spearhead, rounded at each end, but having the anterior end more pointed. On the interior surface are two strong and conspicuously raised rays of shelly matter radiating from the hinges to give additional strength to the shell, which is rather thin in comparison to its large size. It is not common, and may attain a length of four and a-half inches. Found in association with the *Zenatia Acinaces*.

Plate XII
No. 10

North and South Islands. Mount Maunganui; Ohiwa.

Plate X
No. 1

DOSINIA ANUS (*dusenemos*, stormy; *anus*, a ring).—A flat, heavily-built, circular bivalve of a pale fawn or biscuit colour, bluish or purplish near the hinges, with a dull surface, and sculptured with numerous and fine deeply-engraved regular ring-like striations. It is exceptionally thick and heavy. The internal markings for the adductor muscles and pallial lines are beautifully defined, the colouring being a delicate violet, the remaining portions white. The largest specimens are about three inches across.

North and South Islands. Mount Maunganui.

Plate X
No. 3

DOSINIA LAMBATA (*dusenemos*, stormy; *lambata*, licked, smoothened).—The shell of this species resembles that of the *D. subrosea* in shape, so closely that specimens of each should be placed side by side in order that the difference between them may be duly appreciated. In general outline it is fairly round, the beaks are small, close together, and bent forwards; the sculpture consists principally of small and closely-set concentric striations. The chief points which distinguish it are as follows:—The length is almost identically the same as the breadth; the thickness between the two valves is relatively greater than in the *D. subrosea*; the dorsal margin on the posterior side of the beaks has a more rapid slope. There are faint radiate striations on the valves, which result in a somewhat granular finish. As these are very faintly defined, they should be examined through a lens. The valves are thin, white, and about an inch in diameter against the two-inch diameter of the *D. subrosea*, and the three-inch diameter of the *D. anus*.

Found at Monganui; Bay of Islands; Hauraki Gulf; Auckland Harbour; Queen Charlotte Sound.

Plate X
No. 2

DOSINIA SUBROSEA (*dusenemos*, stormy; *sub*, under, slightly; *rosea*, pink, rosy).—A bivalve similar in shape to the *D. anus*, but much thinner, and of a pale pinkish white, or pale burnt sienna, instead of biscuit colour; polished, and having the concentric striations so small, fine, and closely set together that it appears to have a comparatively smooth surface. It may attain a length of two inches, and is not uncommon.

North and South Island. Mount Maunganui.

Plate IX
No. 18

MACROCALLISTA MULTISTRIATA (*makros*, long; *kalos*, beautiful; *multistriata*, having many striations).—A small and rather thin bivalve of beautiful shape and colour, found only in deep water. It is obliquely narrowed, oval, elongated, with both ends somewhat drawn out, and having the valves sculptured with many small but well-defined

concentric striations. There are five or six radiate bands of pinkish-fawn colour extending from the beaks to the ventral border. The margins are smooth, and the valves fit closely all round. It is about an inch and a half long by one inch high. It is quite a rare shell.

Bay of Islands; Hauraki Gulf; Great Barrier Island; Wellington; Queen Charlotte Sound; Stewart Island.

CYTHEREA OBLONGA (*Cytherea*, a name of Venus; oblong).—A cockle-shaped bivalve, moderately large, of a brown or yellowish-brown colour, thick in the middle, and sculptured with concentric, thin, sharp, upstanding lamellæ. The beaks are well sculptured in the same fashion, contrary to the usual rule, where the beaks are either smooth or the sculpture is in such low relief as to be almost a negligible quality. The anterior end is semicircular, like the posterior end, but forms a considerably smaller arc. The ventral margin is regularly rounded; the interior smooth and white, with the inner margins finely toothed. It is about two and a-quarter inches in length, and may be found buried in a few inches of sand, usually in boulder-strewn localities.

Throughout New Zealand. Mount Maunganui; Chatham Islands.

Plate XI
No. 1

CHIONE SPISSA (*Chione*, the daughter of Boreas; *spissa*, thick).—This shell was formerly described under two names, as if representing two distinct species—namely, *Chione crassa* and *Chione mesodesma*,—and my former suspicions of their identity have been since confirmed by reading Iredale's paper, where he quotes E. A. Smith, I.S.O., of London, the greatest British authority on bivalve molluscs, as stating that "he is still unable to separate this species (*Chione crassa*) from *C. mesodesma* . . . which Suter has maintained as a distinct species." The main features of the species are, briefly: its cockle-like shape, its size, which is approximately an inch in length, its mode of sculpture, which takes the form of concentric ribs closely set together, with the sharp upper edges tilted upwards towards the beaks, and the colour, which varies so much that there is little room for surprise that the species has proved rather puzzling to describe. It ranges from a plain light nut brown to plain pale grey, and between these two extremes are many variations. Brown with two radiating white bars on each valve; white with brown bars, broad or narrow in either case; brown zigzag patterns, combined, or not, with bars brown or white, broad or narrow, scarcely two alike. One point emphasized by the separatists was

Plate IX
No. 5

the shape of the lunule, which is the little heart-shaped or lancet-shaped area situated on the anterior side of the beaks, opposite the ligament, and half of it on each valve; also the relative flatness or rotundity of the valves. The interior is white or bluish white, with a well-defined border of purple, either bright, or brownish purple. Now, if we take a hundred specimens, or a thousand, picked up at random, for they are common enough, it will be noticed that the lunule is wider or narrower, just according to the width or flatness of the shell, and bears not the slightest relation to the colour or markings, inside or out, of any specimen. Should you incline to the belief that this species is not masquerading under two names, and that there are really and truly two different individuals, and you have, say, a real and genuine *C. crassa*, you open it to examine the interior, and behold!—it should be a *C. mesodesma*. Finally, you give it up as a hopeless business or you search diligently, and carefully select specimens from either end of your long series, label them conscientiously, and deposit them in your cabinet, conveniently ignoring all the rest as freaks, mongrels, or reversions of type; though I think even the most ardent pluralist would have some difficulty in accounting for two species having something like ninety per cent. of overlapping types.

Although this mollusc is known under no less than nine different *aliases*, the budding conchologist may take heart of grace and, recovering from his bewilderment, breathe a sense of gratitude to Iredale and Smith for untangling the problem, and realise that if the scientific naturalist does stand upon a lofty pedestal, his feet, after all, are the feet of clay.

The *Chione spissa* is found throughout New Zealand on sandy beaches between tide marks. Mount Maunganui.

Plate XI
No. 7

CHIONE STUTCHBURYI (*Chione*, the daughter of Boreas; Stutchbury, the naturalist).—This fairly large, bluish or greyish-white or reddish-brown cockle, with curved beaks directed forwards, is called the Pipi by the Maoris, and is highly esteemed by them as one of their standing dishes. The sculpture consists of radiate ribs and fine concentric ridges, the ridges more prominent than the ribs, especially at the ventral margin and towards the anterior end. About the upper quarter of the shell the ribs and ridges appear to be equally defined, crossing each other at right angles, and so forming little hollow squares. The interior is white or bluish white; the posterior end, and more than half of the ventral margin, exhibits a broad

dark purplish blue patch, shading off to white at the anterior end. It is about two inches long, and very plentiful on sand banks in shallow water.

Throughout New Zealand. Mount Maunganui; Chat-ham and Auckland Islands.

CHIONE YATEI (*Chione*, the daughter of Boreas; Yates, the naturalist).—A beautiful shell, solidly built, yellowish cream or lemon-coloured, shaped like a cockle, with thin knife-like ridges arranged concentrically round the valves, parallel to the ventral border, and somewhat wide apart. The beaks are coloured pale purple, shading off to blue. The interior is white, bordered with pale yellow. It is upwards of two inches in length. In older shells the ridges are generally worn down. Live specimens are often washed ashore on sandy beaches after storms.

North and South Islands. Mount Maunganui.

Plate XI
No. 6

PAPHIA COSTATA (*Paphos*, a city of Cyprus, sacred to Venus; *costata*, ribbed).—The Carpet shell. An oval asymmetrical whitish-yellow bivalve of cockle-like appearance, and elegant proportions. The beaks are sharply pointed, and curve forwards. The anterior end is short and somewhat pointed, the posterior end more squarely rounded. Sculpture consists of well-defined radiate ribs, finer at the anterior end, broader at the posterior end, almost absent in the middle, and again well marked, but not so pronounced, at the posterior end. The ventral border is slightly curved; the interior white, with the posterior end and upper part dark purple. The margins are finely crenulated. About one and a-half inches long by one and a-quarter inches in height.

Throughout New Zealand, but not common. Takapuna; Mount Maunganui.

Plate XI
No. 9

PAPHIA INTERMEDIA (*Paphos*, a city of Cyprus, sacred to Venus; *intermediate*).—This is also a Carpet shell. A fairly large white or creamy-white bivalve of asymmetrical ovate shape. The sculpture consists of numerous concentric ribs, which become more marked, lamellar, or plate-like towards the ventral border and the posterior end. Many of them coalesce, running into each other to form one rib, and other ribs branch off into two. They are crossed by very fine radiate striæ, more pronounced on the anterior end and the middle of the valves. The interior is white, and not polished; the margins smooth,

Plate XI
No. 10

marked at the posterior end with a patch of purple, varying in depth from very pale to very dark. It is a common shell, about two inches long.

Throughout New Zealand. Mount Maunganui.

Plate IX
No. 2

VENERUPIS ELEGANS (*Venerupis*, Venus; *rupis*, a rock; *elegans*, elegant).—A somewhat long, narrow, yellowish or creamy-white bivalve with the beaks closely approximated, and the sculpture consisting of very fine radiate striations and concentric, equally spaced lamellar ribs. The anterior is acutely rounded, the posterior broadly rounded. It should be remembered that the foot naturally is protruded from the anterior end, or in the direction in which the animal moves, and the siphons are behind; so we may generally expect to find the fore end more pointed, the hindmost square, blunter or larger. These points will help us in determining right from left valves without any trouble. To return to the *V. elegans*, the beaks are situated at the anterior fourth or, in other words, at a point, one-quarter the length of the entire shell, starting from the front end. The margins are finely crenated, notched or toothed; the interior is white, with the posterior end purple. It is a borer in soft rock, and is about one and a-quarter inches in length.

Found in the northern parts of New Zealand. Whangarei; Auckland Harbour.

Plate IX
No. 1

VENERUPIS REFLEXA (*Venerupis*, Venus; *rupis*, a rock; *reflexa*, reflected, bent back).—A small white bivalve of irregular shape, having neither lunule nor escutcheon. The beaks are situated at about the anterior fourth; the posterior end truncated or cut off at an obtuse angle; the ventral margin rounded. The sculpture consists of concentric ribs folded, reflexed or bent over at the posterior end, with two or three smaller ribs in between. The posterior end is often marked with little brown splashes of colour. It is a trifle over an inch in length.

Found in the North and South Islands. Auckland Harbour; Mount Maunganui.

Plate IX
No. 3

VENERUPIS SILIQUA (Venus; *rupis*, a rock; *siliqua*, a pod).—A very similar shell to the foregoing, differing from it mostly in having a long, deep escutcheon on the left valve only. The sculpture consists of concentric ribs which are thinner and more plate-like than those on the *V. reflexa*. The ribs also anastomose or coalesce on account of being crowded together. The interior is similar in being yellowish white with a more or less dark purple patch at

the posterior end. The margins are smooth and waved irregularly; in fact, the mouth, if one may be permitted to speak of a bivalve possessing a mouth, is almost invariably crooked. Both of these species—*V. reflexa* and *V. siliqua*—are remarkably deformed, the deformity being due to the creatures being huddled together in rock cavities. They are both met with on the ocean beach at the Mount, being sometimes washed ashore after gales, together with quantities of coarse pumice sand. As the pumice rock is always submerged, even at the lowest tides, live specimens are not to be expected in this locality; still, some good ones are to be found occasionally. In Auckland Harbour, at Narrow Neck, they may be obtained in their natural haunts in the soft, consolidated mud rocks when the tide is out.

Manukau Harbour; Hauraki Gulf; Mount Maunganui; Gisborne.

Note.—The difference between the *Venerupic reflexa* and the *V. siliqua* is merely a matter of degree. As for the escutcheon, in no species of bivalve mollusc is it marked off so definitely as the lunule is, and one is often at a loss to decide whether it is present or not. The fact of it occurring on one valve only, makes one suspicious. I have since learned that Mr. R. W. B. Oliver, in the Proc. Mal. Soc., Vol. XV., March, 1923, has identified and united the two under the name *V. reflexa*. In the plate, a figure is given of each, a good example of the extreme forms we sometimes meet with in one species.

PROTocardia pulchella (*Proteus*, a marine deity; *kardia*, the heart; *pulchella*, beautiful).—A delicate little bivalve shaped like a cockle, with a thin, fragile shell, the anterior end being roundly curved and the posterior end slightly straight. Sculptured with very fine, numerous riblets, radiating from the beaks. They are coloured a bright coral pink, shading off to white close to the hinge. Three-quarters of the shell are coloured pink; then there is a sharply marked-off portion of white, which gives place to pink again at the posterior end. The margin is finely serrated, the tiny little teeth corresponding to the ends of the ribs. The interior is white and glossy, especially towards the ventral margin; the dorsal half, approaching the hinge, being a deep pink, the colour arranged in three radiating bands or patches. This beautiful little shell, which is about three-quarters of an inch across, is to be found washed up on sandy beaches. It should be noticed that the ligament of this species, like that of the *Divaricella Cumingi*, or Lace shell, which holds the valves together, is so delicate that

Plate XI
No. 8

the collector will rarely find complete specimens, especially during hot weather; when washed up, the shells rapidly dry in the hot sun, the ligament becomes very brittle, and so the valves fall apart at the least touch, or puff of wind. There are times when one will be rewarded by finding a few perfect specimens, and these may be carefully cleaned by removing the remains of the adductor muscles—which will be about all there is left of the animal—and rinsing in cold fresh water to get rid of the salt, sand, and any extraneous matter on the outside of the shell. A little glycerine applied to the ligament, inside and out, will prevent that structure from drying up and becoming brittle, or the valves may be bound together with a few turns of cotton for a day or two; when dry, the thread may be removed, and the shell will remain closed; the specimens may thus be kept intact for the cabinet. Those treated with glycerine will remain open, so that the beautifully-tinted interior may be displayed.

The *Protocardia pulchella* is found in the Hauraki Gulf; Mount Maunganui; Stewart Island.

Plate XII
No. 3

PSAMMOBIA LINEOLATA (*psammos*, sand; *bios*, life; *lineolata*, being marked with lines).—This is one of the well-known Sunset shells. A prettily-marked oblong bivalve about two inches long, equally rounded at both ends, rather thin, translucent and polished. The colour is purplish pink, and is arranged in concentric bands of varying widths and shades, the different shades of colour being caused by very fine lines close together or spaced further apart. There are three or four darker bands close to the ventral margin, then a paler zone along the middle of the shell, gradually shading into a darker zone toward the hinge. There are also fan-shaped whitish rays proceeding from the beaks to the ventral border, somewhat feebly marked. Some specimens have the sunset rays well defined, while in others they are quite absent. This variation might lead one to suppose them to be distinct varieties, but this is not the case. The interior has a highly-glazed surface, similarly coloured to the exterior, but paler.

Found washed ashore on sandy ocean beaches.

North and South Islands. Mount Maunganui; Chatham Islands.

Plate XII
No. 4

PSAMMOBIA STANGERI (*psammos*, sand; *bios*, life; Stanger, the naturalist).—This Sunset shell is a purplish-white, thick bivalve, rayed with darker bands of violet arranged either singly or in groups of two or three, the rays being more conspicuous at either end. The colour

having a great tendency to fade, specimens should not be exposed to the light more than is necessary; in fact, all marine shells retain their colours better for being kept in the dark. When held up to a strong light, the bands on the Sunset shell appear much deeper and richer in colour. The interior is a fine deep purple or purplish white, very smooth and glossy. About two and a-quarter inches in length. Live specimens are often washed ashore on ocean beaches.

Throughout New Zealand. Bay of Islands; Mount Maunganui.

SOLETELLINA NITIDA (*solen*, a razor; *tellina*, a kind of mussel; *nitida*, shining).—An exceedingly thin, semi-transparent mauve-coloured bivalve, narrow and oblong, of about one and three-quarter inches in length, more or less covered with a thin, glossy, transparent epidermis, generally worn off in the middle of the valves. The interior is mauve. Washed ashore on sandy ocean beaches.

Throughout New Zealand. Mount Maunganui; Bay of Islands.

Plate XII
No. 14

CORBULA ZEALANDICA (*corbula*, a little basket; New Zealand).—A small bivalve, commonly known as the Basket shell, about the shape, colour, and size of an orange pip. It is opaque, and has the posterior end somewhat angled and the valves unequal. The right valve, larger than the left, is described technically as embracing the left, which is smaller, and represents the lid of the basket. The escutcheon is well marked, and bordered by a keel, or ridge, on each valve, descending from the beaks to the angle where the posterior end meets the ventral border. The shell is sculptured with concentric striations, which are well developed. It is about half an inch in length, and is found throughout New Zealand, in ten to a hundred fathoms of water. It may be picked up on beaches, washed up after gales, always with sponge or sprays of seaweed attached to the posterior end. It is by means of this sponge and seaweed that the live molluscs are wrenched from the ocean depths during extra boisterous weather.

Plate IX
No. 17

Common in the North Island; Mount Maunganui; also Australia.

SAXICAVA ARCTICA (*saxum*, stone; *cavo*, excavate; Arctic).—Commonly known as the Rock-borer; not exactly a good name, for it is not the only rock-borer, and, so far as my experience goes, it does not appear to be a rock-borer at all. The most insignificant, misshapen, and

Plate IX
No. 6

Plate V
No. 23

dingiest bivalve of all the New Zealand shellfish, it is a small, irregularly, asymmetrical shell of a yellowish or greyish white, which at first sight one might mistake for one of the *Venerupis* species. The beaks are relatively large, and situated towards the anterior end. From the beaks to the posterior end are two fairly sharp ridges, which, in the juvenile shell, are furnished with small hollow spines. Sculptured with rather conspicuous and irregularly undulating folds concentrically arranged. The interior is smooth, shining, and yellowish white. The margins are irregular, and the valves do not entirely close. It attains a length of five-eighths of an inch, and lives from low-water mark down to five hundred fathoms. They may be found in crevices under boulders, on the bottom of old punts, and especially embedded in the roots of the *Macrocystis*, a large brown seaweed with broad leaves and a thick, smooth, long stalk. This is the same weed that is washed up in such huge quantities attached to large Horse mussels after a prolonged storm.

Throughout New Zealand. Mount Maunganui; Chatham and Auckland Islands.

Plate XI
No. 11

PANOPEA ZEALANDICA (*Panope*, a Nereid or sea-nymph; New Zealand).—A rough, strongly-built, though comparatively thin, oblong bivalve of a greyish-white colour, with a concentrically wrinkled surface, having its shortest diameter from the dorsal to the ventral border, these borders being nearly straight and parallel. The most striking feature of the *Panopea* is the extremely wide gape at the posterior end, from which the siphons protrude; these are united, and form an enormous trunk-like organ, of an orange-yellow colour, and having a wrinkled leathery surface. The siphons are about a foot or eighteen inches long, and cannot be retracted within the valves, as is the usual case with bivalves. The animals burrow in the sand till only the tips of the siphon remain exposed. The shell may be as much as four inches long by two and a-quarter inches wide. The species is not common, but may be, on rare occasions, washed ashore in numbers after a severe storm. Found from extreme low water to a depth of several fathoms.

North and South Islands. Mount Maunganui; Chatham Islands.

Plate XI
No. 20

PHOLADIDEA SPATHULATA (*pholeo*, to burrow; *spathulata*, shaped like a spatula or spatha, a broad flat blade).—A *Phola*, or rock-boring mollusc, bulbous and round at the anterior end, and about one and three-quarter

inches in length; sculptured in somewhat file-like fashion, and at the posterior end furnished with a dark brown, horny appendage. The creature bores into clay and soft rock with a rotary movement, and possesses long siphons, by means of which it draws up and expels the water required for its sustenance.

North and South Islands. Narrow Neck, Auckland Harbour; Mount Maunganui.

PHOLADIDEA TRIDENS (*pholeo*, to burrow; *tridens*, a trident, three-pronged spear or fork).—A white or cream-coloured rock-borer, of an elongated pear shape, rounded and bulbous at the anterior end, tapering off and flattening towards the posterior end. The shell is thin and fragile, with an oblique groove on each valve in front of which is a triangular area, furnished with rasp-like ribs. The posterior end is truncated or cut off abruptly and has, attached to it, a pair of curved calcareous plates, one to each valve; each plate strengthened by a shelly trident on the inner surface in high relief. The interior is white and shining, with an oblique rib corresponding to the groove on the outside. It is rather more than one inch in length, and not so common as the *P. spathulata*.

Found in the northern parts of New Zealand. Narrow Neck, Auckland Harbour; Mount Maunganui (found in water-logged timber).

Plate XI
No 19

BARNEA SIMILIS (same derivation as Barnacle, a corruption of *pernaculum*, dim. of *perna*, a shellfish; *similis*, like).—This mollusc is known as the Piddock, a rock-boring bivalve, about two and a-half inches in length, very asymmetrical in shape, the anterior end being pointed. The sculpture consists of concentric raised ridges, which at the anterior end are crossed by ribs radiating from the hinge. These ribs at the point of crossing are furnished with short, hollow spines, and the shell is curled over the beaks, which are quite hidden. The posterior end of the valves taper to a rounded point. The shells are rather fragile, and are white where the epidermis is worn off; otherwise the colour is light brown. The valves have a wide gape at the anterior end, giving free scope to the muscular foot which supplies the motive force for the rasping revolutions of the shell. There is a protoplax present, which is an accessory plate of a lancet shape curved and hinged to join the two valves at the anterior end, close to the umbones. It probably represents the lunule in other bivalves. On the ocean beach at Mount Maunganui, and southward of Moturiki, are to be seen, occasionally, long rounded and worn

Plate XI
No. 21

pieces of pumice, each with a round hole bored right in the long axis. I found these to be the work of the *Barnea similis*, dead valves of that species being picked up sometimes in that particular spot. The bore always corresponded with the average size of the animal. But why the surface of the pumice should conform in shape and direction to the tunnel I could not at first determine. After examining a number of these curious objects, it occurred to me that the pulverised pumice formed during the boring process mixed with the fluid secreted by the mantle, or shell-making organ, of the animal, resulting in a sort of natural cement, which, permeating the porous walls of the tunnel, formed a hard core of equal thickness surrounding the creature. Burrowing between tide marks and below low water. Common in the North Island, rare in the South.

Narrow Neck, Auckland Harbour; Mount Maunganui.

Plate XI
No. 17

COCHLODESMA ANGASI (*cochlea*, a spoon; *desma*, a ligament; Angas, the naturalist).—Commonly known as the Lantern shell or Spoon hinge. A fairly large, extremely thin and fragile, pure white, pearly bivalve, with the lustrous sheen of silk; asymmetrical in shape, and having the right valve much fuller than the left, which is comparatively flat. The anterior end of the shell is rather round, while the posterior end is prolonged into a curious squarish sort of projection, much more noticeable in west coast specimens than in those from the Bay of Plenty. The valves gape slightly at both ends. The interior is white, rather pearly, and has projecting horizontally from the hinge a half-round hollowed-out spoon-like process for the attachment of the resilium or cartilaginous hinge pad. Supporting this process is to be seen a buttress or raised band of callus. The valves being literally as thin as paper, and about two and a-half inches long, this reinforcing callus is very essential. Both valves present a small fissure at the umbones, or rounded eminences close to the beaks. At first sight one might be inclined to think that the shell is cracked, but the fissure is present in all species and genera of the family to which this one belongs. Examining many broken shells on the beach, one is struck by the number of instances where the beaks remain united and intact, though the remaining portions of the valves are missing. The fissures, then, instead of being a starting point for fracture, actually contribute to the safety of the parts. This seeming paradox, that there is strength in weakness, I leave to the ingenious reader to meditate upon.

The *Cochlodesma Angasi* is not at all common, but live specimens have been washed ashore in fair numbers

after strong easterly gales at Mount Maunganui and at Opotiki. It has also been recorded from the Manukau Heads and other places in both Islands.

MYODORA BOLTONI (*mya*, a mussel; *dora*, a skin, a hide; Bolton, the naturalist).—A small white bivalve, barely exceeding half an inch in length, and rather more than a quarter of an inch from the beaks to the ventral margin. Differing from most bivalves, the beaks are directed backwards, towards the ligament. The right valve is convex externally, and the left valve, instead of being flat, as in the *M. striata*, is somewhat concave or, in other words, it bulges inwards slightly. In shape, the valves are considerably narrowed at the posterior end, where they are cut off abruptly. The dorsal margin in front of the beaks is almost a straight slope downwards; behind the beaks it takes a sharp inward curve. The ventral border is one broadly-rounded sweep. The sculpture consists of fine concentric ribs and grooves, not very pronounced, and at the posterior end there is a deep fold on the right valve, commencing at the beak and descending to the cut-off margin. The interior is lined with glistening white mother-of-pearl.

Plate IX
No. 10

Found between tide marks.

Auckland Harbour; Mount Maunganui; Lyttelton Harbour.

MYODORA STRIATA (*mya*, a mussel; *striata*, with striae or fine lines).—A fan-shaped bivalve with the angle at the hinge, and the ventral border semi-circular. The beaks are directed backwards, contrary to the general rule. One valve—the right—is convex, and the left one is flat, both sculptured with well-defined concentric striations. The interior is smooth, lined with mother-of-pearl, white and glistening. It is about one and a-half inches long, and is often met with on sandy ocean beaches.

Plate IX
No. 11

North and South Islands. Mount Maunganui.

CHAMOSTREA ALBIDA (*chama*, a bivalve so named by Pliny; *ostrea*, an oyster; *albida*, whitish).—A curious wedge-shaped oyster-like bivalve, with the right valve deeply hollowed, attached to rock, and the left valve flat. At the hinge the shell is of a whitish yellow, or light brown, the interior being of a greenish white and slightly pearly. The shell is very thick and strongly built, and is about two and a-half inches long. The sculpture consists of concentric lamellae, with a slight indication of spiral arrangement, on the left valve. There is a single large tooth on the left valve, fitting into a corresponding pit in the right valve, and

Plate XI
No. 18

two scars for the adductor muscles on each valve. The Chamostrea is not a true oyster in any sense, and is unfit to eat.

Auckland Harbour; Bay of Islands; Cook Strait; Chatham Islands.

Plate III
No. 21

SPIRULA SPIRULA (*spirula*, diminutive of *spira*, a spire).—The Ram's Horn shell. These exceedingly fragile white shells are occasionally thrown up on the beach in great numbers, but the animal itself is extremely rare; in fact, only one complete Spirula has ever been found, and that was picked up on the New Zealand coast by Mr. Percy Earl. They are found in all warm seas, and are sometimes driven ashore in the Gulf Stream on the coast of Cornwall and Devonshire, in the Old Country. The animal belongs to the Cephalopoda, the same order that the Octopus and the Nautilus are members of. The spiral coils are all on the same plane, and are not in contact with each other, as other spiral univalves; consequently there is no suture. The shell is divided into separate compartments, each septum being beautifully rounded and pearly, and fitted with a calcareous tube near to the ventral or inner side, and running along the entire length of the shell, traversing each compartment. This tube is popularly supposed to be for the purpose of filling the cells with water or air, by means of which the creature may be enabled to sink to the bottom or rise to the surface, an ingenious theory, but quite wrong. The tube which runs through the cells is closed and does not in any way communicate with them, so the air-and-water idea falls to the ground. As the growing animal has to enlarge its shell from time to time, it shuts off the portion no longer required. Oliver Wendell Holmes has written a poem on the Pearly Nautilus, containing some beautiful thoughts inspired by the contemplation of that shell, which is constructed on the same lines as our little Spirula. They were his favourite lines, and are generally considered the finest he ever wrote. Too long for quotation here, the line, "Build thee more stately mansions, oh, my soul?" gives one some idea of the fine sentiment they express.

Three distinct species of the Spirula have been found in different parts of the world, and it is curious to note that the shell in each case is precisely the same, the difference being in the animal itself. It is about three-quarters of an inch across.

Throughout New Zealand. Mount Maunganui.

Plate I
No. 2

ARGONAUTA ARGO (*Argonaut*, a companion of Jason in the ship "Argo").—The Paper Nautilus is one

of the most interesting of the Octopods. It is unique in the fact that the female alone possesses a shell, which is useful, not only as a nest for the eggs, but serves also as a nursery for the young. While the male Nautilus is only about an inch long, the female is much larger, and may occupy a shell upwards of nine inches in the largest diameter. There are no muscular attachments, as in other shellfish, and the animal retains possession of the shell by clasping the sides of the aperture with her two dorsal arms, thereby leaving six arms for swimming with and procuring food. The shell of the Argonauta Argo is sculptured with numerous ribs, which are somewhat close together, becoming nodular as they approach the keel. The keels are fairly approximate, and are furnished with sharp spines corresponding in number to the ribs. The aperture exhibits two ears or lugs, or everted angles, on the margin next to the spire, and the mouth extends outwards on either side at a right angle.

Mayor Island, Bay of Plenty.

ARGONAUTA TUBERCULATA (*Argonaut*, a companion of Jason in the ship "Argo"; *tubercle*, a little knob).—This Nautilus differs very little from the A. Argo. The ribs are more numerous and the sharp spines on the keels are likewise increased and closer together. The ribs are cut up into little nodes or tubercles, and the mouth at its margin, next to the spire, curves gently down on either side. Fifty years ago an Argonaut shell in the Old Country would fetch as much as £14, but at the present day there is little commercial value attached to them.

Mayor Island, Bay of Plenty.

Plate I
No. 1

TEREBRATELLA RUBICUNDA (*terebratella*, dim. terebratus, perforated; *rubicunda*, reddish).—These shells, popularly known as Rose Petals, from their pinkish-red shells, are of very ancient lineage, their ancestors being well represented in the Coal Measures. They are also called Lamp shells, in common with some other species of the same family, from their striking resemblance to the old Roman lamp, with the small round hole near the hinge corresponding to the hole for the wick of the little oil lamp. This aperture in the shell gives passage to a sinewy stalk, which is used by the animal to attach itself to stones, shells, etc., sometimes to shells of its own kind. Nothing in the shape of anchorage comes amiss to these queer Brachiopods, for I have seen in a friend's collection an old jam-pot almost completely covered with the shells. The valves can be opened only to a slight extent without break-

Plate V
No. 21

ing, and for this reason should be left to dry naturally before being deposited in the cabinet; or they may be soaked in methylated spirit for twenty-four hours. As the creatures are by no means fleshy, they shrivel up in a very short space of time. From the difference in anatomical structure of the animal to the other mollusca, the valves are not right and left, but upper and lower; technically, dorsal and ventral. Although included among the molluscs in the Manual of the New Zealand Mollusca, the Lamp shells are regarded as a sub-kingdom quite apart from the mollusca, and are collectively named Molluscoidea, their exact position in the scale of creation not being quite understood. About an inch long, and rather less in breadth.

Rangitoto Island; Mount Maunganui; Oamaru; Chatham and Auckland Islands.

TEREBRATELLA SANGUINEA (*terebratella*, dim. of *terebratus*, perforated; *sanguinea*, red, blood-red).—A large Lamp shell, with its two valves, dorsal and ventral, of an orange-red colour, rather than of a sanguinary hue, in spite of its specific name. The upper valve has a somewhat raised area extending towards the front margin, and the lower valve a like area, which is depressed, both reaching from the beaks to the front border. The sculpture consists of radiate ribs and well-marked growth lines. The round hole, which looks upwards, is in the ventral valve, at the beak, which curves upwards and forwards. The *Terebratella sanguinea* is an inch and a-half long by an inch and a-quarter broad and an inch deep.

From Cook Strait to Stewart Island, and in the North Island, dredged off Cape Colville.

Plate V
No. 22

HEMITHYRIS NIGRICANS (*hemi*, half; *thyreos*, a shield; *nigresco*, to grow black).—A Lamp shell of a bluish or dark chocolate brownish black colour, strongly marked with rounded radiate ribs, commencing from the hinge and spreading outwards to the front margin. The upper valve is rounded and high, the lower one much flatter, with a decided groove, occupying about one-third of the shell, and extending from the front to about half-way to the beak. The beak is narrow, sharply pointed, and the whole shell is somewhat quadrilateral. It is also much wider from side to side than from back to back, proportions reversed to those of the other two species previously described. It is about seven-eighths of an inch across.

From the Great Barrier Island to Stewart Island and the Chatham Islands.

CONCLUSION.

OUR forefathers, when producing a book, usually commenced proceedings with a foreword or preface, followed by a humble dedication to some most illustrious and puissant personage, and a quite unnecessary Apologia embellished with flourishes, copper-plate headings and tailpieces, and a profusion of marvellous capitals, all of which are peacefully slumbering on the shelves of our libraries, and conform not at all to our modern notions of the literary craft. However, I cannot abruptly take leave of my readers who have been considerate enough to patiently wade with me through the foregoing pages without a feeling of gratitude for their kindly indulgence. Partly to disarm criticism, if such a consummation were possible, and at the same time account for some, to me, obvious shortcomings in this book, I must, after all, resort to the old-fashioned author's apology as a prelude to my concluding remarks. An apology of this nature, to my way of thinking, savours too frequently of the "devil's darling sin, the pride that apes humility," a weakness I cannot subscribe to, but certainly I know that there are a few errors of omission, not to mention those of commission, in the work which should be explained. As this little book is written simply for the amateur, no one need expect an account of, or even a reference to, those small molluscs possessing shells the size, say, of a pin's head, more or less. The soft-bodied mollusca, often of most charming appearance and colour, have been silently passed over. We may watch them in some pellucid pool, pay a passing tribute to their rare beauty and stately movements, and leave them to the calm enjoyment of their simple lives. Other important mollusca not mentioned in these pages are the Chitons, bearing neat coats of plate armour on their backs. At Mount Maunganui some twenty different species are to be found, including the lovely and much-sought-after "butterflies," whose valves of deep Forget-me-not blue are among the prettiest of their kind, as well as the pure Wild Rose variety; but as I have only found one of these, and have neither heard nor read of a similar one being taken, I am afraid it can only be regarded as a sport. The reason that the Chitons have not been described is that the subject has proved too much for

more than one scientific conchologist, and, rather than leave my readers to flounder in a sea of bewildering details, I have definitely decided, at all events at present, to let the Chitonidæ severely alone, for I am convinced from my own experience that personal instruction is the only method of introducing one to the study of these interesting and beautiful Gasteropods. One more confession, and I have finished. Each species mentioned in the book has been placed in the proper order of classification as followed by the late Mr. H. Suter, but it will be observed that there is little or no reference to families, genera or species, for the beginner does not want to be burdened with a mass of unnecessary academic work. Should these amateur efforts have given him a desire for wider scope in conchology, then he can get the requisite text books and take up the study seriously; but my object has been to present to the average person a fascinating and wholesome hobby in such form that it may be assimilated "*cito et jucunde.*" I might here mention that of the two hundred and fifty-three species and sub-species described, no less than two hundred and sixteen have been found at Mount Maunganui, a locality easily holding the record in the Dominion as the best hunting-ground for shell collectors, for within a radius of a couple of miles one finds every possible kind of cover for marine life—sandy beach, shallows and deeps; rocks, boulders, reefs; harbour and open sea; surf and still water, pool and cove,—and what more can one desire?

Besides the enduring delights of seeking for shells in all seasons of the year and all weathers, fair or foul, with the constant chances and hopes of finding a rare or particularly choice specimen, one gets, as it were, a peep into the infinite mystery of Nature, a glimpse of a world abounding in things and beings of which the most capacious intellect can grasp but a fraction. If we are blessed with the possession of an artistic temperament, or a poetic sense—and the germ of this priceless gift is latent in us all, however trammelled we may be by the conventions of civilisation—the pursuit of knowledge at first hand, and in the wide spaces of heaven and earth, broadens the mind and ennobles the soul in such manner that we soar above the little ills and worries of life without effort, and the world, we sometimes think so full of woe, we find filled to the brim with harmony and grace. No longer need we be misled by the cynic's exhortation, "Presume not God to scan, the proper study of mankind is man," for all Nature is before us, and we are part and parcel of the great Cosmos, atoms if you will, but fitting well and truly into the eternal fitness of things.

GLOSSARY

- Adductor Muscles.**—The muscles of bivalve molluscs, which are attached to the valves internally, one at either end. They adduct or draw together the two portions of the shell, and so close it. The scars, or points of attachment, are well marked in the Pipi.
- Byssus.**—The beard, or small bundle of threads, by which some bivalves attach themselves to rocks, etc.
- Chiton.**—Multivalve mollusca. Animals with a shelly integument, consisting of eight separate pieces overlapping each other like plates of armour.
- Columella.**—The central pillar of a univalve, round which the whorls are built, extending from the apex to the base of the shell. A portion of the columella is seen at the aperture of most spiral univalves.
- Escutcheon.**—An elongated depression on the valves of a bivalve shell, situated behind the beaks and enclosing the ligament. Not always present.
- Fauna.**—A collective term for all the different forms of animal life peculiar to a district, a country, or belonging to the same epoch.
- Genus.**—A number of species closely allied to each other, and grouped together for convenience in classification. (Plural, *genera*).
- Hinge Teeth.**—Small projections at the hinge of bivalve shells fitting into corresponding depressions on the opposing valve to prevent lateral displacement when the valves are closed.
- Incremental Lines.**—Marks on the shell indicating growth. The shell grows at set periods with intervals of absolute rest.
- Lamina.**—A thin plate; lamella being the diminutive form of the same.
- Laminarian Zone.**—The zone or belt below low-water mark, and including the bed of the ocean in which seaweed grows.
- Ligament.**—A tough, fibrous structure attached to both valves and holding them securely together.
- Lira.**—A fine ridge between two small furrows. (Plural, *liræ*).

- Litoral Zone.**—*Litus*, the seashore. That zone or belt which lies between high and low-water marks.
- Lunule.**—Literally a little moon. A heart-shaped or lancet-shaped area in front of the beaks of a bivalve, one-half being on each valve.
- Mantle.**—A fleshy tunic investing the soft body of a mollusc, which makes the shell, produces the colour, and provides the periostracum or epidermis which covers and protects the shell like a skin.
- Nacreous.**—Composed of nacre; pearly. (*Nacrum*, mother of pearl).
- Operculum.**—A cover or lid, composed of shelly or calcareous matter, or of horny material; it is attached to the foot of spiral molluscs, and closes or partially closes the entrance when the creatures retire within.
- Pallium.**—The mantle (*q.v.*).
- Parietal** (*paries*, a wall, a partition).—Pertaining to a wall, usually referring to that portion of a shell, in the neighbourhood of the inner lip of a spiral univalve.
- Pelagic.**—Inhabiting the open seas, like the Violet sea snails, and the Spirula.
- Periostracum.**—The skin or epidermis, covering the outside surface of shells, well seen in the Pipi. It protects the shell from the solvent action of carbonic acid gas, especially in fresh-water mollusca.
- Peristome** (*Peri*, around; *stoma*, the mouth).—The thickened rim or lip round the mouth of shells, such as the Ring shell and the Pawa.
- Radula.**—The tongue of univalve shellfish such as Whelks and limpets. It is a long ribbon-like organ, furnished with hard, sharp teeth. Used for the purpose of rasping vegetable matter for food, and, in the carnivorous shellfish, for boring holes in the shells of their victims. (*Radula*, a scraper).
- Resilium.**—A resilient piece of cartilage, at the hinge of some bivalves, situated in a resiliifer, or spoon-like pit, and which causes the shell to open, when the contractile muscles are relaxed.
- Species.**—All the specimens or individuals which are so much alike that we may reasonably believe them to have descended from a common stock constitutes a species. (Woodward).
- Spire.**—Includes all those whorls of a spiral univalve between the apex and the top of the aperture.

Suture.—The line of union between one whorl and the adjacent one in a spiral univalve.

Umbilicus.—A cavity, circular depression or chink at the base of spiral univalves, affording lightness and strength; not present in all. Those possessing it are termed *perforate*; those without, *imperforate*.

Umbo (plural, *umbones*).—The boss or rounded eminence of a circular shield. In bivalves, the umbo is the rounded and elevated portion adjoining the beaks.

Varix (plural, *varices*).—A large rib, such as those on the *Septa costata* and the *Murex Angasi* var. *Eos*, descending down the whorls. They are usually few in number, and are so named in contradistinction to the ordinary longitudinal ribs on spiral univalves, which are numerous and of much smaller size.

Whorl.—One complete turn of a spiral univalve; the lowest of all, with the aperture—*i.e.*, the body whorl—containing the body of the animal. This is at the anterior end of the shell, as the animal, during its progress, advances this portion of its shell in front. In describing the dimensions of a univalve, the word *length* denotes the distance between the tip of the spire and the extreme base; the word *height* signifies precisely the same dimension, but presumably in the empty shell, held in the hand with the spire naturally pointing upwards. In the bivalve the height is invariably the distance measured from the hinge to the opposite point of the ventral margin, the length being always the distance between the anterior and posterior borders. The length is not always the longest diameter: for instance, the *Lima bullata* is only half as long as it is high.





PLATE I.

1. Argonauta tuberculata 117
2. „ argo 116



1



2

PLATE II.

	PAGE
1. Helcioniscus strigilis	18
2-2a. " radians	15
3. " " var. olivaceus	17
4. " " " argenteus	16
5-5a. " " " flavus	17
6. " denticulatus	14
7. " redimiculus	18
8. " ornatus	15
9. " " var. inconspicuus	15
10-10a-10b. Helcioniscus stelliferus	18
11. Turbo smaragdus	33
12. " granosus	33
13. Astraea sulcata	35
14-14a. " heliotropium	34
15. Tonna variegata	56
16. Scutus ambiguus	21
17. Serpulorbis siphon	41
18. Submarginula intermedia	21
19-19a. Siliquaria weldii	41
20. Haliotis iris	19
21. " virginea	20
22. " australis	20

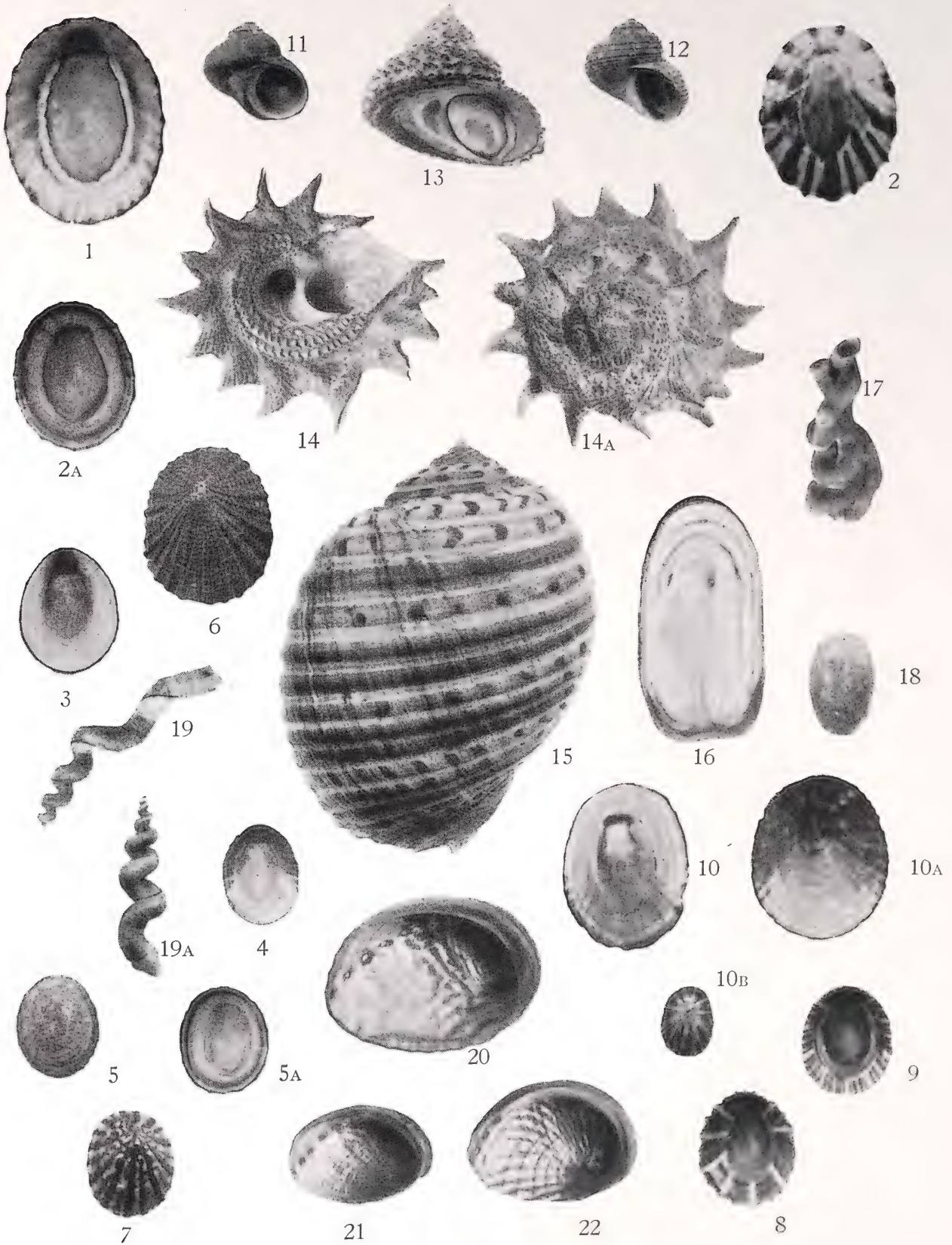


PLATE III.

	PAGE
1. Calliostoma tigris	32
2. " selectum	32
3. " pellucidum	31
4. " punctulatum	32
5. Megalatractus maximus	59
6. Siphonalia mandarina	62
7. " dilatata	62
8. " caudata	61
9. " nodosa	62
10. Mitra carbonaria	61
11-11a. Fulguraria arabica	74
12-12a. " " var. jaculoides	74
13. " " " elongata	74
14-14a. " gracilis	75
15-15a. Siphonaria obliquata	82
16-16a. " zelandica	82
17. Murex ramosus	67
18. Nerita melanotragus	37
19. Bullaria australis	79
20. Natica zelandica	47
21. Spirula spirula	116



PLATE IV.

	PAGE
1. Xenophora corrugata	45
2. Septa costata	51
3. „ rubicunda	51
4. Argobuccinum argus	54
5. „ australasia	54
6. Thais succincta	73
7. „ haustum	71
8. „ scobina	72
9. „ „ var. albomarginata	72
10-10a. „ striata	72
11. Cymatium spengleri	53
12. „ exaratum	53
13. Murex octogonus	66
14. „ „ var. umbilicatus	67
15. „ zelandicus	68
16. Struthiolaria vermis	44
17. „ „ var. tricarinata	45
18. „ papulosa	43
19. Phalium labiatum	55
20-20a. „ pyrum	55
21. Cominella virgata	66
22. „ maculata	65
23. „ nassoides	65
24. „ maculosa	65

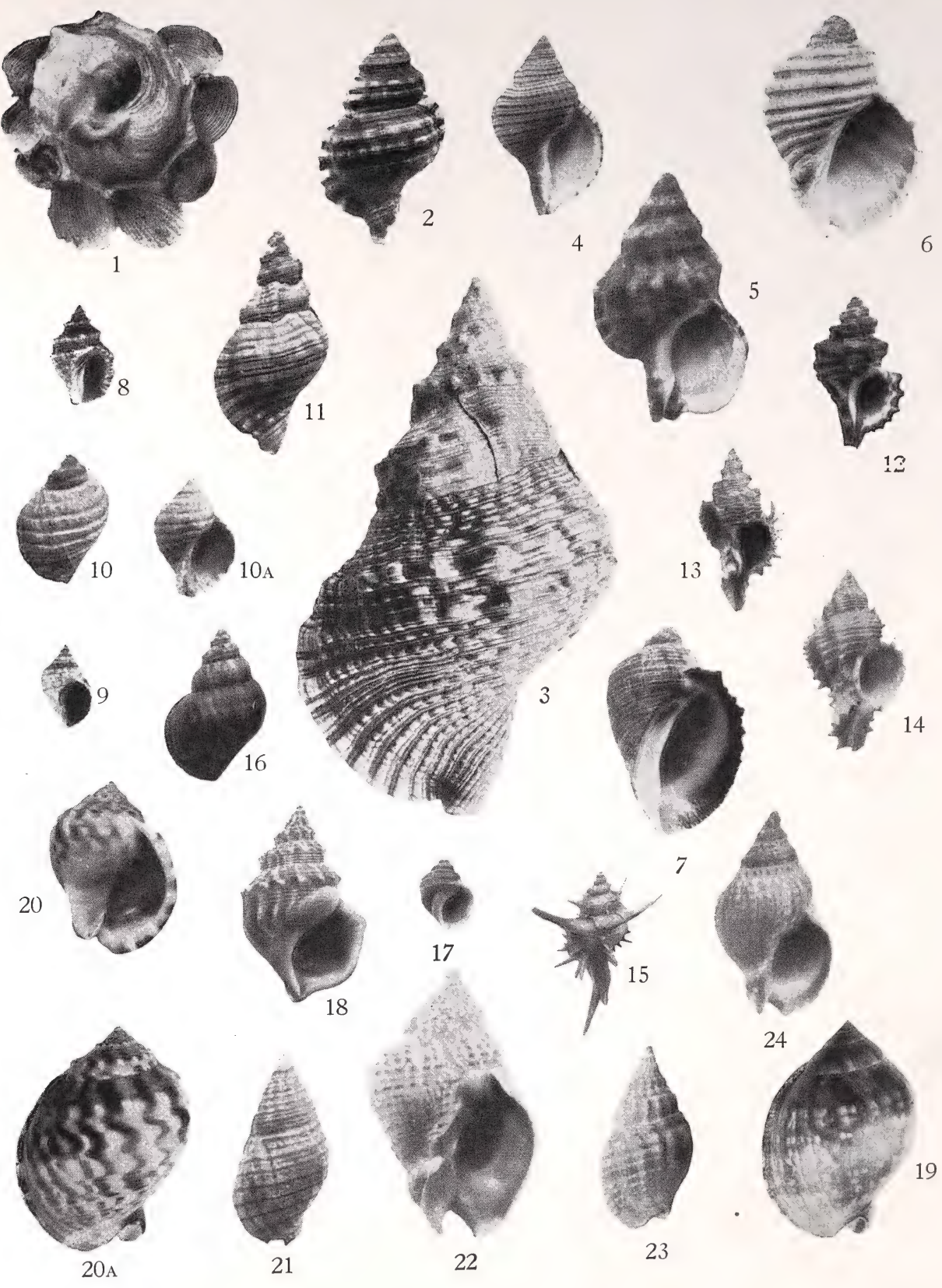


PLATE V.

	PAGE
1-1a. <i>Acmaea stella</i>	14
2-2a. „ „ var. <i>corticata</i>	14
3. „ <i>septiformis</i>	13
4.4a. „ <i>parviconoidea</i>	12
5. „ <i>fragilis</i>	12
6. „ <i>pileopsis</i>	13
7. „ <i>rubiginosa</i>	13
8-8a. „ <i>helmsi</i>	12
9. „ <i>daedala</i>	11
10. <i>Emarginula striatula</i>	21
11. <i>Ancilla depressa</i>	76
12. „ <i>australis</i>	75
13. „ <i>mucronata</i>	76
14. „ <i>bicolor</i>	76
15. <i>Pupa gracilis</i>	81
16. <i>Bullina scabra</i>	78
17. <i>Murex angasi</i> var. <i>eos</i>	66
18-18a. <i>Janthina baltéata</i>	49
19. „ <i>exigua</i>	50
20. „ <i>globosa</i>	50
21. <i>Terebratella rubicunda</i>	117
22. <i>Hemithyris nigricans</i>	118
23. <i>Philine constricta</i>	80
24. <i>Lamellaria ophione</i>	48
25-25a. <i>Trivia australis</i>	50
26. <i>Euthria martensiana</i>	63
27. „ <i>linea</i>	63
28. „ <i>littorinoides</i>	63
29. „ <i>vittata</i>	63

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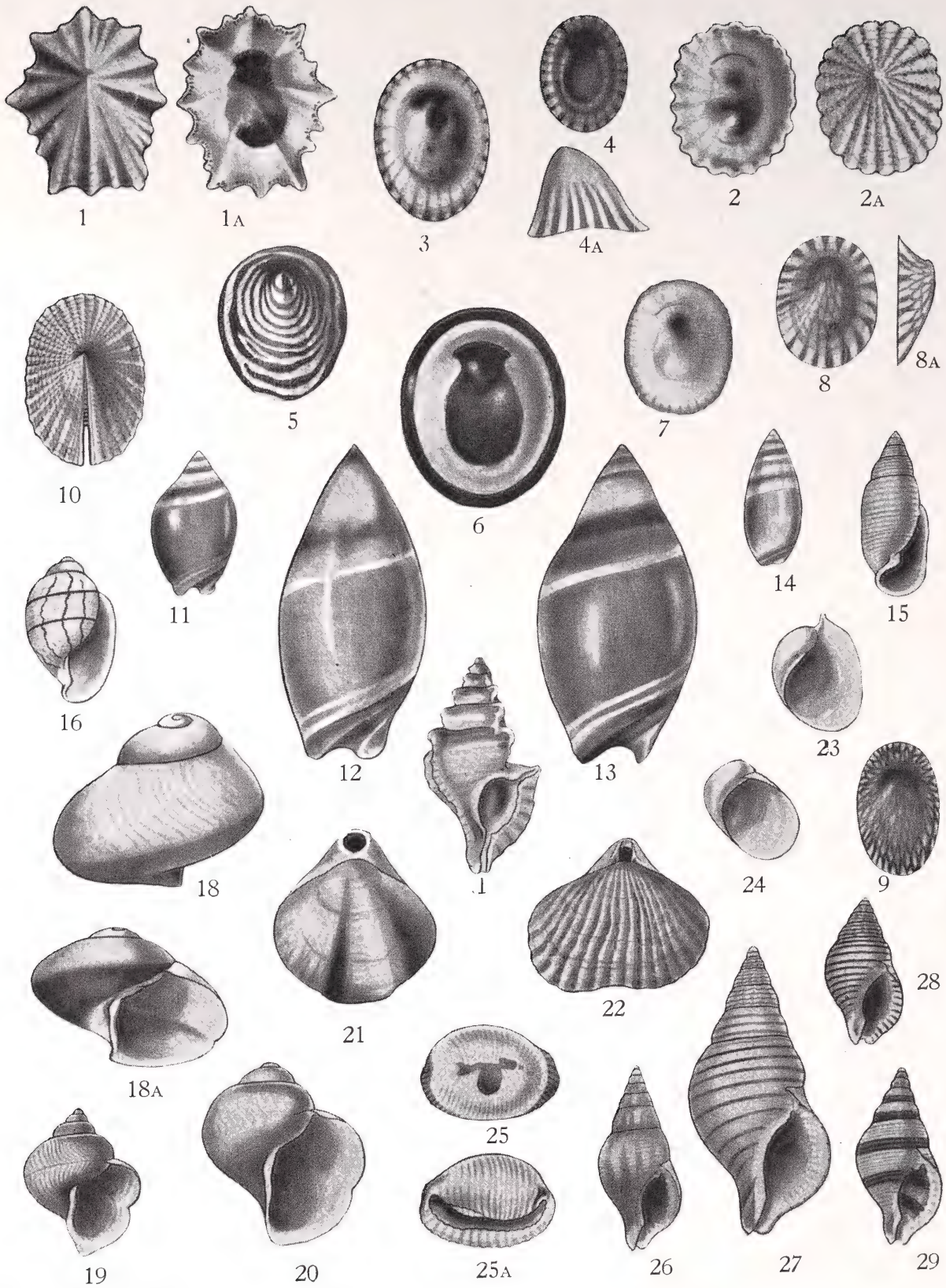


PLATE VI.

	PAGE
1. Calyptraea maculata	45
2-2a. „ scutum	45
3. Monodonta morio	26
4. „ corrosa	24
5. „ coracina	24
6. „ lugubris	25
7. „ atrovirens	24
8. „ aethiops	23
9. „ excavata	25
10. „ subrostrata	26
11. „ nigerrima	26
12. Latirus huttoni	60
13. Crepidula costata	46
14. „ crepidula	46
15. Trochus tiaratus	22
16. „ viridis	23
17. Cominella huttoni	64
18. „ lurida	64
19. Terebra tristis	78
20. Planaxis brazilianus	38
21-21a. Risellopsis varia var. carinata	38
22. Seila chathamensis	40
23-23a. Ethalia zelandica	36
24. Turbonilla zelandica	59
25. Haminea zelandiae	79
26-26a. Euchelus hamiltoni.—T. W. Kirk.	

(This shell was described in 1882, but has not hitherto been figured).

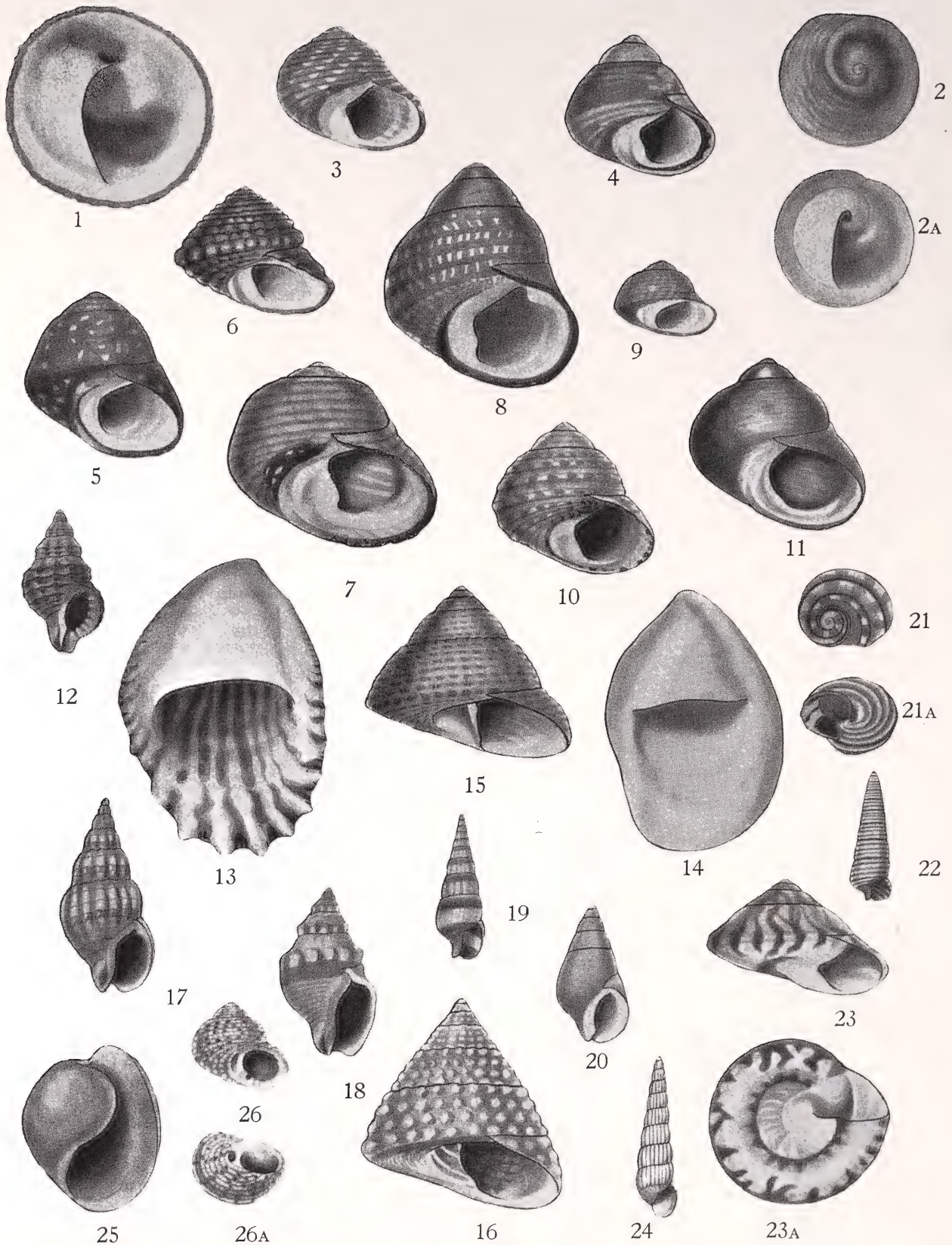


PLATE VII.

	PAGE
1. <i>Cantharidus tenebrosus</i> var. <i>huttoni</i>	29
2. „ <i>purpuratus</i>	28
3. „ <i>opalus</i>	27
4. „ <i>dilatatus</i>	27
5. „ <i>rufozona</i>	29
6. „ <i>pupillus</i>	28
7. „ <i>sanguineus</i>	29
8. <i>Gibbula suteri</i>	31
9. <i>Euchelus bellus</i>	33
10. <i>Ampullina undulata</i>	47
11. <i>Photinula nitida</i>	30
12. <i>Epitonium zelebori</i>	58
13. „ <i>jukesianum</i>	57
14. „ <i>tenellum</i>	58
15. „ <i>philippinarum</i>	58
16. „ <i>bucknilli</i>	57
17. <i>Fusinus spiralis</i>	60
18-18a. <i>Monilea egena</i>	31
19. <i>Architectonica reevi</i>	57
20. „ <i>lutea</i>	56
21. <i>Polinices amphialus</i>	47
22. <i>Litorina mauritiana</i>	37
23. „ <i>cincta</i>	37
24. <i>Trochus chathamensis</i>
25. „ <i>oppressus</i>	22

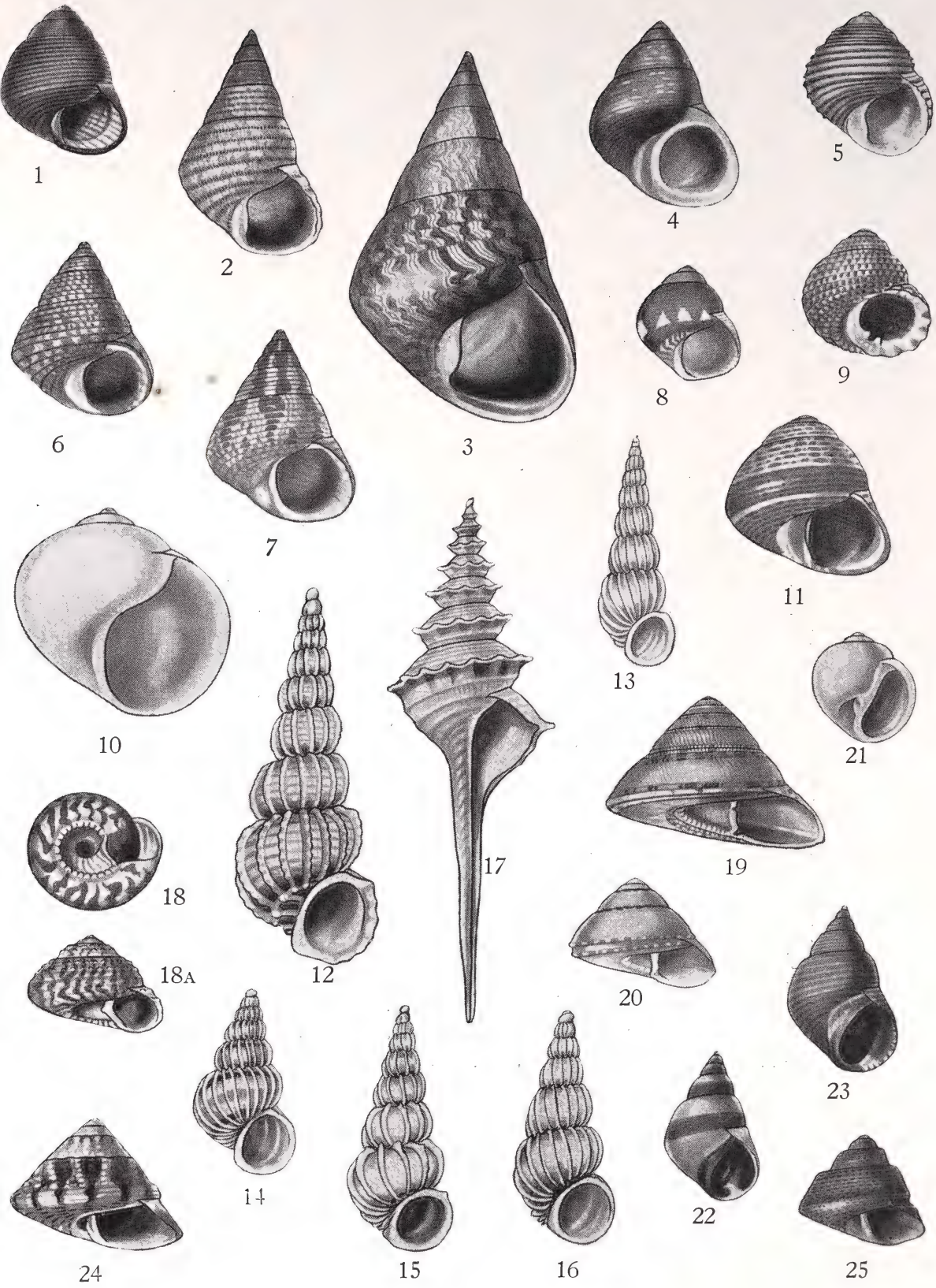


PLATE VIII.

	PAGE
1. Trichotropis clathrata	48
2. Mitrella choava	73
3. „ paxillus	73
4. Thophon plebeius	70
5. „ cheesemani	69
6. „ curtus	70
7. „ rugosus	71
8. „ corticatus	69
9-9a. „ ambiguus	68
10. Vexillum rubiginosum	61
11. Ophicardelus australis	80
12. Marinula filholi	80
13. Phasianella huttoni	36
14. Rissoa zosterophila	39
15. Rissoina rugulosa	39
16. Marginella mustelina	76
17. „ pygmaea	77
18. Mangilia sinclairi	78
19. Bathytoma cheesemani	77
20. Drillia novae zelandiae	77
21. Cerithidea bicarinata	39
22. „ subcarinata	40
23. „ tricarinata	40
24. Amphibola crenata	81
25. Turritella fulminata	42
26. „ carlottae	41
27. „ rosea	42
28. „ pagoda	42
29. Dentalium nanum	84
30-30a. Gadinea nivea	83

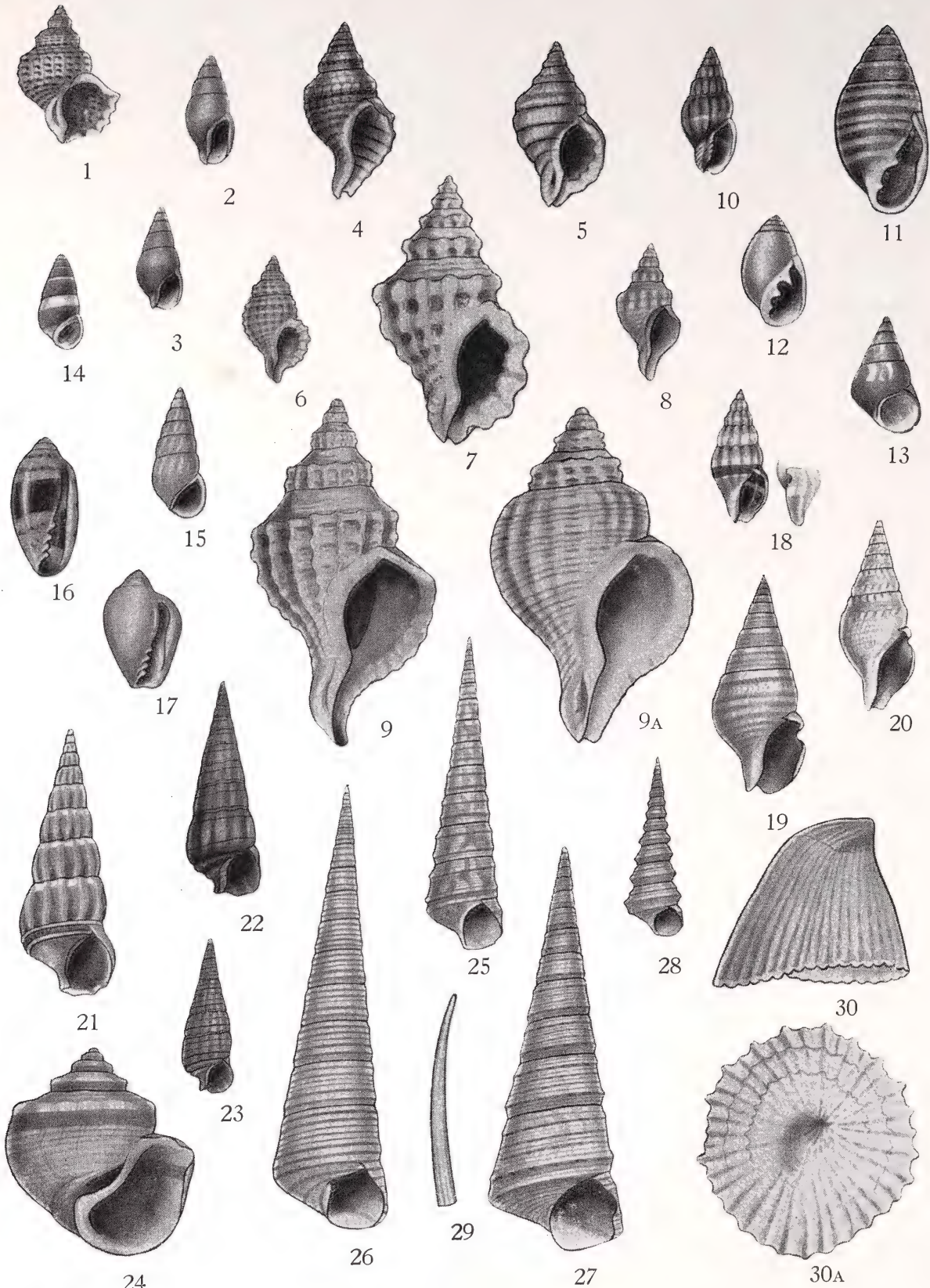


PLATE IX.

	PAGE
1. <i>Venerupis reflex</i>	108
2. „ <i>elegans</i>	108
3. „ <i>siliqua</i>	108
4-4a. <i>Nucula hartvigiana</i>	84
5. <i>Chione spissa</i>	105
6. <i>Saxicava arctica</i>	111
7. <i>Leptomya lintea</i>	99
8. <i>Diplodonta zelandica</i>	96
9. „ <i>globularis</i>	96
10. <i>Myodora boltoni</i>	115
11. „ <i>striata</i>	115
12. <i>Myllita stowei</i>	97
13. <i>Sardita calyculata</i>	95
14. <i>Modiolaria impacta</i>	89
15. <i>Lima bullata</i>	93
16. <i>Mactra scalpellum</i>	102
17. <i>Corbula zelandica</i>	111
18. <i>Macrocallista multistriata</i>	104
19. <i>Rochefortia reneformis</i>	97
20-20a. <i>Malletia australis</i>	85
21-21a. <i>Glycymeris modesta</i>	87

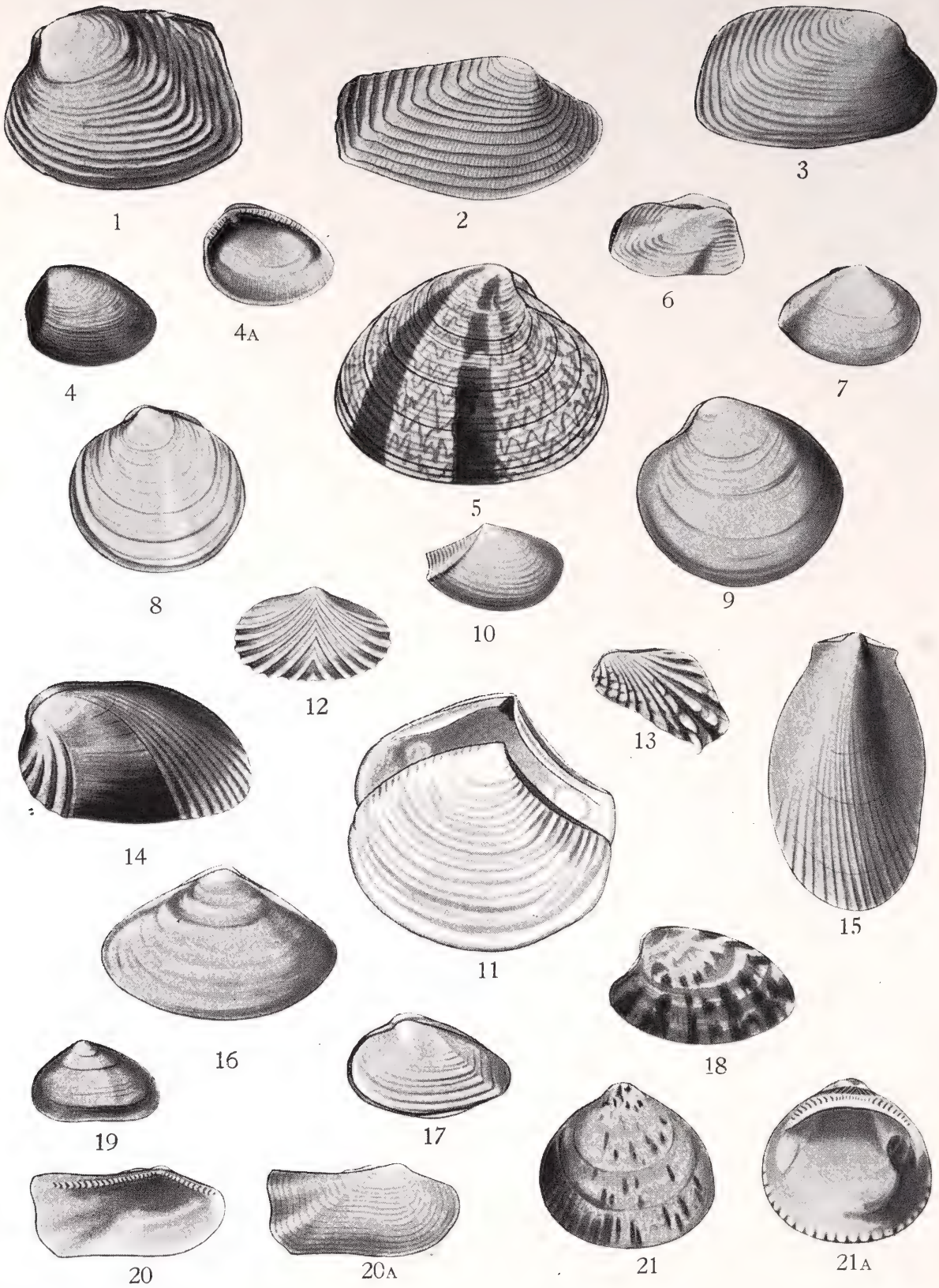
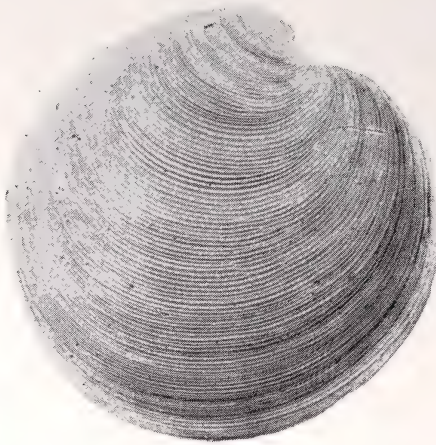


PLATE X.

	PAGE
1. <i>Dosinia anus</i>	104
2. „ <i>subrosea</i>	104
3. „ <i>lambata</i>	104
4. <i>Ostrea glomerata</i>	94
5. „ <i>angasi</i>	93
6. <i>Glycymeris laticostata</i>	87
7. <i>Atrina zelandica</i>	94
8. <i>Modiolus ater</i>	89
9. „ <i>australis</i>	89
10. <i>Lithophaga truncata</i>	90
11. <i>Divaricella cumingi</i>	96
12. <i>Solemya parkinsoni</i>	84
13. <i>Mytilus magellanicus</i>	88
14. „ <i>canaliculus</i>	87
15. „ <i>planulatus</i>	86
16. <i>Arca decussata</i>	86
17. <i>Venericardia australis</i>	96



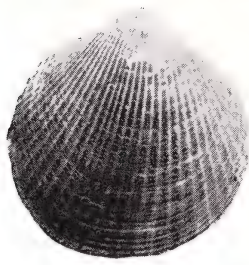
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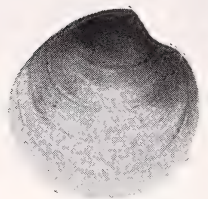
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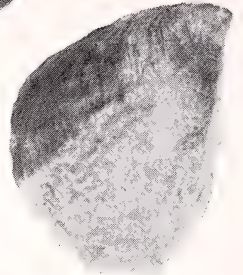
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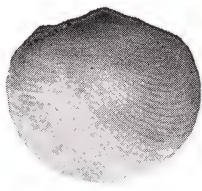
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14



15



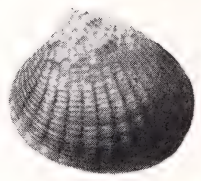
12



13



16



17

PLATE XI.

	PAGE
1. Cytherea oblongo	105
2. Pecten medius	92
3. „ convexus	91
4. „ zelandiae	92
5. „ imparvicostata	91
6. Chione yatei	107
7. „ stutchburyi	106
8. Protocardia pulchella	109
9. Paphia costata	107
10. „ intermedia	107
11. Panopea zelandica	112
12. Tellina spenceri	99
13. „ alba	98
14. „ deltoidalis	98
15. „ disculus	98
16. Lima lima	93
17. Cochloidesma angasi	114
18. Chamostrea albida	115
19. Pholadidea tridens	113
20. „ spathulata	112
21. Barnea similis	113

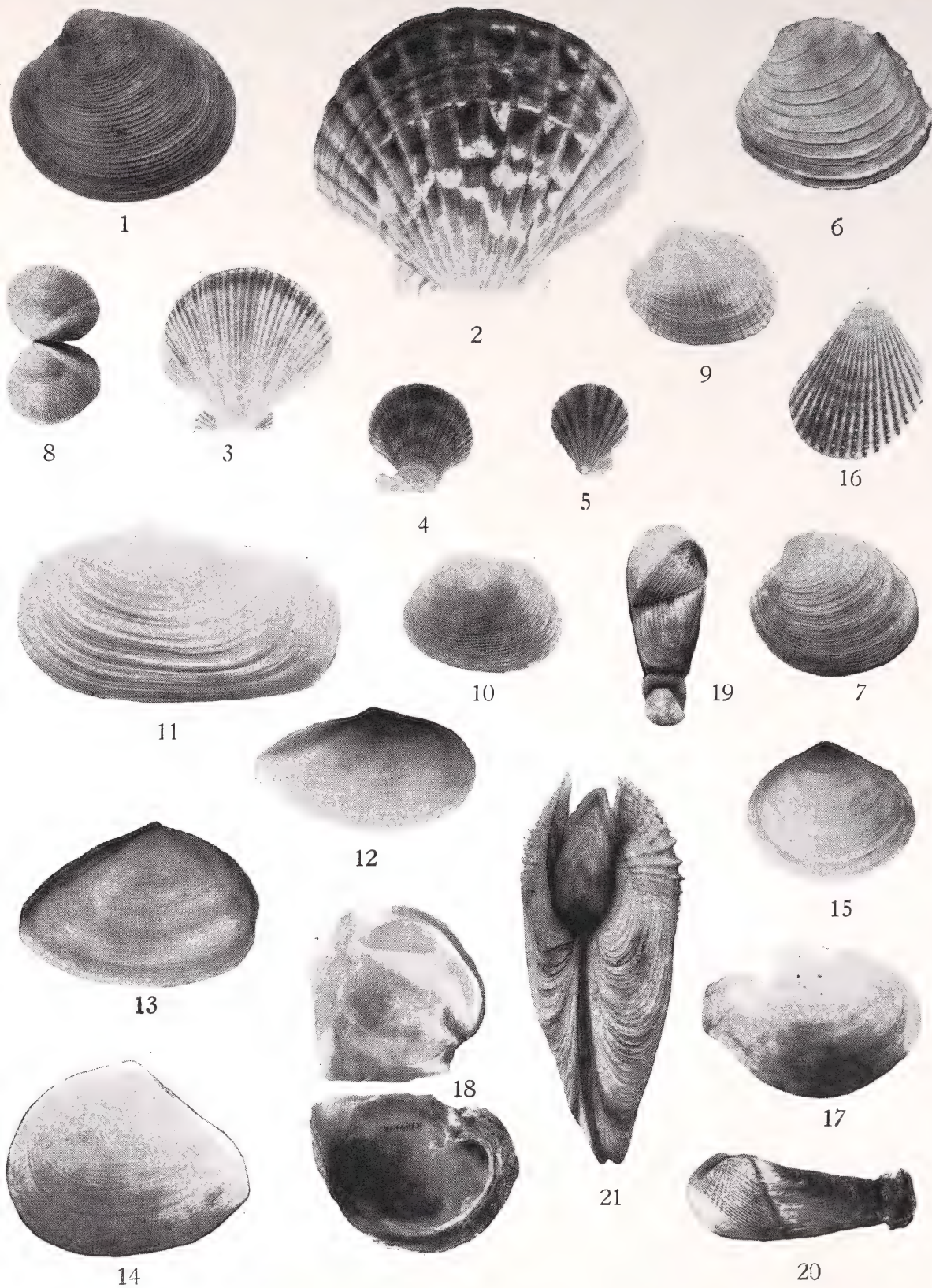


PLATE XII.

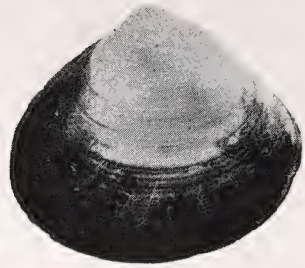
	PAGE
1. Anomia walteri	85
2. Placunanomia zelandica	86
3. Psammobia lineolata	110
4. „ stangeri	110
5. Mactra discors	101
6. „ elongata	101
7. „ ovata	102
8. Spisula aequilateralis	102
9. Zenatia acinaces	103
10. Resania lanceolata	103
11. Mesodesma australe	99
12. „ ventricosum	100
13. „ subtriangulatum	99
14. Soletellina nitida	111



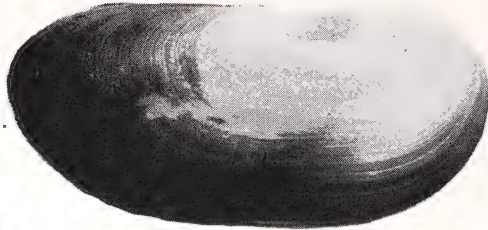
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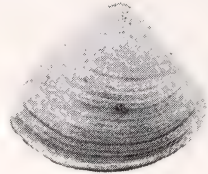
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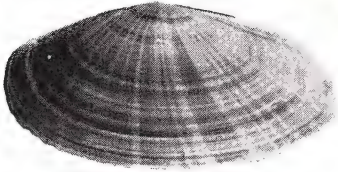
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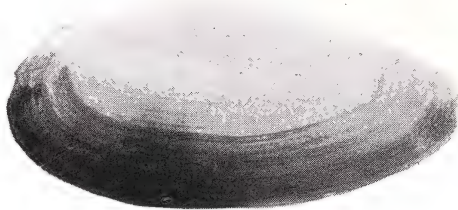
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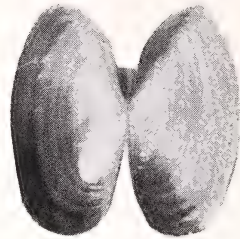
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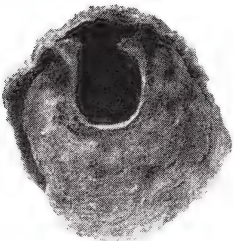
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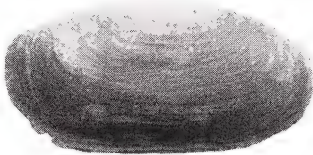
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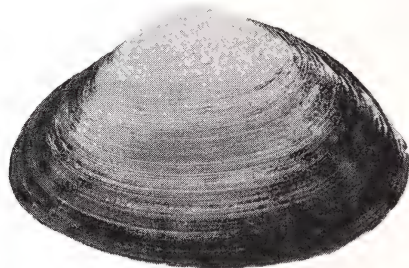
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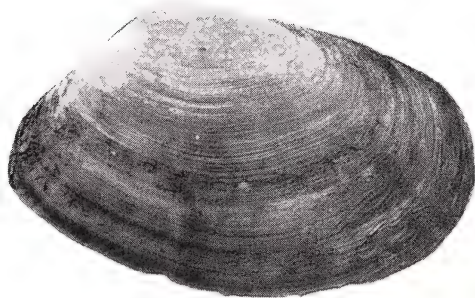
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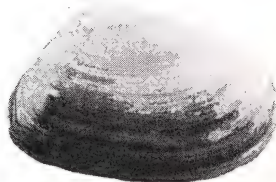
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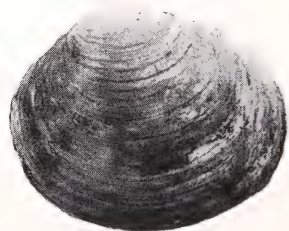
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