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Bulletin of the Museum of Comparative Zoölogy  
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REPORTS ON THE DREDGING OPERATIONS OFF THE WEST COAST OF  
CENTRAL AMERICA TO THE GALAPAGOS, TO THE WEST COAST  
OF MEXICO, AND IN THE GULF OF CALIFORNIA, IN CHARGE OF  
ALEXANDER AGASSIZ, CARRIED ON BY THE U. S. FISH COMMISSION  
STEAMER "ALBATROSS," DURING 1891, LIEUT. COMMANDER  
Z. L. TANNER, U. S. N., COMMANDING.

XXXVII.

REPORTS ON THE SCIENTIFIC RESULTS OF THE EXPEDITION TO THE  
EASTERN TROPICAL PACIFIC, IN CHARGE OF ALEXANDER AGASSIZ,  
BY THE U. S. FISH COMMISSION STEAMER "ALBATROSS," FROM  
OCTOBER, 1904, TO MARCH, 1905, LIEUT. COMMANDER L. M. GARRETT,  
U. S. N., COMMANDING.

XIV.

THE MOLLUSCA AND THE BRACHIOPODA.

BY WILLIAM HEALEY DALL.

Division of Mollusks  
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WITH TWENTY-TWO PLATES.

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| <p>A. AGASSIZ. V.<sup>5</sup> General Report on the Expedition.</p> <p>A. AGASSIZ. I.<sup>1</sup> Three Letters to Geo. M. Bowers, U. S. Fish Com.</p> <p>A. AGASSIZ and H. L. CLARK. The Echini.</p> <p>F. E. BEDDARD. The Earthworms.</p> <p>H. B. BIGELOW. The Medusae.</p> <p>R. P. BIGELOW. The Stomatopods.</p> <p>O. CARLGREN. The Actinaria.</p> <p>S. F. CLARKE. VIII.<sup>8</sup> The Hydroids.</p> <p>W. R. COE. The Nemerteans.</p> <p>L. J. COLE. The Pycnogonida.</p> <p>W. H. DALL. XIV.<sup>14</sup> The Mollusks.</p> <p>C. R. EASTMAN. VII.<sup>7</sup> The Sharks' Teeth.</p> <p>B. W. EVERMANN. The Fishes.</p> <p>W. G. FARLOW. The Algae.</p> <p>S. GARMAN. XII.<sup>12</sup> The Reptiles.</p> <p>H. J. HANSEN. The Cirripeds.</p> <p>H. J. HANSEN. The Schizopods.</p> <p>S. HENSHAW. The Insects.</p> <p>W. E. HOYLE. The Cephalopods.</p> <p>C. A. KOFOID. III.<sup>3</sup> IX.<sup>9</sup> The Protozoa.</p> | <p>P. KRUMBACH. The Sagittae.</p> <p>R. VON LENDENFELD and F. URBAN. The Siliceous Sponges.</p> <p>H. LUDWIG. The Holothurians.</p> <p>H. LUDWIG. The Starfishes.</p> <p>H. LUDWIG. The Ophiurans.</p> <p>G. W. MÜLLER. The Ostracods.</p> <p>JOHN MURRAY. The Bottom Specimens.</p> <p>MARY J. RATHBUN. X.<sup>10</sup> The Crustacea Decapoda.</p> <p>HARRIET RICHARDSON. II.<sup>2</sup> The Isopods.</p> <p>W. E. RITTER. IV.<sup>4</sup> The Tunicates.</p> <p>ALICE ROBERTSON. The Bryozoa.</p> <p>B. L. ROBINSON. The Plants.</p> <p>G. O. SARS. The Copepods.</p> <p>F. E. SCHULZE. XI.<sup>11</sup> The Xenophyophoras.</p> <p>H. R. SIMROTH. The Pteropods and Heteropods.</p> <p>E. C. STARKS. XIII.<sup>13</sup> Atelaxia.</p> <p>TH. STUDER. The Alcyonaria.</p> <p>T. W. VAUGHAN. VI.<sup>6</sup> The Corals.</p> <p>R. WOLTERECK. The Amphipods.</p> <p>W. McM. WOODWORTH. The Annelids.</p> |
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<sup>1</sup> Bull. M. C. Z., Vol. XLVI., No. 4, April, 1905, 22 pp.

<sup>2</sup> Bull. M. C. Z., Vol. XLVI., No. 6, July, 1905, 4 pp., 1 pl.

<sup>3</sup> Bull. M. C. Z., Vol. XLVI., No. 9, September, 1905, 5 pp., 1 pl.

<sup>4</sup> Bull. M. C. Z., Vol. XLVI., No. 13, January, 1906, 22 pp., 3 pls.

<sup>5</sup> Mem. M. C. Z., Vol. XXXIII., January, 1906, 90 pp., 96 pls.

<sup>6</sup> Bull. M. C. Z., Vol. L., No. 3, August, 1906, 14 pp., 10 pls.

<sup>7</sup> Bull. M. C. Z., Vol. L., No. 4, November, 1906, 26 pp., 4 pls.

<sup>8</sup> Mem. M. C. Z., Vol. XXXV., No. 1, February, 1907, 20 pp., 15 pls.

<sup>9</sup> Bull. M. C. Z., Vol. L., No. 6, February, 1907, 48 pp., 18 pls.

<sup>10</sup> Mem. M. C. Z., Vol. XXXV., No. 2, August, 1907, 56 pp., 9 pls.

<sup>11</sup> Bull. M. C. Z., Vol. LI., No. 6, November, 1907, 22 pp., 1 pl.

<sup>12</sup> Bull. M. C. Z., Vol. LII., No. 1, June, 1908, 14 pp., 1 pl.

<sup>13</sup> Bull. M. C. Z., Vol. LII., No. 2, July, 1908, 8 pp., 5 pls.

<sup>14</sup> Bull. M. C. Z., Vol. XLIII., No. 6, October, 1908, 285 pp., 22 pls.



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XXXVII.

REPORTS ON THE SCIENTIFIC RESULTS OF THE EXPEDITION TO THE EASTERN TROPICAL PACIFIC, IN CHARGE OF ALEXANDER AGASSIZ, BY THE U. S. FISH COMMISSION STEAMER "ALBATROSS," FROM OCTOBER, 1904, TO MARCH, 1905, LIEUT. COMMANDER L. M. GARRETT, U. S. N., COMMANDING.

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No. 6. — *Reports on the Dredging Operations off the West Coast of Central America to the Galapagos, to the West Coast of Mexico, and in the Gulf of California, in charge of ALEXANDER AGASSIZ, carried on by the U. S. Fish Commission Steamer "Albatross" during 1891, LIEUT. COMMANDER Z. L. TANNER, U. S. N., Commanding, XXXVIII.*

AND

*Reports on the Scientific Results of the Expedition to the Eastern Tropical Pacific in charge of ALEXANDER AGASSIZ, by the U. S. Fish Commission Steamer "Albatross," from October, 1904, to March, 1905, LIEUT. COMMANDER L. M. GARRETT, U. S. N., Commanding, XIV.*

*Reports on the Mollusca and Brachiopoda.*

By WILLIAM HEALEY DALL.

#### Introduction.

THE following report includes in the material treated of, first, the Mollusca and Brachiopoda collected by the U. S. S. "Albatross" during the cruise of February to April, 1891, under the direction of Dr. Agassiz; and, secondly, further material obtained during the voyage of 1904-5, under the same auspices.

At the suggestion of Dr. Agassiz, the molluscan material of the last voyage having proved small in amount though most interesting in quality, the report was extended to cover both voyages, and for completeness' sake I have added a few species obtained in the same region by the "Albatross" during 1888, while on her way from the Atlantic to California, and which had remained without being worked up, having come into my custody after my report on the voyage of 1887-8 had been printed. The few deep-water forms, as well as the shore and reef shells obtained during the Expedition to the Tropical Pacific, August, 1899, to March, 1900, are also included.

As regards the deep-water species this is the first general report upon those obtained in the eastern Pacific, north of the Antarctic region properly so called, and south of California, on the west coast of Middle and South America. The "Challenger" only entered this region for a very brief period, in which but a few hauls of the dredge were made, and the number of species of Mollusca then obtained was very small. A little dredging has been done by the various Antarctic expeditions en route, but in the area above indicated for the abyssal Mollusca the "Albatross" had a practically virgin field.

The littoral mollusk-fauna of the west coast of South America has been explored by D'Orbigny, Cuming, Hupé, C. B. Adams, Plate, Hidalgo, and several other naturalists, with a considerable literature as a result. Smith, Strebel, Mabile and Rochebrune, Couthouy, Gould, King, Philippi, and Melvill have investigated in more or less detail the shallow-water fauna of the Magellanic region, which is now becoming relatively well known; but these orarian species, with an interest all their own, have comparatively little affinity with those of the deeper waters beyond the hundred-fathom line.

I have included in this report a general discussion of all the mollusks collected, with the exception of the nudibranchs, which were placed in the very competent hands of Dr. Rudolph Bergh of Copenhagen, and which were for the most part from comparatively shallow water.

The brachiopods were individually few, but included several interesting new forms.

To the discussion of the species I have prefixed a list of the mollusks and brachiopods of the deep sea actually known to have been obtained from the region indicated. In this list, for completeness' sake, I have included the few species obtained by the "Challenger" and by other expeditions, but which were not collected by the "Albatross."

Species not found at greater depths than 100 fathoms are not included in the list, with the exception of a few obviously benthal forms which seemed to have strayed into shallower water. There was much temptation to include a certain number of deep-sea mollusks which have been dredged in the Pacific or Antarctic seas and which were known or suspected to have a wide distribution in the deep sea, in common with certain others which also do occur off the South American coast. But on reflection it was thought best for the usefulness of the list to restrict it to species actually obtained in the region referred to, taking nothing for granted, except where otherwise indicated. It is true that some abyssal species do have a most extraordinarily extended range, but it

also true that many others, sometimes associated with the former, so far as yet known have a quite restricted range. The reference of any particular species to the one or the other of these groups will therefore necessarily depend upon actual observation.

The material obtained northwest from Panama is less abundant than that from the Gulf of Panama, the vicinity of the Galapagos Islands, and of the southwest coast of the Chilian territory, formerly referred to as western Patagonia. Hence the lists may be regarded as more complete for the west coast of South America than for the deeps further north. There are in the text a considerable number of species discussed which do not appear in the lists, having been collected by the "Albatross" party from moderate depths of water or even on the shores between tides. As a whole, however, this report will add materially to our knowledge of the West American fauna of both deep and shallow water.

The opportunity seems good for making some comparisons between the deep-sea fauna of the West American region we are considering and the fauna disclosed by the researches of the "Blake," "Hassler," and other expeditions on the Atlantic side of the continent, and especially in the Antillean region. The latter was fully reviewed in my report on the "Blake" Mollusca, and the data are therefore ready for making the comparison, which will leave out of consideration the forms belonging to the shallows. If the comparison was made without this discrimination, many of the most striking features of it would be lost. It seems probable that the fauna of the deeps is very ancient, while that of the shallows may date from the late Pleistocene in some cases. Therefore, assuming that the deep-sea fauna is reasonably well known, the contrast between the faunas of the adjacent portions of the two oceans should be suggestive and important in connection with geological theories as to the former relations of seas and shore lines.

The known fauna of the eastern Pacific deep sea, as previously limited, contains about 300 species of Mollusks, if we omit pelagic species which only appear on the bottom, after death, like the Pteropods, *Janthina*, the Argonauts, etc. These are really inhabitants of the superficial strata of the sea and have no place in this discussion. These 300 species are divided into 134 generic and subgeneric groups, but some groups are very populous, while the larger number are represented by but one or two species. The Antillean region possesses 174 groups and a much larger number of species. There are practically no species common to the two regions, except at the southern extreme of South America, where a few species extend northward on both shores of the continent,

but do not reach the Antillean or Panamic regions. A few species like *Bathyarca corpulenta*, or some of the Solemys, have a very wide range over the floor of the Pacific Ocean. Among brachiopods *Discinisca atlantica* is common to the two oceans, and in the Atlantic to both hemispheres. The presence of the *Terebratulina crossei* in both Japan and Patagonia, to my mind, requires confirmation. I have seen numerous specimens from Japan, but nothing of the kind from the Magellanic region, and this is not an abyssal species, like *Terebratula moseleyi*.

That a certain proportion of the North Pacific fauna of the deep sea originated in the south seems highly probable. The north, however, seems also to have contributed its migrants. When the question of "bipolarity" is raised, and based upon a few supposedly identical species, it is but feebly, if at all, supported. But if generic and subgeneric groups be taken instead of species for comparison, an undeniable "bipolarity" is displayed. But this question is one with which our present faunal area is only distantly connected.

Our fauna, which I shall for brevity in this discussion call the "Pacific" fauna, contains about 300 species, belonging to sixty-seven families. Of these eight families furnish more than half, and three of these family groups contain one-third of the whole fauna.

Turritidae contains . . . . .	57 species
Ledidae " . . . . .	35 "
Dentaliidae " . . . . .	14 "
Pectinidae " . . . . .	13 "
Nuculidae and Naticidae, each . . . . .	11 "
Trochidae and Limopsidae, each . . . . .	9 "

The total number of species in these eight families is 159, leaving 141 species for the other fifty-nine families, or little more than two species apiece.

The Antillean fauna has 174 distinct generic and subgeneric or sectional groups of importance represented. The Pacific fauna has only 144. But of all these groups only eighty-nine of mollusks are common to both faunas and six of brachiopods.

The Pacific has three groups of brachiopods and twenty-seven of mollusks not represented in the Antillean fauna.

The Antillean has three groups of brachiopods and seventy-six of mollusks not represented on the Pacific side.

These statistics would indicate, if confirmed by further researches,

that the separation between the abyssal fauna of the Pacific and that of the Antilles is very ancient indeed, for in the shallows many of these groups are represented on both sides of the isthmus of Darien, yet have not succeeded in reaching the deep water. That they can endure life in the abysses and are not kept out by any physiological characteristics which unfit them for life in deep water, is proved by the fact that on one side or the other they do at present flourish there, though not on both sides.

The peculiarities of distribution, when analyzed, prove remarkably interesting and not a little puzzling.

For instance, the following Antillean groups, some of which are very populous in species, are not revealed in the Pacific dredgings from deep water :

Ovulactaeon	Aurinia
Ringicula	Turbonilla
Trigonostoma	Addisonia
Benthobia	Microgaza
Conomitra	Dillwynella
Mitra	Basilissa
Nassarina	Pleurotomaria
Dalium	Fissurisepta
Eudolium	Pectinodonta
Triforis	Lepetella
Cerithiopsis	Hanleyia
Seila	Limaea
Mathilda	Spondylus
Fluxina	Dimya
Clathrella	Astarte
Rissoa	Liocardium
Benthonella	Meiocardia
Hyalorisia	Abra
Olivella	Euciroa
Marginella	Thecidium
Voluta	Megathyris

The above list includes the more conspicuous instances only.

On the other hand the Pacific fauna has the following groups not represented in the Antillean deep sea :

Irenosyrinx	Surculina
Steiraxis	Narona
Calliotectum	Adelomelon
Borsonella	Miomelon
Phymorhynchus	Tractolira

Solenosteira	Pallium
Truncaria	Acesta
Tritonoharpa	Archivesica
Capulus	Pholadidea
Clanculus	Dermatomya
Zeidora	Hemithyris
Spinula	Terebratella
Malletia (s. s.)	Magellania
Neilo	Basiliola ?

Even in the groups common to both regions there are some interesting differences.

Mangilia is numerous in the Atlantic, rather sparse in the Pacific; Fusinus rare in the Pacific, numerous in the Atlantic. Anachis, Murex, Scala, Calliostoma, Dentalium, Cadulus, Propreamusium, Phacoides, and Venericardia are relatively common on the east and sparse on the west of the continent. The total absence of the Triphoridae, Cerithiopsidae, and all the group of Marginellidae from the fauna of the west is astonishing, and incomprehensible with our present knowledge. Why should Vesicomya on the east be moderate or small in size, and on the west large even to gigantic?

Why are there no Pyramidellidae of any sort in deep water on the Pacific side? Why should European or Japanese types of Pecten, Lima, etc., appear on the west coast and be absent from the Antilles? These questions will doubtless be answered in the future, but with our present knowledge we can make no satisfactory reply.

After a general survey and comparison of the two faunas, Atlantic and Pacific, as developed by the "Albatross" and other dredgings, it may be concluded that the deep-sea fauna of the eastern Pacific is composed of several elements. We have first a comparatively limited number of abyssal forms of wide distribution. These are doubtless the descendants of very ancient migrants to the deeps, and their precise number and character can only be definitely known after much more extended exploration of the floor of the deep sea. Still, from our present knowledge, it is practically certain that there is such a group of species, although we cannot as yet state how many of them there are.

Secondly, there is a considerable number of species characteristic of the Antarctic and Magellanic regions. Whether they are descended from the present shoal-water fauna to which they are systematically akin, members of which may have strayed into deeper water from time to time and become acclimated there, or whether the deep-sea fauna and the littoral fauna are both descendants of an Antarctic fauna which

flourished at a time when the Antarctic region had a milder climate, it is not practicable yet to determine. It is, however, certain that there is a considerable austral element in the existing faunas, both littoral and benthal.

The contributions of boreal seas to the fauna of the eastern Pacific are less easy to determine and less numerous in species under any hypothesis, since when a species extends from one end of the earth to the other it is difficult to determine from which end it originally started.

Lastly, there is an element, of which the extent is still uncertain, due to migration from the Antillean region and adjacent shores of the continent at a time when the passage between the two seas in the region of Panama or elsewhere was not obstructed. Probably a more or less constant migration from shoal water to deeper is going on now, and has always gone on since littoral faunas existed, when barriers of land or of temperature have not intervened.

There is much in the distribution of the present marine invertebrate fauna of South America, east and west, to support the view so strongly urged by von Ihering and others that a barrier existed between the north and south Atlantic basins during late geologic time, making it difficult for the South European animals to reach the South Atlantic unless by the roundabout way of the Red Sea and Indian Ocean. In fact, without some such barrier it seems impossible to account for some of the facts of the present distribution of marine animals.

But that the influx from the Antillean region of its essentially Mediterranean faunal elements into the Pacific by way of the gaps between North and South America was so small as it appears to be seems to need explanation. It may possibly be accounted for by the hypothesis that the immigrants from the Atlantic found the ground already well occupied by a Pacific fauna; but however we attempt to explain it, the fact remains, that the Antillean forms on the Pacific coast are almost exclusively confined to shoal water, while the Pacific coast types like *Strombina* and *Fasciolina*, though found abundantly in the Tertiaries of the Texas coast and the West Indies, have survived the Pleistocene only on the shores of the Pacific.

In conclusion I have to thank the authorities of the U. S. National Museum and Smithsonian Institution, the Director of the U. S. Geological Survey, and the Librarian of Congress, for facilities offered and utilized in the preparation of this report. To Dr. H. A. Pilsbry of the Academy of National Sciences, Philadelphia, I am also indebted for advice and information received. The late Dr. J. C. McConnell prepared

many of the earlier drawings which appear on the plates, whose perfection accentuates the sense of loss due to his premature death. Miss Evelyn Mitchell has prepared those subsequently required.

I have also to express my gratitude to Dr. Alexander Agassiz for his consideration during the years which have elapsed since this work was begun, and his constant kindness at all times.

SMITHSONIAN INSTITUTION,  
May, 1908.

List of Mollusca from deep water of the eastern Pacific Ocean dredged by the U. S. S. "Albatross" on the coasts of Middle and South America, 1887-1904, or reported by other expeditions.

### CEPHALOPODA.

#### *Argonautidae.*

- Argonauta cornuta Conrad.  
Argonauta nouryi Lorois.  
Argonauta pacifica Dall.

### GASTROPODA.

#### PTEROPODA.

#### *Cavoliniidae.*

- Cavolina telemus Linné.  
Cavolina uncinata Rang.  
Cavolina longirostris Lesueur.

### OPISTHOBRANCHIATA.

#### *Acteonidae.*

- Acteon panamensis Dall.  
Acteon (Microglyphis) mazatlanicus Dall.  
Acteon (Microglyphis) curtulus Dall.  
Acteon (Microglyphis) perconicus Dall.

#### *Scaphandridae.*

- Scaphander cylindrellus Dall.  
Scaphander interruptus Dall.  
Cylichnella (Bullinella) inca Dall.  
Cylichnella (Cylichnium) pizarro Dall.  
Cylichnella (Cylichnium) atahualpa Dall.

*Bullariidae.*

*Bullaria* (*Leucophysema*) *morgana* Dall.

## CTENOBRANCHIATA.

*Terebridae.*

*Terebra* (*Strioterebrum*) *panamensis* Dall.

*Terebra* (*Subula*) *lingualis* Hinds.

*Conidae.*

*Conus gradatus* Mawe.

*Conus sieboldi* Reeve.

*Turritidae.*

*Turris* (*Surcula*) *fusinella* Dall.

*Turris* (*Surcula*) *dolenta* Dall.

*Turris* (*Surcula*) *armilda* Dall.

*Turris* (*Surcula*) *notilla* Dall.

*Turris* (*Surcula*) *resina* Dall.

*Turris* (*Surcula*) *dotella* Dall.

*Turris* (*Surcula*) *callicesta* Dall.

*Gemmula exulans* Dall.

*Gemmula esuriens* Dall.

*Gemmula esuriens pernodata* Dall.

*Gemmula herilda* Dall.

*Gemmula benthima* Dall.

*Gemmula eldorana* Dall.

*Gemmula vicella* Dall.

*Gemmula serilla* Dall.

? *Leucosyrinx clionella* Dall.

? *Leucosyrinx pacifica* Dall.

*Irenosyrinx persimilis* Dall.

*Irenosyrinx leonis* Dall.

*Irenosyrinx goodei* Dall.

*Irenosyrinx crebristriata* Dall.

*Ancistrosyrinx cedonulli* Reeve.

*Steiraxis aulaca* Dall.

*Calliotectum vernicosum* Dall.

*Borsonia* (*Borsonella*) *dalli* Arnold.

*Borsonia* (*Borsonella*) *agassizii* Dall.

*Borsonia* (*Borsonella*) *diegensis* Dall.

*Borsonia* (*Borsonella*) *hooveri* Dall.

*Borsonia* (*Borsonella*) *saccoi* Dall.

Borsonia (Borsonella) coronadoi Dall.  
 Pleurotomella (Gymnobela) agonia Dall.  
 Pleurotomella (Gymnobela) altina Dall.  
 Pleurotomella (Gymnobela) egregia Dall.  
 Pleurotomella (Gymnobela) isogonia Dall.  
 Pleurotomella (Gymnobela) xylona Dall.  
 Pleurotomella polystephanus Dall.  
 Pleurotomella dinora Dall.  
 Pleurotomella esilda Dall.  
 Pleurotomella suffusa Dall.  
 Pleurotomella sp.  
 Pleurotomella (Phymorhynchus) argeta Dall.  
 Pleurotomella (Phymorhynchus) cingulata Dall.  
 Pleurotomella (Phymorhynchus) castanea Dall.  
 Pleurotomella (Phymorhynchus) clarinda Dall.  
 Mangilia movilla Dall.  
 Mangilia enora Dall.  
 Mangilia genilda Dall.  
 Mangilia sedillina Dall.  
 Mangilia encella Dall.  
 Clathurella orariana Dall.  
 Clathurella panamella Dall.  
 Glyphostoma immaculata Dall.  
 Daphnella (Eubela) imparella Dall.  
 Daphnella (Surculina) blanda Dall.  
 Daphnella (Surculina) cortezi Dall.  
 Clinura monochorda Dall.  
 Clinura peruviana Dall.

*Cancellariidae.*

Cancellaria (Narona) exopleura Dall.  
 Cancellaria (Merica) corbicula Dall.  
 Cancellaria (Merica) centrota Dall.  
 Cancellaria (Merica) io Dall.  
 Cancellaria (Merica ?) microsoma Dall.  
 Cancellaria (Admete ?) californica Dall.

*Volutidae.*

Adelomelon benthalis Dall.  
 Adelomelon (Miomelon) philippiana Dall.  
 Tractolira sparta Dall.

*Ptychatractidae.*

Ptychatractus californianus Dall.

*Fasciolaridae.*

- Solenosteira elegans Dall.  
 Fusinus panamensis Dall.  
 Fusinus fragilissimus Dall.  
 Fusinus (Exilia ?) rufocaudatus Dall.

*Buccinidae.*

- Truncaria brunneocincta Dall.  
 Volutopsius ? amabilis Dall.  
 Phos cocosensis Dall.  
 Chrysodomus testudinis Dall.

*Alectrionidae.*

- Alectrion (Hima) catallus Dall.  
 Alectrion (Hima) miser Dall.  
 Alectrion (Hima) townsendi Dall.  
 Alectrion (Tritia) exsarcus Dall.  
 Alectrion (Tritia ?) goniopleura Dall.

*Columbellidae.*

- Columbella (Anachis) scalaris Watson.  
 Columbella (Anachis) fusidens Dall.  
 Columbella (Astyris) sp. indet.

*Muricidae.*

- Murex (Tritonalia) diomedae Dall.  
 Murex (Alipurpura) centrifuga Hinds.  
 Trophon liratus Couthouy.  
 Boreotrophon acanthodes Watson.  
 Boreotrophon panamensis Dall.  
 Boreotrophon mazatlanicus Dall.  
 Boreotrophon disparilis Dall.

*Scalidae.*

- Epitonium (Ferminoscala) ferminianum Dall.  
 Epitonium (Acrilla) pompholyx Dall.  
 Epitonium (Sthenorhytis) turbinum Dall.

*Eulimidae.*

- Stilifer (Mucronalia) bathymetrae Dall.

*Septidae.*

Fusitriton cancellatus Lamarck.  
Distorsio decussatus Valenciennes.  
Tritonoharpa vexillata Dall.

*Ranellidae.*

Bursa (Lampadopsis) calcipicta Dall.

*Cassididae.*

Oocorys rotunda Dall.  
Oocorys elevata Dall.  
Oocorys (Benthodolium) pacifica Dall.

*Trichotropidae.*

Cerithioderma pacifica Dall.

*Seguenziidae.*

Seguenzia occidentalis Dall.  
Seguenzia stephanica Dall.

*Vermetidae.*

Petalconchus complicatus Dall.

*Turritellidae.*

Turritella mariana Dall.

*Solariidae.*

Architectonica radialis Dall.

*Choristidae.*

Choristes carpenteri Dall.

*Capulidae.*

Capulus chilensis Dall.

*Hipponicidae.*

Hipponix delicata Dall.

*Naticidae.*

- Natica* (*Cochlis*) *othello* Dall.  
*Natica* (*Cochlis*) *scethra* Dall.  
*Polinices* *uber intemerata* Philippi.  
*Polinices* (*Euspira*) *agujanus* Dall.  
*Polinices* (*Euspira*) *solutus* Gould.  
*Polinices* (*Euspira*) *crawfordianus* Dall.  
*Polinices* (*Euspira*) *pardoanus* Dall.  
*Polinices* (*Euspira*) *vaginatus* Dall.  
*Polinices* (*Euspira*) *constrictus* Dall.  
*Polinices* (*Euspira*) *litorinus* Dall.  
*Polinices* (*Euspira*) *strebali* Dall.

*Bathysciadiidae?*

- Bathysciadium pacificum* Dall.

*Cocculinidae.*

- Cocculina agassizii* Dall.  
*Cocculina nassa* Dall.  
*Cocculina diomedae* Dall.

*Turbinidae.*

- Leptothyra panamensis* Dall.

*Liotiidae.*

- Liotia* (*Arene*) *californica* Dall.  
*Liotia* (*Arene*) *pacis* Dall.

*Trochidae.*

- Clanculus* (*Panocochlea*) *rubidus* Dall.  
*Gaza rathbuni* Dall.  
*Calliostoma iridium* Dall.  
*Turricula macdonaldi* Dall.  
*Solariella nuda* Dall.  
*Solariella ceratophora* Dall.  
*Solariella galapagana* Dall.  
*Solariella equatorialis* Dall.  
 ? *Ganesa panamensis* Dall.

*Haliotidae.*

- Haliotis pourtalesii* Dall.

*Fissurellidae.*

- Puncturella (Cranopsis) expansa Dall.  
 Puncturella falklandica A. Adams.  
 Zeidora flabellum Dall.

## ISOPLEURA.

## POLYPLACOPHORA

*Lepidopleuridae.*

- Lepidopleurus halistreptus Dall.  
 Lepidopleurus luridus Dall.  
 Lepidopleurus opacus Dall.  
 Lepidopleurus incongruus Dall.  
 Lepidopleurus farallonis Dall.

*Mopaliidae.*

- Placiphorella blainvillei Broderip.

## SCAPHOPODA.

*Dentaliidae.*

- Dentalium aequatorium Pilsbry and Sharp.  
 Dentalium megathyris Dall.  
 Dentalium ceras Watson.  
 Dentalium peruvianum Dall.  
 Dentalium agassizii Pilsbry and Sharp.  
 Dentalium brevicornu Pilsbry and Sharp.  
 Dentalium dalli Pilsbry and Sharp.  
 Cadulus striatus Dall.  
 Cadulus albicomatus Dall.  
 Cadulus californicus Pilsbry and Sharp.  
 Cadulus platystoma Pilsbry and Sharp.  
 Cadulus peruvianus Dall.  
 Cadulus panamensis Pilsbry and Sharp.  
 Cadulus (Polyschides) dalli Pilsbry and Sharp.

## PELECYPODA.

*Solenomyacidae.*

- Solemya (Acharax) agassizii Dall.  
 Solemya (Acharax) patagonica Smith.

- Solemya* (*Acharax*) *johnsoni* Dall.  
*Solemya* (*Petrasma*) *panamensis* Dall.

*Nuculidae.*

- Nucula tanneri* Dall.  
*Nucula savatieri* Mabilie and Rochebrune.  
*Nucula panamina* Dall.  
*Nucula taeniolata* Dall.  
*Nucula iphigenia* Dall.  
*Nucula pigafettae* Dall.  
*Nucula agujana* Dall.  
*Nucula exigua* Sowerby.  
*Nucula chrysocoma* Dall.  
*Nucula declivis* Hinds.  
*Nucula colombiana* Dall.

*Ledidae.*

- Leda* (*Jupiteria*) *callimene* Dall.  
*Leda* (*Jupiteria*) *agapea* Dall.  
*Leda* (*Jupiteria*) *pontonia* Dall.  
*Leda* (*Jupiteria*) *lobula* Dall.  
*Leda cordyla* Dall.  
*Leda loshka* Dall.  
*Leda rhytida* Dall.  
*Leda peruviana* Dall.  
*Leda* (*Spinula*) *calcar* Dall.  
*Leda* (*Spinula*) *calcarella* Dall.  
*Yoldia* (*Katadesmia*) *vincula* Dall.  
*Yoldia* (*Orthoyoldia*) *panamensis* Dall.  
*Yoldia* (*Yoldiella*) *chilenica* Dall.  
*Yoldia* (*Yoldiella*) *indolens* Dall.  
*Yoldia* (*Yoldiella* ?) *infrequens* Dall.  
*Yoldia* (*Yoldiella* ?) *mantana* Dall.  
*Yoldia* (*Yoldiella*) *granula* Dall.  
*Yoldia* (*Yoldiella*) *discella* Dall.  
*Yoldia* (*Yoldiella*) *leonilda* Dall.  
*Malletia magellanica* Mabilie and Rochebrune.  
*Malletia inequalis* Dall.  
*Malletia peruviana* Dall.  
*Malletia truncata* Dall.  
*Malletia* (*Minormalletia*) *arciformis* Dall.  
*Malletia* (*Minormalletia*) *benthima* Dall.  
*Malletia* (*Neilo*) *goniura* Dall.  
*Tindaria compressa* Dall.  
*Tindaria panamensis* Dall.

- Tindaria atossa Dall.  
 Tindaria smirna Dall.  
 Tindaria mexicana Dall.  
 Tindaria virens Dall.  
 Tindaria thea Dall.  
 Tindaria (Tindariopsis) sulculata Gould.  
 Phaseolus (Silicula) patagonicus Dall.

*Limopsidae.*

- Limopsis zonalis Dall.  
 Limopsis compressus Dall.  
 Limopsis jousseaumei Mabile and Rochebrune.  
 Limopsis diegensis Dall.  
 Limopsis mabileana Dall.  
 Limopsis panamensis Dall.  
 Limopsis stimpsoni Dall.  
 Limopsis juarezi Dall.  
 Limopsis diazi Dall.

*Arcidae.*

- Arca (Bathyarca) nucleator Dall.  
 Arca (Bathyarca) pompholyx Dall.  
 Arca (Cucullaria) endemica Dall.  
 Glycymeris multicostatus Sowerby.

*Pectinidae.*

- Pecten sericeus Hinds.  
 Pecten (Pallium) miser Dall.  
 Pecten (Pseudamusium) liriopae Dall.  
 Pecten (Pseudamusium) neoceanicus Dall.  
 Pecten (Pseudamusium) polyleptus Dall.  
 Pecten (Pseudamusium) panamensis Dall.  
 Pecten (Pseudamusium) subhyalinus Smith.  
 Pecten (Pseudamusium) randolphi Dall.  
 Pecten (Pseudamusium) gelatinosus Mabile and Rochebrune.  
 Pecten (Cyclopecten) rotundus Dall.  
 Pecten (Cyclopecten) cocosensis Dall.  
 Pecten (Propeamusium) meridionalis Smith.  
 Pecten (Propeamusium) malpelonius Dall.

*Limidae.*

- Lima (Acesta) patagonica Dall.  
 Lima (Acesta) agassizii Dall.  
 Lima (Acesta) diomedae Dall.  
 Lima (Limatula) falklandica A. Adams.

*Mytilidae.*

*Crenella* *megas* Dall.

*Carditidae.*

*Venericardia* (*Cyclocardia*) *velutina* Smith.

*Kelliellidae.*

*Aligena* *pisum* Dall.

*Aligena* *borniana* Dall.

*Leptonidae.*

*Rochefortia* *mabiliei* Dall.

*Rochefortia* *rochebrunei* Dall.

*Thyasiridae.*

*Thyasira* *fuegiensis* Dall.

*Lucinidae.*

*Phacoides* (*Lucinoma*) *lamellatus* Smith.

*Cardiidae.*

*Protocardia* *panamensis* Dall.

*Vesicomycidae.*

*Vesicomya* *lepta* Dall.

*Vesicomya* *ovalis* Dall.

*Vesicomya* *donacia* Dall.

*Vesicomya* *stearnsii* Dall.

*Vesicomya* (*Archivesica*) *gigas* Dall.

*Vesicomya* (*Callogonia*) *annulata* Dall.

*Tellinidae.*

*Tellina* (*Phyllodina*) *fluctigera* Dall.

*Tellina* (*Moerella*) *chrysogona* Dall.

*Tellina* (*Angulus*) *carpenteri* Dall.

*Macoma* (*Psammacoma*) *hesperus* Dall.

*Corbulidae.*

*Corbula* (*Cuneocorbula*) *ira* Dall.

*Saxicavidae.*

*Saxicava antarctica* Philippi.

*Pholadidae.*

*Xylophaga mexicana* Dall.

*Pholadidea* (*Penitella*) *minuscula* Dall.

*Periplomatidae.*

*Periploma carpenteri* Dall.

*Anatinidae.*

*Bushia panamensis* Dall.

*Lyonsiidae.*

*Lyonsia panamensis* Dall.

*Verticordiidae.*

*Verticordia perplicata* Dall.

*Lyonsiella radiata* Dall.

*Poromyacidae.*

*Poromya perla* Dall.

*Poromya* (*Dermatomya*) *mactroides* Dall.

*Poromya* (*Dermatomya*) *equatorialis* Dall.

*Poromya* (*Dermatomya*) *chilensis* Dall.

*Cetoconcha smithii* Dall.

*Cetoconcha scapha* Dall.

*Cuspidariidae.*

*Cuspidaria patagonica* Smith.

*Cuspidaria panamensis* Dall.

*Cuspidaria* (*Cardiomya*) *pseustes* Dall.

*Cuspidaria* (*Cardiomya*) *planetica* Dall.

*Cuspidaria* (*Luzonia*) *chilensis* Dall.

*Myonera garretti* Dall.

List of Brachiopoda from deep water dredged by the U. S. S. "Albatross" on the coasts of Middle and South America or reported by other expeditions.

## BRACHIOPODA.

### NEOTREMATA.

#### *Discinidae.*

*Discinisca* (*Pelagodiscus*) *atlantica* King.

#### *Craniidae.*

*Crania patagonica* Dall.

### TELOTREMATA.

#### *Rhynchonellidae.*

*Hemithyris craneana* Dall.

*Hemithyris strebeli* Dall.

? *Basiliola beecheri* Dall.<sup>1</sup>

#### *Terebratulidae.*

*Terebratulina* n. sp.

*Liothyrina uva* Broderip.

*Liothyrina moseleyi* Davidson.

*Liothyrina clarkeana* Dall.

*Liothyrina wyvillii* Davidson.

#### *Terebratellidae.*

*Terebratella dorsata* Gmelin.

*Magellania wyvillii* Davidson.

*Macandrevia americana* Dall.

*Macandrevia diamantina* Dall.

*Macandrevia craniella* Dall.

*Note.* — The truly Antarctic species and the species from shallow water, like *Magellania venosa*, from America, are not included in this list.

<sup>1</sup> Reported from Australia and the Hawaiian Islands, but not yet from the American region.

## CEPHALOPODA.

## DIBRANCHIATA.

## OCTOPODA.

*Argonautidae.***ARGONAUTA** LINNÉ.

*Argonauta* Linné, Syst. Nat., 1758, Ed. 10, p. 708 (First species and type *A. argo* L. Mediterranean); Hoyle, Cat. Rec. Ceph., 1886, p. 8.

***Argonauta cornuta*** CONRAD.

*Argonauta cornuta* Conrad, Journ. Acad. Nat. Sci. Phila., Feb., 1854, 2d ser., 2, p. 332, no. 9, pl. 34, fig. 2.

*Argonauta expansa* Dall, Proc. Cal. Acad. Sci., Dec., 1872, 4, p. 303; Proc. U. S. Nat. Mus., 1902, 24, p. 511, pl. 33, figs. 1, 2, 3.

Fragments of this species were dredged at stations 3354, 3356, 3360, 3376, and 3392, in the Gulf of Panama east of Cocos Island. The original description gives the habitat as unknown; the specimens described by me in 1872 were collected in the Gulf of California by Fisher. So far as known, the range of the species is confined to the region between Cape St. Lucas and Panama Bay.

When I described this species, Conrad's paper above referred to was not accessible to me, and, curiously enough, I have found no reference to his descriptions or plate in any of the works on *Argonauta* I have been able to consult. His figure is not very characteristic, yet, taken in connection with his description, it seems very probable that the two diagnoses refer to the same species. The specimens I have seen are very uniform, the wide auricles invariably present, and the size about the same in all adults, also the granulate surface.

***Argonauta nouryi*** LOROIS.

*Argonauta nouryi* Lorois, 1852 (Jan.), Rev. et Mag. Zool., 2me sér., 4, p. 9, pl. 1, fig. 5; Conrad, Journ. Acad. Nat. Sci. Phila., Feb., 1854, 2d ser., 2, p. 333.

*Argonauta grumeri* Dunker, Zeitschr. Mal., Mar. 26, 1852, p. 43; Nov. Conch., Moll., Mar., 1858; p. 29, pl. 9, figs. 1, 2; Reeve, Conch. Icon., 1861, pl. 3, fig. 20.

*Argonauta argo*, forma *mutica* Martens, Ann. Mag. N. H., 1867, 3d ser., 20, p. 104.

? *Argonauta grumeri* Sowerby, Thes. Conch., 1864, 3, p. 264, pl. 253, fig. 9 (very bad figure).

Marquesas Ids., Lorois, Dunker; equatorial Pacific, Conrad; stations 3394 and 3431, U. S. S. "Albatross," in the Gulf of Panama, and in N. Lat. 24°, in the Gulf

of California; off the coast of Peru, Scammon. Also off Acapulco, Mexico, at station 3422, U. S. S. "Albatross."

This beautiful and very distinct little species is widely distributed. It is probable that the reference by von Martens of this species to a form of *argo* is due rather to the very poor figures of Reeve and Sowerby than to actual inspection of specimens, as with the latter under one's eyes any specific connection with the *argo* type is seen at once to be inadmissible. Dunker has given an admirable figure in his *Novitates*.

The material obtained, as above, by the "Albatross," in all cases was fragmentary, though enough to identify the species, which is represented in the National Museum by other well-preserved specimens.

### *Argonauta pacifica* DALL.

*Argonauta pacifica* Dall, Amer. Nat., 1869, 3, p. 237; Amer. Jour. Conch., 1871, 7, p. 95; Hoyle, Cat. Rec. Ceph., 1886, p. (213) 9.

? *Argonauta argo* Reeve, Conch. Icon. *Argonauta*, 1861, pl. 3, fig. 2 d.

Monterey, California, southward to the Gulf of California. U. S. S. "Albatross," stations 3365, 3374, 3389, and 3400, in the Gulf of Panama and near the Galapagos Islands; fragments.

It was with some hesitation that I separated this form from the Mediterranean *A. argo* (L.) Blainville, and the reasons which led to the decision are mentioned in the American Journal of Conchology. I have seen much more dry material since that time, all of which is fairly uniform. The specimens are invariably rounder, wider, and shorter than those from the Mediterranean, and the auricles tend more outward. The figures of Reeve and Sowerby representing *compressa* Blainville and *argo* all show a greater space in the lateral sinuses than I have seen in any actual specimen of either. It is probable that further study of the animal will be required to decide the standing of the nominal species of the *argo* group. It seems almost certain that specimens from the Mediterranean, Antilles, and the west coast of America never attain the size of the oriental *compressa*. But it is also practically certain that in this and the *hians* groups the presence or absence of auriculation is not a specific character. Some species appear to be always auriculate, others always without these projections, while others again have an auriculate and a simple form with intermediate gradations occasionally.

As there seems to be no recent summary of the species of Argonauts I have prepared one.

## SUMMARY OF RECENT ARGONAUTS.

### GROUP OF *A. ARGO*.

Aperture simple.

#### *A. Argonauta grandiformis* PERRY.

**B. *Argonauta argo* (L.) BOLTEN.**

1. *A. argo papyria* (Conrad).  
Aperture angulate.
2. *A. argo cygnus* (Monterosato).  
Aperture auriculate.
3. *A. argo* s. s. (Linné) Bolten.
4. *A. argo americana* (Dall).
5. *A. argo pacifica* (Dall).

**C. *Argonauta bulleri* KIRK.**GROUP OF *A. CORNUTA*.

Aperture simple.

**D. *Argonauta nouryi* LOROIS.****E. *Argonauta cornuta* CONRAD.**

1. *A. cornuta dispar* (Conrad).  
Aperture auriculate.
2. *A. cornuta* s. s. Conrad.  
GROUP OF *A. NODOSA*.

**F. *Argonauta nodosa* SOLANDER.**

1. *A. nodosa bibula* (Bolten).  
Aperture simple.
2. *A. nodosa* s. s. Solander.  
GROUP OF *A. HIANIS*.

**G. *Argonauta hians* SOLANDER.**

1. *A. hians navicula* (Solander).  
Aperture auriculate.
2. *A. hians* s. s. Solander.  
Aperture simple.

**H. *Argonauta boettgeri* MALTZAN**

I. INCERTAE SEDIS.

1. *A. fragilis* Parkinson.
2. *A. geniculata* Gould.
3. *A. rufa* Owen.
4. *A. conradi* Parkinson.

This indicates the existence of eight well-defined species of *Argonauta*, four of which are known to have both auriculate and simple forms or varieties.

The data are yet insufficient to formulate the range of distribution of any of the species, but they show that several of the species are apparently limited in their range, two species being known from the Gulf of Panama which are unknown from the Caribbean Sea or the Atlantic Ocean.

#### NOTES ON THE SUMMARY.

The granulation of the surface is not a specific character in *Argonauta*; all the species show granulation occasionally, though with some it is more conspicuous and constant than with others.

By carefully tracing back the early names, which were nearly all based on still earlier figures, I have been able to determine to which phase, auriculate or simple, each name applies, which necessitates some changes from the usage current in most *Argonaut* literature. For the convenience of the student I have noted, under the letter and number of each name in the summary, the chief synonyms in the following paragraphs. It should be noted that young specimens of nearly all the larger forms are for a time distinctly auriculate, but may become simple in the adult stage. The brown species, like *A. hians*, are sometimes profusely polka-dotted with small round white spots resident in the shell itself and not in the periostracum.

- A. *A. grandiformis* Perry, Conch., 1811, pl. 42, fig. 4. Cape of Good Hope. This is *A. compressa* Blainville, Dict. Sci. Nat., 1826, 43, p. 212, and *A. maxima* of some authors, both based on the *Cymbium maximum striatum*, etc., of Gualtieri, 1742, pl. 11, fig. A. So far as I have observed, none of the very large specimens is auriculate.
- B. 1. *A. papyria* Conrad, Journ. Acad. Nat. Sci. Phila., 1854, n. s., 2, p. 331, pl. 34, fig. 1; and *A. argo agglutinans* Martens, Ann. Mag. N. Hist., 1867, 3d ser., 20, p. 106. The locality is not known, but I suspect the closing up of the lateral sinuses is really an abnormality.
- B. 2. *A. cygnus* Monterosato, Journ. de Conchyl., 1889, 37, p. 120. Mediterranean and Caribbean seas. This is the *forma obtusangula* of von Martens.
- B. 3. *A. argo* (Linné, 1758, *ex parte*) Bolten, Mus. Bolt., 1798, p. 70, no. 905; + *A. sulcata* Lamarck, Syst. An. s. Vert., 1801, p. 99; + *A. papyracea* Link, Besch. Rostock Samml., 1807, p. 85; + *A. argo* Lamarck, An. s. Vert., 1822, 7, p. 652; Blainville, Dict. Sci. Nat., 1826, 43, p. 212 (after *Cymbium tenue* Gualtieri, 1742); + *A. haustum* Dillwyn, Rec. Shells, 1817, 1, p. 335 (testa junior); + *A. naviformis* Conrad, Journ. Acad. Nat. Sci. Phila., 1854, 2d ser. 2, p. 334. Mediterranean.

The Mediterranean form was early selected from amongst the heterogeneous assembly contained in the *Argonauta argo* of Linné and the older authors. Martini's figure 157, referred to by Bolten, shows only moderate auriculation, which is

the rule in Mediterranean specimens, the angles being more vertically extended than in most of the other species.

- B. 4. *A. argo* var. *americana* Dall, Bull. 37, U. S. Nat. Mus., 1889, p. 174, pl. 67, figs. 1-3. East coast of the United States south of Cape Cod, and the West Indies.

This form is small, broad-backed, and strongly auriculate.

- B. 5. *A. pacifica* Dall, Amer. Nat., 1869, 3, p. 237; Amer. Journ. Conch., Nov., 1871, 7, p. 95.

This is more compressed than the *americana* and with pronounced auricles. Its range extends from Monterey, California, south to the Galapagos Islands.

- C. *A. bulleri* Kirk, Trans. N. Zealand Inst., May, 1886, n. s., 1 (18), p. 138, pl. 4. New Zealand.

This form has a wide auriculate aperture, and its sides slope rapidly to a narrow, deeply channelled keel with particularly sharp compressed tubercles. This results in a wedge-shaped form, apparently unique in the group.

- D. 1. *A. nouryi* Lorois; see page 224 for synonymy and remarks.

- E. 1. *A. dispar* Conrad, Journ. Acad. Nat. Sci. Phila., 1854, n. s., 2, p. 332, pl. 34, figs. 3, 3a. Locality unknown.

This form, by its simple aperture and partly tuberculate dorsal channel, recalls *A. nouryi*, which is however smaller, less compressed, and differently sculptured. If *A. cornuta* has an inauriculate form, this species might represent it, judging by the figures given by Conrad.

- E. 2. *A. cornuta* Conrad; see page 224 for synonymy and remarks.

- F. 2. *A. nodosa* Solander, Portland Cat. 1786, p. 96, no. 2120, based on the form without auricles figured by Rumphius, Amboin. Rariteitk., pl. 18, fig. 1; + *A. oryzata* Meuschen (*ex parte*), Mus. Gev., 1787, p. 252; + *A. tuberculata* Bolten, Mus. Bolt., 1798, p. 71; + *A. rotunda* Perry, Conch., 1811, pl. 42, fig. 2; + *A. tuberculatus* Shaw, Nat. Misc., 1811, 23, pl. 995; + *A. gracilis* Kirk, Trans. N. Zeal. Inst., 1885, 17, p. 58, pl. 13, upper figs. Brazil; Cape of Good Hope, New Zealand, Indo Pacific.

Meuschen's species *oryzata* was a compound of *Argonauta* and *Carinaria* and his nomenclature not Linnean.

- F. 1. *A. bibula* Bolten, Mus. Bolt., 1798, p. 71, after Martini, Conch. Cat., 1769, 1, pl. 18, fig. 160 = *Nautilus papyraceus auritus* of Favanne, 1756, pl. 7, fig. A. 7; + *A. tuberculosa* Lamarck, An. s. Vert., 1822, 7, p. 652; + *A. tuberculata* Kirk, Trans. N. Zeal. Inst., 1885, 17, p. 58, pl. 13, lower figures; + *A. nodosa forma aurita* Martens, Ann. Mag. N. Hist., 1867, 3d ser., 20, p. 104.

Indo Pacific, Moluccas, New Zealand. This at first sight looks very different from the simple *nodosa*, but there are intermediate phases.

- G. 1. *A. navicula* Solander, Portland Cat., 1786, p. 44, no. 1055; after Rumphius, Amboin. Rariteitk., pl. 18, fig. 4; + *A. nitida* Lamareck, An. s. Vert., 1822, 7, p. 653 (syn. excl.); + *A. oweni* Adams and Reeve, Zool. Voy. Samarang, Moll., 1850, p. 4, pl. 3, figs. 1a-1d; + *A. kochiana* Dunker, Zeitschr. Mal., May, 1852, p. 49; Novit. Conch., Moll. Marina, 1858, p. 29, pl. 9, figs. 7, 8; + *A. polita* Conrad, Journ. Acad. Nat. Sci. Phila., 1854, 2d ser., 2, p. 333, pl. 34, fig. 4. Antilles, South Atlantic, Indo Pacific region.

Even this polished species will show traces of granulation between the ribs in some specimens. Lamareck's synonyms include the auriculate form, but in his diagnosis he mentions that his shell is not auriculate.

- G. 2. *A. hians* Solander, Portland Cat., 1786, p. 44, no. 1055; after Rumphius, Amboin. Rariteitk., pl. 18, fig. B; + *A. gondola* et *hians* Dillwyn, Rec. Shells, 1817, 1, pp. 334, 335; + *A. raricostata* Leach, Phil. Trans., 1817, p. 296, pl. 11, fide Blainville, Dict. Sci. Nat., 1826, 43, p. 213; + *A. hians* Adams and Reeve, Zool. Voy. Samarang, Moll., 1850, p. 4, pl. 3, figs. 2a-2c; + *A. crassica* Blainville, *op. cit.* (young shell), p. 213. Antilles, South Atlantic, Indo Pacific region.
- H. *A. boettgeri* Maltzan, Journ. de Conchyl., 1881, 29, p. 163, pl. 9, fig. 7; Smith Ann. Mag. N. Hist., 1887, 4th ser., 20, p. 409, pl. 17, figs. 1-6. Indo Pacific region, China Seas, Chagos Islands, Mauritius, Australia.

A small, closely rolled, inauriculate brown species, quite distinct in character.

- I. 1. *A. fragilis* Parkinson, Proc. Boston Soc. N. Hist., Aug., 1856, 5, p. 387. Locality unknown.

After a careful examination of the description of this unfigured species, I am inclined to believe it based on an abnormal specimen.

- I. 2. *A. geniculata* Gould, Wilkes Exploring Expedition, Moll. and shells, 1852, p. 470, pl. 45, figs. 585 a-c; Otia Conch., 1862, p. 231. Rio Janeiro.

This name is based on the animal of an Argonaut taken without the shell and fully figured in the report.

- I. 3. *A. rufa* Owen, name only, Trans. Zool. Soc. Lond., 1836, 2, p. 114; Gray Cat. Moll. Brit. Mus., Ceph., 1849, p. 34. South Pacific.

The only description of this alleged species is comprised in the five words "animal and shell thick, red," in Gray's catalogue.

- I. 4. *A. conradi* Parkinson, *op. cit.*, 1856, p. 386. "New Nantucket," Pacific Ocean.

The description of this small and unfigured shell reads as if it might relate to a variety or mutation of *A. dispar* Conrad.

## GASTROPODA.

## EUTHYNEURA.

## PTEROPODA.

## THECOSOMATA.

*Cavoliniidae.*

## CAVOLINA ABILDGAARD.

- Monoculus* (sp.) Linné, Syst. Nat., 1758, ed. 10, p. 635; 1767, ed. 12, p. 1059.  
*Anomia* sp., Forskäl, Desc. Anim. Orient., 1775, p. 124; Gmelin, Syst. Nat., 1791, p. 3348.  
*Cavolina* Abildgaard, Skrivter Naturh. Selsk., 1791, 1 pt. 2, p. 173, pl. 10; not of Bruguière, Enc. Meth., 1791, pl. 85.  
*Cavolina* Poli, Test. utr. Sicil., 1826, 3, p. 38.  
*Rheda*, Anonymous, Mus. Calonnianum, 1797, p. 41 (*nomen nudum*), fide H. and A. Adams, Gen. Rec. Moll., 1853, 1, p. 51.  
*Hyalaea* Lamarck, Prodrôme, 1799, p. 89; Syst. An. s. Vert., 1801, p. 139.  
*Tricla* Oken, Lehrb. d. Zool., 1815, 3, pp. xi, 327, not of Retzius, 1788.  
*Orbignyia* A. Adams, Ann. Mag. N. Hist., 1859, 3d ser., 3, p. 45.  
*Cavolina* Fischer, Man. de Conchyl., 1883, p. 434; Pelseneer, Chall. Rep. Pter., 1887, p. 69; not of Menke, Zeitschr. Mal., 1844, 1, p. 73.

According to Poli, the naturalist, from whose manuscript and drawings this genus was recognized by Abildgaard, was named Caulini, which is properly rendered into Latin by Poli in the form Cavlina. The rendering Cavolina, though inexact, has precedence and must be adopted, though there is some doubt whether the name of Bruguière or Abildgaard has precedence, both having been published in the same year. Gioeni figured this genus, but did not name it, hence it is inaccurate to refer to him as the author of the name, as too often has been done.

*Cavolina telemus* LINNÉ.

- Monoculus* ? *telemus* Linné, Syst. Nat., 1758, ed. 10, p. 1059. Mediterranean.  
*Anomia tridentata* Forskäl, Descr. Anim. Orient., 1775, p. 124; Gmelin, Syst. Nat., 1791, p. 3348.  
*Clio volitans* Caulini, Descr. An. ined. Crat. Nap., 1826, MS., fide Poli, p. 38.  
*Cavolina natans* Abildgaard, Skrivter Naturh. Selsk., 1791, 1, part 2, p. 175, pl. 10.  
*Hyalaea tridentata* Lamarck, Prodrôme, 1799, p. 89.  
*Hyalaea cornea* Lamarck, Syst. An. s. Vert., 1801, p. 140; Roissy, Hist. Nat. des Moll., 1806, 5, p. 73.  
*Hyalaea tridentata* Bosc, Hist. Nat. Coq., 1802, 2, p. 241; Boas, Spolia atlantica, 1886, p. 115, pl. 1, figs. 8, 9; pl. 2, fig. 19; pl. 4, fig. 66; pl. 6, fig. 100.

*Cavolina telemus* A. Adams, Ann. Mag. N. Hist., 1859, 3d ser., 3, p. 44.

*Cavolina tridentata* Fischer, Man. de Conchyl., 1883, p. 434; Pelseener, Chall. Rep. Pter., 1887, p. 83.

Station 3407, U. S. S. "Albatross," in 885 fathoms, near the Galapagos Islands.

This species was obtained by the "Albatross" in 1887 at several stations in the South Atlantic off the coast of South America and is widely distributed in the open sea of both the Atlantic and Pacific oceans. A long list of stations is given by Boas, and Arthur Adams reports it common in the Atlantic and Indian oceans.

The tendency of the early authors who had small collections of pteropods was to name each distinguishable form, and doubtless far too many names were proposed. The reaction from this has swung the pendulum in the other direction perhaps too far, and it is probable that a more thorough knowledge of the living animals would show the truth to lie between these extremes. The uniformity of the living animals taken from a single swarm, and the wide differences of form, color, and proportion which appear in the sketches made from life, can hardly all be attributed to errors of the draughtsman, though the latter must also be allowed for. It is the writer's opinion that future investigation will show that there are some species of *Cavolina*, at least, which have very similar tests, but differ in form and color of the flippers and other parts of the body.

The full illustration of the stages of growth in the various thecosomatous pteropods is yet a desideratum.

The unequal contraction of muscular and cellular tissue in alcohol, which is exceptionally great among the pteropods, prevents the student of alcoholic material from gaining any just idea of the proportions of the living animal, while its rich violet or crimson coloration is almost wholly lost.

Dr. J. I. Peck discussed the pteropods of the "Albatross" voyage around the Horn, but the very few collected, and the small number of stations, render generalizations on his material of very little weight.

The rapid dissolution of the fragile pteropod shells under the influence of the carbon dioxide contained in sea water at considerable depths is absolutely certain, and unless the dead shells were almost immediately recovered by the dredge, no trace would remain of them. It is probable that a very few months are all that is needed to completely dissolve the shell of a *Cavolina* or *Cleodora*. In regions where there is a considerable quantity of organic lime-material on the bottom, as off St. Augustine, Florida, in 400 fathoms, the small pteropod shells are well preserved, but in the deeper and more argillaceous areas they are found with extreme rarity, though abundant on the surface. Hence little can be safely predicated from the absence of pteropod shells on a given bottom, and it is absolutely unsafe to base generalizations of distribution upon negative evidence of this kind.

The season of the year and the state of the great oceanic currents has much to do with the abundance and even the presence of pteropods. In the Pacific the writer has made some twenty-six voyages between California and the Aleutian Islands, on nearly all of which a tow net was kept going. Consequently a tolerably full

series of observations has been made on the area northeast of a line drawn from San Francisco to Unalashka Island. The chief oceanic current in this area is the enfeebled remnant of the Kuro Siwo and its deflected northerly and southerly arms. A drift of Arctic water southward is noticeable near the passes between the Aleutian Islands. The latter brings Clione and Limacina from Bering Sea, and the latter genus reaches, on the southerly arm, or coastal current, sometimes as far south as Monterey, California.

The Kuro Siwo is at the height of its strength and temperature in the early part of September in this region. Its surface water 300 miles off shore sometimes rises as high as 68° Fahrenheit, though the heat is rapidly given off to the atmosphere after the coast is reached, and the southerly arm off San Francisco has a temperature of only 54° Fahrenheit. The warm belt is never more than fifty miles in width in the area in question. The current is imperceptible, as such, in winter and early spring, when one encounters only northern pteropods. At this season, and well up to July, no pteropods of the genera Cleodora, Cavolina, Pneumodermon, and Corolla were taken north of latitude 38°. After this time the Kuro Siwo water begins to be noticed in the temperatures, and the forms mentioned are more or less prevalent in small swarms. In September they exist in great abundance, brought in the warm water as far north as latitude 50° and less abundantly to latitude 54°.

The Cavolina, Cleodora, and Pneumodermon are apt to appear (when present in the area) at the surface during calms, especially if the sun be overcast. The last mentioned genus is particularly noticeable from the disturbance caused by the rapid movements of its large and powerful flippers. Its motions recall those of humblebees over a field of clover. If a breeze of any strength springs up, the pteropods sink to a calmer stratum. I am unable to say positively that they are habitually crepuscular, but it is a fact that my largest hauls have been made about sundown. These animals are not equally distributed over the sea, but are distinctly gregarious, occurring in large swarms, which are trailed out into long bands by the action of the winds. Adjacent tracts of ocean may be almost destitute of pteropods. I was much surprised in opening the stomach of a large sunfish taken off Point Reyes, California, to find it crammed with Cleodora. That such a slow and clumsy creature as *Orthagoriscus mola* could gorge itself with the nimble pteropods was indeed remarkable. Another fact of interest was developed by the examination of molluscan fragments found in the stomachs of the Pacific salmon fresh from the sea, sent me by Professor Kofoid of the University of California for identification. These consisted almost exclusively of Spirialis and Limacina, showing that the last meal of the fish had been taken in cold water. In the Northeast Pacific I have not taken these two genera in the open sea, but only near shore in the colder coast currents.

The form collected by me in 1865 and 1871, and from living specimens of which carefully enlarged colored figures were drawn, differed so much from the figures given by Rang, Souleyet, and other authors as representing the Mediterranean *tridentata* (= *telemus*) that it seemed impossible that both should belong

to the same species, but pending further investigations I gave it in my notes the varietal name of *C. occidentalis*; the large Atlantic form, or anything corresponding to the Mediterranean animal not having been obtained in the Northeast Pacific during fifteen years of collecting.

The following notes were made upon the animal<sup>1</sup> (see plate 12, figures 1, 1*b*, 1*c*.). The fully adult shell measures 9 mm. long, 6 mm. in greatest width, and 5 mm. in greatest convexity. The "appareil de fermeture" consists of a tooth-like process projecting on each side from the ventral plate and entering a depression in the inner side of the dorsal plate. The ventral lip is strongly constricted close to its narrowly reflected anterior margin. The posterior median spine is usually decollate at the tip. The back has a broad median and two narrower lateral obscure ridges ending at the thickened "bridle" or concentric callous ridge characteristic of this species; the ventral plate is most convex in front, where it is suddenly constricted; the portion near the aperture strongly marked by concentric whitish impressed lines with wider interspaces, though these do not interrupt the smoothness of the surface. The "hood" or produced margin of the dorsal plate, instead of being produced in a nearly continuous plate as figured by Boas for *C. tridentata* (= *telemus*), is bent ventrally in a curved manner over the aperture, and about half the anterior convexity of the ventral plate is thus overshadowed. The whole shell is shorter and more globose than the Mediterranean form as figured by Boas, and the lateral slits behind the interlocking processes form a straight even line, not arcuate and anteriorly expanding, as in the figures referred to.

It seems amazing that, with the opportunity at Naples and elsewhere, neither the author of the "Challenger" Report, Boas, nor any other recent writer on these animals, has troubled himself to give a drawing from life of the animal forming the type of the genus, nor even a careful description of its external characters while living. So we are obliged to fall back on the drawings and engravings of the field naturalists of half a century ago, whose discrimination of species from the life is treated with so little consideration by the histologists of to-day.

Pelseneer has given us an excellent generalized description of the anatomy in his "Challenger" Report, comparing it with the more archaic *Cleodora*. But no attempt is made by him to compare all the anatomical features of the several species among themselves in this genus. Any one, however, who compares the best existing figures of the living animal, such as those in the voyage of the "Bonite," will be struck by the extreme differences between any one of them and the animal about to be described.

The animal swims on its back, the ventral surface of the parapodia uppermost, advancing by a jerking motion due to the simultaneous flapping of the parapodia at the average rate of eighty strokes to the minute.

When weary, the animal contracts the parapodia, which are then turned backward, partially overlapping each other and folded fan-wise before being withdrawn into the shell (see figure 1*b*). When fully expanded, the parapodia in the

<sup>1</sup> U. S. N. Mus. 110,591.

present species have their front edges in a nearly straight line, slightly notched medially, and extend about four times the width of the shell, or some 20 mm. When folded preparatory to complete retraction, they are contracted about one-fourth of their extent.

The parapodia are roughly triangular with the anterior margin longest, the lateral margin distinctly trilobate and passing imperceptibly into the posterior lamina, which is slightly reflected over the reflected anterior edge of the ventral plate. In no case was this lamina seen to extend over the convexity of the ventral plate, as it is asserted to do in the Mediterranean species. If the dimensions of the figures of the animal in the plates of the "Bonite" are taken from the fully expanded animal (which I strongly doubt), they are hardly half as large as those of our Pacific variety. But the contractibility of these delicate organs is so excessive that in a dead or exhausted specimen the real extent of the fins is never shown, much less in one which has been subjected to a preservative fluid. The appendages of the mantle which extend from the lateral slits are short and also trilobed, but not deeply; in the Mediterranean form they are represented as entire or obscurely bilobate, and longer. The color of the living animal is translucent yellowish, with two large, sharply defined dark violet spots on the parapodia, and a paler violet of some of the viscera shining through the shell. In the Mediterranean form the violet is represented as gradually fading out toward the edge of the parapodia, but in the Pacific variety the violet area is dark up to its extreme edges and not graduated in any way. The anterior edge is mesially indented; behind and above it extend two small tentacles (figure 1c) minutely swollen at their distal ends. The right-hand one is about twice as long as the left one. The mouth is axial in its longest diameter, narrow, with raised margin slightly pointed in front.

In captivity in a bowl of fresh sea water the individuals kept up swimming for some time. When exhausted, they drew in the parapodia and slowly sank to the bottom of the bowl. After a rest they would resume their activity, and several of them lived for three days, the water being frequently renewed.

The most nearly related species, so far as the soft parts are concerned, to our Pacific variety is *C. gibbosa* Rang, as figured by D'Orbigny in the *Voyage dans l'Amerique Méridionale*, but this species has a shell of quite different form.

*Hyalaea truncata* Krauss (1848), which appears to be the same as *H. cumingi* Deshayes (1877), seems to me from authentic specimens to be a distinct species. It is reported from the South Atlantic in latitude 40° S., the Cape of Good Hope, and the Indian Ocean.

The very great discrepancy in size of extreme mutations of the species of *Cavolina* has led to the separation of some of them as distinct species, but we have in such genera as *Cypraea* and *Marginella* other instances of such discrepancies between individuals of the same species. Individuals of a single swarm are usually nearly identical in size, according to my observations. It is therefore not improbable that the discrepancies observed are due to some conditions of food supply or temperature which have affected a particular swarm during its period of adolescence, which is presumably very short.

**Cavolina uncinata RANG.**

*Hyalaea uncinata* Rang (MS.), in D'Orbigny, Voy. dans l'Am. Mérid., 1836, p. 93, pl. 5, figs. 11-13.

*Cavolina uncinata* Gray, Cat. Moll. Brit. Mus., 1850, 2, Pteropoda, p. 7.

Station 3422, U. S. S. "Albatross," off Acapulco, Mexico, U. S. N. Mus. 123,071; stations 3354 and 3392 in the Gulf of Panama; and station 3398 off the coast of Ecuador.

General distribution in the Atlantic from off Martha's Vineyard, Massachusetts, in about latitude 41° N. south to latitude 20° 30' S., eastward to the Cape of Good Hope, the Indian Ocean, and the Bay of Bengal; the China and Japan seas in the Western Pacific, and in the Eastern Pacific from the equator to Cape St. Lucas in about latitude 23° N. It was found by Grayson very abundant on the surface near the entrance to the Gulf of California.

**Cavolina longirostris LESUEUR.**

*Hyalaea longirostris* Lesueur (MS.), in Blainville, Dict. Sci. Nat., 1821, 22, p. 81.

*Hyalaea limbata* D'Orbigny, Voy. dans l'Am. Mérid., 1836, p. 101, pl. 6, figs. 11-15.

*Cavolina longirostra* Gray, Cat. Moll. Brit. Mus., 1850, 2, Pteropoda, p. 8.

U. S. S. "Albatross," stations 3407 and 4751, near the Galapagos Islands; U. S. N. Mus. 123,072; and station 3422, off Acapulco, Mexico.

General distribution, in the Atlantic, from about latitude 42° N., south to latitude 40° S.; eastward to the Indian Ocean, Red Sea, Australia, the Philippines, and Japan; and in the Eastern Pacific from latitude 23° N. to latitude 12° S.

This is perhaps the most abundant, widely distributed, and variable species of the genus. Adult specimens vary from 7.5 × 6.0 mm., to 3.0 × 2.25 mm. in length and width.

While discussing the pteropods, it may be mentioned that *Olio sulcata* Pfeffer, was obtained off Manta, Ecuador, by the "Albatross" in 1888; and *Cavolina inflexa* Lesueur, and *Limacina inflata* Orbigny, were dredged off Cerros Island, Lower California, in 1889.

**OPISTHOBRANCHIATA.****TECTIBRANCHIATA.***Acteonidae.***ACTEON MONTFORT.**

*Acteon* Montfort, Conch. Syst., 1810, 2, p. 314; type *Voluta tornatilis* Gmelin; not *Acteon* Fleming, 1828, or *Actaeon* Oken, 1815.

*Solidula* (sp.) Fischer, Mus. Demidoff, 1807, p. 226; Tabl. Synopt. Zoogn., 1808, p. 126; type *Voluta solidula* Linné.

*Tornatelle* Lamarck, Extr. du Cours de Zool., 1812, p. 117; not latinized, no species cited.

*Tornatella* Lamarck, An. s. Vert., 1822, 6, p. 219.

*Speo* Risso, Hist. Nat. Eur. Mérid., 1825, p. 235; type *S. bifasciatus* Risso, l. c. fig. 107.

*Actæon* Voigt, in Cuvier, Das Thierr., 1834, 3, p. 201, not of Oken, 1815; Meek, Amer. Journ. Sci., 1863, ser. 2, 35, p. 87; and the majority of authors.

*Kanilla* Sowerby, Edin. New Phil. Journ., 1833, 15, p. 367, *nomen nudum*.

As Montfort says nothing to connect his *Actæon* with the mythological proper name *Actæon*, their identity is a pure assumption, and I therefore return to the original mode of spelling used by Montfort, Cuvier, D'Orbigny, Agassiz, and others of the earlier writers who adopted it.

The genus is represented on the west coast of America in the recent fauna by the following groups:

*Actæon* s. s. Spire produced, outer lip simple not thickened, a single plait upon the pillar, continuous with the anterior margin of the aperture and with no sulcus or canal anteriorly. Type *A. tornatilis* Gmel.

*Rictaxis* Dall, 1871 (*Actæonidea* Gabb, 1873). Like *Actæon*, but with the anterior end of the pillar truncate and projecting. Both the above operculate. Type *A. punctocoelata* Carpenter.

*Microglyphis* Dall, 1902. Shell short and swollen, pillar with two distinct plaits and a well-marked siphonal sulcus anteriorly. Inoperculate. Type *A. curtulus* Dall.

This last group resembles *Tornatellaea (bella)* Conrad, 1860, described from the so-called "Lignitic" of Alabama, but the latter differs by its thickened and, in the mature condition, denticulate outer lip, and peculiar acute nepionic shell which is quite unlike that of any recent form of *Actæon* known to me. Conrad's original figure was taken from an immature specimen. *Tornatellaea* is not known in the recent state. M. Cossmann has brought together indications of a large number of forms belonging to this family, but, unfortunately, the photographic figures by which they are illustrated are so imperfect that it is in many cases quite impracticable to gain from them any idea of the exact characters of the specimen figured.

### *Actæon panamensis* DALL, n. sp.

Plate 11, figure 6.

Shell with the apex badly eroded, but apparently blunt, with about four whorls, the last much the largest; spire shorter than the aperture; suture strongly marked, the whorl in front of it abrupt, but not channelled; periostracum pale

yellowish, nearly transparent, polished; sculpture of (on the penultimate whorl four) sharp distant spiral, fine, microscopically punctate, incised lines; these increase on the last whorl to about fifteen, of which five or six on the base are closer, the remainder, on the sides of the whorl, are less crowded, subequidistant, and similar; shell obscurely parallel-sided, slightly rounded, with a rounded and slightly protracted base; aperture narrow, rounded in front; the outer lip sharp, simple, or minutely notched by the incised spiral lines; body with a slight wash of callus; pillar straight, short, with a single obscure fold near the middle, which lags behind the aperture; there is no umbilical perforation. Lon., 7.0+; max. diam., 4.5 mm.

U. S. S. "Albatross," station 3392, in the Gulf of Panama, in 1270 fathoms, hard bottom, bottom temperature 36°.4 F. U. S. N. Mus. 123,074.

No species at all similar is reported from this part of the world, and hence, though the spire is imperfect, it has seemed best to name it.

### **Acteon (Microglyphis) mazatlanicus DALL, n. sp.**

#### **Plate 5, figure 7.**

Shell small, polished, white, acute, five-whorled, the spire shorter than the aperture; nucleus glassy, small, sinistral, mostly immersed in the following whorl; suture distinct, not channelled or appressed; early whorls moderately rounded, with extremely faint traces of spiral striation or smooth; last whorl obscurely angulate at the shoulder, above which the whorl slopes flatly toward the suture, remainder of the whorl evenly ovately rounded; sculpture of extremely fine, sharp, close-set spiral striae, with a tendency to pair, slightly less crowded behind the shoulder and more crowded on the base near the pillar; these striae are crossed by faint, irregularly distributed, slightly raised lines of growth, and are more or less microscopically punctate; periostracum imperceptible; outer lip thin, simple, sharp, slightly patulous toward the middle, and receding near the suture; pillar arcuate, truncate obliquely, and with two strong spiral plaits, the anterior of which is seated on the edge of the truncation and is continuous with a distinct notch at the end of the pillar, around which it passes imperceptibly into the margin of the lip; body with a faint wash of callus; base imperforate. Lon., 5.5; of spire, 2.3; max. diam., 3.0 mm.

U. S. S. "Albatross," station 3431, in 995 fathoms, mud, off Mazatlan, Mexico, bottom temperature 37°.0 F. U. S. N. Mus. 123,075.

This species is more acute and more closely sculptured than *A. (M.) breviculus* of the California coast, while the spire is more acutely pointed and the spiral sculpture more close-set than in *A. (M.) perconicus*, which approaches it more closely than either of the other known species of this subgenus.

The group is apparently characteristic of the West American coast from California to Cape Horn, but will probably be found elsewhere, in great depths of water.

**Acteon (Microglyphis) estuarinus** DALL, n. sp.

Shell small, white, plump, with a very short, rather acute spire, and swollen last whorl; there are four and a half closely coiled whorls, the nucleus being sinistral and sunken; when fresh, the shell is of a translucent pinkish white, the thicker parts near the suture are more opaque and give the effect of a white band in front of the suture; the general form resembles that of *A. (M.) curtulus*, though the shell, with the same number of whorls, is much larger, the spire less evenly dome-like, and the nucleus more sunken; suture very distinct, almost channelled; sculpture of fine, close-set, minutely punctate spiral lines, hardly visible without a lens; aperture with a well-marked anterior sulcus or canal; anterior plait on the pillar strong, prominent, the posterior plait weaker, and ending further within the aperture, but quite distinct. A very thin wash of callus on the body; outer lip thin, simple. Alt., 5.5; diam., 3.7; spire above the last whorl, 1.0 mm.

U. S. S. "Albatross," station 3194, off Estero Bay, California (N. Lat. 35° 23' 30"), in 92 fathoms sand, bottom temperature 45°.9 F.

It may be accidental, but two living specimens were both without the operculum, which is present in the littoral species of Acteon. The species of Microglyphis at present known are:

<i>M. estuarinus</i> Dall,	off Estero Bay, Cal.,	in 92 fms.
<i>M. breviculus</i> Dall, <sup>1</sup>	" Sta. Rosa Id., Cal.,	" 53 "
<i>M. mazatlanicus</i> Dall,	" Mazatlan, Mexico,	" 995 "
<i>M. perconicus</i> Dall,	" Galapagos Ids.,	" 812 "
<i>M. curtulus</i> Dall,	" Magellan Strait	" 122 "

The temperature of the water in which they lived was 37° to 48° F., and the bottom either sandy or muddy.

*Scaphandridae.***SCAPHANDER** MONTFORT.

*Scaphander* Montfort, Conch. Syst., 1810, 2, p. 334, type *Bulla lignaria* Linné.  
*Assula* Schumacher, Essai, 1817, pp. 78, 258.

The species of this genus are readily recognized, but the smaller forms belonging to the family are often so similar to Acteocina (Gray, 1847, type *Acteocina wetherilli* Lea, better known as Tornatina A. Adams, 1850) that in the absence of the soft parts the reference of the shell to a particular group must be regarded as merely provisional.

The nomenclature of the groups is also in an uncertain state, its final arrangement depending upon the anatomical characters as yet unknown. If we must

<sup>1</sup> See Plate 15, figure 12.

follow the extremists and reject such a name as *Cylichna* Lovén, on account of the prior existence of *Cylichnus* Burmeister, as has been pointed out by Pilsbry we must take the next valid group-name given to any part of the genus for the generic name and let subsequent appellations take precedence only in conformity with the order of their dates.

### *Scaphander cylindrellus* DALL, n. sp.

#### Plate 8, figure 1.

Shell subcylindric, thin, white, covered with a pale straw-colored periostracum, the aperture as long as the shell, with one and a half visible whorls; apex occluded except the last whorl and a half, which rise above and conspicuously overhang the spiral excavated callous deposit, which is also deeply concave at its distal edge where it meets the aperture; posterior margin raised above the edge of the preceding whorl in an even spiral, not produced at its termination as in most species of this genus; surface covered with minute spiral threads, mostly paired, the interspaces between the pairs usually wider than the threads and often wider than the pairs, the width decidedly irregular; the axial sculpture of small equal threads subequally spaced and crossing the spiral interspaces, but not overriding the spiral threads; the reticulum formed is rectangular and does not give the effect of punctation; aperture somewhat wider in front, but not flaring, as in most species of the genus; outer lip thin, body with a thin callus extending on to the pillar which is not gyrate and has no chink behind it; axis not pervious; anterior and posterior parts of the aperture excavated. Lon. of shell, 33; max. diam., 16 mm.

U. S. S. "Albatross," station 4672, 88 miles southwest of Palominos Light, Peru, in 2845 fathoms, infusorial ooze, bottom temperature 35°.2 F. U. S. N. Mus. 110,563.

This species is much thinner and even more cylindrical than *S. gracilis* Watson, which is its nearest ally in the genus.

### *Scaphander interruptus* DALL.

#### Plate 19, figure 9.

*Scaphander interruptus* Dall, Proc. U. S. Nat. Mus., 1889, 12, p. 297, pl. 12, fig. 12.

U. S. S. "Albatross," station 2788, on the southern coast of Chile, in 1050 fathoms, mud, bottom temperature 37° F.; station 2807, near the Galapagos Islands, in 812 fathoms, ooze, temperature 38°.4; station 3392, in the Pacific west of the Gulf of Panama and northwest of the Galapagos Islands, in 1270 fathoms, hard bottom, temperature at bottom 36°.4 F. U. S. N. Mus. 123,077. One of the specimens obtained was living.

Fragments were also obtained at station 3360, in 1672 fathoms, sand, tempera-

ture 42°; and 3393, in 1020 fathoms, mud, temperature 36°.8, both in the Gulf of Panama.

The species is more conical than *S. cylindrellus*, the apex wider, more blunt, and the spire less sunken. The sculpture is stronger and relatively coarser in the young shell above described. A fragment of an adult measures about 30 mm. in length and 15 mm. in diameter; on it the sculpture is nearly obsolete; the loss of the periostracum may account for part of the difference, but that there was originally a considerable disparity is certain.

### **Scaphander decapitatus** DALL, n. sp.

Shell subcylindric, anterior and posterior ends about equally rounded, white, covered with a pale yellowish, thin, polished periostracum; apex with a small dimple, hardly a perforation, the edge of the aperture coiled around but hardly beyond the margin of the apex; axial sculpture only of faint lines of growth; the posterior fourth of the shell with numerous close, fine spiral striae, but no punctations; the middle part is without spirals; the anterior part with a few sparse, irregularly disposed spiral striae and numerous very faint, almost microscopic striulae; aperture as long as the shell, not produced or channelled behind; outer lip thin, nearly straight; body with a faintly granular, white, thin wash of callus; pillar thin, short, very obliquely attenuated. Lon. of shell, 15; max. diam., 8 mm.

U. S. S. "Albatross," station 3683, in Mid Pacific, N. latitude 9° 57' W., longitude 137° 47', in 2690 fathoms, radiolarian ooze, bottom temperature about 35° F. U. S. N. Mus. 110,746.

From the fact that the outer lip is not channelled or produced behind the apex of the whorls, this species has somewhat the aspect of a *Cylichnium*. The absence of punctuation is also unusual; but the shell has more the look of a *Scaphander* than anything else, and, in the lack of any knowledge of the soft parts, more exact reference to its place in the system must at present be deferred.

### **Sabatia** BELLARDI.

#### SABATINA DALL, nov.

The callosity on the body of the species of this subgenus in most if not all cases does not form a "fold." It is an amorphous mass, sometimes granular or smooth, but occasionally with a tubercular surface. The typical species, if correctly figured, does seem to have the callus produced into the interior, but the recent species without exception differ from Bellardi's fossil, not only in the character of the callus, but also in their globose, instead of pyriform, shell. For the globose recent species, therefore, I propose the name *Sabatina* with *S. planetica* Dall, as type. They have an animal capable of retiring wholly into the shell, and gastroliths exactly of the type found in *Scaphander lignarius*. A large foraminifer was found in the stomach of the following species.

**Scaphander (Sabatina) planeticus** DALL, n. sp.

Shell small for the genus, creamy white, of about four whorls; spire much more exposed than in the majority of species, the edges of all the whorls being visible, though in the specimen somewhat eroded; shell heavy, solid, widest behind, with the spire very low and the last whorl with a bluntly rounded shoulder behind which it is obscurely flattened; last whorl much the largest; axial sculpture starting from the distinct but shallow suture in the form of small arcuate retractive wrinkles, about four to a millimeter, which soon become obsolete, being hardly visible beyond the shoulder of the whorl; spiral sculpture of conspicuous close spiral lines of shallow but distinct punctations, the interspaces being flat and polished; aperture ample, somewhat patulous, outer edge thin and sharp; body with a heavy smooth white callus; pillar arcuate, callous, passing imperceptibly into the anterior margin of the aperture; gastroliths of exactly the same type as those of *S. lignarius*. Lon. of shell, 8; max. lat., 5.5 mm.

U. S. S. "Albatross," station 3684 in Mid Pacific, N. latitude  $0^{\circ} 50'$ , W. longitude  $137^{\circ} 54'$ , in 2463 fathoms, ooze, bottom temperature  $35^{\circ}$  F. U. S. N. Mus. 110,748.

None of the species with which I have compared this one have the spire exposed, but it may well be that this is not a character of extreme importance. The most conspicuous feature of this species, after the exposed spire, is the anterior attenuation of the profile, the main part of the penultimate whorl being in the posterior third of the shell.

**CYLICHNELLA** GABB.

*Bullina* Risso, Hist. Nat. Eur. Mer., 1826, 4, p. 51; not of Férussac, 1822.

*Cylindrella* Swainson, Mal., 1840, pp. 135, 326 (not p. 311); not of Pfeiffer, 1840.

*Cyliclina* Lovén, Index Moll. Scand. Occid., May, 1846, p. 10, 1st sp. *C. cylindracea* Pennant. Not *Cylichnus* Burmeister, Handb. Entom., 1844, 4, 171.

> *Cryptaxis* Jeffreys, Ann. Mag. N. Hist., 1883, 5th ser., 11, p. 400; not of Lowe, 1854, nor Reuss, 1865.

? *Mnestia* H. & A. Adams, Gen. Rec. Moll., 1854, 2, p. 10.

> *Cylichnella* Gabb, Proc. Acad. Nat. Sci. for 1872, Feb., 1873, p. 273 (type *Bulla bidentata* Orb.).

*Bullinella* Newton, Syst. List. Edw. Coll., 1891, p. 265.

*Clistaxis* Cossmann, Essais Pal. Comp., 1895, p. 90.

*Cyclina* Gray, Guide Moll., 1857, 1, p. 195; not of Deshayes, 1850, nor *Cyclinus* Kirby,<sup>1</sup> *Coleoptera*, 1837.

Swainson, in his Malacology, applied the name *Cylindrella* first to the present genus, and secondly to a Cone. In the latter case it may be surmised its use was accidental, perhaps a heterophemism for *Cylinder*. At any rate the latter use is

<sup>1</sup> in case one of these names has to be changed on account of their similarity, I would propose for Deshayes's genus the name *Eocyclina*.

ignored in the index to his volume. It is uncertain which use of *Cylindrella* was prior, Swainson's or Pfeiffer's; the latter having also used the name (for landshells of the genus *Urocoptis* Beck) in 1840. The presumption, however, is in Pfeiffer's favor, in comparison with Swainson. It would be a pity to resurrect a name so well known in so unfamiliar a connection. *Cylichnus* Burmeister is a barbarism, and cannot be derived by any recognized rule of orthography from the Greek *κυλίγνη*, from which we might obtain *Cylichnes* or *Cylichnium*, as well as *Cylichna*. The latter might thus be plausibly held until it be shown that *Cylichnus* is a masculine form of it. I do not like to use *Mnestia* for the genus, thinking it highly improbable that the colored species for which that name was proposed are identical with the group typified by *C. cylindracea* Pennant. The next name in order of date is *Cylichnella* Gabb, the shell of which differs from *Cylichna* by having two distinct plaits on the pillar instead of one, and since this has been recognized by Gabb, Pilsbry, and others as a distinction of rank not greater than subgeneric *Cylichnella* will become the generic name with the species formerly grouped under *Cylichna* now forming a subgenus with the name of *Bullinella* Newton. It is of course understood that with the general knowledge of the anatomy some revision will undoubtedly be called for.

The genus may be subdivided as follows:

#### A. SHELL UNICOLORATE, CYLINDRIC.

*CYLICHNELLA* Gabb, s. s., type *C. bidentata* Orb. Pillar with two distinct plaits.

*BULLINELLA* Newton, type *C. cylindracea* Pennant. Pillar with a single plait.

*CYLICHNIUM* Dall, *nov.*, type *Utriculus domitus* Dall. Pillar simple, aperture ample in front.

#### B. SHELL VERSICOLED, SUBOVATE.

*MNESTIA* H. and A. Adams, type, *C. marmorata* Adams.

### *Cylichnella* (*Bullinella*) *inca* DALL, n. sp.

#### Plate 11, figure 3.

Shell small, white, with a pale yellowish periostracum (mostly eroded), the aperture as long as the shell; spire entirely and deeply immersed, leaving only a small deep cylindrical perforation at the apex; summit of the whorls rather evenly rounded, except where slightly indented by the more pronounced incremental irregularities; sides nearly parallel, the posterior end, if anything, with a slightly greater diameter; surface smooth (where not eroded) except for lines of growth; middle of the shell a trifle constricted; body with a light wash of callus; outer lip thin, sharp; pillar a little twisted with a faint trace of a revolving ridge upon it; anterior end rounded. Lon., 6; max. diam., 2.5 mm.

U. S. S. "Albatross," station 3392, off the Gulf of Panama, in 1270 fathoms, hard bottom, temperature 36°.4 N. U. S. Nat. Mus., 123,080.

**Cylichnella (Cylichnium) pizarro** DALL, n. sp.**Plate 11, figure 1.**

Shell small, subcylindric, blunt behind, with the spire immersed, showing only a minute apical perforation; yellowish white with a thin, translucent polished periostracum; inner lip with a thin wash of callus; outer lip behind appressed toward but not quite touching the apex of the last whorl, gyrate, laterally straight, the lateral profile gently, convexly arcuate; margin thin, simple, slightly produced and excavated in front, and passing with but a hardly perceptible angle into the short straight pillar; over the latter is a wash of callus, but behind it no umbilical chink; sculpture of fine, close, spiral lines, microscopically punctate, and tending to arrange themselves in pairs; near the shoulder of the whorl are six or seven much stronger subequal and nearly equidistant spirals, apparently not punctate; inner lip quite smooth and the pillar unarmed; axis not pervious. Lon., 9.75; max. lat., 5.0 mm.

U. S. S. "Albatross," station 3392, off the Gulf of Panama in the Pacific, in 1270 fathoms, bottom temperature 36°. 4 F. U. S. N. Mus. 123,079.

The form of this species is not unlike that of *Cylichna crispula* Watson, from North Australia, but the latter is a very much smaller shell, has the outer lip more produced behind the apex, and the aperture in front more contracted.

**Cylichnella (Cylichnium) atahualpa** DALL, n. sp.**Plate 11, figure 2.**

Shell small, elongate, white with a pale yellowish periostracum which shows reddish brown in the incised sculpture; the aperture as long as the shell, the general form attenuated toward the extremities, especially in front, but moderately convex near the middle of the whorl; spire entirely concealed, the summit forming a shallow funnel, owing to the gyration of the posterior margin, about half of which is occupied by a deep rounded sulcus; apex imperforate but with a reflected edge of callus on the body, forming a chink at the bottom of the funnel; exterior polished, smooth except for faint lines of growth, but with a very few fine incised punctate lines close to the anterior and posterior margins of the shell; body with a thin callus with a brown line at the outer edge; outer lip thin, sharp; aperture narrow, deeply sulcate at each end; pillar simple, gyrate but not pervious, short and thick, with a little callus reflected upon it. Lon., 9; max. diam., 4 mm.

U. S. S. "Albatross," station 3354. Gulf of Panama, in 322 fathoms, mud, bottom temperature 46° F. U. S. N. Mus. 123,081.

*Bullariidae.***BULLARIA** RAFINESQUE.

*Bulla* Linné, Syst. Nat., 1758, ed. 10, p. 725; 1767, ed. 12, p. 1181; not of Linné, op. cit., ed. 10, p. 427, nor of Muller, Prodr. Zool. Dan., 1776, p. 242.

*Bullus* Montfort, Conch. Syst., 1810, 2, p. 330. Type *B. ampulla* L.

*Bullaria* Rafinesque, Anal. Nat., 1815, p. 142; new name for *Bulla* Linné.

*Bullea* Blainville, Malac., 1825, pp. 477, 626; not of Rafinesque, 1815.

*Gondole* Latreille, Fam. Nat. Règne Anim., 1825; German edition p. 171 (not *Cymbium*, as stated by H. and A. Adams, 2, p. 15).

*Vesica* Swainson, Malac., 1840, p. 360; not of the Mus. Calonnianum, 1797.

Linné first used the name *Bulla* for a subgenus of *Gryllus* (Orthoptera) and only subsequently applied it to a mollusk. The latter use, therefore, cannot prevail. As for M. Cossmann's reference to Klein, if we are to consider pre-Linnean authors, we must carry the name half a century further back and give his due to Rumphius.

*Bullus* Montfort, must be excluded by the same rule which is invoked against *Cylichna*. The next name in order of date is *Bullaria* of Rafinesque. Dumeril's quadrinomials being excluded as non-Linnean nomenclature, his *Bullarius* has no standing and does not exclude Rafinesque's name, which is accordingly adopted, the more readily as it recalls the more familiar *Bulla* of authors.

Among recent *Bullaria* two groups may be readily noted, the large brownish mottled forms from shallow water like *B. ampulla* L., the type of the genus, and the small, white, or nearly white species of the deep-sea fauna. For the latter with *Bulla abyssicola* Dall, as type, I propose the sectional name of **LEUCOPHYSEMA**.

### ***Bullaria* (*Leucophysema*) *morgana* Dall, n. sp.**

Plate 11, figure 4.

Shell small, yellowish-white, short-ovate; apex perforate, showing about half a turn of the involved spire; summit rounded, smooth; surface smooth except for more or less evident lines of growth and about twenty-two spiral incised lines, strongly punctate, between the summit and the anterior end; these lines are nearly equidistant and a little less deep on the periphery of the whorl than toward the extremities; outer lip gently arcuate forward, thin, simple; body with a thin white callus; pillar short, concavely arcuate, callous, and reflected. Lon., 5.5; max. diam., 4.0 mm.

U. S. S. "Albatross," station 3392, off the Gulf of Panama, in 1270 fathoms, hard bottom, temperature 36°.04 F. U. S. N. Mus. 123,082.

All the Nudibranchs and a part of the Tectibranchs, Gastropteron, and Marseniidae, having been sent to Doctor Rudolph Bergh of Copenhagen, it is not necessary to do more in regard to this part of the collection than to refer to his paper. Bulletin of the Museum of Comparative Zoölogy, 25, number 10, entitled "Die Opisthobranchien," comprising 110 pages and twelve plates, October, 1894.

Further information on the mollusks of these groups derived from this general region will be found in the paper by the same author in the Zoologische Jahrbuch, 3, Suppl. 4, 1898, entitled "Die Opisthobranchier der sammlung Plate," and comprising 100 pages and six plates.

## CTENOBRANCHIATA.

## ORTHODONTA.

## Toxoglossa.

*Terebridae*.

## TEREBRA BRUGUIÈRE.

- Terebra* Bruguière, *Encycl. Méth.*, Vers, 1789, 6, p. xv, no. 47 (no species mentioned); Lamarck, *Prodr.*, 1799, p. 71, no. 15 (type *Buccinum subulatum* Linné); *Syst. An. s. Vert.*, 1801, p. 78 (sole ex. *B. maculatum* Linné); *An. s. Vert.*, 1822, 7, p. 283; *Encycl. Méth.*, atlas, 1816, pl. 402; not of *Mus. Calonnianum*, 1797.
- Epitonium* (*pars*) Bolten, *Mus. Bolt.*, 1798, p. 93, sect. 3.
- Acus* (Anonymous) *Mus. Calonnianum*, 1797, p. 31 (first identifiable species *Buccinum lanceatum* Linné); not *Acus* Edwards, 1771.
- Vertagus* Link, *Beschr. Rostock Samml.*, 1807, p. 128 (first species *Buccinum maculatum* Linné), = *Terebra* Lam.
- Terebrum* Montfort, *Conch. Syst.*, 1810, 2, p. 430 (type *T. subulatum* L. sp.), = *Terebra* s. s. Lam.
- Terebraria* Rafinesque, *Analyse de la Nature*, 1815, p. 145 (new name for *Terebra* Brug.).
- > *Subula* Schumacher, *Essai*, 1817, p. 233 (sect.  $\alpha$  *Buc. maculatum* L.; sect.  $\beta$  *Buc. dimidiatum* L.).
- > *Acus* Gray, *P. Z. S.*, 1847, p. 139; *Guide Moll.*, B. M., 1857, p. 6; *A. maculatus* Linné; not *Acus* Edwards, 1771.
- > *Subula* Gray, *Guide Moll.* B. M., 1857, p. 6; *S. dimidiata* Linné.
- > *Leiodomus* Gray, *Guide Moll.* B. M., 1857, p. 6. *L. caeruleus* Lam.; not *Leiodomus* Swainson, 1840.
- > *Turricula* Herrmannsen, *Index Gen. Mal. Suppl.*, 1852, p. 137 (as of J. Hermann, 1783); not of Schumacher, 1817.
- > *Acus* H. and A. Adams, *Gen. Rec. Moll.*, 1853, 1, p. 224; type cited *A. maculata* L. sp.
- > *Abretia* H. and A. Adams, l. c., p. 225; first species *Terebra cerithina* Lam.
- > *Hastula* H. and A. Adams, l. c., p. 225, no type selected (not *Hastula* Miller, *Lepid.*, 1857); Tryon, *Struct. Syst. Conch.*, 1883, 2, p. 182 (*Terebra strigilata* Lam. non Gmelin, selected as type); Fischer, *Man. de Conchyl.*, 1883, p. 587.
- > *Euryta* H. and A. Adams, l. c., p. 225, 1st sp. *T. aciculata* Lamarck (not *Euryta* Gistel, 1848) = *Mazatlanina* Dall, 1900.
- > *Myurella* Hinds, in Sowerby, *Thes. Conch.*, 1844, 1, pt. 5, p. 171, no type selected; Herrmannsen, *Index Gen. Mal. Suppl.*, 1852, p. 89, selects *Terebra myuros* Lamarck (not *Myurella* Fischer, *Man. Conch.*, 1883, p. 587, *T. armillata* Hinds).
- > *Impages* E. A. Smith, *Ann. Mag. N. Hist.*, 1873, 4th ser., 11, p. 263; type *Terebra caeruleus* Lamarck; Fischer, *Man. de Conchyl.*, 1883, p. 587.

- > *Strioterebrum* Sacco, Moll. Terz. Piem., 1891, **10**, p. 33; type *Terebra basteroti* Nyst.
- > *Spineoterebra* Sacco, l. c., 1891, p. 58; type *Terebra* var. *spinulosa* Doderlein. fos. Tortonian.
- > *Fusoterebra* Sacco, l. c., 1891, p. 59; type *Fusus terebrinus* Bonelli, fossil, Tortonian.
- > *Myurella* Cossmann, Essais Pal. Comp., 1896, **2**, p. 49 (*T. affinis* Gray) = *Strioterebrum* Sacco, but not *Myurella* Hinds, 1844.
- > *Noditerebra* Cossmann, l. c., 1896, p. 51; type *T. geniculata* Tate, Miocene of Australia.
- > *Mazatlaniana* Dall, Nautilus, 1900, **14**, p. 44; Proc. U. S. Nat. Mus., 1903, **26**, p. 951, note; new name for *Euryta* Adams, not of Gistel.
- > *Oxymeris* Dall, Nautilus, Aug., 1900, **14**, p. 44; new name for *Acus* Gray, not of Edwards.
- > *Perirhoë*, *Triplostephanus*, *Acuminia*, and *Duplicaria* Dall, Nautilus, Mar., 1908, **21**, p. 124.

The nomenclatorial status of the genus *Terebra* and its subdivisions has been very confused. This is largely due to an error of Quoy and Gaimard, who figured *Terebra subulata* with the eyes wrongly placed, thus leading the brothers Adams into the mistake of dividing the genus on this character. Hinds, in placing the description of his subgenus *Myurella* after, instead of before the description of the three species he referred to it, has betrayed several careless authors into error. A few notes on the nomenclatorial history may make the changes required more easily understood.

The shells of this genus were called *Strombus* by Rumphius, and the name *Terebra*, introduced by Adanson for a heterogeneous assembly, was adopted binomially by Bruguière, in 1789, and a type, *T. subulata* (Linné) supplied by Lamarck ten years later. The name *Acus* was proposed in the anonymous *Museum Calonnianum* in 1797, but according to Sherborn had been used by Edwards for a fish in 1771. The name *Vertagus*, proposed by Link as a substitute for *Terebra*, in 1807, is an exact synonym of *Terebra* as treated by Lamarck. *Terebrum* Montfort, 1810, is based on the type species of *Terebra* Lamarck, and *Terebraria* Rafinesque, is another change arbitrarily proposed for the same genus. *Subula* Schumacher was proposed as a substitute for *Terebra*, because that author thought the shells "had more the form of an awl than of an auger." He divided the group into two sections, of which the first was named *Acus* by Gray, in 1847, with the type *T. maculata*, for which *Oxymeris* was substituted by Dall, in 1900, *Acus* being preoccupied. The second section of Schumacher typified by *Terebra dimidiata* will retain Schumacher's name in a sectional sense.

The name *Turricula* (for *T. subulata*), alleged by Herrmannsen to have been used by J. Hermann in his "Tabula" in 1773, does not appear in that work, though the plural form is used (not in a generic sense) to cover a subdivision of the heterogeneous genus *Buccinum*.

Hinds proposed, in 1844, for three species of *Terebra* having mostly spiral sculpture, strongly nodulous sutural band, many slender whorls, and a thickened

and projecting callosity on the inner lip in the adult, the name *Myurella*, based on the *Terebra myuros* of Lamarck, which was designated as type a little later by Herrmannsen. In 1873 E. A. Smith proposed the name *Impages* for *Terebra coerulescens* and a few similar species which were supposed to be characterized by a band of callus, extending over the body and somewhat behind the advancing suture.

The group named *Euryta* by Adams should doubtless be regarded as a distinct genus from *Terebra* proper, on account of its pervious axis and abbreviated nodulous form. The name being preoccupied for an *Acaleph*, the writer substituted *Mazatlania* in 1900. *Spineoterebra* Sacco, is proposed for a shell very similar to *Mazatlania*, but with a callous pillar, with a different canal and an impervious axis. The canal is so little indented that the siphonal fasciole is almost obsolete, and the keel, which usually marginates its posterior edge, is represented only by a slightly raised line of junction. Being doubtless the ancestor of *Mazatlania* and the name prior, it will take generic precedence, while *Mazatlania* will form a subdivision under it as a subgenus. Whether *Cossmann's Noditerebra* comes under *Spineoterebra* or is a variant of *Strioterebrum* is not clear from the description and rather obscure figure, and I have not been able to examine a specimen.

Having gone over the entire collection of recent *Terebra* in the National Museum, and tabulated the characters of each species, I have formulated the following arrangement. It should be premised, however, that apparently Hinds was quite right in concluding that so far as the shell characters are concerned, no rigorous lines of subdivision can be drawn within the genus, though groups which are for the great majority of the species perfectly recognizable may easily be segregated.

The larval shell throughout the group is the same, except in number of whorls. It is blunt, glassy, smooth, and forms a shorter or longer subcylindrical spire. It is usually dark-colored. The nepionic shell may agree in sculpture with the adult portion, or may be entirely different, its sculpture gradually becoming modified with growth. So far as reported the operculum is uniformly subannular, ovoid, narrow with a terminal nucleus.

The old genus *Terebra* is now admitted to be necessarily divided into four distinct genera as follows:

### *Terebridae.*

**TEREBRA** Bruguière. Radula edentulous, the proboscis forming a voluminous, muscular, evertible sac, in which the prey may be enfolded and its juices squeezed out and absorbed. The presence of a poison gland may be explained by supposing the secretion to paralyse the living prey when taken into the sac. Eyes terminal on very short small tentacles, and a long slender verge without appendages, are present. Type *Terebra subulata* (Linné).

**HASTULA** Adams. Radula with Toxoglossate teeth as in *Conus*, pierced for the secretion of a poison gland; eyes and tentacles present. Type *Terebra strigilata* Lamarck, not Gmelin.

DUPLICARIA Dall (*Myurella* Troschel, not Hinds). Radula with a double row of arcuate solid teeth, not pierced for secretion; no poison gland, eyes and tentacles wanting. Type *Terebra duplicata* Lamarck.

SPINEOTEREBRA Sacco. Shell with no presutural sulcus, the sculpture of knobby ribs, the siphonal fasciole and its posterior keel obsolete. Soft parts unknown. Type *Terebra* var. *spinulosa* Doderlein. Fossil of the Tortonian of Italy.

These genera are subdivisible on the basis of the shell, as far as now known, and the following groups seem recognizable.

### TEREBRA BRUGUIÈRE.

Subgenus (and section). STRIOTEREBRUM Sacco 1871.

Shell with uniform sculpture, relatively small, acute, a strongly marked presutural sulcus and band, whorls flattish with axial ribs and spiral sculpture, short canal or none, usually two keels on the pillar; the body is destitute of callus and without a raised pillar lip. Type *T. basteroti* Nyst.

A recent species is *T. dislocata* Say. *Noditerebra* Cossmann, does not appear to differ essentially.

Section FUSOTEREBRA Sacco, 1891.

Like *Strioterebrum* but with the axial sculpture emphasized, the spiral sculpture absent or obsolete, the sulcus feeble, and the canal more or less elongated. Type *Fusus terebrina* Bonelli, Miocene.

A recent species of this group is *Terebra benthalis* Dall, West Indies.

Section PERIRHOË Dall.

Like *Strioterebrum*, but with the axial sculpture obsolete or absent and the spiral emphasized. Type *Terebra circumcincta* Deshayes. *Acus rushii* Dall is an American species.

Section TRIPLOSTEPHANUS Dall.

Shell many whorled, slender, the whorls medially constricted, the sculpture uniform, the whorls with one or two nodulous bands in front of the suture, and a third angulating the base of the whorl, the spiral sculpture predominant, the axial (except the nodules) feeble, the body callous, with a raised inner lip. Type *Terebra triseriata* Gray.

This group was included by Hinds in the original *Myurella*, but the type of the latter has the young and old with discrepant sculpture, the later whorls having the reticulation of *Strioterebrum*, which has therefore usually been included in *Myurella*. It also has no basal keel and the whorl is not constricted. Both *Triplostephanus* and *Myurella*, like the great majority of the family, have only a single marginal keel on the anterior edge of the pillar.

Subgenus (and section) TEREBRA s. s.

Young with the sculpture of *Triplostephanus*. Shell slender with many whorls, the inner lip not callous, the sulcus and sutural band obsolete or absent, and the surface of the whorls smooth in the adult. Type *T. subulata* (L.) Lamarck.

## Section MYURELLA Hinds, 1844.

Young with double nodulous band and strong sulcus in front of the suture, shell many whorled, the whorls not constricted, in the adult the nodules obsolete and the band and sculpture as in *Strioterebrum*, inner lip callous and elevated. Type *Terebra myuros* Lamarck.

See remarks under preceding section. The sulcus is persistent in the adult, though the character of the band alters.

## Section SUBULA Schumacher, 1817.

Young with presutural sulcus and band, band and body regularly axially ribbed, the whorl not constricted. Adult shell with many slender whorls, smooth, but with the sulcus persistent; inner lip not callous, other features as in *Terebra*. Type *Terebra dimidiata* (Linné).

This is the second section of *Schumacher's* *Subula* to which the name was restricted by Gray, in 1847.

Section ABRETIA H. and A. Adams, 1853. = *Abretella* Dall -

Shell small, sculpture uniform, but in the later whorls more or less obsolete, sulcus persistent, whorls axially evenly ribbed, not constricted; young acute, adult subcylindric; columellar lip callous: the posterior angle of the aperture compressed into a sort of channel. Type *Terebra cerithina* Lamarck.

## Section OXYMERIS Dall, 1900.

Shell large, heavy, acute, the later whorls rapidly enlarging; the young as in *Subula*, the sulcus not persistent in the adult, which has the later whorls smooth. Type *Terebra maculata* Lamarck.

This is *Acus* Gray, 1847, not of Edwards, 1771.

## Subgenus (and section) ACUMINIA Dall.

Young with flat axially regularly ribbed whorls, blunt at the suture without sutural band or sulcus, shell slender, many whorled, the adult smooth, the columellar lip bare, with no canal, but a deep siphonal sulcus. Type *Terebra lanceata* (Linné).

This section of *Subula* is remarkable for the total absence of the presutural sulcus.

**HASTULA ADAMS.**

## Subgenus HASTULA H. and A. Adams, 1853.

Shell small and slender, the sculpture similar in young and old; no presutural band or sulcus, no canal, suture appressed, sculpture of fine axial wrinkles and feeble spiral striae, whorls flattish, spire acute, columellar lip with a thin callus, the posterior angle of the aperture channelled; colors usually dark and lurid. Type *Terebra strigillata* Lamarck.

This is a widely distributed group of peculiar sculpture and coloration, represented by closely similar species in nearly all the tropical seas.

Subgenus *IMPAGES* Smith, 1873.

Shell larger with whorls flat and rapidly enlarging; sculpture of young and old discrepant. Young, faintly axially ribbed, the suture appressed, with no sulcus or band; the adult smooth, a thin wash of callus on the body, extending over the whorl behind the line of the following suture; inner lip not raised, the aperture with no posterior channel or anterior canal, but a deep siphonal sulcus, the pillar with one more or less hidden keel. Type *Terebra coerulea* Lamarck.

The band of enamel behind the suture is not very conspicuous and may not be of much systematic value; the other characters, however, seem to give it a certain value.

### **DUPLICARIA** DALL. *< Diplomeriza Dall 191*

*DUPLICARIA* Dall, Nautilus, March, 1908, p. 124.

Shell small, acute, similarly sculptured throughout, with sharp, regular, numerous axial ribs crossing the flat whorls and divided by a conspicuous spiral sulcus; suture distinctly channelled; pillar with a single keel, the columellar lip not callous or raised, the canal obsolete, the aperture with no posterior channel. Type *Terebra duplicata* Lamarck.

This is *Myurella* Troschel, not Hinds. The anatomical characters have already been mentioned and forbid its consolidation with the other genera. It is the only group in the family with a channelled suture.

### **SPINEOTEREBRA** SACCO.

Subgenus *SPINEOTEREBRA* Sacco, 1801, s. s.

Shell rather elongate, with knobby axial sculpture, no spiral sculpture, an impervious axis, and a markedly callous pillar lip. Type *Terebra spinulosa* Doderlein, Tortonian. The siphonal fasciole is nearly obsolete.

Subgenus *MAZATLANIA* Dall, 1900.

Shell shorter, buccinoid, thin, with sparse knobbed axial ribbing, spiral sculpture conspicuous toward the canal; the pillar gyrate, the axis pervious, the pillar lip bare, the siphonal fasciole well developed. Type *Terebra aciculata* Lamarck.

*Mazatlanian* is *Euryta* Adams, 1853, not of Gistel, 1848. It appears to be a descendant of *Spineoterebra*, which is intermediate between *Strioterebrum* and *Mazatlanian*. The soft parts of both are unknown.

### *Terebra (Strioterebrum) panamensis* DALL, n. sp.

Plate 5, figure 10.

Shell small, acute, twelve-whorled, with rather prominent sculpture and a generally brownish tint; nucleus eroded in all the specimens; subsequent whorls

nearly uniformly sculptured with (on the penultimate whorl 17) sharp, narrow, equal and equidistant, slightly retractive axial ribs, separated by wider shallow interspaces, crossed by (between the sutures 3-5) spiral cords which become slightly nodulous at the intersections; the spirals are uniformly spaced except at the summit, where there are two closely adjacent which may unite as a presutural band, or remain divided like the others; at the periphery of the base is a narrower cord separated from those behind by a wider space; the suture is coiled on this keel, while the space behind it gives the effect of a channelled suture; on the base the ribs extend toward the canal, the spirals are smaller than those between the sutures, and about seven in number, but owing to the obsolescence of the ribs they are not tuberculate and form no distinct reticulations; the base is constricted above the siphonal fasciole, which is sometimes bordered by a keel, which on the adult pillar is lost in the thick callus; canal short, wide, recurved; outer lip thin, throat not lirate. Lon., 22; max. diam., 6 mm.

U. S. S. "Albatross," station 3291, Gulf of Panama, in 153 fathoms, mud, bottom temperature 55° 8 F. U. S. N. Mus., 123,084.

Also at station 2834, in 48 fathoms, mud, off the west coast of Lower California, in latitude 26° 14' N. near Ballenas Bay, bottom temperature 53° 9.

The reticulation of this species is so close and strong that the sutural band is rendered quite inconspicuous.

### *Terebra (Strioterebrum) pedroana* DALL, n. sp.

Shell small, slender, acute, apex (slightly decollate); subsequent whorls flattened, about eleven in number, the sutural band, on the early whorls, axially undulate by the prolongations of the ribs across the feeble sulcus to the suture; axial sculpture of numerous, nearly vertical, low, narrow riblets with wider interspaces, proportionately less marked on the last whorl; these are crossed without nodulation by three obscure flattish spiral bands, with one or two narrower and more thread-like, and on the base of the last whorl six or seven more feeble spirals of the same sort, all with narrower feebly channelled interspaces; aperture narrow behind a thin callus and anterior keel on the pillar; outer lip thin, sharp; canal very short, recurved, bordered by a prominent sharp keel on the posterior edge of the siphonal fasciole, hardly visible on the pillar but perceptible within the whorls; color bluish white with irregular blotches of yellowish brown, or all brownish. Lon. of (decollate) shell, 32; of last whorl, 12; of aperture, 8; max. diam., 6.5 mm.

U. S. Nat. Museum 118,806 and 32,772, both from San Pedro, California, Stearns and Mrs. Burton Williamson.

This species, which had been regarded as a variety of *T. plicata* Gray, resembles that species but is smaller and more slender. The specimens had been in the collection many years. Further search will doubtless show it to be extended southward in its geographical range.

***Terebra (Strioterebrum) balaenorum* DALL, n. sp.**

Shell small, slender, acute, whitish flesh-color, with occasional brown flecks, or all pale brown, with about fifteen whorls, of which the apical three are glassy, smooth, and brownish; subsequent whorls flattish, with a well-marked nodulous presutural band and impressed sulcus; the nodules are subrectangular, corresponding to the axial ribs, which are feeble, moderately retractively arcuate and about seventeen in number on the penultimate whorl; in front of the band are six or seven flattish straplike or threadlike spiral little-elevated ridges, irregular in width with narrower interspaces and obscure very fine spiral striation visible on top of the ridges here and there, the base being similarly sculptured with rather narrower ridges; all the ridges are slightly nodulous or wavy when interrupted by the ribs; aperture elongate, lozenge-shaped, the outer lip thin, inner lip polished but not callous, pillar hardly keeled; canal reduced to a notch, siphonal fasciole with a sharp posterior keel. Lon. of shell, 27.0; of last whorl, 10.5; of aperture, 7.0; max. diam., 6.0 mm.

U. S. S. "Albatross," station 2835, off Ballenas Bay, west coast of Lower California, in five and a half fathoms, mud. U. S. N. Mus. 110,599; also at La Paz, Gulf of California, by W. J. Fisher.

This species is somewhat like Reeve's figure of *Terebra serotina* Adams and Reeve, from Japan, which, however, is a larger species, has a double band of nodules and a callous inner lip.

***Terebra (Strioterebrum) lucana*, DALL, n. sp.**

Shell small, straw-colored, acute, with about fourteen whorls, the apex blunt and slightly swollen and, with the following whorl, glassy, smooth, and polished; subsequent whorls flat, regularly increasing, with a rather wide, closely vertically ribbed presutural band, which is also closely spirally evenly threaded with about five threads; the sulcus is marked by a series of rather deep punctations between the raised axial sculpture; body of the penultimate whorl with about thirty-two similar narrow, low, nearly vertical, wave-like ribs which are also prolonged across the band and are separated by rather wider interspaces; these are crossed between the sulcus and the next preceding suture by about a dozen even, nearly uniform and uniformly spaced spiral threads with narrower interspaces which have an almost punctate appearance from the fine reticulation; similar threads and the anterior prolongations of the ribs cover the base; aperture narrow, rather long; outer lip simple, inner lip slightly glazed; pillar with two distinct rounded plaits; canal distinct; fasciole lamellose with a strong posterior keel. Lon. of shell, 36; of last whorl, 14; of aperture, 9; max. diam., 7 mm.

U. S. S. "Albatross," station 2830, west of the southern extreme of Lower California, in 66 fathoms, sand, bottom temperature 74° F. U. S. N. Mus. 96,567.

This species is nearest to *T. hindsii* Deshayes (not Carpenter) from China, but is more regularly conical and acute, the whorls flatter with a relatively wider

sutural band which is much less prominent. The *T. hindsii* of Carpenter was published earlier than the species of the same name described by Deshayes and the latter was later re-named *T. bruguieri* by Reeve.

***Terebra (Strioterebrum) bridgesi* DALL, n. sp.**

Shell very small, livid purple, with a white peripheral broad band and the more prominent portions of the axial sculpture more or less whitish; with about three smooth coniform glassy nepionic whorls, and nine or more subsequent sculptured whorls; penultimate whorl with about twelve strong, short, rounded, whitish ribs which have wider interspaces and become obsolete at the periphery of the shell; the sutural band is very distinct, set off by a strongly constricted sulcus, while the whorl in front is rounded and more prominent than the band; the latter is similarly ribbed, but the ends of the ribs on the body of the whorl meet the band at the interspaces between the ribs on the band so that the two alternate; the interspaces on the band show about three, and the rest of the whorl between the sulcus and the suture about five or six sharply incised grooves which do not cross the ribs; the base is similarly sculptured with rather distant grooves; aperture ample, outer lip thin, sharp, inner lip bare, canal reduced to a wide, short sulcus, the fasciole obscure, the pillar with one obscure plait. Lon. of shell, 10.5; of last whorl, 4.0; of aperture, 2.5; max. diam., 2.5 mm.

Panama, Bridges. U. S. N. Mus. 9404.

This is a remarkably distinct and peculiar little species, very uniform in color and sculpture, which was collected at Panama by the late Thomas Bridges and acquired by the Museum with the Stearns Collection.

***Terebra (Perirhoë?) stylus* DALL, n. sp.**

Shell with the extreme tip defective but having about sixteen subsequent whorls remaining, of a uniform pale yellowish brown, not far from straw color; axial sculpture only of sigmoid incremental lines; spiral sculpture consisting of a moderately prominent presutural band, divided by an incised line at its anterior third, giving somewhat the effect of a double band; in front of this are about seven fine spiral threads with narrower interspaces; on the last whorl these threads appear uneven, some being stouter than others; the periphery is obscurely subangular, the base finely spirally closely threaded; these spiral threads are hardly visible without a lens; aperture semilunate, short, a glaze on the body and pillar; canal very short, constricted, and recurved, a keel behind the fasciole not continued on the pillar. Lon. of shell, 29; of last whorl, 7; of aperture, 4; max. diam., 5 mm.

Panama Bay, Stearns, U. S. N. Mus. 32,773.

This species approaches *T. laevigata* Gray, but has longer whorls and a less prominent and conspicuous presutural band.

**Terebra (Subula) lingualis HINDS.**

*Terebra lingualis* Hinds, Proc. Zool. Soc. London, 1843, p. 153; Thes. Conch., 1844, 1, pt. 11, p. 167, pl. 43, fig. 50; Reeve, Conch. Icon., 1860, 12, Mon. Terebra, pl. 5, fig. 15.

*Terebra insignis* Deshayes, Journ. de Conchyl., 1857, 6, p. 70, pl. 3, fig. 2.

*Terebra robusta (pars)* Tryon, Man. Conch., 1885, 7, p. 11, pl. 2, fig. 17; not of Hinds, 1843.

U. S. S. "Albatross," station 3354, one dead and broken specimen, Gulf of Panama, in 322 fathoms, mud, bottom temperature 46° F. U. S. N. Mus. 123,083. Probably disgorged by a fish. Gulf of Papagayo and Bay of Montijo, west coast of the State of Panama, Middle America, in ten to seventeen fathoms, sandy mud, Cuming.

It is not likely that this well-known species lived at a depth of 322 fathoms. It was dredged in Panama Bay at two localities in 33 fathoms, bottom temperature 64°F., off Guaymas in 20 fathoms, and near the head of the Gulf of California, in 33 fathoms, mud. Other localities represented in the National Museum are: Cape St. Lucas, Puerto Libertad, and Real Llejos. It had also been reported from the last mentioned locality by Mörch.

*Conidae.***CONUS LINNÉ.****Conus gradatus MAWE.**

*Conus gradatus* Mawe, Conch., 1823, p. 90; Wood, Suppl. Ind. Test., Conus, 1828, fig. 6.

U. S. S. "Albatross," station 3368, in 66 fathoms, rocky bottom, near Cocos Island, Gulf of Panama; one dead specimen, verging toward the variety *regularis* Sowerby. The species ranges from the Gulf of California to Panama.

**Conus ? sieboldi REEVE.**

*Conus ? sieboldi* Reeve, Conch. Icon., 1848, 1, Conus, fig. 269; Sowerby, Thes. Conch., 1857, 3, p. 13, pl. 202, fig. 369.

U. S. S. "Albatross," station 4642, four miles off Hood Island, Galapagos Ids., in 300 fathoms.

A broken fragment, agreeing very well with Sowerby's figure of this species, was obtained as above, U. S. N. Mus. 110,614. It was originally described from Japan, and better material may in future show the Galapagos shell to be distinct.

*Turritidae.***TURRIS** BOLTEN.

- Turris* Rumphius, Amboynische Rareitkammer, 1704; Argenville, Conchyliologie, 1757; Chemnitz, Conchylien Cabinet, 1780 (nomenclature prelinnean).  
*Murex* (sp.) Linné, Syst. Nat., 1758, ed. 10, p. 753; 1767, Ed. 12, p. 1220.  
*Fusus* (ex parte) Helbling, Abhandl. ein. privatges. in Boehmen, 1779, 4, p. 116; not of Lamarck, 1799.  
*Turris* (Anonymous) in Mus. Calonnianum, 1797, p. 34, 82; nude name including *T. babylonius*.  
*Turris* Bolten, Mus. Boltenianum, 1798, p. 123; 1st species *Murex babylonius* Linné, after *Turris babylonica* of Rumphius.  
*Pleurotoma* Lamarck, Prodrôme, 1799, p. 73; sole ex. *Murex babylonius* Linné.  
*Turris* Gray, P. Z. S. 1847, p. 134, type *T. babylonius* (Linné); H. and A. Adams, Gen. Rec. Moll., 1853, 1, p. 87; Weinkauff, Jahrb. Mal. Ges., 1875, p. 285; Martini-Chemnitz, Conch. Cab. Zweite Ausg., 1876, 4, pt. 3, *Pleurotomacea* p. 5; Gabb, Journ. Acad. Nat. Sci. Phila., 1860, 2d ser., 4, p. 378; Dall, Journ. Conch. (Leeds), April, 1906, 11, p. 291; not *Turris* Montfort, 1810, nor *Turris* Lesson, 1837.

The name *Turris* was originally proposed by Rumphius in 1704 for the shell afterward called *Murex babylonius* by Linné. He was followed by other non-binomial writers, such as Argenville and Chemnitz. The first binomial use of the name was in the anonymous Museum Calonnianum, but the names of both genus and species listed under it are absolutely "nude." The only way of knowing what the author of the list meant is by a manuscript note of Humphrey which was inserted in copies sold by him. *Turris* "Humphrey" is erroneously stated by Herrmannsen and Cossmann to have been equivalent to *Turritella*, which is called *Terebra* in the Museum Calonnianum.

In the following year the publication of Bolten's catalogue introduced *Turris* in the sense originated by Rumphius nearly a century before and with the same type included.

In this Bolten was followed by Fabricius in 1822,<sup>1</sup> Gray in 1847, and H. and A. Adams in 1853. No other course is consistent with the rules of nomenclature, as is shown by the writer in an impending publication on the Miocene Fossils of Oregon.

A year after the issue of Bolten's catalogue Lamarck, disregarding a century of usage and tradition, proposed the name *Pleurotoma* for this group, which has generally been adopted, owing to the wider circulation of Lamarck's Animaux sans Vertèbres, and the influence of the French school, at that time the most brilliant workers in Conchology of the whole world.

It is with regret that we are obliged to discard a familiar name, but there seems to be no alternative open to the impartial student.

<sup>1</sup> Fortegnelse, p. 83. This is stated on the authority of Herrmannsen, as the writer has not been able to consult this work.

This family probably contains more species than any other group of Gastropods of the same rank. Their variations are such that subdivision is imperatively necessary, and numerous generic and subgeneric names have been applied to both recent and fossil groups. The work has been done in a more or less superficial manner, and the result is that the nomenclature of the group stands in great need of revision by some one who will go into the matter with thoroughness, patience, and care. I have felt unable at present to give the time needed, and therefore feel obliged to state that the subdivisions adopted in this memoir are but provisionally and tentatively used. The final systematic arrangement of the family cannot be had until the anatomy and dentition are better known. There is little doubt, however, that the subdivisions will prove fully as numerous as they are at present, though many of the old ones will have to be rejected for various reasons.

At present the most convenient way of dividing the family seems to be by separating the two groups of operculate and inoperculate species as subfamilies *Turritinae* and *Mangiliinae* respectively.

The following groups are recognizable among the species of *Turritinae* treated of in this memoir:

**TURRIS** s. s., large fusiform strongly sculptured shells, with a long spire, a long straight canal, the outer lip not thickened or reflected, the anal sulcus not close to the suture, and the operculum claw-shaped or narrowly oval, with an apical nucleus.

**SURCULA** H. and A. Adams, 1853 (*Surgula* Weinkauff, 1876). Shells similar, but with the body more robust, the canal shorter and often more or less curved, the sinus close to the suture. Type *Murex javanus* Linné.

**DRILLIA** Gray, 1838. Shells relatively smaller, solid, mostly strongly sculptured, with a conspicuous sulcus anteriorly and another near the suture in a thickened and produced outer lip; a callous inner lip and short canal. Type *D. umbilicata* Gray.

**GEMMULA** Weinkauff, 1876. Shell resembling *Drillia*, but with a thin and simple outer lip without an anterior sulcus, and the pillar lip usually simple, hardly callous, the sculpture most emphasized in a spiral direction, often with a prominent beaded keel at or in front of the anal fasciole. Type *Pleurotoma gemmata* Hinds. *Hemipleurotoma* Cossmann, 1889, is believed to be synonymous.

**PSEUDOTOMA** Bellardi, 1875. Shell ovate, fusiform, short, stout; spire about the length of the aperture, columella straight, very short, axis impervious, canal very short and wide; anal sulcus wide, moderately deep, close to the suture; spiral sculpture feeble, axial of moderately strong riblets; operculum wide, ovate, with apical nucleus. Type *Pleurotoma intorta* Brocchi.

**LEUCOSYRINX** Dall, 1889. Shell moderately large, thin, white, or pale, with impervious axis, the sculpture chiefly of delicate spiral threading with feeble axial riblets at the shoulder; anal fasciole wide, shallow, next the suture; canal moderately long, distally flaring; the pillar thick, anteriorly obliquely truncate; oper-

culum subovate, acute in front, with a medial thickened rib on the inner face, the area of attachment small, the nucleus apical. Type *Pleurotoma verrilli* Dall.

This group is chiefly Atlantic in its distribution, and as at first used comprised some species which I now separate as follows:

**IRENOSYRINX** Dall, nov., 1908. Shell large, thin, fusiform white, with a keel at the shoulder; sculpture feeble, wholly spiral; anal sulcus wide, shallow, nearer the shoulder than the suture; axis pervious, aperture and canal longer than the spire; outer lip produced, thin, simple; canal elongate, pillar obliquely truncate; operculum in the young paucispiral, later the paucispiral nucleus is surrounded by concentric additions, leaving the nucleus subcentral, or a little anterior and to the right, in an elliptical concentric operculum without internal rib, with a large area of adhesion, and an outline in general like the operculum of *Buccinum*. Type *Pleurotoma (Leucosyrinx) goodei* Dall.

This group seems rather characteristic of the eastern Pacific, usually in rather deep water. The *Turris (Aforia) circinata* Dall, from the North Pacific, has much the same type of shell, though of a brown color, but has the operculum narrow with an apical nucleus, and, in the adult, a prominent and singular channel in the anterior part of the outer lip. *Irenosyrinx* is doubtless a modification of the type *Steiraxis*, in which the operculum remains permanently paucispiral.

**COCHLESPIRA** Conrad, 1865. Shell moderate in size, with a subacute, few whorled, glassy nucleus, elongated slender, straight canal, the whorls tabulated by a sharp recurved spinose or beaded keel, between which and the suture the surface is concave, nearly smooth; anal sulcus deep, narrow, the fasciole separated from the suture by a beaded ridge, the outer margin of the fasciole not elevated. Type *Pleurotoma cristata* Conrad. Oligocene fossil.

This group is extremely close to *Ancistrosyrinx* Dall, 1881, the latter differing only by having the anal sulcus at the suture, with no intervening ridge, while the outer margin of the fasciole has an elevated lamella between which and the reflected keel at the shoulder there is an excavated channel. These differences hold good between the Oligocene and the recent forms, so far known, without exception. The recent forms have an operculum like that of *Leucosyrinx*.

**STEIRAXIS** Dall, 1895. Shell resembling *Irenosyrinx*, but with stronger sculpture and with a paucispiral operculum, bearing such a relation to the normal species of *Turris* as *Mohnia* bears to *Chrysodomus*.

**CALLIOTECTUM** Dall, 1889. Shell with a dark vernicose periostracum, no differentiated canal, anal sulcus or fasciole; axially ribbed, pillar thin, twisted; axis impervious; outer lip simple, arcuate, thin, not internally lirate; operculum like that of *Fusinus*, but arcuate; animal blind, without radula or poison gland. Type *C. vernicosum* Dall. *belongs in Mollusca*

By a misplacement of a sheet of the MS., not detected at the time, this group appeared in the original publication as a subdivision of *Mangilia* instead of *Pleurotoma*.

In the *Mangiliinae* the following groups have species referred to in this paper:

**BORSONIA** Bellardi, 1838. Shell fusiform, with spiral and axial sculpture, the anal sulcus close to the suture, wide and shallow; the canal elongated, the pillar with a single plait (or, according to Cossmann, in the type species two) on the proximal part of the pillar. Type *B. prima* Bellardi.

The abyssal and Pacific Coast species are sufficiently different and numerous to stand as a distinct group from that containing the Italian fossils, as follows :

**BORSONELLA** Dall, nov., 1908. Shell with a small, blunt nucleus of one or two whorls, sculpture chiefly spiral, feeble, except for one or two spiral carinae, sometimes with a few small riblets or beads on the principal carina; periostracum conspicuous, smooth or vermiculate; canal wide and very short; outer lip sharp, simple, arcuate; pillar solid, with one strong, nearly horizontal plait continuous upon the whole axis; axis impervious, operculum absent. Type *Borsonia dalli* Arnold. = *B. angelona* Hanna. *Col. Acad.* XIII, p. 158, 172 ff.

There is never more than one plait in *Borsonella*; in *Cordieria*, as restricted by Cossmann, there are never less than two. In *Rouaultia* the anal sulcus is narrow, sharp, and situated at the shoulder in the peripheral carina. Both *Cordieria* and typical *Borsonia* have a long and slender canal and the general aspect of *Gemula*, while *Borsonella* resembles an *Antiplanes* with a strong plait on the proximal part of the pillar.

**GYMNOBELA** Verrill, 1884. Shell ample, stout, smaller than the average *Pleurotomella*, with a short spire and no operculum. Type *G. curta* Verrill.

These shells occupy, so far as the shell characters are concerned, a place in the *Mangiliinae* analogous to that which is assigned to *Bela* among the operculate forms.

**PLEUROTOMELLA** Verrill, 1873. Shell with a small blunt nucleus of several whorls, closely arcuately axially ribbed, the succeeding whorls with axial and spiral sculpture, short-fusiform; the anal sulcus close to the suture, deep and wide, with a distinct fasciole; canal very short, narrow, recurved; outer lip thin, simple, sharp; pillar thin, gyrate, anteriorly obliquely truncate, almost pervious. Animal blind, inoperculate. Type *P. packardii* Verrill.

The original type was a small, very delicate shell, but species subsequently added to the group attain a notable size and solidity.

**PHYMORHYNCHUS** Dall, 1908, nov. Shell thin, smooth, or spirally sculptured, axial sculpture less conspicuous; fusiform, canal nearly obsolete, pillar and outer lip simple; sulcus wide, shallow, close to the suture; animal blind, with a distinct muzzle into which the proboscis is retracted, operculum wanting. Type *Pleurotomella castanea* Dall.

The average *Pleurotomoid* gastropod, as far as indicated by the animals figured and those examined by the writer, has a simple orifice under and covered by the head and expanded tentacular bases; in the species of the present section a projecting flat-ended muzzle exists, which permanently extends beyond the line joining the tentacles, and into an aperture in the end of which the proboscis is

retracted. The three species known to possess this character have therefore been thought worthy of a special name.

**MANGILIA** Risso, 1826. Shell small, with an elevated spire, feeble spiral and more emphatic axial sculpture; aperture elongate, outer lip thin, entire, simple; anal sulcus obscure; animal inoperculate. Type *M. costulata* Risso = *Murex nebula* Montagu.

Risso named no type, and his species are heterogeneous, as were those of Leach published a quarter of a century later. *M. striolata* Risso, suggested as type by Gray in 1847, cannot be accepted in that character, as it does not agree with the generic diagnosis, being a *Clathurella*. By taking the first species as type, which also agrees, not only with the diagnosis but with the majority of the species mentioned by Risso, we come to a result harmonious with the practice of the majority of authors who have treated of the genus. This will exclude from the group a few species of *Cythara* and *Clathurella* unwisely included in Risso's original list. Since the name of the author intended to be honored was Mangili, we accept the correction proposed by Philippi to the *Mangilia* of Leach and Risso.

**CLATHURELLA** Carpenter, 1856. Shell small, short-fusiform, with spiral and axial sculpture, usually pronounced; the last whorl large, with a very short canal; outer lip varicose, the margin in the adult projecting as a thin lamina somewhat beyond the varix; anal sulcus strong, not deep, close to but not at the suture, the narrow bit of the outer lip behind the sulcus projected sometimes upon the body of the inner lip as a dentiform or nodulous morsel of callus; except this the body and columella bare, free from callus or lirae or denticulation; canal narrow, slightly recurved; suture distinct, spire rather acute, operculum wanting. Type *Defrancia pagoda* Millet; Tertiary fossil, 1825, not *Pleurotoma pagoda* Reeve, 1845.

The genus *Defrancia* was proposed by Millet in a paper printed in the early part of 1827, and in the course of that year it was adopted by Des Moulins and shortly after by several other authors. It was soon pointed out that the name was preoccupied in Polyzoa by Brown, and Philip Carpenter in 1856 proposed for *Defrancia* Millet, *non* Brown, the new name of *Clathurella*, on the ground that the former name is preoccupied. Carpenter named no type, and therefore those who concern themselves with the genus must accept as the type of *Clathurella* the type of the original *Defrancia* Millet. Millet himself named no type, though his species seem all congeneric.

Lovén, who adopted *Defrancia* in 1846, referred to it the recent *Pleurotoma linearis*, which, although a member of the genus, was not included in Millet's list. Notwithstanding this it has been generally cited as the type of the genus following Gray's mention of it in 1847. The only species mentioned by Millet which is averred to be found living is his *D. suturalis*. This is stated by several authors to be identical with *Pleurotoma gracilis* Philippi (= *emarginata* Donovan) which has served as the type for the groups *Bellardia* Bucquoy, Dollfus and Dautzenberg, 1882, not of Mayer, 1870; *Comarmondia* Monterosato, 1884, and *Bellar*

diella Fischer, 1883; and also includes a large number of Bellardi's species of Homotoma according to Cossmann, who makes the group under the name of Bellardiella a subgenus of Daphnella which he thinks has a similar nucleus. It is curious that, while the figure of the nucleus given by M. Cossmann (that of *Murex textilis* Brocchi) correctly illustrates the nucleus of Daphnella, the nucleus of *Bellardiella gracilis* is entirely different. It is irregularly coiled and swollen, without sculpture, except for the punctations which are a feature of the whole surface of this species, and on the last whorl, which assumes a strong peripheral carina before the mature sculpture begins to be developed. The nucleus of Daphnella, on the other hand, is a typical "*Sinusigera*." So it would seem as if *Bellardiella (gracilis)*, whether it agrees with the typical form of Defrancia (= Clathurella) or not, can at least not be united with Daphnella on account of a similarity of its nuclear characters.

As three of Millet's five species are the victims of a more or less complicated and possibly doubtful synonymy, and no type was mentioned in the original publication, it is best to take as type one of those which seem free from uncertainty, and preferably his largest and first species, *Defrancia pagoda* (pl. 9, fig. 1). It should not be forgotten, however, that Millet himself points out that the subsutural callus mentioned in his diagnosis is not invariably present. As Clathurella takes the type of Defrancia, the species just mentioned will serve the substituted generic name in the same capacity.

GLYPHOSTOMA Gabb, 1872. Shell small, fusiform, elegantly and profusely sculptured; aperture varicose, columellar lip lirate or denticulate, the outer lip similarly ornamented; sinus deep and conspicuous, canal moderately produced and recurved, operculum absent; nucleus conic, of a few polished unicarinate whorls. Type *G. dentifera* Gabb.

This group is related to Clathurella, from which it differs by the dentate or lirate pillar lip in the adult, and the very conspicuous anal sulcus. The species assigned to it have a common facies which cannot be mistaken when once recognized, and having usually a brilliant surface polish, are among the most elegant of small gastropods. The suture is less constricted and the whorls less rounded than in Clathurella.

EUBELA Dall, 1889. Shell small, thin, glossy, polished, the outer lip sharp, simple, arcuate; pillar and inner lip simple, canal inconspicuous, reduced to a mere angle as in *Trichotropis*, operculum wanting, nucleus of the *Sinusigera* type; anal sulcus at the suture, very inconspicuous and shallow. Type *Daphnella (Eubela) limacina* Dall.

The typical species has a pretty garland of nodules in front of the suture but this proves to be merely a specific character.

SURCULINA Dall, 1908, *nov.* Shell of moderate or small size, slender, elongate-fusiform, the earlier whorls feebly ribbed or axially sculptured, the later ones with fine even spiral sculpture; spire acute, suture appressed, aperture long and narrow; both lips perfectly simple; pillar straight, outer lip gently arcuate, anal

sinus obsolescent at the suture; canal rather wide, long; operculum wanting. Nucleus eroded. Type *S. blanda* Dall.

The characteristic sculpture and form of these little shells is very notable. They resemble in miniature *Irenosyrinx* without the operculum or carinae. If one may be permitted to judge from a figure only, the *Homotoma producta* Bellardi, should belong to it.

CLINURA Bellardi, 1875. Shell solid, short, biconic, the whorls strongly carinate at the periphery and flattened toward the suture; anal sulcus wide and deep, close to the suture; canal short and recurved; axial sculpture inconspicuous, operculum absent. Type *Pleurotoma calliope* Brocchi.

This section is convenient for holding a few species with very marked form which, if rounded instead of carinate and with a less constricted suture, might easily find a place with *Gymnobela*.

BELLARDIELLA Fischer, 1883 (*Bellardia* B. D. and D., 1882). Shell small, fusiform, with axial and subequal spiral sculpture; nucleus having the exposed part with a trochoid aspect, and carrying the *Sinusigera* sculpture; subsequent whorls rounded, with very distinct suture; anal sulcus at the suture, rather deep, leaving an inconspicuous fasciole; outer lip thin, simple, sharp, much produced in arcuate form; pillar simple, obliquely truncate in front, twisted, impervious; animal inoperculate. Type *Murex gracilis* Montagu.

It is particularly called to the reader's attention that the above groups are accepted tentatively for the purpose of this paper and that, in so accepting them, subject to future revision, no attempt at a new classification or arrangement of this family is intended.

### **Turris (Surcula) fusinella** DALL, n. sp.

#### **Plate 14, figure 7.**

Shell small, slender, delicate, white with a faint suffusion toward the periphery of pale pinkish, with ten or more whorls; spire acute, a little shorter than the aperture; nucleus of three elevated whorls milk-white, glassy, smooth, abruptly changing to the adult type of sculpture; fifth whorl with seven, ninth with ten, short axial ribs, chiefly visible on the periphery, crossed by two strong spiral cords, more or less turgid at the intersections; the whorl above these cords is somewhat excavated with a nearly smooth surface except for lines of growth and three or four spiral threads, more distinct and numerous on the later whorls; base bordered by a prominent cord on which the suture is laid, giving the effect of a presutural ridge just behind the anal fasciole; on the base are about 20 more cords with a tendency to alternate in size; the whole surface has minute spiral striae and lines of growth which form a microscopic reticulation only visible with a good lens; aperture rounded, canal long, slender; body polished and the sculpture eroded; pillar white, callous, obliquely truncate in front, slightly twisted, not pervious; outer

lip thin, simple; anal sulcus wide, shallow. Lon. of shell, 17; of aperture, 9; max. diam. 5 mm.

U. S. S. "Albatross," station 3391, in the Gulf of Panama, in 153 fathoms, mud, bottom temperature 55° 8 F. U. S. N. Mus. 123,086. Also at station 3017, off Cape Lobos, Gulf of California, west coast of Mexico, in 53 fathoms, mud, bottom temperature 61° 8 F. U. S. N. Mus. 110,600.

This species has very much the look of a small *Fusinus* of the typical group.

### ***Turris (Surcula) dolenta* DALL, n. sp.**

Shell elongate, acutely fusiform, white, with nine rather rounded whorls following the (lost) nucleus; general aspect recalling the preceding species but larger, with a proportionately more swollen body whorl; fifth whorl with nine, ninth with nine short protractive axial ribs confined to the shoulder and periphery; the whorls are covered with spiral threads of which two marginating the suture and two on the periphery are more conspicuous than the rest, but not perceptibly nodulous; between the peripheral cords there are, on the later whorls, from two to four minor threads; on the base of the last whorl there are six or seven major, as many intermediate, and about a dozen minor threads; the suture is very closely appressed and the anal fasciole nearly free from axial and with only very fine spiral threads; anal sulcus wide and deep beginning at the suture; outer lip thin, much produced, roundly arcuate to the somewhat constricted base of the whorl; aperture, including the canal, as long as the spire; pillar smooth, white, not callous; obliquely attenuated in front, the canal ample; flaring a little in front; axis impervious; the back of the canal closely spirally threaded; length of shell, 36.5; of aperture, 19.25; max. diam. of last whorl, 13.0 mm.

U. S. S. "Albatross," station 2804, in Panama Bay, in 47 fathoms, mud; U. S. N. Mus. 96,645 (type) and station 3389, Gulf of Panama, in 200 fathoms, mud, bottom temperature 48° 8 F.

With extremely similar sculpture this differs from *T. fusinella* in size and in the proportions of the whorls, which are also of a dull white surface, while *T. fusinella* is polished and shows indications of a color band which in some specimens may be well marked.

### ***Turris (Surcula) armilda* DALL, n. sp.**

Shell small, delicate, fleshy white, obscurely banded with brown, a pale belt on the last whorl just in front of the periphery; whorls eight excluding the (lost) nucleus; spire acute, slightly shorter than the aperture including the canal; whorls with a conspicuous shoulder, above which a slightly concave spirally striate anal fasciole extends to the appressed suture, which on the last whorl or two shows indications of a marginal thickening; axial sculpture of (on the last whorl, about fifteen) protractive short riblets with subequal or slightly shorter interspaces

apparently confined to the periphery: these are crossed by two strong spiral threads, the posterior largest and forming oblong tumid nodules at the intersections; the anterior thread is also but less conspicuously nodulous or undulated; the rest of the surface is covered with fine spiral threads, of which there are three between the two large ones above mentioned; the base of the last whorl has fourteen coarse spiral threads with one to three finer intercalary threads; anal sulcus very deep and wide; outer lip thin, sharp, much produced; pillar smooth, twisted, obliquely attenuated in front with an impervious axis; canal long, moderately narrow, slightly recurved. Lon. of shell, 29.0; of aperture, 15.5; max. diam. 9 mm.

U. S. S. "Albatross," station 3017, Gulf of California, off Cape Lobos, in 58 fathoms, mud, bottom temperature 51° 8 F. U. S. N. Mus. 110,601.

This species belongs to the group of *T. fusinella*, from which it differs by the obliquity of the ribs and the disparity in size between the peripheral spiral cords, which are quite equal and equally nodulous in *fusinella*.

#### **Turris (Surcula) notilla** DALL, n. sp.

Shell small, solid, fusiform, the spire acute and slightly longer than the aperture; whorls ten, beside the (lost) nucleus, covered with a conspicuous olivaceous periostracum; suture appressed, with a strong spiral cord between it and the somewhat excavated anal fasciole which is sculptured by several sharp spiral incised lines; from the shoulder extend about eighteen slightly protractive axial rounded riblets, stoutest at the shoulder, diminishing forward, and extending nearly to the canal, with narrower interspaces; these are crossed by about eighteen larger spiral cords on the last whorl, seven of which are on the body of the whorl and the rest on the beak and canal; the former are turgid where they cross the ribs, and in the interspaces have one to three much finer threads; the latter are more or less undulate, but have hardly any or no spiral secondary threads; anal sulcus, shallow and wide; aperture rather narrow, outer lip produced, thin, simple; pillar lip smooth, whitish; pillar straight, obliquely attenuated in front; canal rather short and wide. Lon. of shell, 26; of aperture and canal, 12; max. diam., 9 mm.

Found with the last-mentioned species. U. S. N. Mus. 110,602.

This and the following species show characters connecting them with *Drillia*, especially such species as *D. alesidota* Dall, and *D. polytorta* Dall, from the Carolina coast of the Atlantic.

#### **Turris (Surcula) dotella** DALL, n. sp.

Shell in general appearance resembling the last species but more acute and slender, the ribs only fourteen in number on the last whorl, straighter, sharper, with wider interspaces, crossed by, on the body of the last whorl, about a dozen similar, regular low ridges with narrower interspaces, the whole regularly and

evenly, finely, spirally, sharply striated; the intersections at the ribs of the major spirals are distinctly nodulous, the same sculpture is continued on to the canal, but there is crowded and less coarse; on the spire there are three or four spiral ridges crossing the ribs, and one or two well marked cords close to and in front of the suture; there are nine whorls beside the (lost) nucleus; aperture narrower, anal sulcus narrow, sharply defined, but not very deep; pillar straight, with a thin, smooth, callous surface; outer lip thin, very little produced; canal short, wide, slightly recurved. Length of shell, 30.0; of aperture, 13.5; max. diam. 8.0 mm.

U. S. S. "Albatross," station 2823, Gulf of California, in 27 fathoms, sand and broken shells, U. S. N. Mus. 96,731.

**Turris (Surcula) resina DALL, n. sp.**

Shell (decollate) moderately large, slender, fusiform, solid, the spire longer than the aperture; shell with a broad, somewhat constricted anal fasciole and closely appressed suture, the fasciole chiefly sculptured by incremental lines; whorls with an angle at the shoulder where terminate (on the penultimate whorl twenty) straight, somewhat protractive, low, narrow, rather sharp axial ribs, which extend forward on the last whorl nearly to the base; incremental lines rather prominent; spiral sculpture of a few faint striae on the fasciole, between the fasciole and the next suture on the spire of five or six strap-like ridges with narrower interspaces often containing an obscure small intercalary thread, overriding the ribs without nodulation at the intersections; on the last whorl these ridges extend, somewhat diminishing in size, forward to the end of the canal, occasionally divided by a medial incised line, and with few intercalary threads, numbering about twenty-five in all; aperture narrow, outer lip defective, but by the lines of growth not much produced; anal sulcus shallow, pronounced, the posterior angle of the aperture produced, much thickened and recurved; pillar straight, smooth, callous, axis impervious; canal straight, rather wide; interior of outer lip smooth; length of (decollate) shell, the last five whorls, 50; of the last whorl, 33; of the aperture, 25; diameter at the posterior angle of the aperture, 17 mm.

U. S. S. "Albatross," station 3354, Gulf of Panama in 322 fathoms, mud, bottom temperature 46° F. U. S. N. Mus. 123,103.

This species has such a striking appearance that, although the unique specimen is defective, it could not fail to be recognized if found again.

A large shell very much broken and eroded with a somewhat similar form and sculpture, but smoother, the spirals fainter and the ribs rounder and less numerous, was dredged at station 3370, in 134 fathoms, near Cocos Island. It has a large amorphous mass of callus on the proximal end of the pillar, but which does not extend inward beyond the first half whorl, and may be a pathological feature. There are parts of about six whorls remaining, about 58 mm. in length and 17 in maximum diameter. It is too imperfect to name, but is different from any other species obtained.

***Drillia decenna* DALL, n. sp.**

Shell small, white, solid, acute, with about eight whorls, the spire longer than the aperture; the two nuclear whorls are small, smooth and apically blunt, the succeeding ones have strong axial sculpture, but visible spiral sculpture is confined to the region of the canal; suture appressed, the anal fasciole inconspicuous; axial sculpture of (on the last whorl 8-10) sharp, slightly protractive ribs, most prominent on the periphery, the last rib preceding the formation of the adult aperture distinctly larger than the rest; the ribs though not invariably continuous form a series obliquely ascending the spire, and in front fading out only near the canal where there are a few spiral threads; on the surface when not worn, can be discerned with a lens fine spiral striations, but whether these are generally distributed my material is not fresh enough to show; aperture short, rather wide; anal sulcus short, conspicuous, with projecting margin; outer lip slightly varicose, sharp, produced; pillar smooth, short, straight, heavily callous; canal short, rather wide, the fasciole inconspicuous. Length, 12.5; of last whorl, 8.0; of aperture, 5.5; max. diam. 5.3 mm.

U. S. S. "Albatross," station, 2798, in 18 fathoms, sand, Panama Bay. U. S. N. Mus. 110,603.

This species is related to *D. ebur*, *D. coccinata* and *D. fucata* of Reeve, of the West Indies, but has fewer and less knobby ribs than any of them.

***Gemmula exulans* DALL.**

Plate 13, figure 5.

*Pleurotoma exulans* Dall, Proc. U. S. Nat. Mus., 1889, 12, p. 302, pl. 5, fig. 7.

U. S. S. "Albatross," station 3376, off the coast of Ecuador, in 1132 fathoms, ooze, bottom temperature 36° F. U. S. N. Mus. 123,095.

An immature specimen of this species was obtained at the locality mentioned. The original specimens were obtained near the Galapagos Islands at stations 2807, in 812 fathoms, ooze, and 2808, in 634 fathoms, sand; temperatures 38°.4 and 40° F.

***Gemmula esuriens* DALL, n. sp.**

Shell small, solid, subfusiform, of about five whorls, the nucleus defective; periostracum pale olive; suture distinct, not appressed; fasciole hardly constricted; whorls moderately rounded, the suture between them not deep; axial sculpture of incremental lines and about twelve peripheral rounded low nodules, hardly produced enough to be termed ribs; spiral sculpture in front of the periphery of 15-20 incised, rather distant, obscure lines extending to the canal; none is visible behind the periphery where the sculpture consists chiefly of incremental lines and faint traces of vermiculation; aperture lunate; anal sulcus wide, shallow; outer

lip thin, simple, strongly protractive; body with a thin white callus; pillar short, very obliquely truncate anteriorly, more or less twisted but not pervious; canal short, wide, slightly recurved. Lon. of shell, 15.2; of last whorl, 10; of aperture, 7.5; max. diam. 6.5 mm.

U. S. S. "Albatross," station 3392, Gulf of Panama, in 1270 fathoms, hard bottom, temperature 36°.4 F. U. S. N. Mus. 123,128; also at station 3407, near the Galapagos Islands, in 885 fathoms, ooze, temperature 37°.2; and at station 3392, Gulf of Panama, in 1270 fathoms, hard bottom; temperature 36°.4.

### *Gemmula esuriens* var. *pernodata* DALL.

Shell defective, about three whorls remaining, resembling the last species in a general way, having the median vermiculate band, similar periostracum, aperture and pillar, but differing as follows: the whorls are separated by a deeper constriction; the fasciole less excavated and without spiral striae; the basal spiral sculpture is hardly perceptible; the ribs are reduced to nodules in front of the suture and more obliquely protractive and irregular or even obsolete; the vermicular sculpture is more or less extended over the base. Lon. of last whorl, 14.0; of aperture, 10.0; max. diam. 8.7 mm.

U. S. S. "Albatross," station 3414, southwest of Tehuantepec in the Pacific, in 2232 fathoms, green mud, temperature 38°.5 F. U. S. N. Mus. 123,127.

These specimens are so badly eroded that in order to get the diagnostic characters one has to study uneroded patches of surface, and, while the result is believed to be accurate, it was impossible to get a draughtsman who could restore the shell so as to make a reliable figure, so it was thought better to omit the figure pending the receipt of better material.

### *Gemmula herilda* DALL, n. sp.

Shell rather small, stout, solid, chalky under an olivaceous periostracum; the spire longer than the aperture; whorls at least eight in the adult but usually much eroded; summit of the spire apparently blunt, the whorls in the young short in their axial dimension, giving a "chunky" aspect to the shell; early whorls with two beaded spiral series or cordons one at the posterior suture, and another, larger, near the anterior suture. Between them is the anal fasciole; as the shell grows the anterior beaded cordon becomes situated more near the centre of the exposed whorl and (on the fourth whorl about twenty) the nodulations represent the posterior terminations of narrow very protractive axial riblets, which on the fifth whorl fade out on the base; the anal fasciole is conspicuously marked with arcuate, close, fine ripples; in front of the shoulder in the young the whole base of the shell and canal are covered with close, fine, spiral threads, which as the shell grows older appear also on the anal fasciole; on the other hand in the older shells the nodular band next the suture and that at the periphery be-

come less prominently sculptured and the ribs almost obsolete; aperture and canal short and wide; pillar with little callus, straight, solid; outer lip produced, thin, sharp, simple; anal sulcus wide, shallow, in the older shells nearly reaching the suture. Length of shell, about 18+; of last whorl, 11.5; of aperture, 8.0; max. diam. 7.0 mm.

U. S. S. "Albatross," station 3360, Gulf of Panama, in 1672 fathoms, sand; bottom temperature 42° F. U. S. N. Mus. 123,091.

This species when old and eroded can hardly be distinguished from *G. esuriens* in the same condition, but fortunately specimens of the young shells in good condition could be compared and show obvious and sufficient characters proving the distinctions between the two species.

### *Gemmula benthima* DALL, n. sp.

Plate 1, figure 7; Plate 13, figure 4.

Shell solid, with a conspicuous greenish-gray periostracum, ten-whorled, with the spire longer than the aperture, biconic, usually much eroded; nucleus lost in all the specimens; subsequent whorls appressed at the suture, in front of which is a strap-like revolving ridge with (on the fifth whorl twenty-two) low nodules, each one corresponding to a feeble, strongly retractive, lamella-like riblet, which becomes prominent again as a semilunate nodule on the anal fasciole which forms the periphery of the whorl; between the fasciole and the presutural band the whorl is a little excavated; on the anterior side of the fasciole the whorl is rounded, with more or less alternated low spiral threads stronger near the periphery, where the suture is laid on the second thread, and diminishing toward the canal; the interspaces are decidedly wider than the threads, which become more or less obsolete on the last whorl; the surface is also more or less reticulated by fine spiral striae and elevated lines of growth, giving it a rough aspect; last whorl much the largest; the anal fasciole situated a little above the normal periphery of the whorl, but by its own prominent sculpture becoming peripheral; the sulcus is narrow and square-cut; outer lip thin, simple; body with a white callus which extends forward upon the very short, obliquely truncate but not pervious pillar, which is slightly recurved; operculum normal, large, brownish. Lon. of shell, about 28+ (decollate); of aperture, 14; max. diam., 12 mm.

U. S. S. "Albatross," station 3392, off the Gulf of Panama in 1270 fathoms on hard bottom, temperature 36°.4 F. U. S. N. Mus. 123,089. Also at stations 2807, 3360, 3365, 3366, 3376 and 3413, in from 812 to 1360 fathoms, sand or ooze, temperatures 36° to 42° F. in the Gulf of Panama, the adjacent coast of Ecuador, and the Galapagos Islands.

This species is a typical *Gemmula*, with a narrow anal sulcus situated in the peripheral carina, an oval operculum with apical nucleus and concentric lines of increase, and nodose periphery. It is usually badly eroded.

*Gemmula eldorana* DALL, n. sp.

## Plate 14, figure 8.

Shell small, solid, chalky with an olivaceous periostracum, decollate with about four and a half remaining whorls; suture obscure, with a narrow slightly elevated band in front of it, and on the last whorl a gradually developing similar band behind it; in front of the first band is a depression with two or three incised spiral lines, followed by a strong nodulous keel corresponding to the anal fasciole, in front of which again are (on the spire one, on the last whorl four) strong, simple, distant, spiral threads, of which the second is strongest and followed by the widest interval, the series preceded by eight or ten smaller, closer, simple, spiral threads which extend to the end of the canal; axial sculpture of incremental lines and on the earlier whorls obscure wrinkles connected with the nodules on the keel, which number on the penultimate whorl about twenty-four and on the last whorl become obsolescent; aperture short, lunate; outer lip sharp, with a well marked sulcus at the principal keel; body with the sculpture erased; pillar very short, twisted, obliquely truncate in front; axis not pervious; canal short, recurved, with flaring edges. Lon. of three whorls, 8; of last whorl, 6; of aperture, 4; max. diam. 5 mm. Operculum small, narrow, pale brown, nucleus apical.

U. S. S. "Albatross," station 3392, Gulf of Panama, in 1270 fathoms, hard bottom, temperature 36°.4 F. U. S. N. Mus. 123,120. Also at station 2807, near the Galapagos Islands, in 812 fathoms, ooze, temperature 38°.4.

Another species of the same group but with distinctive sculpture.

*Gemmula vicella* DALL, n. sp.

## Plate 14, figure 5.

Shell small, stout, subturritid, the nuclear whorls eroded, the spire longer than the aperture, with about six whorls in addition to the nucleus; white with a gray, olivaceous periostracum, the aspect much like a stumpy *Bela*; suture distinct, not appressed, whorl in front of it slightly constricted, sloping to a prominent keel at the shoulder; this slope is apparently coincident with the anal fasciole and is sculptured only by curved lines of growth and faint indications of axial ribs, which become more prominent in front of the shoulder, are stronger on the earlier whorls and number about fifteen on the penultimate whorl; these ribs are feeble, with wider interspaces, rounded, and protractive, becoming obsolete on the base and most of the last whorl; spiral sculpture strongest in the shoulder keel, which is a little nodulous where it crosses the ribs; in front of it are three to five spiral threads (on the spire) of which the second is strongest and faintly nodulous, the others feebler, more adjacent and simple; these become more numerous by intercalation, the last whorl having about sixteen between the keel and the end of the canal; the lines of growth are rather strong and give the

surface a rough appearance; aperture short, anal sulcus shallow and feeble; outer lip sharp, thin, simple; body with the sculpture erased; pillar smooth short, obliquely attenuated, twisted; canal wide, short, funicular, slightly recurved. Lon. of (decollate) shell, 8.5; of last whorl, 6.0; of aperture, 4.0; max. diam. 4.5 mm.

U. S. S. "Albatross," station 3392, Gulf of Panama, in 1270 fathoms, hard bottom, temperature 36°.4 F. U. S. N. Mus. 123,122.

**Gemmula serilla** DALL, n. sp.

Plate 13, figure 6.

Shell small, fusiform, sharply sculptured, white with an olivaceous periostracum, with about four whorls exclusive of the decollate apex; suture distinct not appressed, whorl in front of it descending flatly to a nearly peripheral keel, the flattened portion corresponding to the anal fasciole; fasciole spirally sculptured by four or five very fine, equidistant, simple, similar threads, crossed by (on the last whorl about twenty-five) elevated, sharp, arcuate, lamellar riblets, which are continued over the whorl with wider interspaces to the anterior part of the base; the shoulder keel is minutely duplex, narrow, subspinose where it crosses the ribs, and more prominent than they; in front of it are about twelve strong rounded primary spiral threads, with wider interspaces, each containing a finer intercalary thread, the whole extending to the end of the canal; aperture narrow, anal sulcus wide, shallow; outer lip sharp, simple; body smooth, pillar straight, obliquely attenuated in front; canal narrow, straight, rather produced. Lon. of (decollate) shell, 8.3; of last whorl, 6.0; of aperture, 4.5; max. diam. 4.0 mm.

U. S. S. "Albatross," station 3392, Gulf of Panama, in 1270 fathoms, hard bottom, temperature 36°.4 F. U. S. N. Mus. 123,123.

The shell described appears to be not quite adult.

**Leucosyrinx erosina** DALL, n. sp.

Plate 2, figure 1.

Shell fusiform, white, with an olive-gray more or less deliscent dull periostracum; nucleus eroded, subsequent whorls about seven; spire without the nucleus about equal in length to the aperture; suture appressed; a little in front of it is the anal fasciole, which is narrow, slightly constricted, and ill defined; in front of it and forming the shoulder of the whorl is a series of about twelve round-topped, slightly protractive, wavelike axial ribs, which only reach the suture in front of them in the earlier whorls, falling short of it in the later ones; other axial sculpture consists of rather irregular, more or less prominent incremental lines; spiral sculpture consists of three or more somewhat obscure incised lines over the fasciole; on the basal side of the whorl are numerous rather distant, distinct spiral striae, subequal and nearly equidistant, the interspaces a little elevated and, on the canal, becoming threads; in addition to these there are on the middle of the whorls a quantity of irregular, oblique, somewhat vermicular, short

incised lines, the interspaces between which are faintly beaded or reticulated by the short segments they intercept of the incremental lines; traces of analogous sculpture can be observed with a lens also on the base; aperture semilunar; outer lip thin, sharp, with a shallow anal sulcus adjacent to the suture; body with the sculpture erased, white, polished; pillar solid, white, twisted, obliquely truncate in front; canal wide, short, recurved and flaring anteriorly; operculum rounded, triangular with an apical nucleus, pale brownish. Lon. of shell, 28; of aperture, 14; max. diam. 11.5 mm.

U. S. S. "Albatross," station 3360, Gulf of Panama, in 1672 fathoms, sand, bottom temperature 42° F. U. S. N. Mus. 123,106.

The specimens, like most of those from these depths, are badly eroded.

### *Leucosyrinx ? clionella* DALL, n. sp.

Plate 14, figure 3.

Shell large, solid, chalky, with a rather thick olivaceous periostracum, and about seven whorls, the apex being eroded; spire much longer than the aperture, subfusiform, with whorls appressed at and constricted in front of the suture; the constriction corresponds to the anal fasciole behind which the margin of the whorl has the aspect of a thickened band; axial sculpture, beside incremental lines, consisting of twelve low, rounded, strong, slightly protractive ribs with subequal interspaces, strongest just in front of the fasciole, and, on the last whorl becoming obsolete on the base; spiral sculpture of numerous obsolete rather close spiral threads, irregularly disposed, stronger and much more distant on the base, but always obscure; aperture narrowly lunate, the anal sulcus conspicuous but shallow; the outer lip simple; body with a moderately thick, smooth callus extended onto the short, straight pillar, which is obliquely attenuated in front, with a wide, short, shallow canal. Lon. of five (decollate) whorls, 35.0; of last whorl, 22.5; of aperture, 15; max. diam., 12.5 mm.

U. S. S. "Albatross," station 3394, Gulf of Panama, in 511 fathoms, mud, bottom temperature 41° 8 F. U. S. N. Mus. 123,125. Also at station 2792, off Manta, Ecuador, in 401 fathoms, mud, temperature 43° F. (types).

This species has the thick olivaceous periostracum of a *Clionella*, as well as the sculpture of the typical *Clionella*, but a careful examination failed to discover any radula, though a poison gland seemed to be present. The head was that of typical *Turris*, with no muzzle, short tentacles with prominent eyes near their tips; the operculum oval, concentric, with the nucleus not lateral but near the smaller end, just within the margin of the apex.

### *Leucosyrinx ? pacifica* DALL, n. sp.

Plate 13, figure 3.

Shell small, delicate, white with a pale yellowish periostracum, with at least six whorls beside the (lost) nucleus; spire acute, slender, longer than the aperture;

suture deep, appressed; whorls gently rounded; apical whorls with (on the third whorl about fifteen) very narrow, sharp, threadlike, vertical ribs with much wider interspaces, and at the suture numerous, irregular, small, retractive folds extending over the fasciole, with wider interspaces, nearly twice as many as there are ribs; on the succeeding whorls these ribs and folds grow sparser and weaker, so that on the sixth whorl ribs, folds and fasciole are obsolete or absent; on the spire, the axial sculpture is crossed by (on the third whorl about eight, on the sixth ten or a dozen) fine flat threads with wider interspaces, (increasing by interpolation), which override the ribs and rise above them but do not form nodules at the intersections; these spirals are very uniform and on the last whorl extend forward covering the canal, and are slightly scored by the incremental lines; aperture oval, not mature in the specimen, the anal sulcus obsolete; pillar and body polished, the surface erased, not callous; the pillar is short, gyrate, the axis pervious, but the canal is short, rather wide, with no siphonal fasciole; the outer lip only slightly produced, sharp and thin in the type specimen. Operculum concentric, pointed in front, with an apical nucleus. Lon. of (decollate) shell, 23; of last whorl, 15; of aperture, 10.5; max. diam. 7 mm.

U. S. S. "Albatross," station 2859, in the Pacific Ocean, in 1569 fathoms, ooze, bottom temperature 34°.9. U. S. N. Mus. 122,590.

This shell recalls *Surculina*, but has harsher sculpture and a large normal operculum. It may prove eventually to belong to a group other than *Leucosyrinx*.

### *Irenosyrinx persimilis* DALL.

Plate 12, figure 2.

*Leucosyrinx persimilis* Dall. Proc. U. S. Nat. Mus., 1889, 12, p. 301, pl. 6, fig. 3.

Shell large, white, fusiform, with a pale olive periostracum, acute spire, and eight whorls, exclusive of the (lost) nucleus, each carrying a peripheral keel; suture distinct; whorls behind the periphery somewhat flattened, with a shallow constriction just behind the keel; axial sculpture only of incremental lines; spiral sculpture between the suture and periphery of numerous flat, subequal, strap-like bands separated by narrower, shallow channels; periphery with a low, rather wide prominence, giving the effect of a keel and sculptured with several similar but larger, stronger and more distant bands, tending to arrange themselves in pairs, and with a fine, subsidiary spiral striation upon them; this sculpture extends over the anterior half of the whorl, becoming finer and closer on the canal; aperture elongate; outer lip thin, sharp; a wide, deep, anal sulcus on the posterior slope of the whorl about midway between the suture and the periphery; anterior part of the lip arcuate, protractive; body with the sculpture erased, white, polished; pillar short, twisted, in front obliquely truncate and gyrate, but not axially pervious; a touch of brown on the edge; canal wide, elongate, slightly recurved, with no fasciole. Lon. of shell, 95; of last whorl, 70; of aperture, 55; max. diam. of shell, 32; of canal, 7 mm. Operculum brown, oval, the exterior imbricately lamellose, the nucleus inside the apical end which is bluntly rounded.

U. S. S. "Albatross," station 3393, Gulf of Panama, in 1020 fathoms, mud, bottom temperature 36°.8 F. U. S. N. Mus. 123,101. Also at station 3366, in 1067 fathoms, globigerina ooze, off Panama, bottom temperature 37° F.; at station 2791, on the S. W. coast of Chile, in 677 fathoms, mud, bottom temperature 38° F.; and at station 2919, off Cortez Bank, California, in 984 fathoms, mud, temperature 35° F.

The characteristics of the soft parts were described in the original publication. It may be added that *Pleurotoma (Surcula) clara* von Martens, from Patagonia, though much smaller, is evidently a member of this group.

The immense range of the species already indicated will be greatly increased if with the reception of more and better material the following form is definitely fixed as a variety of *persimilis*, which at present seems doubtful.

#### *Irenosyrinx (persimilis) var ? leonis* DALL.

Shell small compared with the preceding species, white, of about seven evenly rounded whorls. Compared with the young of *I. persimilis* of the same size the whorls are more capacious, smoother, not flattened behind nor on the periphery; the carinations of *persimilis* are wanting or represented only by an obsolete indication of a ridge; the canal is wider and more recurved, the anal fasciole shows the markings of the sulcus to be wider and not quite so near the suture. Lon. of shell, 50; of last whorl, 38; of aperture, 29; max. diam., 18 mm.

U. S. S. "Albatross," station 3074, off Sea Lion Rock, coast of Washington, in 877 fathoms, mud, temperature 36°.6 F. U. S. N. Mus. 110,605.

Three specimens were obtained, of which all were more or less eroded.

#### *Irenosyrinx goodei* DALL.

Plate 19, figure 2.

*Leucosyrinx goodei* Dall, Proc. U. S. Nat. Mus., 1889, 12, p. 300, pl. 6, fig. 1.

U. S. S. "Albatross," station 2788, in 1050 fathoms, mud, bottom temperature 36°.9 F.

Figured for comparison with *I. persimilis*.

#### *Irenosyrinx ? crebristriata* DALL, n. sp.

Plate 13, figure 10.

Shell of moderate size, white, covered with a pale yellow periostracum; spire acute, a little shorter than the aperture; whorls rounded, six in number exclusive of the (lost) nucleus; suture very distinct; axial sculpture none, except incremental lines, unless on the (eroded) apical whorls; siphonal fasciole wide, extending from the suture to an obscure ridge which forms the shoulder of the

whorl just behind the periphery; on the fasciole are six or seven smooth rounded subequal spiral threads with equal or wider interspaces, more crowded anteriorly; beyond the shoulder are nine similar but coarser threads, sometimes entire, sometimes flattened or even medially sulcate on top, extending over the base, and on the region of the canal as many more, smaller and more distant, crossed by obvious incremental lines; aperture elongate, rather narrow, anal sulcus very wide but shallow; outer lip produced, evenly arcuate to the end of the canal, not constricted at the base of the whorl; pillar lip smooth, pillar short, obliquely truncate, gyrate, the axis pervious; canal wide, hardly differentiated. Lon. of shell, 48; of last whorl, 35; of aperture, 26; max. diam. 16.5 mm.

U. S. S. "Albatross," station 2859, Pacific Ocean, in 1569 fathoms, ooze, bottom temperature 34° 9 F. U. S. N. Mus. 122,563.

The soft parts and operculum were not obtained, so the shell is only provisionally placed in this group. It recalls the shell described by me in the Blake Report from Cuba under the name of *Aforia hypomela*, but which is perhaps an *Irenosyrinx*. The latter has the spiral sculpture more delicate, the posterior slope of the whorls flattened, and the whorls more numerous.

#### ***Ancistrosyrinx cedonulli* REEVE.**

*Pleurotoma cedonulli* Reeve, Proc. Zool. Soc., London, 1843, p. 185; Conch. Icon., *Pleurotoma*, fig. 117 a.

U. S. S. "Albatross," station 2799, in Panama Bay, in 30 fathoms, mud; and station 3391, Gulf of Panama, in 153 fathoms, mud, bottom temperature 55° 8 F. U. S. N. Mus. 123,102.

Several fairly well preserved specimens were obtained, as above, but without the animal. There is no doubt that the species belongs to the same group of Turritidae that includes the Atlantic coast *A. elegans* and *A. radiata* Dall, which have granular sculpture and an operculum like *Drillia*. That Tryon, who knew the Panama species only from an inadequate figure, should have regarded it as the young of the Japanese Columbarium (with a wrong locality) was under the circumstances not extraordinary, though erroneous. The relations of this group to *Cochlespira* Conrad, its Eocene precursor, have already been alluded to (see page 257). In view of the ambiguity of Reeve's figure it might be well to say that this species has no axial sculpture on the whorls between the carina and the base except what may be due to accidents during growth. The surface is normally smooth and polished, above and below the carina, and of a delicate pale brown color.

#### ***Steiraxis aulaca* DALL.**

Plate 2, figure 5.

*Pleurotoma (Steiraxis) aulaca* Dall, Proc. U. S. Nat. Mus., 1896, 18, p. 14.

Shell large, solid, white, fusiform, with about five whorls (nucleus eroded) covered with a pale straw-colored epidermis; whorls rounded, with rather distinct

lines of growth, crossed by numerous very sharp, narrow, prominent, subequal spiral ridges with about equal or narrower interspaces; the periphery is formed by a sort of rib, on which stand two to four similar keels, but smaller than the others and more crowded; in front of the rib there is a faint constriction of the whorl; the keels are less prominent on the canal, which is moderately long and recurved; on the penultimate whorl there are about fourteen keels between the sutures; aperture elongate, reflecting the sculpture, but without lirae; outer lip very flexuous, with a broad, rather shallow anal sulcus behind, and arched forward in front of the peripheral rib; body white, not callous; pillar thin, attenuated, and obliquely truncate in front, concave, twisted, exhibiting a pervious axis; canal shallow, not producing a fasciole; operculum like that of *Mohnia frielei*. Height of shell, 60; of last whorl, 48; of aperture, 38; max. diam. 26 mm.

U. S. S. "Albatross," station 3415, off Acapulco, Mexico, in 1879 fathoms, globigerina ooze, bottom temperature 36° F. U. S. N. Mus. 123,099. Also at station 3381, east of Malpelo Island, Gulf of Panama, in 1772 fathoms, mud, bottom temperature 35° 8 F. U. S. N. Mus. 123,098.

The initiatory part of the operculum is spiral, as in *Mohnia*, thus differing from the typical deep-water Turritidae, which it in general resembles. They have the nucleus of the operculum apical and not spiral. It differs from the operculum of *Irenosyrinx* in being enlarged at the inner posterior margin as in *Lunatia*, so that the spiral apex remains apical, while in *Irenosyrinx* the operculum after a brief period of spiral growth is entirely surrounded by concentric additions, so that the spiral portion is within a subsequent concentric margin, like the nucleus of the operculum in *Buccinum*.

### CALLIOTECTUM DALL.

*Calliotectum* Dall, Proc. U. S. Nat. Mus., 1889, 12, p. 304.

#### *Calliotectum vernicosum* DALL.

*Calliotectum vernicosum* Dall op. cit., p. 304, pl. 5, fig. 8, 1889.

U. S. S. "Albatross," station 2793, off the coast of Ecuador, in 741 fathoms, mud; station 2807, near the Galapagos Islands, in 812 fathoms, mud, bottom temperature in both cases 38° 4 F. Also at station 3407, off the Galapagos Islands in 885 fathoms, bottom temperature 37° 2; and at station 4654 twenty-four miles W. 68° N. from Aguja Point on the Peruvian coast, in 1036 fathoms, mud, bottom temperature 37° 3. Both the latter stations afforded fragments only.

A full account of the animal was given in the publication of 1889.

## MANGILIINAE.

**BORSONIA** BELLARDI, 1838.**Borsonia (Borsonella) dalli** ARNOLD.

## Plate 13, figure 9.

*Pleurotoma (Borsonia) dalli* Arnold, Mem. Cal. Acad. Sci., 1903, 3, p. 201, pl. 6, fig. 2.

Pliocene and Pleistocene of San Pedro, Arnold. U. S. S. "Albatross," station 2839, in 414 fathoms, sand, bottom temperature 41°.4 F., and 2918, in 67 fathoms, sand, temperature 52°.4; off the edge of the Cortez Bank, N. Pacific Ocean. U. S. N. Mus. 96,841 and 122,576.

**Borsonia (Borsonella) agassizii** DALL, n. sp.

## Plate 1, figure 5.

Shell biconic, the aperture shorter than the spire, apex eroded but with six remaining whorls, white and chalky under a pale greenish yellow periostracum; suture distinct, not appressed, the whorls sloping flatly to the periphery which is marked by a rounded keel with (on the last whorl fifteen) obscure elongated swellings or nodulations; the anal fasciole which is close to the suture is marked by lines of growth concavely arcuate, crossed by half a dozen spiral incised lines in the path of the sulcus; below the keel are lines of growth, obscure traces of spiral distant incised lines, and numerous irregularly impressed striae, which are perhaps pathological; base moderately convex; outer lip thin, sharp, strongly protractive below the keel, above the latter with a wide, shallow anal sulcus reaching close to the suture; body polished, milkwhite; pillar short, twisted, white, with a well-marked spiral plait near its insertion; canal wide, short, distally funicular, somewhat recurved. Lon. of shell (decollate), 23; of last whorl, 15; of aperture, 11; max. diam. 11 mm.

U. S. S. "Albatross," station 3361, Gulf of Panama, in 1471 fathoms, ooze, bottom temperature 36°.6 F. U. S. N. Mus. 123,107.

This species resembles *B. diegensis* Dall in outline, but is larger, has the carina proportionately nearer the middle of the whorl, and the nodulation of the keel is strongest on the last whorl; while in *diegensis* it is more marked on the earlier whorls and is sometimes entirely obsolete on the later ones. The latter species also has the vermicular impressed sculpture finer and much closer, though this may be pathological.

**Borsonia (Borsonella) diegensis** DALL, n. sp.

## Plate 13, figure 11.

Shell small, stout solid, decollate, with a whitish substratum and strong olivaceous periostracum; the four remaining whorls are closely coiled and have the

aperture longer than the remaining portion of the spire; the sculpture consists of a strong spiral keel, peripheral on the spire with more or less nodulation (in one specimen with fifteen small modules on the penultimate whorl, but none on the last whorl; another has them obsolete on the spire), stronger on the earlier whorls when present, an obscure ridge in front of the suture, stronger on the earlier whorls, faint spiral striation on the anal fasciole between the ridge and the keel, the whole surface covered with a microscopic, close, impressed, vermicular network of fine lines anastomosing in every direction; on the last whorl the keel is well above the periphery; base evenly rounded, aperture ample, anal sulcus at the suture wide and deep; outer lip thin, arcuately produced; pillar lip smooth, with a glaze of callus, the plication on the proximal part of the pillar lagging behind the aperture; canal very wide and short with an obsolete fasciole. Length of four whorls, 15.0; of last whorl, 12.5; of aperture, 9.5; max. diam. 8.0 mm.

U. S. S. "Albatross," station 2923, off San Diego, California, in 822 fathoms, mud, bottom temperature 39°F. U. S. N. Mus. 122,573.

Like the preceding species this has the plication on the pillar hardly visible from the aperture.

### *Borsonia* (*Borsonella*) *hooveri* ARNOLD.

Plate 13, figure 7.

*Pleurotoma* (*Borsonia*) *hooveri* Arnold, Mem. Cal. Acad. Sci., 1903, 3, p. 201, pl. 10, fig. 1.

Shell small, chalky-white, covered with a polished olive-gray periostracum; apex eroded, leaving indications of about six whorls; general form biconic with a single sharp keel at the shoulder, between which and the suture the whorl is more or less excavated; suture distinct, the margin in front of it turgid, giving an effect as if minutely channelled; excavated area forming the anal fasciole, with arcuate growth lines, crossed by about six faint incised distant spiral lines; keel somewhat above the periphery, with a rounded and somewhat compressed edge without waves or nodulations; surface in front of the keel moderately convex, spirally sculptured by obsolete distant lines crossed by fine irregular slightly elevated incremental lines, which, in spots, produce a vermiculate aspect; base a little constricted behind the short, nearly straight, attenuated canal; body with a wash of callus; outer lip with a wide, moderately deep, rounded anal sulcus; in front of the keel markedly protractive, thin and simple; pillar straight, moderately callous, with a single strong almost horizontal plait near its insertion, anteriorly obliquely truncate, twisted, not pervious; canal very short. Lon. of (decollate) shell, 14.7; of last whorl, 10; of aperture, 7.5; max. diam. 8 mm.

Pleistocene of San Pedro, California, Arnold.

U. S. S. "Albatross," station 3431, off Mazatlan, Mex., in 995 fathoms, mud, bottom temperature 37°F. U. S. N. Mus. 123,110. Also at station 3392, Gulf of Panama, in 1270 fathoms, hard bottom, temperature 36°.4; and station 3376, on the coast of Ecuador, in 1132 fathoms, ooze, temperature 36°F.

Smaller, more slender, and with a distinctly more excavated fasciole than in the last species which also has the keel usually nodulous. In the better preserved specimens the spiral sculpture is continued in front of the keel while in the two preceding species it is confined to the anal fasciole.

***Borsonia (Borsonella) saccoi* DALL, n. sp.**

Shell much eroded, solid, short, chalky, with an olive-gray periostracum and over five whorls; spire short, conic, nuclear whorls lost; the anal fasciole depressed, forming a constricted concave band near the posterior edge of the whorl which is thickened and marginate; on the anterior side of the fasciole the shoulder of the whorl forms the periphery on which are (thirteen on the last whorl) short, rounded, wavelike nodules or axial ribs which are slightly protractive and do not extend over the base; the other axial sculpture is composed of rather marked elevated, more or less irregular lines of growth; on the fasciole and base these are more or less obscured by spiral impressed lines with much wider interspaces, which appear feeble and as if obsolete where not eroded; canal short, straight; outer lip simple with the sulcus near the suture, rather wide and deep when complete; body with a white callus and near the insertion of the pillar a single very strong sharp edged spiral plication extending into the spire. Lon. of (eroded) shell, about 14; of aperture, about 7 mm.; max. diam. about 7 mm.

U. S. S. "Albatross," station 3354, Gulf of Panama, in 322 fathoms, mud, bottom temperature 46° F. U. S. N. Mus., 123,105.

Although this specimen is so imperfect it is clearly distinct from any other collected in the region and is therefore worthy of description. It differs from the others in its stronger ridge in front of the suture, its fewer, longer, and more persistent ribs. The plication on the pillar extends fully to the columellar callus, and is quite conspicuous.

***Borsonia (Borsonella) coronadoi* DALL, n. sp.**

**Plate 14, figure 2.**

Shell slender, acute, pinkish white, with a pale brown periostracum and about ten whorls; spire longer than the aperture, the nuclear whorls smooth, turgid, the subsequent turns carrying a rounded low keel, usually in front of the middle of the whorls forming the spire, the area between which and the suture is flatly impressed, the whorl in front gently rounded; on some of the early whorls the keel is slightly undulated, but not regularly nodulous; besides the lines of growth, both the fasciole and the anterior part of the whorl show indications under a lens of obscure regular distant spiral striae, and are also more or less marked with a faint vermicular reticulation of the surface; suture not appressed, distinct; aperture narrow, anal sulcus deep and wide, reaching the suture; outer lip thin, sharp, arcuately produced; inner lip slightly eroded, polished, with no callus;

plication at the proximal end of the pillar; axis impervious, canal short, wide, deep, slightly recurved with a fairly well-marked fasciole. Lon. of shell, 29.0; of last whorl, 16.5; of aperture, 12.0; max. diam. 9.0 mm.

U. S. S. "Albatross," station 2931, off Los Coronados Islands, California, in 34 fathoms, sand, bottom temperature 56° F. U. S. N. Mus. 110,608.

This is nearest *B. dalli* Arnold, but of a different color, more slender, and on the last whorl has the flattened fasciolar area very much wider. The fold on the pillar is easily visible.

### PLEUROTOMELLA VERRILL.

#### *Pleurotomella* (*Gymnobela*) *agonia* DALL.

##### Plate 1, figure 6.

*Pleurotomella* (*Gymnobela*) *agonia* Dall, Proc. U. S. Nat. Mus., 1889, 12, p. 307, pl. 6, fig. 4.

Shell large, thin, chalky, with a pale straw-colored periostracum; form biconic, with a presumably blunt, eroded apex and about seven whorls; suture distinct, minutely channelled; the margin in front of the suture is turgid and pinched up into numerous short, narrow, obliquely retractive small folds with wider interspaces and rounded summits; these become obsolete on the last whorl; there are about twenty-one on the penultimate whorl, and they do not cross the anal fasciole which is gently excavated; on the shoulder of the whorl are a series of lunate projections corresponding to the anal sulci (about nineteen on the penult whorl) less distinct and prominent than the sutural folds but larger: the whole surface is spirally sculptured with small low flattish ridges finer and closer on each side of the shoulder but elsewhere subequal and nearly equidistant, with subequal interspaces which become somewhat wider near the canal; there are also numerous very fine spiral striae and lines of growth forming a microscopic obscure reticulation; base rounded, attenuate in front; outer lip (defective) thin, simple, with a wide shallow anal sulcus at the shoulder; body and pillar slightly callous, with the appearance (which may be pathological) of an internal spiral ridge on the pillar not visible from the aperture; pillar straight, very obliquely truncate and twisted in front; canal moderately wide, not recurved. Lon. of (decollate) shell, 25; of last whorl, 18.5; of aperture, 14; max. diam. 12 mm.

U. S. S. "Albatross," station 2808, near the Galapagos Islands, in 634 fathoms, coral sand, bottom temperature 40° F. U. S. N. Mus. 96,493. Also at 2807, in 812 fathoms, ooze, temperature 38°.4.

#### *Pleurotomella* (*Gymnobela*) *agonia* var. *altina* DALL, nov.

##### Plate 14, figure 9.

Shell large, thin, pinkish brown, biconic, spire slightly longer than the aperture with seven well-rounded whorls in addition to the (lost) nucleus; suture dis-

tinct, not appressed, the anal fasciole forming a sharply limited band immediately in front of it; fasciole polished, sculptured with small numerous elevated concave wrinkles, with regular wider interspaces; these wrinkles on the last whorl become closer and less prominent; axial sculpture of inconspicuous irregular protractive depressions hardly to be distinguished from emphasized lines of growth; spiral sculpture of numerous fine, channelled, incised lines with wider flattened interspaces, five or six to a millimeter, the whole more or less minutely reticulated by the incremental lines; aperture narrow, the anal sulcus parallel-sided, deep; the outer lip arcuate, strongly protractive, thin, sharp, simple; pillar and body without callus; pillar straight, twisted, almost pervious at the axis; canal short, wide, slightly recurved. Lon. of shell, 24; of last whorl, 16; of aperture, 12; max. diam. 11.5 mm.

U. S. S. "Albatross," station 3365, off Cocos Island, Gulf of Panama, in 1010 fathoms, ooze, bottom temperature 37° F. U. S. N. Mus. 123,136. Also at station 3366, in 1067 fathoms, ooze, temperature 37° F. (type).

This differs from the typical *P. agonia* in having more numerous, finer and less prominent spirals which are not cut into short segments by the incremental lines, and a higher and more acute spire of at least one more whorl, giving the whole shell a more elevated and slender aspect.

#### *Pleurotomella (Gymnobela) egregia* DALL, n. sp.

Shell of the same type as the preceding species, but larger and proportionally much stouter, of the same pinkish brown color and delicate construction, and about five whorls; spire subconoid, with distinct suture and well-rounded whorls; sculpture similar to that of *P. agonia* but more emphatic, particularly the arcuate wrinkles which cross the anal fasciole; aperture wide, anal sulcus deep and rounded, the outer lip thin, roundly produced in front, no perceptible callus on the body; pillar thin, twisted, obliquely truncate in front; canal very short and rather contracted, axis not pervious. Lon. of shell, 23; of last whorl, 18; of aperture, 13; max. diam. 11.7 mm.

U. S. S. "Albatross," station 4656, 100 miles west of the Peruvian coast, in 2222 fathoms, mud, bottom temperature 35°.2 F. U. S. N. Mus. 110,610.

In this species the spiral sculpture is well defined and emphatic over the whole surface.

#### *Pleurotomella (Gymnobela) isogonia* DALL, n. sp.

##### Plate 4, figure 3.

Shell short, stout, biconic, white or subtranslucent with a yellowish periostracum; apical whorls much eroded, indicating for the whole shell six or more turns; suture appressed, whorl in front of it steeply descending to a very strong keel at the

shoulder, behind which it is slightly excavated; this area is spirally sculptured with numerous, very fine, close-set threads, one of which, two-thirds of the way to the keel, is more prominent than the others; these are crossed by numerous rather irregular low sharp ridges strongest near the keel, which they nodulate more or less, especially on the earlier whorls, and, fading out toward the suture, faintly reticulating the spirals; keel high, sharply compressed below, with a rounded edge; whorl in front of it spirally sculptured with numerous flat low ridges with narrower channelled interspaces, the ridges crossed by fine sharp lines of growth and occasional faint vertical folds, low and obsolete except near their beginning in front of the keel; body polished, with the sculpture erased; outer lip angulated and notched by the keel, thin, sharp, simple; pillar short, white, with a faint brown band around it; the anterior portion acute, and obliquely truncate; canal short, slightly recurved. Lon. of (eroded) shell, 12.5; of last whorl, 11.0; of aperture, 9.0; max. diam., 7.7 mm.

U. S. S. "Albatross," station 3393, Gulf of Panama, in 1020 fathoms, mud, bottom temperature, 36°.8 F. U. S. N. Mus. 123,112.

This is quite a peculiar shell, and looks more like one of the northern *Belas* than any of the preceding species.

### *Pleurotomella (Gymnobela) xylona* DALL, n. sp.

#### Plate 2, figure 3.

Shell thin, white, elongate, subturritid, with eight whorls beside the (lost) nucleus; suture distinct, deep, not channelled; whorl in front of it sloping flatly to an angular shoulder, sculptured with three or four flattish spiral threads with slightly wider interspaces separated from the keel at the shoulder by a channel three times as wide as the others; shoulder keel duplex, the posterior cord most prominent, the anterior, closely adjacent, less so; in front of these, extending to the canal, is a series (five on the penult, eighteen on the last whorl) of similar but less prominent, subequal, and subequidistant cords, with numerous smaller intercalary threads, the interspaces wider than the primary cords; from the shoulder to the periphery on the last whorl are (on the type about fourteen) numerous obscure narrow vertical riblets extending to but not over the base, but not nodulating the superincumbent cords; there are also numerous very fine, slightly prominent lines of growth which tend to roughen the spiral sculpture; aperture short, wide; outer lip (defective) thin, simple; body with the sculpture erased, polished, milk-white; pillar very short, gyrate, almost pervious; canal very short and wide. Lon. of shell, 27; of last whorl, 16; of aperture, 12; max. diam. 12 mm.

U. S. S. "Albatross," station 3413, near the Galapagos Islands, in 1360 fathoms, ooze, bottom temperature 36° F. U. S. N. Mus. 123,111.

A form of problematical relations, perhaps least out of place here, until more is known about it.

**Pleuromella (Pleuromella) polystephanus** DALL, n. sp.

Shell of moderate size of six or more whorls, the apex eroded, white, with a cream-colored periostracum; spiral sculpture of numerous fine, subequal, flattish threads with narrower interspaces, which cover the whole shell; to these are added a thickened ridge which borders the anterior margin of the suture, and on the spire a peripheral nodose keel, which is less marked on the last whorl, where it forms the shoulder; on the penultimate whorl there are twenty of these nodules; other axial sculpture is furnished by fine, short, sharp elevated wrinkles which cross retractorily the ridge adjacent to the suture, like the "gathers" of a skirt, and become obsolete on the fasciole; there are twenty-eight of these wrinkles on the margin of the penultimate whorl; the space above the shoulder is distinctly excavated, especially on the spire; suture distinct and, on the earlier whorls, almost channelled; aperture ovate; anal fasciole comprised in the nodose shoulder, not reaching the suture; outer lip arcuately produced forward; pillar with a thin, smooth layer of enamel, obliquely attenuated distally, somewhat twisted; canal wide, shallow. Lon. of shell, 25; of last whorl, 19; of aperture, 14.5; max. diam. 12.5 mm.

U. S. S. "Albatross," station 2808, near the Galapagos Islands, in 634 fathoms, sand, bottom temperature 40° F. U. S. N. Mus. 96,498.

The several encircling rows of nodosities or wrinkles give this shell a particularly elegant appearance.

**Pleuromella (Pleuromella) dinora** DALL, n. sp.

Shell small, short-fusiform, stout, white with a pale yellowish periostracum, and about seven whorls; apex defective, subsequent whorls rather rapidly increasing, with an appressed suture behind a smooth and constricted anal fasciole in front of which the shell is shouldered by a series of short, slightly protractive ribs, of which, on the penultimate whorl there are fifteen, with subequal interspaces and crossed by half a dozen irregularly spaced spiral striations; these striae are ill defined, and on the last whorl extend over the base of the shell to the canal; on the last half of the last whorl the ribs become obsolete; aperture narrow, anal sulcus at the suture wide and deep, the outer lip in front of it prominently arcuate, thin and simple; pillar lip smooth with a thin wash of callus; pillar twisted, rapidly attenuated; axis impervious; canal moderately wide, short and slightly re-curved. Length of (decollate) five whorls, 15; of last whorl, 11; of aperture, 8; max. diam. 7 mm.

U. S. S. "Albatross," station 2807, near the Galapagos Islands, in 812 fathoms, ooze, bottom temperature 38°.4 F. U. S. N. Mus. 96,479.

This a pretty but small form, which recalls in its general aspect several of the larger Atlantic species.

**Pleurotomella (Pleurotomella) esilda** DALL, n. sp.

Shell fusiform, the spire longer than the aperture, chalky, apically eroded, with a pale gray, very thin periostracum and about five remaining whorls; suture appressed with a slightly constricted anal fasciole in front of it and about sixteen subequal, low, rounded protractive ribs crossing the upper whorls from in front of the fasciole with subequal interspaces and, on the last whorl, ceasing rather abruptly near the periphery; these ribs are not particularly strong or abrupt at their beginning; spiral sculpture of six or eight faintly incised lines in front of the suture and on the fasciole, and beginning again on the base near the anterior ends of the ribs and continuous but not sharp over the base and canal; the band between the two series includes the ribbed part of the whorl and is sculptured with irregular, more or less retractive, oblique, vermicular, more or less punctate markings which override ribs and intervals with about the same strength as the spirals; whorls moderately rounded, spire subacute; anal sulcus wide, shallow; outer lip thin, simple; body with a wash of callus extending also over the short, straight, obliquely truncate, slightly twisted pillar; canal short, wide. Lon. of five (decollate) whorls, 23.5; of last whorl, 16.0; of aperture, 11.0; max. diam. 9.7 mm.

U. S. S. "Albatross," station 3395, Gulf of Panama, in 730 fathoms, rocky bottom, temperature 38°.5 F. U. S. N. Mus. 123,126.

Not unlike the preceding in sculpture but larger, less compact, and with a different minor sculpture.

**Pleurotomella (Pleurotomella) suffusa** DALL.

Plate 14, figure 10.

*Pleurotomella suffusa* Dall, Proc. U. S. Nat. Mus., 1889, 12, p. 308, pl. 12, fig. 10.

U. S. S. "Albatross," station 2807, near the Galapagos Islands, in 812 fathoms, ooze, bottom temperature 38°.4 F. U. S. N. Mus. 92,533.

**Pleurotomella (Pleurotomella) parella** DALL, n. sp.

Plate 14, figure 4.

Shell large, thin, elongate-fusiform, white with a very thin translucent periostracum, and about eight whorls exclusive of the (lost) nucleus; spire rather acute; suture slightly appressed, whorl in front of it polished and slightly constricted; margin of the whorl here and there obscurely plicate by the incremental lines; surface of the fasciole here and there marked by obscure, irregular, short, oblique, fine ridges at right angles to the lines of growth; in front of the fasciole are (on the penultimate whorl fourteen) low, feeble, protractively oblique ribs, with much wider shallow interspaces, hardly reaching the suture in front on the spire

or the periphery on the last whorl; spiral sculpture confined to the whorl in front of the fasciole and consisting of (on the penultimate whorl about fifteen) fine, sharp incised lines, on the body of the whorl rather distant, the interspaces flat and often unequal but toward the canal closer and more regular; aperture semilunar; anal sulcus near the suture, wide, shallow; outer lip very thin, sharp, simple; body polished; pillar straight, gyrate, obliquely truncate in front; axis pervious; canal short, wide, in front slightly flaring. Lon. of shell, 41; of last whorl, 24; of aperture, 16; max. diam. 13.5 mm.

U. S. S. "Albatross," station 3376, off the coast of Ecuador in 1132 fathoms, ooze, bottom temperature 36° F. U. S. N. Mus. 123,135.

### **Pleurotomella (Pleurotomella) sp. indet.**

A species of this group, but with the exterior so eroded as to be unrecognizable, though apparently different from any heretofore mentioned, was obtained East of Mapelo Island, in the Gulf of Panama, at station 3381, in 1772 fathoms, mud, bottom temperature 35° 8 F., and at station 3418, off Acapulco, Mexico, in 660 fathoms, sand, temperature 39°. U. S. N. Mus. 123,124.

### **Pleurotomella (Phymorhynchus) argeta DALL.**

#### **Plate 19, figure 8.**

*Pleurotomella argeta* Dall, Proc. U. S. Nat. Mus., 1889, **12**, p. 307, pl. **6**, fig. 5.

U. S. S. "Albatross," station 2807, near the Galapagos Islands, in 812 fathoms, mud, bottom temperature 38° 4 F. U. S. N. Mus. 96,552. Also at station 3407, in 885 fathoms, ooze, temperature 37° 2 F. U. S. N. Mus. 123,138.

Though snow-white and perfectly smooth, except for incremental lines, this species by the characters of the animal belongs with the brown spirally sculptured forms which follow.

### **Pleurotomella (Phymorhynchus) cingulata Dall.**

#### **Plate 19, figure 6.**

*Pleurotomella cingulata* Dall, Proc. U. S. Nat. Mus., 1889, **12**, p. 306, pl. **6**, fig. 2.

U. S. S. "Albatross," station 2793, off the coast of Ecuador, in 741 fathoms, mud, bottom temperature 38° 4. Also at station 2807, near the Galapagos Islands, in 812 fathoms, mud, same temperature. U. S. N. Mus. 96, 554.

This very handsome species is fully described and figured in the publication referred to above.

*Pleurotomella (Phymorhynchus) castanea* DALL.

## Plate 1, figure 1.

*Pleurotomella castanea* Dall, Proc. U. S. Nat. Mus., 1895, 18, p. 15.

Shell polished, thin, resembling *P. cingulata*, Dall, of a chestnut-brown color, fading to a paler pinkish-brown, with seven whorls; the nucleus eroded, the early whorls with four or five flattened elevated spirals with wider interspaces in front of a somewhat sloping anal fasciole, more or less reticulated by narrow, slender, irregular, elevated riblets in harmony with the lines of growth, and which form on the fasciole delicate arches concave forward; the suture is appressed; on the body are about twenty spirals, stronger at the shoulder, smaller and closer forward, the wide interspaces finely spirally striate, while the most prominent spirals are undulate or obscurely nodulous; the transverse sculpture is nearly obsolete and hardly to be distinguished from the incremental lines; aperture elongate, oval; outer lip thin, sharp, crenulated by the sculpture, but not liriate; anal sulcus shallow, wide, directly in front of the suture; body with a thin wash of callus; pillar thin, gyrate, attenuated in front, forming a narrowly pervious axis, the whole of a pinkish-brown color; canal short, shallow, not recurved. Height of shell, 53; of last whorl, 38; of aperture, 28; diameter, 23 mm.

U. S. S. "Albatross," station 3400, in 1322 fathoms, ooze, temperature 36° F.; eastward from the Galapagos Islands. U. S. N. Mus. 123,134.

This differs from *P. cingulata* Dall by its smaller size, more sloping whorls, more delicate and reticulate sculpture, and by its pervious axis. The animal is blind, and there is no operculum. There is a distinct muzzle into which the proboscis is retracted when at rest, as described under *Pleurotomella argeta* in 1889, and at page 258 of this report. Specimens were also obtained at station 3374, Gulf of Panama, in 1823 fathoms, ooze, bottom temperature 36°.4; and at station 3413, in 1360 fathoms, ooze, near the Galapagos Islands, temperature 36°F.

*Pleurotomella (Phymorhynchus) oceanica* DALL, n. sp.

Shell short, stout, white, the spire shorter than the aperture, including about six whorls; nucleus eroded, whorls rounded, but the shoulder rather posterior, giving a subtabulate aspect to the whorls; suture distinct, not channelled; axial sculpture of fine, close, subequal lines in harmony with the lines of growth; spiral sculpture of numerous flat, longitudinally striated straplike slightly elevated bands, with subequal interspaces about half a millimeter wide, or less; there is a slight arcuation in the lines of growth but no anal fasciole; aperture pyriform, outer lip thin, simple, sharp, with no anal sulcus; body with a thin wash of white callus; pillar short, twisted but not pervious, obliquely attenuated in front; canal hardly defined, wide, very short, slightly recurved; alt. 25; of last whorl, 20; of aperture, 15; max. lat. 15 mm.

U. S. S. "Albatross," station 3681, in Mid-Pacific, north latitude 28° 23',

west longitude  $126^{\circ} 57'$ ; in 2368 fathoms, ooze, bottom temperature  $34^{\circ}.6$  F. U. S. N. Mus. 110,751.

The animal has a distinct subcylindrical muzzle, slightly expanded distally, into which the proboscis is withdrawn; the tentacles are rather posterior, small, short, and subcylindric; there are no eyes and no operculum. The foot is short and blunt behind, double edged at the front margin which is straight; the verge is small, coiled in a loose turn and laid back, the extremity with a lateral point; the siphon is thick and separate from the mantle-edge, without appendages; there is a moderately long retractile proboscis and a poison gland. The teeth of the radula are very like those of *Pleurotomella packardii* as figured by Verrill, there are two rows of about forty teeth each. The exterior of the animal is whitish throughout.

*Pleurotomella* (*Phymorhynchus*?) *clarinda* DALL, n. sp.

Plate 1, figure 3.

Shell white, with a pale yellowish periostracum, thin, fusiform, six whorled; whorls rounded, flattened a little over the anal fasciole in front of the suture, which is very distinct but not channelled; nuclear whorls eroded; subsequent whorls, with between the suture and the shoulder five or six fine, sharp, spiral threads with wider interspaces, which are not beaded by the concavely arcuate growth lines which are prominent on the fasciole; at the shoulder is a weak spiral ridge, followed by five stronger ones, subequal and equidistant with wider interspaces; on a sixth similar ridge the suture is wound, followed by, on the base, about thirty similar but less prominent ridges which gradually diminish in size and strength, and approximate more closely to each other until the canal is reached; over all these ridges and interspaces fine sharp threads run spirally, as on the fasciole and are perhaps a little more prominent on the ridges, where they are rendered more or less scabrous by the elevated lines of growth; outer lip thin with a shallow rounded excavation, near the suture, which forms the anal sulcus; body polished, with the spiral sculpture erased; pillar thin, gyrate, pervious, white, with a slightly thickened edge; canal short, wide, slightly recurved. Lon. 39; last whorl, 30; aperture, 22; max. diam. 18 mm.

U. S. S. "Albatross," station 3381, east of Malpelo Island, Panama Bay, in 1772 fathoms, mud, bottom temperature  $35^{\circ}.8$  F. U. S. N. Mus. 123,097.

The form and sculpture of this species have a general resemblance to those of the preceding two species, although the color is wholly different and in the absence of the soft parts it is provisionally placed with them.

**MANGILIA** RISSO.

*Mangilia movilla* DALL, n. sp.

Plate 14, figure 6.

Shell small, thin, white, fusiform, with about five whorls beside the (eroded) nucleus; suture distinct, slightly appressed; anal fasciole narrow, nearly smooth

except for lines of growth, bordered in front by an inconspicuous angular shoulder; from this shoulder extend (on the last whorl about eighteen) feeble, narrow, subequal, protractive, axial riblets, with subequal interspaces, crossed by fine, close-set spiral threads; the ribs extend to the suture, or on the last whorl to the base, and the threads cover the whole surface; anal sulcus shallow, outer lip thin, simple, moderately arcuate; pillar and body smooth, the former obliquely attenuated in front, not pervious; canal short, wide, slightly recurved; Lon. of shell, 4.9; of aperture, 2.6; of last whorl, 3.7; max. diam. 2.0 mm.

U. S. S. "Albatross," station 3418, off Acapulco, in 660 fathoms, sand, bottom temperature 39°F. U. S. N. Mus. 123,118.

#### *Mangilia cetolaca* DALL, n. sp.

*Aesopus oldroydi* Arnold, Mem. Cal. Acad. Sci., 1903, 3, p. 238, pl. 6, fig. 7. Not *Mangilia oldroydi* Arnold, *op. cit.* p. 213.

Löwer Pleistocene of San Pedro, California, Arnold.

Living at U. S. S. "Albatross," station 2835, at Ballenas Lagoon, Lower California (N. Lat. 26° 42' 30"), in five and a half fathoms, temperature 56°F.

#### *Mangilia enora* DALL, n. sp.

##### Plate 4, figure 6.

Shell small, yellowish-white, decollate with about six whorls beside the (lost) nucleus, the spire longer than the aperture; suture distinct, not appressed, with a broad anal fasciole in front of it, arcuately sculptured by lunate wrinkles following the lines of growth and in the earlier whorls elevated into sharp wrinkles at regular intervals, which are carried more or less distinctly over the anterior part of the whorls; in front of the somewhat concave fasciole the whorls are rounded and spirally sculptured with numerous close, very fine, sharp, spiral threads which cover the whorl, becoming coarser, less regular, and less crowded toward the canal; aperture short, lunate; outer lip with a broad, deep, rounded, anal sulcus close to the suture, the lip in front of it thin, sharp, and strongly arcuately protractive; body smooth; pillar very short, smooth, obliquely truncate; the canal very short, deep, recurved, forming a marked siphonal fasciole; operculum absent. Lon. of shell, 9.5; of last whorl, 5.7; of aperture, 4.0; max. diam. 4.2 mm.

U. S. S. "Albatross," station 3376, off the coast of Ecuador, in 1132 fathoms, ooze; bottom temperature 36°.4 F. U. S. N. Mus. 123,121.

#### *Mangilia?* *genilda* DALL, n. sp.

##### Plate 13, figure 3.

Shell small, white, with about six whorls exclusive of the (lost) nucleus; suture distinct, the whorl in front of it slightly turgid, in front of which the anal fasciole

is more or less constricted; at the shoulder begin about fifteen short, very obliquely protractive, wave-like ribs, with narrower interspaces, which are conspicuous only near the periphery; surface otherwise smooth except for faint incremental lines; aperture lunate; anal sulcus wide, shallow; outer lip sharp, thin, arcuately produced in front of the sulcus; body polished; pillar short, gyrate, not pervious, obliquely truncate in front; canal very short, wide, and slightly recurved. Lon. of shell, 10.5; of last whorl, 6.5; of aperture, 5.0; max. diam. 4.6 mm. Operculum none.

U. S. S. "Albatross," station 3392, Gulf of Panama, in 1270 fathoms, hard bottom, temperature 36°.4 F. U. S. N. Mus. 123,131; and station 3393, in 1020 fathoms, mud, temperature 36°.8 F. U. S. N. Mus. 123,122.

This and the preceding species are not of the typical group of *Mangilia*, having more the profile of a *Gemmula* with a short canal, or a small, slender, high-spired *Gymnobela*, but they are left here for the present, pending a revision of the entire group.

### *Mangilia sedillina* DALL, n. sp.

Plate 13, figure 8.

Shell small, translucent white, very thin, fusiform, the nucleus eroded, with four subsequent whorls; suture distinct, whorl in front of it with a narrow, thickened margin; whorls slightly angulated at the shoulder, the angle obsolete on the last whorl; axial sculpture, in addition to lines of growth of (on the penultimate whorl about twenty-six) fine, sharp, narrow lamellose riblets following the lines of growth, beading the presutural band, angulated at the shoulder and obsolete on the base, with wider, excavated interspaces; these are crossed by very numerous, fine, close-set, spiral threads, slightly coarser on the canal and minutely feebly reticulated by the incremental lines; body and pillar polished, the sculpture erased; outer lip thin, simple, with a wide sulcus occupying the space between the suture and the shoulder, in front of which it is arcuately protractive; pillar straight, simple, obliquely truncate in front; canal short, wide, not recurved. Operculum absent.

Variety with stronger sculpture, shorter and stouter shell, and distinctly recurved canal.

Lon. of (decolate) shell, 8.0; last whorl, 6.7; aperture, 5.0; max. diam. 4.0 mm. Same dimensions in the variety, 5.7, 4.5, 4.0, and 3.5 mm.

U. S. S. "Albatross," station 3392, Gulf of Panama, in 1270 fathoms, hard bottom, temperature 36°.4 F. U. S. N. Mus. 123,116 and 123,116 a.

### *Mangilia encella* DALL, n. sp.

Plate 14, figure 11.

Shell small, white, with a translucent thin periostracum and about five whorls (the nucleus eroded); spire slightly longer than the aperture; early whorls rounded with about fifteen slender, low, arcuate, protractive, axial riblets which are

obsolete on the last whorl; suture distinct, marginate, where the riblets are conspicuous as at the periphery and continued to the suture in front; there are also fine, well-marked lines of growth, all crossed by close-set, low, spiral threads which become coarser and slightly more distinct on the canal; anal sulcus deep, wide, rounded, the outer lip in front of it strongly protractive, thin, simple; body and pillar with a thin wash of callus; the pillar straight, attenuated in front, aperture narrow and lunate, canal short, rather wide, not recurved. Lon. of shell, 11.25; of last whorl, 8.5; of aperture, 6.5; max. diam. 5.0 mm.

U. S. S. "Albatross," station 3366, off Cocos Island, in 1067 fathoms, ooze, bottom temperature 37° F. U. S. N. Mus. 123,113.

### CLATHURELLA CARPENTER, 1856.

#### *Clathurella orariana* DALL, n. sp.

##### Plate 14, figure 12.

Shell small, fusiform, white or pale yellowish, dull surfaced, with a nucleus (eroded) and about six subsequent whorls; suture distinct, not appressed; whorls rounded; anal fasciole smooth except for minute arcuate, elevated, more or less distant axial lines, and the intervening incremental lines; whorl in front of the fasciole axially sculptured with (on the last whorl about twenty-six) moderately strong, equal, rounded, somewhat protractive ribs with subequal interspaces, the ribs extending from the shoulder to the suture or, on the last whorl, to the base, where they become obsolete; these ribs are crossed on the spire by about six prominent spiral threads, subequal and with wider interspaces, often with a more minute intercalary thread, the primaries somewhat swollen on the summits of the ribs; on the last whorl the same sculpture extends over the whorl and upon the canal; outer lip thin, broadly arcuate, simple, with a rounded, shallow, anal sulcus close to the suture; body with a thin wash of callus, white and smooth; pillar straight, rapidly attenuated in front with a pervious axis; canal wide, slightly recurved. Lon. of shell, 12.0; of last whorl, 8.7; of aperture, 6.0; max. diam. 5.0 mm.

U. S. S. "Albatross," station 3392, Gulf of Panama, in 1270 fathoms, hard bottom, temperature 36°.4 F. U. S. N. Mus. 123,117.

This species is not a typical *Clathurella*, but in the present confused state of the *Turritidae* no other group seems more appropriate, and it seems unsafe to apply a new sectional name to it until more is known.

#### *Clathurella panamella* DALL, n. sp.

##### Plate 14, figure 1.

Shell small, polished, white, with, on the last whorl and in the throat, a livid pinkish tint, ten-whorled; nucleus eroded, but with its first whorl flattish and appearing from above discoid and glassy; subsequent whorls glistening, constricted and appressed at the suture, with (on the penultimate whorl eighteen) arcuate

and protractive axial ribs which extend from the suture to the canal except over the last half of the last whorl; the constriction which indicates the anal fasciole gives the posterior edge of the whorl a marginate appearance, but does not interrupt the ribs, which are very prominent in front of the fasciole at the shoulder; the whole surface is evenly sculptured by strongly incised, almost channelled lines, with wider, flat, strap-like interspaces; near the canal these become narrower and cord-like and the channels wider, diminishing again toward the end of the canal; the spiral sculpture does not nodulate the ribs, but is minutely crenulated on the eminences by fine, even, incremental lines; aperture short, wide, with a deep rounded anal sulcus next the suture, a thin and much produced outer lip, a short, slightly recurved, flaring canal, an arcuate callous pillar, white and smooth, with a conspicuous nodule on the body between the sulcus and the suture; operculum wanting. Lon., 14; of last whorl, 8; of aperture, 5.5; max. diam. 6 mm.

U. S. S. "Albatross," station 3391, in the Gulf of Panama, 153 fathoms, mud, bottom temperature 55°.8 F. U. S. N. Mus. 123,104.

The species was also dredged at station 2804, in Panama Bay, in 47 fathoms, mud, bottom temperature 64° F. U. S. N. Mus. 122,771.

The first half of the last whorl in the adult ends in a node or varix, indicating a previous resting stage with developed outer lip; beyond this the whorl is destitute of ribs.

#### *Clathurella plicatella* DALL, n. sp.

Shell very small, acute, eight-whorled, flesh color or pinkish white, polished; nucleus turbinate, blunt, polished, smooth, of about two whorls; subsequent whorls axially sculptured with (on the last whorl behind the node) ten sharp, more or less sigmoid, slightly protractive ribs extending from the suture to the canal, or on the spire from suture to suture, with wider interspaces; suture appressed; in front of it is a very slight constriction corresponding to an anal fasciole, though no actual fasciole is visible; aperture moderate, anal sulcus large for the size of the shell, rounded and deep; lip in front of it rounded and produced; on the body a small mass of callus limits the posterior edge of the sulcus; the body is smooth and callous, the enamel extending upon the pillar, which is short and attenuated; canal short, recurved, on the back finely, sharply, spirally striated, but these striae do not extend over the rotundity of the whorl. Length of shell, 7.0; of last whorl, 3.5; of aperture, 2.5; max. diam. 2.5 mm.

U. S. S. "Albatross," station 2799, in Panama Bay, in 29½ fathoms, mud.

This pretty little species is a typical *Clathurella*.

### GLYPHOSTOMA GABB.

#### *Glyphostoma immaculata* DALL, n. sp.

Plate 1, figure 9.

Shell small, white, with a faint brownish or pinkish flush on the last whorl brilliantly polished and with no perceptible periostracum or operculum; nucleus

three-whorled, white, polished, with a peripheral carina on the third whorl which terminates abruptly; subsequent whorls four and a half, strongly sculptured; suture distinct, simple; whorls with 12-14 strong axial, slightly protractive ribs, faint on the anal fasciole, strong at the shoulder, and gradually attenuated over the base; these are crossed by (on the last whorl about fourteen) strong, subequal, equidistant channelled sulci, absent on the fasciole, obsolete in the depressions between the ribs, but cutting the summits of the ribs into squarish nodules; the fasciole is smooth and polished, but shows about four alternate opaque and translucent spiral bands of white, which at first look like threads; aperture narrow, anal sulcus strong, not deep, surrounded with a heavy callus; outer lip callous, forming a heavy varix, with six or seven internal lirae strongest and dentiform at the margin; body with a heavy and prominent anal callus separated by a gap from eight or nine dentiform lirae on the straight pillar; canal short, wide, at the anterior margin flaring. Lon. of shell, 10.4; of last whorl, 7.0; of aperture, 6.0; max. diam. 5.0 mm.

U. S. S. "Albatross," station 3391, Gulf of Panama, in 153 fathoms, mud, bottom temperature 55° 8 F. U. S. N. Mus. 123,115.

I do not feel certain that the existing nuclear shell is not an internal cast of a very thin, perhaps differently sculptured, larval shell, of which in one specimen I fancy traces are visible near the suture.

#### *Glyphostoma thalassoma* DALL, n. sp.

Shell slender, acute, eight-whorled, beside a nucleus of about a whorl and a half; the spire longer than the aperture, whorls gently rounded, suture appressed, not deep; axial sculpture of (on the penultimate whorl twenty-one) feeble, narrow, protractive ribs, concavely arcuate where they pass over the anal fasciole, and at the other end becoming obsolete on the base of the whorl, their interspaces narrower or subequal to the ribs; these are crossed by (between the sutures five or six, on the last whorl about eighteen) rounded, equal, strong spiral threads, with narrower interspaces, and hardly enlarged where they intersect the ribs; the anal fasciole is rather obscure and sculptured with incremental lines, and on the anterior edge about three very fine spiral threads; on the canal beyond the major threads are about fifteen minor spirals closely crowded; outer lip with a strong varix and conspicuous rounded anal sulcus, behind which on the body is an arcuate mass of callus; edge of the outer lip thin, strongly lirate within, the anterior margin denticulate; inner lip thinly callous, with a marginal row of small pustules opposite the lirae; canal constricted, deeply sulcate, somewhat recurved; shell discolored, probably originally whitish. Length of shell, 19.5; of last whorl, 12.0; of aperture, 9.0; max. diam. 6.5 mm.

U. S. S. "Albatross," station 3017, off Cape Lobos, Gulf of California, in 58 fathoms, mud, bottom temperature 61° 8 F. U. S. N. Mus. 110,612.

It is possible that, with greater age, the armature of the inner lip might be more conspicuous, as the shell may not be completely mature.

**DAPHNELLA** HINDS.**Daphnella (Eubela) imparella** DALL, n. sp.

## Plate 2, figure 2.

Shell small, translucent white, smooth, polished, very thin, with a three-whorled yellow nucleus of the "*Sinusigera*" type, ending abruptly; the form of the shell fusoid, whorls gently rounded, with about four whorls following the nucleus, marked only with lines of growth, obscure spiral markings, and on the canal a few obsolete spiral threads; suture distinct, not marginate; aperture lunate; anal sulcus very wide and shallow, outer lip thin, arcuately protractive; body smooth; pillar straight, obliquely truncate in front, hardly callous; canal wide, shallow, not recurved. Lon. of shell, 12.7; of last whorl, 9.0; of aperture, 7.0; max. diam. 5.5 mm.

U. S. S. "Albatross," station 3392, Gulf of Panama, on hard bottom, in 1270 fathoms, bottom temperature 36° 4 F. U. S. N. Mus. 123,114.

The species wants the sutural margination and beading of *Eubela limacina* Dall, of the Atlantic, and its proportions are different, but in other respects it is rather similar. This group has no operculum.

**Daphnella (Surculina) blanda** DALL, n. sp.

## Plate 3, figure 1.

Shell elongate fusiform, thin, slender, of a pale buff color, eroded nucleus, and about six subsequent whorls; suture distinct, slightly appressed, whorl in front of it minutely arcuately axially wrinkled; nucleus and the following whorl and a half eroded, the next two or three whorls faintly axially ribbed with (on the third whorl about fifteen) low, rounded, narrow, subequal protractive riblets which on the following whorls weaken and disappear; the intervals are wider than the ribs, shallow, and crossed by (between the sutures 8-9) low, regular, equal, rounded spiral threads, equally distributed and not nodulous, but weaker or absent between the suture and shoulder where the ribs originate. On the last whorl the spiral sculpture is much the same except that the threads are flattened and strap-like and the interspaces more or less channelled and near the canal wider; outer lip arcuate, slightly excavated near the suture, protractive below, moderately constricted on the canal, thin, simple; pillar straight, rapidly attenuated forward, the edge gyrate and minutely pervious at the axis; canal long, straight, wide, obliquely truncated. Lon. of shell, 26.5; of last whorl, 20.0; of aperture, 16.5; max. diam. 8.0 mm.

U. S. S. "Albatross," station 3366, off Cocos Island, Gulf of Panama, in 1067 fathoms, ooze, bottom temperature 37° F. U. S. N. Mus. 123,119.

*Daphnella* (*Surculina*) *cortezi* DALL, n. sp.

Shell slender, chestnut brown fading to white or yellowish, fusiform, the spire shorter than the aperture, with more than five whorls; nucleus defective; somewhat constricted over the anal fasciole with an appressed suture, periphery moderately rounded; axial sculpture at the suture of small, little-raised folds, with wider interspaces, not surpassing the width of the fasciole; on the earlier whorls are small, feeble, narrow axial riblets extending to the suture (on the antepenultimate whorl fourteen), with wider interspaces and almost vertical; these are crossed by very numerous flat, strap-like spirals with narrower channelled interspaces somewhat unequal in width and covering the whole shell; the entire surface is also sculptured with a multitude of fine spiral striae; outer lip thin, hardly arcuate; inner lip smooth, the surface erased; pillar anteriorly rapidly attenuated; anal sulcus shallow and inconspicuous; canal long and wide. Length of (decolate  $4\frac{1}{2}$  whorled) shell, 39-43; of last whorl, 29-34; of aperture, 24-27; max. diam. about 14 mm.

U. S. S. "Albatross," station 2919, off Cortez Bank, in 984 fathoms, mud, bottom temperature 38° F. U. S. N. Mus. 110,613. Also off San Diego, Cal., at station 4353, in 639 fathoms, mud, bottom temperature 39°.

The second specimen fortunately contained the soft parts, which were of a brownish color, the foot broad and large; the animal contracted by alcohol shows no tentacles, eyes, or muzzle, the retractile proboscis is large and rather long. There is no operculum; the anterior margin of the foot is transversely truncate and duplex, or with a double edge, the two separated by a shallow sulcus; the gill and osphradium large and produced. The siphonal fold of the mantle is large, elongate and smooth-edged; the posterior end of the foot bluntly rounded, the upper surface of the foot strongly corrugated, with no trace of an opercular gland. The verge was retracted in a sigmoid curve, its form subcylindrical near the base and gradually attenuating distally, the extreme tip papilliform, with no trace of an appendix.

It is of course possible that the typical species may differ anatomically from this one, but the shells are in general sufficiently similar to be provisionally associated. Whether they have anything to do with *Daphnella* is of course problematical, but that is the Mangilioid group they are least unlike.

The place of the two following species is also uncertain, nothing being known of the soft parts.

*Clinura* *monochorda* DALL, n. sp.

## Plate 13, figure 1.

Shell small, white, biconic, with a very thin yellowish periostracum and six sharply angular whorls; nucleus eroded; suture distinct, not appressed; axial sculpture of (on the penultimate whorl thirteen, on the last whorl seventeen) sharp, narrow, nearly vertical ribs, with wider interspaces, arcuate and feeble above the

periphery, where they form angular projections, obsolete on the last half of the last whorl, becoming obsolete midway between the periphery and the canal; the upper surface of the whorls flattish, sloping, with about fifteen fine, close, more or less alternated spiral threads; periphery with a strong projecting spiral keel more or less angulated by the ribs at their intersections; in front of the keel are about fifteen primary spiral ridges, low, with wider interspaces; both the ridges and the interspaces sculptured with finer subequal close secondary threads, except on the canal where they alternate; aperture elongate, angulated by the keel; anal sulcus wide, shallow; outer lip sharp, thin, crenulated by the spiral sculpture; body with a thin wash of callus; pillar straight, obliquely truncate in front; canal moderately long, rather wide and slightly flaring at the end; operculum none. Lon. of shell, 11.5; of last whorl, 8.0; of aperture, 6.2; max. diam. 6.5 mm.

U. S. S. "Albatross," station 3393, Gulf of Panama, in 1020 fathoms, mud, bottom temperature 36° 8 F. U. S. N. Mus. 123,130.

The shell is probably not fully grown, and the character of the aperture may be somewhat different at maturity.

### *Clinura peruviana* DALL, n. sp.

#### Plate 13, figure 2.

Shell small, white, with a thin grayish periostracum and about five similarly sculptured whorls exclusive of the (lost) nucleus; axial sculpture of (on the last whorl thirteen) sharp, narrow, vertical ribs, feeble and concavely excavated between the suture and the keeled shoulder of the whorl, there prominently angular, beyond the shoulder vertical, becoming obsolete on the base; beside this the incremental lines are minutely elevated and rasp-like over the whole surface, but most so between the spirals; suture distinct, not appressed, the whorl between it and the shoulder descending and flattened, with five or six revolving fine threads and some secondary, finer intercalary threads; shoulder with a prominent, small, rounded keel, undulated by the ribs, beyond which similar spiral threads to the number of a dozen or more, with wider interspaces, to the canal; the first interspace has three equal fine intercalary threads, the second two, and the remainder one each, becoming gradually closer anteriorly; aperture rather narrow, the anal sulcus wide, shallow, extending from the shoulder to the suture; aperture angulated by the shoulder keel; outer lip thin, entire; body with a wash of callus, white, polished; pillar rapidly attenuated, straight, axis not pervious; canal narrow, straight. Lon. of shell, 9.0; of aperture, 5.2; of last whorl, 7.0; max. diam. 4.2 mm.

U. S. S. "Albatross," station 4654, 24 miles N. 68° W. from Point Aguja, Peru, in 1036 fathoms, mud, bottom temperature 37° 3 F. U. S. N. Mus. 110,564.

*Cancellariidae.***CANCELLARIA LAMARCK.**Type *Voluta reticulata* Linné.**NARONA H. AND A. ADAMS.**Type *C. mitraeformis* Sowerby, not Brocchi.***Cancellaria (Narona) exopleura* DALL, n. sp.**

Shell small, slender, acute, with five rounded whorls, a deep suture, a pilose periostracum, whitish more or less banded spirally with reddish brown; nucleus defective, but apparently glassy, bluntly pointed and with about two whorls; subsequent whorls with (on the antepenultimate whorl fourteen) narrow, sharp, low riblets, with wider interspaces, becoming relatively less prominent on the later whorls; these are crossed by from four to six narrow, subequal, distant, rounded spiral threads, not nodulous at the intersections; the last whorl is also furnished with two or three prominent varices, irregularly disposed, beside the terminal varix; these are thick and rounded; on the last whorl there are about fifteen feeble spirals and some intercalary finer threads appear; aperture slightly shorter than the spire, semilunate, the outer lip reflected and thickened, with 9-10 denticles internally, not continued into the throat; inner lip not callous; pillar with two strong distant plaits, the canal wide, produced and recurved; no operculum. Length of shell, 26; of the last whorl 18; of the aperture, 12.5; max. lat. 12 mm.

U. S. S. "Albatross," station 2804, in Panama Bay, in 47 fathoms, muddy bottom. U. S. N. Mus. 96,638. Also at Payta, Peru, Dr. Jones.

This is nearest to *C. clavatula* Sowerby, from the same region, which is a smaller shell, with one less whorl, with fewer ribs (ten on the antepenultimate whorl), which are rounded and much more prominent; the whorls in *C. clavatula* also increase more rapidly and have a tabulate aspect.

***Cancellaria (Merica) corbicula* DALL, n. sp.****Plate 1, figure 4.**

Shell small, thin, milk-white, with a thin, pale yellow periostracum, and about six whorls beside the blunt (decollate) nucleus; form bulimoid, aperture nearly equal to the spire in length; whorls evenly rounded, with a strongly marked suture; sculpture between the sutures of seven to nine flattish revolving threads with slightly wider channelled interspaces; these are crossed by numerous, subequally spaced, very narrow, low, slightly arcuate axial ridges, slightly nodulous at the intersections; there are also very numerous, prominent, incremental lines in the interspaces; aperture oval, outer lip thin, smooth, entire, reflected; inner

lip with a thin callous coat of enamel, continuous with the outer margins; pillar short, axis imperforate, with two strong oblique plaits near the proximal end of the pillar; canal obsolete. Length of shell, 21.5 (to 26.0); of last whorl, 16.0; of aperture, 10.5; max. diam. 9.5 mm.

U. S. S. "Albatross," station 2936, off San Diego, California, in 359 fathoms, mud, bottom temperature 49° F. Also at station 4382, in 656 fathoms, mud, temperature 42° 5; at station 4407, off Catalina Island, in 600 fathoms, sand, temperature 39° 4; and station 4425, in 1100 fathoms, mud, north of San Nicolas Island.

The figure of this pretty species was drawn from a rather small specimen. The type of the Merica group is *Cancellaria melanostoma* Sowerby.

### *Cancellaria (Merica) centrota* DALL.

Plate 1, figure 8.

*Cancellaria centrota* Dall, Proc. U. S. Nat. Mus., 1896, 18, p. 13.

Shell solid, short, ashy or pinkish white, with a smooth, small nucleus of two whorls, and five and a half strongly sculptured subsequent whorls; spire subtabulate, rather pointed; sculpture of five or six strong spiral threads, of which that at the shoulder is much the largest, crossed by (on the last whorl nine) sharp, recurved varices, spiny at the intersections in well-developed specimens, the spines at the shoulder much longer than the others, while in some depauperate specimens the only spines are at the shoulder; there is also some obscure spiral striation between the threads on the last whorl, and the lines of growth are irregular and often prominent; aperture subtriangular, with three strong plaits on the pillar, and, in fully adult shells, some faint liriation inside the outer lip; canal short, distinct, forming a strong fasciole around a narrow, deep umbilicus, over which the inner lip is partly reflected; body with a wash of callus; throat whitish. Height of shell, 35; of last whorl, 25; of aperture, 18; width of shell exclusive of the spines, 20 mm.

U. S. S. "Albatross," station 3368, in 66 fathoms, rocky bottom, near Cocos Island, Gulf of Panama, temperature 58° 4 F. U. S. N. Mus. 122,996.

This is the most thorny species yet described.

### *Cancellaria (Merica) io* DALL.

Plate 1, figure 2.

*Cancellaria io* Dall, Proc. U. S. Nat. Mus., 1896, 18, p. 14.

Shell fusiform, solid, whitish or pink, with a more or less olivaceous epidermis, and about six whorls; spire pointed, whorls rounded, somewhat constricted in front of the suture, which is appressed; sculpture of numerous flattened spiral threads, with about equal interspaces, uniform over the whole surface, but with

occasional finer intercalary threads; these are crossed by (on the last whorl about thirteen) rather stout, rounded ribs, strongest at the shoulder, obsolete beyond the periphery, and not reaching the suture behind them; aperture rather long, outer lip simple, smooth, not reflected or lirate; pillar rather straight, with three strong plaits; canal shallow, wide, pointed, making no perceptible fasciole; umbilicus none; body with a thin wash of callus. Height of shell, 43; of last whorl, 33; of aperture, 25; width of last whorl, 21 mm.

U. S. S. "Albatross," station 3354, in 322 fathoms, green mud, Gulf of Panama, bottom temperature 54°.1 F. U. S. N. Mus. 122,995.

This species has much the look of a gigantic Admete, but without the arched pillar. Most of the specimens were eroded, and the species has a genuine abyssal aspect.

### *Cancellaria (Merica?) microsoma* DALL, n. sp.

#### Plate 11, figure 10.

Shell small, thin, covered with a pale brownish periostracum, with about five tabulate whorls beside the (lost) nucleus; suture distinct, not channelled; whorl in front of it flattened, beyond the keel at the shoulder moderately rounded; axial sculpture of lines of growth which are at intervals so prominent as to suggest faint ribs; spiral sculpture comprising a marked keel at the shoulder, minutely undulate by the axial riblets, and followed by a wide interval; about eight less prominent spiral threads, separated by successively narrower intervals with microscopic intercalary threads, covering the whole base; aperture ovate, outer lip thin, simple, sharp; body smooth; pillar straight, short, thin, with two plaits, the anterior of which forms the edge of the columella; anterior part of aperture with a distinct, but not deep, rounded notch. Lon. of shell, 3.5; of last whorl, 2.5; of aperture, 1.7; max. diam. 1.8 mm.

U. S. S. "Albatross," station 3418, off Acapulco, Mexico, in 660 fathoms, sand, bottom temperature 39° F. U. S. N. Mus. 122,997.

This small species might be referred to Admete were it not for the absence of the concave arcuation of the pillar which is characteristic of that genus, and the presence of a small umbilical chink.

### *Cancellaria (Admete?) californica* DALL, n. sp.

#### Plate 4, figure 4.

Shell thin, turreted, with five whorls beside the nucleus, white, with a pale, olivaceous periostracum; nucleus blunt, turgid, of about a whorl and a half, smooth but not polished; subsequent whorls with a prominent angular shoulder, above which the whorl is tabulate, the angulation becoming obsolete in the last whorl of the adult shell; in the early whorls the space between the angle and the suture behind it is nearly smooth and flat, later it has faint spiral threads and becomes more

convex; axial sculpture of numerous (on the penultimate whorl about twenty) low rounded ribs, with shallow, subequal interspaces, strongest at the angle, obsolete on the tabulation and on the last whorl, extending on the spire to the succeeding suture; the incremental lines are also rather conspicuous; spiral sculpture in front of the angle of (on the spire about four, on the last whorl about twenty) low rounded subequal spiral threads with wider interspaces, a little turgid where they cross the ribs, especially on the spire, and more crowded on the last whorl, anteriorly, where they extend to the brink of the umbilicus; aperture subtriangular, the outer lip thin, not reflected; body with a thin wash of callus; pillar thin, straight, with three plications, the middle one strongest; canal obsolete or none; umbilicus rather large, funicular, its walls vertically striate, the opening partly concealed by the pillar lip; in the young the umbilicus is relatively much smaller; operculum absent. Length of shell, 16; of last whorl, 11; of aperture, 8; max. diam. 8.3 mm. Length of figured specimen, 10 mm.

U. S. S. "Albatross," station 2980, in 603 fathoms, mud, bottom temperature 39° F. U. S. N. Mus. 110,626. Also at stations 3346, 3194, 2839, 2923, 2936, and 4339, from off Tillamook Bay, Oregon, south to the vicinity of San Diego, California, in from 92 to 786 fathoms, temperatures from 37°.3 to 49° F.

The specimen figured, from 2936, is about two-thirds grown; the others were discovered later. It does not show the third feeble plait, nor the somewhat sudden enlargement of the last whorl, both noticeable in the fully adult shell. It has the aspect of an Admete, in spite of the presence of an umbilicus, but is perhaps only a delicate form of *Trigonostoma*.

### *Volutidae.*

#### CARICELINAE.

#### **ADELOMELON** DALL.

*Adelomelon* Dall, *Nautilus*, April, 1906, **19**, p. 143; type *Voluta ancilla* Solander; Smithsonian Misc. Coll. Quarterly, 1907, **43**, p. 355.

In making a thorough and too long delayed examination of the systematic history of the *Volutidae*, in connection with a revision I have been making of the group, I discovered that the type of the genus *Scaphella* (under which I had formerly included the dull-colored American group of *Volutes*) is *V. undulata*, which belongs to the group of which *Amoria* Gray is a synonymic name; and the type of *Cymbiola* Swainson, which has been used for them by several authors, is *Voluta vespertilio* Linné. Both of these forms have a shelly protoconch, and belong to another subfamily. *Scaphella* has a peculiar brilliant surface enamel which no American *Volute* possesses, and a totally different radular dentition. It is obvious, therefore, that neither of these groups can properly contain the American shells which form an extremely natural group, and to which I have given the name of *Adelomelon*.

It may be well to recall here that the shell to which I originally gave the name of *Volutilithes philippiana*, which is an evident descendant of some of the Chilian and Patagonian Tertiary types, is now known to possess a membranous protoconch, and was referred by me, together with its fossil allies, to a section of Adelmelon under the name of Miomelon (Feb., 1907). Not aware of this fact, my friend, Dr. von Ihering of San Paulo, Brazil, in June of the same year, proposed for the same group of species the genus Proscaphella, with *P. gracilior* Ihering, as type. This is the *Voluta gracilis* of Philippi, not of Lamarck. While the sculpture of these species is rather characteristic, they are united with the Tertiary ancestors of the recent Adelmelon by somewhat intermediate gradations, and therefore I think that they can hardly be more than subgenerically separated from each other.<sup>1</sup>

Excepting *A. stearnsii* of Alaska, which perhaps reached American waters by ancestral emigration along the western shores of the Pacific, the most northerly species of Adelmelon is the following shell.

#### *Adelmelon benthalis* DALL.

Plate 5, figure 8.

*Scaphella benthalis* Dall, Proc. U. S. Nat. Mus., 1896, 18, p. 13.

*Adelmelon benthalis* Dall, Smithsonian Misc. Coll. Quarterly, Feb., 1907, 48, p. 357.

Shell recalling *A. magellanica*, Sowerby, but stouter, with more rounded whorls, the aperture shorter and wider, with a broad flexure where the lip turns to meet the body whorl, while in *A. magellanica* the posterior part of the aperture is pointed; the latter has two strong plaits on the pillar; *A. benthalis* has three, all obsolete, the middle one most perceptible, and has a less marked canal and siphonal fasciole. The interior of the aperture is pale flesh color; the exterior seems to have been like that of *A. magellanica*, but is almost entirely decorticated. It has five whorls beside the nucleus, and there is no operculum. Height, 125; of the last whorl, 90; of the aperture, 70; width of the aperture, 35; of the (decorticated) shell, 60 mm.

U. S. S. "Albatross," station 3360, in 1672 fathoms, sand, in the Gulf of Panama, temperature at bottom 42° F. U. S. N. Mus. 122,998.

At first sight one would be disposed to think that this specimen represented a northward extension by 3360 miles of one of the Magellanic species, but a more careful examination shows numerous points of difference.

The whorls are more nearly tabulate in front of the suture, the whorls rounder, the spire more rapidly tapering and relatively longer.

<sup>1</sup> By the misplacement of some paragraphs in the paper above cited, the genus *Zidona* has been inserted in the text before, instead of after, the portion treating of Miomelon, *op. cit.*, p. 363-365.

**TRACTOLIRA DALL.**

*Tractolira* Dall, Proc. U. S. Nat. Mus., 1896, **18**, p. 12; Smithsonian Misc. Coll. Quarterly, Feb., 1907, **48**, part 3, p. 365.

Shell slender, drawn out in its coil, fusiform, with a short canal and pervious axis; outer lip simple, not expanded or lirated; body not callous, the axis twisted, with a single strong plait at its anterior edge, the young showing five or more narrow, low, thread-like ridges behind the one above mentioned, but which become obsolete in the adult.

This singular shell appears to be a degenerate abyssal form of Volutidae, but which can not be assigned to any of the genera yet established.

Type *T. sparta*, Dall.

The fossil *Voluta alta* Sowerby, of the South American Tertiaries, has the aspect of being a precursor of *T. sparta*.

**Tractolira sparta DALL.**

Plate 2, figure 7.

*Tractolira sparta* Dall, Proc. U. S. Nat. Mus., 1896, **18**, p. 13, Smithsonian Misc. Coll., 1907, **48**, p. 366.

Shell elongate, slender, with a greenish or ashy adherent epidermis (more or less eroded near the apex in all the specimens), and about six whorls; nucleus apparently as in *Adelomelon*, large, with an apical spur; whorls drawn out, rounded, with a distinct suture, the upper whorls at first smooth, then with irregular, partly obsolete, transverse wrinkles, some of which cross the whorl, but which are too irregular to call ribs; surface everywhere sculptured with numerous, even, fine, flattish spiral threads, with equal or slightly wider interspaces, and with well marked but not regular lines of growth; aperture subovate, rather wide in front, the outer lip simple and hardly thickened; the throat white, a thin wash of callus on the body, the pillar thin, pervious, short; the canal short and wide, with hardly any siphonal fasciole; operculum absent. Height of shell, 60; of last whorl, 43; of aperture, 28; diam. 19 mm.

U. S. S. "Albatross," stations 3360, 3374, 3414, and 3415, in 1672 to 2232 fathoms, mud, bottom temperatures 35°.8 to 36°.4 F.; Gulf of Panama to Acapulco, Mexico. U. S. N. Mus. 122,999.

This is a very characteristic and singular abyssal shell.

*Ptychatractidae.***PTYCHATRACTUS STIMPSON.****Ptychatractus californicus DALL, n. sp.**

Shell small, fusiform, white, with a pale straw-colored periostracum and about five whorls; suture distinct, not appressed, whorls turgidly rounded; axial sculp-

ture of (on the last whorl about fifteen) low rounded nearly vertical ribs, with about equal interspaces, which are strongest at the periphery and gradually become weaker in each direction, and obsolete on the base; the periostracum is vertically wrinkled, but the incremental lines are not conspicuous; spiral sculpture of (on the penultimate whorl six or seven, on the last whorl about twenty), flattish spiral threads with subequal or slightly narrower channelled interspaces, this sculpture extending to the tip of the canal; these threads override the ribs but without turgidity at the intersections; aperture elongate, ovate; outer lip simple, sharp, not reflected; inner lip not callous, pillar short, obliquely attenuated; canal short, recurved, narrow; on the pillar one feeble plait is visible at the aperture, further back there are two, and in the spire three with faint indications of a possible fourth plait, oblique and rather close together near the anterior edge of the pillar. Length of shell (nucleus defective), 11.0; of last whorl, 8.5; of aperture, 5.5; max. diam. 5.5 mm.

U. S. S. "Albatross," station 2923, off San Diego, California, in 822 fathoms, mud, bottom temperature 39° F. U. S. N. Mus. 193,650.

This little shell differs from the boreal *P. occidentalis* Stearns, and the *P. ligatus* Mighels, of New England in having axial ribbing and more than two plaits, as well as in its color. The operculum is ovate, concentric, and has an apical nucleus.

### *Fasciolaridae.*

#### **SOLENOSTEIRA DALL.**

*Solenosteira* Dall, Trans. Wagner Inst., 1890, 3, p. 122; type, *Pyrula anomala* Reeve, Conch. Icon., 1847, *Pyrula*, pl. 8, fig. 12.

#### ***Solenosteira elegans* DALL, n. sp.**

##### **Plate 5, figure 6.**

Shell solid, large, white, with a somewhat villous olivaceous periostracum; short fusiform, with a nucleus of two and about five and a half subsequent, rapidly enlarging whorls; nucleus smooth, turgid, blunt; axial sculpture of (on the last whorl ten) strong, prominent, rounded, nearly vertical ribs, with wider interspaces, crossing the whorls, and faint incremental lines emphasized by prominences of the periostracum; spiral sculpture of (between the sutures three and on the last whorl six or seven) major prominent cords, between which are from three to seven finer threads, the former a little turgid where they override the ribs; suture distinct, deep, not appressed; aperture oval, outer lip sharp, not reflected, with about fifteen spiral lirae within, the anterior one largest; inner lip white, callous, with three or four faint subsutural lirae in the fully adult shell, otherwise quite smooth; canal short, wide, recurved; siphonal fasciole prominent; operculum

ovate, with an apical acute nucleus, the area of adhesion quite small in proportion to the surface. Length of shell, 38; of last whorl, 29; of aperture, 22 mm.; max. diam. 22 mm.

U. S. S. "Albatross," station 3355, Gulf of Panama, in 182 fathoms, mud, bottom temperature 54° F. U. S. N. Mus. 123,003.

This is perhaps the handsomest and most regularly sculptured species of this group.

### FUSINUS RAFINESQUE.

*Fusinus* Rafinesque, Anal. de la Nature, 1815, p. 145; new name for *Fusus* Lamarck, preoccupied.

*Fusus* Bruguière, Encycl. Méth., 1789, p. 15 (nude name; not *Fusus* Helbling 1779); Lamarck Prodrôme, p. 73, 1799; type *Murex colus* Linné.

*Fusinus* Dall, U. S. Geol. Survey, Professional Papers.

### *Fusinus panamensis* DALL, n. sp.

Shell solid, white, covered with an olivaceous periostracum and about eight whorls (two or three at the apex defective in the specimen); axial sculpture of (on the apical whorls six, on the last whorl nine or ten) prominent rounded ribs with about equal interspaces; on the apical whorls these cross the whorl from suture to suture, but later become gradually more confined to the periphery, and on the last whorl show signs of obsolescence; these are crossed by numerous fine, sharp threads, slightly turgid where they cross the ribs, and with wider interspaces; the peripheral thread becomes more prominent, and on the last whorl or two almost becomes a keel from which the whorl slopes back to the suture in a flattish manner; the suture is distinctly appressed, not deep except near the apex; aperture rounded, white; the outer lip simple, not reflected, with a few spiral lirae in the throat which fall short of reaching the lip; inner lip with a thin callus with the edge raised anteriorly and faint indications of liration; canal constricted, long (in the specimen it has been broken and a new one formed with some distortion); operculum elongate, oval, with apical nucleus. Length of five whorls, 75; of last whorl, 55; of aperture without the canal, 21; max. diam. 26 mm.

U. S. S. "Albatross," station 3391, Gulf of Panama, in 153 fathoms, mud, bottom temperature 55° F. U. S. N. Mus. 123,004.

A rather rude but very distinct species.

### *Fusinus fragillissimus* DALL, n. sp.

#### Plate 12, figure 6.

Shell small, excessively thin and fragile with (more than) four rapidly enlarging whorls; shell substance chalky, yellowish white, with a pale olivaceous perio-

tracum; suture very deep but not channelled, the whorl in front of it, for a small space, free from spiral sculpture; beyond this the sculpture consists of fine close-set spiral threads, of which some are a little larger than the rest, having from one to three of the smaller ones intercalated between them; there are about six of the larger ones between the sutures on the penultimate whorl; on the earliest remaining whorl there are six similar squarish threads with narrower channelled interspaces, and these are regularly reticulated by fine equidistant vertical elevated lines; on the later whorls there are only incremental lines of no great strength; base of the last whorl rather contracted; aperture ample, the outer lip thin, simple; a faint wash of callus on the inner lip; pillar slender, twisted, with a distinctly margined edge and pervious axis; canal moderately long and wide, twisted and slightly recurved. Length of four whorls, 21; of last whorl, 14; max. diam. 8.5 mm.

U. S. S. "Albatross," station 3398, off the coast of Ecuador, in 1573 fathoms, ooze, bottom temperature 36° F. U. S. N. Mus. 123,007.

This is a very characteristic abyssal species and does not closely resemble any of those heretofore described.

#### **Exilia** CONRAD.

*Exilia* Conrad, Journ. Acad. Nat. Sci. Phila., 1860, n. s., 4, p. 291, pl. 47, fig. 34; type *E. pergracilis* Conrad, l. c. Not *Exilia* Mulsant, 1863.

This shell was described from the Eocene of Alabama by Conrad, and appears to differ from *Fusinus* chiefly by its small size, delicate sculpture, and slender form. It has been stated to have a plicate pillar, but this is perhaps due to confusion with a species belonging to another genus, since the undoubtedly authentic specimens in the National Collection show not the slightest trace of any plication. The following species recalls *Exilia* in many particulars and might perhaps be appropriately referred to this subgenus.

#### **Fusinus (Exilia?) rufocaudatus** DALL.

Plate 3, figure 3.

*Fusus rufocaudatus* Dall, Proc. U. S. Nat. Mus., 1896, 18, p. 12.

Shell elongate, acute, thin, with six or more whorls (partly eroded) covered with a delicate yellow-brown epidermis, the pillar and canal, when fresh, of a pronounced rufous-brown or brown-pink, which fades more or less in the dry shell; whorls drawn out, rounded, with a deep but not channelled suture; nucleus eroded; the remaining whorls sculptured with about a dozen flattened subequal spirals with narrower grooves between them, crossed by lines of growth and (on the last whorl about twenty) sharp flexuous riblets, which cross the whorl and are obsolete on the canal; base attenuated; pillar long, very straight, attenu-

ated, twisted, almost pervious; aperture narrow; outer lip very thin, sharp, concave near the shoulder, produced in front, modified by the sculpture, but not lirated. Height of (eroded) shell, 30; of last whorl, 21; diam. 9 mm.

U. S. S. "Albatross," stations 3360, 3374, 3392, and 3415, in 1270 to 1879 fathoms, Gulf of Panama to Acapulco, sandy or oozy bottom, temperatures 36°.0 to 36°.4 F. U. S. N. Mus. 123,006.

This elegant little shell recalls *Boreotrophon* in its sculpture. The spirals in some of the specimens are narrower and more numerous than in the type, and in the young the ribs are less sharp and the color more ashy.

### TROSCHELIA MÖRCH.

*Troschelia* Mörch, Journ. de Conchyl., 1876, 24, p. 370; type, *Fusus berniciensis* King. Not *Troschelia* Duncan, Echinidae, 1888.

*Boreofusus* G. O. Sars, Moll. Reg. Arct. Norv., 1878, p. 278; type, *B. berniciensis* King.

Shell elongate, fusiform, with a produced recurved canal, a short, rounded-triangular operculum with apical nucleus, slightly sinistrally curved; the radular formula  $\frac{1}{10} + \frac{1}{1} + \frac{1}{10}$ , the cusp of the rhachidian plate well developed, nearly as long as the base; animal having the eyes developed.

### Thalassoplanes DALL, subg. nov.

Shell short, the canal very short, the operculum straight, elongate, wedge-shaped, the extreme apex slightly turned to the right; radula (of the type) with the formula  $\frac{1}{8} + \frac{1}{8} + \frac{1}{8}$ , the rhachidian plate with the cusp obsolete; animal blind, male with a small, subcylindric verge, without appendices. Type *T. mörchii* Dall.

### *Troschelia* (*Thalassoplanes*) *mörchii* DALL, n. sp.

Shell short, stout, with about five whorls, of which two are nuclear, polished, depressed, smooth; subsequent whorls uniformly sculptured with (between the sutures seven, on the last whorl nine or ten) narrow, similar, flat-topped, elevated ridges, with much wider, equal interspaces, and on the canal seven additional spiral threads; this sculpture is crossed by numerous (three or four to a millimeter) equal and equally spaced, flexuous, smaller elevated axial threads, which override the ridges and divide the channels into rectangular spaces; the whole is covered by a fibrous, thin, olivaceous periostracum; suture distinct, not channelled; whorls turgid and evenly rounded; aperture nearly equal to the spire, outer lip thin, sharp (in the adult reflected?), body and inner lip slightly erased, white; pillar short, twisted, its anterior edge thickened and flaring anteriorly, obliquely attenuated; axis pervious; canal almost obsolete, with no siphonal fasciole; operculum thin, brownish, pinna-shaped, the area of attachment

small, rounded, surrounded by a thick deposit of polished brown callus which extends nearly to the apex. Lon. of shell, 16.0; of last whorl, 12.0; of aperture, 8.0; of operculum, 7.5; lat. of shell, 11.0; of operculum, 3.2 mm.

U. S. S. "Albatross," station 3684, in Mid Pacific, N. Latitude 0° 50', W. Longitude 137° 54', in 2463 fathoms, ooze, bottom temperature 35°F. U. S. N. Mus. 110,750.

It is extremely unusual to find a dextral shell with a dextrally curved operculum, and it is possible this feature may prove to be an individual abnormality.

The animal is blind, with a retractile proboscis and no muzzle; small, rounded, blunt tentacles (in alcohol); a small, not twisted or recurved, subcylindric verge with no appendages; the siphonal fold is also simple; the foot is short and bluntly pointed behind; in alcohol, strongly contracted, the surface was coarsely wrinkled and of a whitish color.

Two Antarctic species dredged by the "Challenger" between Marion Island and the Crozets appear to belong to this subgenus. They are *Fusus (Neptunea) calathiscus* and *F. (N.) setosus* of Watson. In looking over the other reports of deep-sea work I do not find any others which can, with probability, be referred to this group. Watson's supposition that his species might belong to *Buccinopsis* (= *Liomesus*), though having some ground in the conchological features and operculum, is negated by the fuller information now supplied.

### *Buccinidae.*

#### **TRUNCARIA** ADAMS AND REEVE.

*Truncaria* Adams and Reeve, Voy. Samarang, Zool. Moll., 1850, p. 33 (type *Buccinum filosum* Ads. and Rve. *op. cit.* pl. 11, fig. 18); H. and A. Adams, Gen. Rec. Moll., 1853, 1, p. 111, (*ex parte*); H. Adams, in Carpenter, P. Z. S., London, 1863, p. 344; Tryon, Man. Conch., 1882, 4, p. 8.

Of the species referred to this genus in the Genera of Recent Mollusca only one, the type, really belongs to it, as was recognized by Henry Adams, according to Carpenter, in 1863. This came from the China Sea. I now have the pleasure of adding a second species, and of completing the diagnosis of the hard parts, by the information that the operculum is narrow, elongate-oval, concentric, with the nucleus apical.

#### **Truncaria brunneocincta** DALL.

##### **Plate 2, figure 6.**

*Cominella brunneocincta* Dall, Proc. U. S. Nat. Mus., 1896, 18, p. 11.

Shell compact, solid, livid pinkish, with narrow, brown, distant, spiral lines and a few brown flammules near the suture; nucleus smooth, small, white, of two

whorls, followed by five subsequent whorls; spire acute, whorls moderately rounded, the last much the largest; sculpture on the early whorls decussate by fine transverse riblets, strongest near the suture, and flattish spiral threading; later the whorls are polished, smooth, except for lines of growth and narrow, distant, sharp grooves; suture with a narrow channel; aperture long, narrow, with a shallow narrow sinus behind and a deep siphonal sulcus in front; outer lip thickened, flexuous, obscurely lirate behind, body with a thin callus; pillar white, concave, with a prominent margin, shorter than the aperture. Operculum narrow, elongate-oval, with an apical nucleus. Height of shell, 31.5; of last whorl, 24.5; diameter, 13.0 mm.

U. S. S. "Albatross," station 3390, in the Gulf of Panama, in 56 fathoms, sand, temperature 62°.6. U. S. N. Mus. 122,009.

Owing to the fact that the accessible species referred to *Truncaria* were all generically different from the present shell, and the original type unknown to me, this species was provisionally referred to *Cominella* in my preliminary diagnosis. Further study led to the discovery of its true relations.

### VOLUTOPSIUS MÖRCH.

#### *Volutopsius? amabilis* DALL, n. sp.

##### Plate 11, figure 9.

Shell decollate, subcylindric, with an apparently blunt spire, whitish, with pale-brown, dull periostracum, and about four whorls, exclusive of the lost nucleus; suture distinct, not channelled, the whorl slightly constricted in front of it; axial sculpture only of faint lines of growth; spiral sculpture of (on the penultimate whorl about seven) weak, narrow, channelled, incised lines, with flat, wider interspaces and a still wider, smooth space between the first channel and the suture; the interspaces are narrower and somewhat rounded near the canal; aperture lunate, outer lip somewhat varicose, simple, entire, vertical; body with a smooth callus extending on to the short, slightly twisted pillar; canal very short, wide, not constricted; operculum short, ovate, with the nucleus near but within the apical margin. Lon. of last two whorls, 10.5; of last whorl, 8.5; of aperture, 6.0; max. diam. 5.2 mm.

U. S. S. "Albatross," station 3392, Gulf of Panama, in 1270 fathoms, hard bottom, temperature 36°.4 F. U. S. N. Mus. 123,008.

This curious little shell is too imperfect for final decision as to its place in the system. It has a distant resemblance to *Truncaria*, but the form of the operculum, as well as the peculiar blunt spire, remove it from that genus. It resembles as much as anything the young shell of a species of *Beringius*. The operculum is not *Columbelloid* or *Purpuroid*.

**PHOS MONTFORT.****Phos cocosensis DALL.**

Plate 8, figure 5.

*Phos cocosensis* Dall, Proc. U. S. Nat. Mus., 1896, **18**, p. 11.

Shell elongate, acute, eleven-whorled, including a nucleus of four whorls; color yellowish-white, with variable brown spiral banding; sculpture of eleven or twelve narrow, little elevated, distant ribs, more or less angulated at the shoulder; spiral sculpture of numerous rather sharp, close threads, flatter on the last whorl, with a few more prominent between the suture and the shoulder; suture distinct, whorls moderately rounded; aperture longer than wide, with an entire outer lip, slightly thickened and internally lirate; throat white, pillar with a groove near its anterior edge; canal short, deep; siphonal fasciole moderate; body with a thin white callus. Height, 47; last whorl, 28; diam. 19 mm.

The operculum is smooth-edged, nearly as in *Fusinus*, with apical nucleus.

U. S. S. "Albatross," station 3368, near Cocos Island, Gulf of Panama, in 66 fathoms, rocky bottom, temperature 58°.4 F. U. S. N. Mus. 123,010. Also at station 3387, in 127 fathoms, sand, bottom temperature 56°.2 F.

This species is nearest to *Phos beani* Crosse and Fischer, of the West Indies, but is larger and further differs by the strong and regular ribs.

*Alectrionidae.***ALECTRION MONTFORT.**

*Alectrion* Montfort, Conchyl. Syst., 1810, **2**, p. 565; type, *Buccinum papillosum* Linné.

*Nassa* Lamarck, Prodrome, 1799, p. 71; type, *Buccinum mutabile* Linné; not *Nassa* Boltén, Mus. Bolt., 1798, p. 132 (= *Purpura* Lamarck, 1799, not Martyn, 1784).

*Hima* (Leach) Gray, 1847, Moll. Gt. Brit., 1852, p. 123; type, *Nassa incrassata* Lamarck.

*Tritia* Risso, Hist. Eur. Mérid., 1826, **4**, p. 172, note; Gray, P. Z. S., 1847, p. 139; type, *Buccinum reticulatum* Linné.

*Tritonella* A. Adams, 1853, not Swainson, 1840.

**HIMA LEACH.**

Shell reticulate, with a callus on the inner lip; the outer lip varicose and internally lirate or denticulate.

***Alectrion (Hima) catallus* DALL, n. sp.****Plate 11, figure 11.**

Shell short, solid, acute-conic, pale brown, with a tendency to darker bands, whorls eight and a half, of which three and a half are nuclear, rapidly increasing, sharply reticulately sculptured; suture very distinct, deep but not channelled; nucleus as in the next species, and the character of the sculpture similar to that species, but closer and finer; on the last whorl are about twenty axial riblets continuing over the whorl from the suture to the siphonal fasciole; on the spire between sutures six, and on the last whorl sixteen strap-like spirals; aperture rounded-quadrate; outer lip with a strong varix, inside of which about nineteen fine elevated lirae extend into the throat; body with a thick whitish callus and a low, rather distant subsutural ridge; pillar short, arcuate, smooth, with one or two elongate pustules near the anterior obliquely truncate edge which bears a strong keel; canal very short, contracted, strongly recurved, with a longitudinally striate siphonal fasciole, behind which, separating it from the base of the whorl, is a deep sulcus. Lon. of shell, 14.0; of last whorl, 9.5; of aperture, 6.0; max. diam. 8.5 mm.

U. S. S. "Albatross," station 3355, Gulf of Panama, in 182 fathoms, mud, bottom temperature 54°.1 F. U. S. N. Mus. 123,013.

A very compact and elegantly sculptured shell of the group to which the *A. ambigua* Montagu belongs, but, like most of the non-littoral species, of a more earthy and less porcellanous consistency. The nucleus is of about the same character as in the species from moderate depths.

***Alectrion (Hima) miser* DALL, n. sp.****Plate 4, figure 1.**

Shell of moderate size, pale straw-color, with a smooth polished nucleus having a very minute swollen apex and three and a half rapidly enlarging rounded whorls followed by an abrupt change to the adult sculpture, which is borne by about five and a half subsequent whorls; shell solid, strongly reticulately sculptured; suture distinct, not channelled; axial sculpture of (on the last whorl about twenty) narrow rounded ribs, extending completely over the whorl, with slightly wider interspaces and fairly distinct lines of growth; spiral sculpture of (between the sutures four and on the last whorl seven) flat, strap-like, elevated bands which override the ribs and are about equally elevated in the interspaces as on the summits, where on the earlier whorls at the intersections, the intersections are very slightly swollen; between the anterior spiral and the siphonal fasciole is a wider sulcus; aperture subquadrate; outer lip somewhat varicose, thick, with, in the adult, eight strong spiral lirae, extending into the throat; body with a thin layer of callus and a faint subsutural ridge; pillar very short, concave, smooth, callous, with a strong keel just behind its anterior, obliquely truncate edge; axis not

pervious; canal short, wide, shallow, with a strong, conspicuously wrinkled siphonal fasciole. Lon. of shell, 20.0; of last whorl, 13.5; of aperture, 9.0; max. diam. 11.5 mm.

U. S. S. "Albatross," station 3355, Gulf of Panama, in 182 fathoms, mud, bottom temperature 54° 1 F. U. S. N. Mus. 123,014. Also at stations 3354, 3387, 3389, 3391, 3396, and 3422, in 141 to 322 fathoms, mud or sand, bottom temperatures from 46° to 56° 2 F., the range extending from the Gulf of Panama to the vicinity of Acapulco, Mexico.

**Alectrion (*Tritia*) *exsarcus* DALL, n. sp.**

Plate 11, figure 12.

Shell small and rather slender, with three and a half nuclear and the same number (or more) of subsequent whorls; color pale yellowish with two pale, reddish brown, narrow bands, so applied that when the suture is formed there is a brown band near and on each side of it; nucleus large, the visible portion having a turbinate aspect, smooth and polished; subsequent whorls reticulated, with a distinct but not channelled suture; axial sculpture of (on the last whorl sixteen) strong, vertical, rounded ribs, which entirely cross the whorls and have a particular prominence (ill-defined) just in front of the suture; lines of growth feeble, surface polished, periostracum thin, yellowish; these ribs are crossed by (on the penultimate whorl five or six, on the last whorl fourteen) strong, rounded, somewhat flattened spiral threads, of which the second in front of the suture is a trifle larger than the others and may be articulated with brown and white; these threads are not nodulous, but become a little turgid when they cross the ribs, and are separated by subequal, or, on the base, slightly wider flattish interspaces; aperture ovate, the outer lip thin (possibly when older varicose?), with eight or nine lirae internally; inner lip with a thin, smooth coat of callus; pillar short, its anterior margin keeled and twisted; canal short, recurved, proximally constricted; siphonal fasciole distinct, with a strong keel behind. Length of shell, 9.0; of last whorl 5.5; of aperture, 3.25; max. diam. 4.5 mm.

U. S. S. "Albatross," station 4642, near the Galapagos Islands, in 200 fathoms, ooze, bottom temperature 48° 6 F. U. S. N. Mus. 110,565.

The operculum is normally nassoid. With this specimen were dredged some gorgonian cores supporting rows of nassoid ovicapsules probably belonging to this species. They are spatuliform, flat, with a small peduncle, the sides channelled, the lateral and upper edges projecting and, above, somewhat wavy or denticulate. They were about a millimeter and a half in height and somewhat less in width.

**Alectrion (*Tritia*?) *goniopleura* DALL, n. sp.**

Shell small, decollate, immature, comprising three whorls, rather rapidly enlarging, straw-color, with a slight brown band at the shoulder; suture deep, not

channelled; sculpture of about ten narrow, prominent ribs, subspinose at the shoulder, crossing the whorls, and separated by much wider interspaces; these are crossed between the sutures by four, and on the last whorl by about fifteen low, rather obscure, strap-like flattened ridges, with narrower interspaces, not nodulous where they cross the ribs; those on the base smaller and closer together; aperture wide, pillar short, twisted, keeled at the anterior edge; inner lip with a thin layer of smooth callus. Length of three whorls, 5.5; max. diam. 4.0 mm.

U. S. S. "Albatross," station 4641, near the Galapagos Islands, in 633 fathoms, ooze, bottom temperature 39°.5 F. U. S. N. Mus. 110,630.

Although this specimen is quite defective, enough of it remains to characterize the species, and to distinguish it from any other forms of the genus known from the region. In form the species is not unlike *Nassa ephamilla* Watson, but the sculpture is different and there is only one row of spines or pointed nodules.

### *Columbellidae.*

#### **COLUMBELLA** LAMARCK.

#### **Columbella** (*Anachis*) **fusidens** DALL, n. sp.

##### **Plate 11, figure 13.**

Shell of moderate size, slender, acute, of a pale brown or brownish white, with a thin, smooth periostracum; whorls five and a half without the (lost) nucleus; suture distinct, not deep; axial sculpture of (on the last whorl thirteen) narrow, rounded nearly vertical ribs with subequal interspaces extending from suture to suture and on the last whorl to the base; spiral sculpture none above, obsolete on the base, a few strong threads on the canal and finer ones on the siphonal fasciole; aperture narrow, contracted; outer lip slightly thickened, within it and parallel to the edge is a ridge of callus more or less continuous and striated so as to appear as if composed of five or six fused denticles; in the type specimen this ridge is broken into two parts, the shorter anterior; in other specimens it is continuous; body and pillar with a rather thick layer of callus, obsoletely transversely striated, in some specimens possibly dentate, its outer anterior edge slightly raised; pillar nearly straight, canal very short, slightly recurved. Lon. of shell (without the nucleus), 15.0; of last whorl, 10.0; of aperture, 7.0; max. diam. 6.0 mm.

U. S. S. "Albatross," station 4642, four miles east of Ripple Point, Hood Island, Galapagos Islands, in 300 fathoms, globigerina ooze, bottom temperature 48°.6 F. U. S. N. Mus. 110,616.

The most striking characteristic of the species is the contracted mouth, with the internal denticles as if melted together. There is nothing which closely resembles it known from the region. *C. iodostoma* Gaskoin, from the Indo-Pacific region, is somewhat similarly contracted.

*Columbella (Astyris) sp. indet.*

A dead and mutilated specimen of an unusually large *Astyris*, recalling *Astyris saintpairiana* Caillet, of the Lesser Antilles, but more solid and with a wider apical angle. The outer lip is broken off, leaving only a trace of its presence near the subsutural callus. There were about six whorls, smooth, except that the apical ones show faint traces of fine low ribbing. The pillar is short and straight, not markedly recurved as in *Strombina*. The somewhat defective shell is 23 mm. long, the last whorl 16, and the aperture 11, while the maximum diameter is (at the suture of the last whorl) 9.5 mm.

U. S. S. "Albatross," station 3370, near Cocos Island, in 134 fathoms, mud, bottom temperature 54°.8 F. U. S. N. Mus. 106,889.

This species, when intact, must very nearly be the largest species known of *Astyris*.

**STROMBINA MÖRCH.***Strombina edentula* DALL, n. sp.

Shell large, smooth, ten-whorled, whitish with obscure brown cloudings and an ill-defined peripheral pale band, all covered by a smooth, pale yellowish periostracum; spire acute, a little shorter than the aperture; suture distinct, not appressed; nucleus small and smooth, of about two whorls; succeeding four apical whorls axially ribbed with fourteen or fifteen small, rounded, smooth, nearly vertical ribs, crossing the whorls, with subequal interspaces; these ribs become obsolete on the next, and are wholly absent from the later whorls which for axial sculpture have only incremental lines, and a single, stout, rounded, not distorted varix behind the outer lip; spiral sculpture only on the base and canal, at first faint, but growing strong anteriorly to the end of the canal; whorls moderately rounded, on the spire rather flattish; aperture elongate, narrow; outer lip thickened but not reflected; internally, perfectly smooth and white, without liration or denticulation of any sort; inner lip with a moderate layer of callus, continuous with that of the outer lip; subsutural ridge on the body rather distant from the posterior commissure of the aperture; pillar long, callous, thickened but not plaited at the anterior edge; canal short, wide, strongly recurved; operculum narrow, ovate, with apical nucleus. Lon. of shell, 34; of last whorl, 24; of aperture, 19; max. diam. 13.5 mm.

U. S. S. "Albatross," station 2830, northwest from Cape St. Lucas, on the outer shore of the Peninsula of Lower California, in 66 fathoms, sand, bottom temperature 74°.1 F. U. S. N. Mus. 96,578.

This is one of the largest species and different from most of the others in having no hump or distortion of the last whorl, and no teeth inside the inner lip or on the pillar. It differs from *S. turrita* Sowerby, its nearest relative, by its shorter and apically ribbed spire, its wider, last whorl, and less emphatic channelling of the aperture behind. Also, probably, in the slight tabulation of the whorl for a narrow space just in front of the suture.

The operculum is typically Columbelloid, having an ovate margin of polished callus with a narrow ray of callus projecting across the centre of the scar of adhesion. The animal is whitish with a reddish-brown margin to the mantle; the tentacles are rather short and stout, with the eyes on short, separate pedicels just outside the tentacles; the proboscis wholly retractile, the foot large, voluminous, solid, with wrinkled surface and an apparently rather blunt posterior extremity.

*Muricidae.*

PURPURINAE.

**THAIS** BOLTEN.

(= *Purpura* Lamarck, 1799, not Martyn, 1784.)

**Thais nesiotus** DALL, n. sp.

Shell small, purple-brown, bleaching to a purplish-white, with four smooth, minute dark brown nuclear whorls and about four subsequent whorls; suture appressed with a slight ridge, followed by a slight constriction, in front of it; aperture longer than the spire, which is acute; whorls moderately rounded; spiral sculpture of numerous flattish major spiral ridges, sometimes striated or even duplex, with narrower channelled interspaces usually with a small intercalary thread; on the penultimate whorl there are five or six major spirals between the sutures and on the last whorl about fourteen; these are crossed by very numerous slightly elevated lamellae, which in well preserved specimens imbricate the interspaces and rise a little higher at the suture; aperture semilunate, narrow behind; outer lip more or less thickened, white, and obscurely dentate within; columella broad with a flattened white callosity; pillar short, straight; canal very short and narrow, but having a strong siphonal fasciole with a closed chink behind the columellar callus. Lon. of shell, 18; of last whorl, 15; of aperture, 11; max. diam. 10.5 mm.

Collected on the shore at Easter Island by the "Albatross" party. U. S. N. Mus. 110,766.

A thorough search has failed to reveal this little species anywhere among the described species of *Purpura*. The specimens are possibly not quite mature.

MURICINAE.

**TROPHON** MONTFORT.

**Trophon (Pascula) citricus** DALL, n. sp.

Shell small, fusiform, acute, the spire longer than the aperture, livid flesh color with orange knobs and aperture, and about six whorls; apex rather acute, but in all the specimens overgrown with nullipore, etc., or eroded so as to be inaccessi-

ble; whorls moderately rounded, suture appressed; axial sculpture of, on the last whorl, about ten, inconspicuous vertical ribs, which bear, near the suture, a feeble spiral row, at the shoulder a very conspicuous row, and on the body of the last whorl three less conspicuous rows, of smooth, more or less orange-tinted, rounded, prominent nodules; between the spiral rows of nodules there are four or five equal and equidistant fine spiral striae; the surface of the shell is subtranslucent, recalling that of *Purpura lapillus* L.; aperture ovate, in the adult minutely channelled behind, glazed with a rich orange enamel, contracted sharply at the beginning of the canal; outer lip not reflected, thin-edged, with an internal thickening which is faintly lirate; body with a broad layer of callus, of which the left hand or outer border is a little raised; a small subsutural nodule in the adult and one on each side the entrance to the canal; pillar short, canal very short, deep, and strongly recurved, making a very prominent siphonal fasciole with a constriction behind it, and deep umbilical chink between it and the reflected edge of the columellar callus. Lon. of shell, 15.5; of last whorl, 10.0; of aperture and canal, 7.0; max. diam. 6.5 mm.

Collected by the "Albatross" party on the reefs at Easter Island. U. S. N. Mus. 110,767.

This shell is not an *Aspella*, as it wants the peculiar chalky surface of that genus and has a totally different sculpture; but I am unable to suggest any group which seems more similar.

The radula is most like that of *Trophon clathratus* as figured by Troschel, Gebiss der Schnecken, 2, pl. 11, figure 17, but differs in having the outer cusps of the rhachidian tooth nearer the outer ends of the basal plate, straighter, and the central cusp of the same tooth longer and more prominent. The laterals have also longer and stronger cusps, though of the same general shape.

The upper surface of the mouth is covered by a thin, smooth layer of chitine, while the anterior margin of the layer is modified into an evenly arched thickened narrow ridge performing the office of a jaw, with the middle part sculptured with many minute spicules or projecting needle-like spines.

The operculum is more or less lozenge-shaped, purpuroid, with a marginal coating of reddish brown enamel on the inner face.

The tentacles were slender and small and the eyes present, though details could hardly be had since the data were obtained from a soaked-out specimen which had been dried in the shell.

The shell is not a *Trophon* or *Boreotrophon* in the strict sense; in conchological and opercular characters it differs from *Aspella*; it cannot be referred to *Purpura* (= *Thais*) or *Murex*, and I am therefore constrained to propose a new sectional name for it with the following characters:

Shell small, with nodular sculpture; the aperture with a projecting margin, feebly lirate within the outer lip when adult, constricted in front at the beginning of the canal; dentition like *Boreotrophon*; operculum purpuroid, lozenge-shaped, with a raised border on the inside face; mouth provided with an arcuate chitinous jaw.

**MUREX** LINNÉ.**Murex (Alipurpura) centrifuga** HINDS.

*Murex centrifuga* Hinds, Zool. Voy. Sulphur, Moll., 1844, p. 8, pl. 3, figs. 7, 8.

West coast of Veragua in fifty-two fathoms, sand, Hinds; U. S. S. "Albatross," station 3391, Gulf of Panama, in 153 fathoms, mud, bottom temperature 55°.8 F. U. S. N. Mus. 123,019.

The operculum is concentric with the nucleus a little above and to the right of the apex. It has no Purpuroid markings on the reverse side.

**Murex (Phyllonotus) humilis** BRODERIP.

*Murex humilis* Broderip, P. Z. S. Lond., 1832, p. 176; Reeve, Conch. Icon., 1845, 3, Murex, pl. 13, fig. 50 b.

St. Elena, west coast of Nicaragua, Cuming; U. S. S. "Albatross," station 2798, in Panama Bay, in 18 fathoms, sand. U. S. N. Mus. 110,615. Also on the beach of Perico Island, Panama Bay.

**Tritonalia** FLEMING.

*Tritonalia* Fleming, Hist. Brit. An., 1828, p. 567 (in corrigenda); type, *Murex erinaceus* Linné.

*Ocenebra* (Leach MS.) Gray, Ann. Mag. N. Hist., 1847, 20, p. 269; Gray, P. Z. S. Lond., 1847, p. 133 No. 10; same type.

*Ocenebra* H. and A. Adams, Gen. Rec. Moll., 1853, 1, p. 74; Fischer, Man. de Conchyl., 1883, p. 642.

It is somewhat surprising that, notwithstanding the above names and dates have been frequently cited, Fleming's name, twenty years prior to the publication of Leach, has been ignored.

**Murex (Tritonalia) diomedæus** DALL, n. sp.**Plate 12, figures 4, 5.**

Shell small, reddish brown with (on the last whorl four, on the antepenultimate whorl five) spinose varices and about seven whorls, of which nearly three are nuclear and defective; spire subtabulate with two strong, rounded revolving ridges, the posterior larger and forming the shoulder, and at the varices forming a long, anteriorly guttered and longitudinally anteriorly lamellose, posteriorly imbricately longitudinally laterally threaded, recurved spine; on the body between varices there are three or four other similar ridges, smooth, except for very fine revolving striae, and ending in similar but shorter spines, in front of

which, on the canal, are two smaller, narrower, and more simple spines; aperture ovate with a projecting, simple margin, not adherent on the side of the body; the outer lip with five notches due to the spiral ridges; interior without lirae; canal elongated, recurved, nearly closed. Lon. of shell, 29; of last whorl, 24; of aperture, 8; max. diam. of whorl, 15; including spines, 19 mm.

U. S. S. "Albatross," station 3397, Gulf of Panama, in 85 fathoms, mud, bottom temperature 57° 3 F. U. S. N. Mus. 123,020.

This shell has the characteristics of the Mediterranean species *Tritonalia erinacea* Linné, but is smaller, with more slender form and fewer and less strongly striated spirals.

### TYPHIS MONTFORT.

#### *Typhis martyria* DALL.

Plate 15, figure 11.

*Typhis martyria* Dall, Proc. U. S. Nat. Mus., 1902, 24, p. 550.

U. S. S. "Albatross," station 3013, off the island of San Pedro Martir, Gulf of California, in 14 fathoms, sand, bottom temperature 65° F. U. S. N. Mus. 130,629.

### ANTISTREPTUS DALL.

*Antistreptus* Dall, Proc. U. S. Nat. Mus., 1902, 24, p. 532; type, *A. magellanicus* Dall. *Glypteuthria* Strebel, Zool. Jahrb., 1905, 22, heft 6, p. 627; type, *Euthria meridionalis* E. A. Smith.

This genus was originally described as sinistral, the type being left-handed in its spiral, but the excellent figures given by Strebel in his most useful work on the Magellanic fauna show that there are also dextral species. Thus, like *Antiplanis* in the *Turritidae*, the diagnosis must be revised to include both dextral and sinistral species. Strebel shows that in fully adult specimens, both outer and inner lips are somewhat thickened, and the outer lip may even show some traces of liration, if all the species he refers to *Glypteuthria* are congeneric. With the above reservation, the operculum may be said to be concentric with an apical nucleus and short ovate form, the inner face with a callous border on the anterior margins. It does not, however, show the purpuroid rotatory markings on the interior face of the operculum, which characterize *Euthria cornea*, the type of the genus to which Strebel refers *Glypteuthria* as a subgenus. Only an examination of the radula can finally decide the question, but the similarities of the shell, nucleus, and operculum are sufficient to render it very probable that *Antistreptus* will eventually form a subordinate group of *Euthria*.

**Antistreptus magellanicus** DALL.

Plate 15, figure 14.

*Antistreptus magellanicus* Dall, Proc. U. S. Nat. Mus., 1902, **24**, p. 532.*Glypteuthria contraria* Strebel, Schwed. Sudpolar Exp., 1908, **6**, 1, p. 29, pl. **1**, figs. 4 a-c.

U. S. S. "Albatross," station 2773, near the eastern entrance to the Magellan Straits, in 10 fathoms, sand, temperature about 50° F. U. S. N. Mus. 96,190. Also at station 2777, in the strait, in 20 fathoms, gravel. North Argentine coast in latitude 37° 57' S., in about 50 fathoms, sand.

Strebel's specimens, of which he gives an excellent figure, are somewhat more mature than ours, but did not contain the animal, so that a knowledge of the operculum is still a desideratum.

## STREPTODONTA.

**Ptenoglossa.***Scalidae.***EPITONIUM** BOLTEN.*Scala* (anonymous) Mus. Calonianum, 1797, p. 23; type, *Turbo scalaris* Linné.*Epitonium* (first section) Bolten, Mus. Boltenianum, 1798, p. 91; first species, *Turbo scalaris* Gmelin.*Cyclostoma* Lamarek, Prodrôme, 1799, p. 74; sole example, *Turbo scalaris* Linné.*Scala* Dall, Bull. Mus. Comp. Zoöl., 1889, **18**, p. 299.

Twenty years ago I discussed the synonymy of this family, showing that if a diagnosis is required to validate a generic name there is no escape from accepting the name of *Cyclostoma* for the wentletraps. I proposed to take the anonymous name usually, at that time (but wrongly as we now know), ascribed to Humphrey. Since then much has been done to clarify the rules governing these matters, and it is generally conceded that an anonymous pamphlet with no ostensible publisher cannot be cited in nomenclature for valid generic names. The next name in order is *Epitonium* of Bolten, of which the first section is identical with *Scala*. I have decided to adopt this, as to further oppose the change would only put off the evil day, and it is best to get it over.

**Ferminoscala** DALL, nov.

Whorls in contact, turritelloid, reticulate, with a single heavy varix for the fully mature shell; base with no umbilicus, a basal disk present; type, *Scala ferminiana* Dall.

*Epitonium (Ferminoscala) ferminianum* DALL.

## Plate 8, figure 8.

Shell large, solid, acute, with eleven or more closely adherent whorls, of a livid flesh-color, fading to white, the terminal varix white; surface dull, not polished; axial sculpture of numerous low, small, sharp lamellae, slightly more prominent before the suture in the last two whorls; these are reticulated by half a dozen prominent, flattish spiral threads with wider interspaces in which run much finer threads; the basal disk is also covered with close-set, very fine spiral threads, and the suture is laid on its posterior margin; aperture rounded, slightly patulous in the prolongation of the axis, and in the fully adult shell with a thick, white varicose peritreme bevelled away from the actual aperture to the thicker portion of the varix behind. Length of shell, 38; of last whorl, 21; diam. of disk, 15.5; of last whorl, 17 mm.

U. S. S. "Albatross," station 2804, in 27 fathoms, mud, Panama Bay, U. S. N. Mus. 96,628. Also station 3391, in the Gulf of Panama, in 153 fathoms, mud, bottom temperature 55°.8 F.; station 2834, off Lower California, in 48 fathoms, mud, bottom temperature 56°.4 (figured type, U. S. N. Mus. 96,818); and station 3034, in the Gulf of California, off Point Fermin, in 24 fathoms, temperature 63°.5.

The fragment collected at station 3391 was the only specimen showing the fully mature varicose lip.

I wrote a description of this species and had the present figure prepared about 1892, but although I have a strong impression the diagnosis was published, I have mislaid the reference to it and so give a brief description.

*Epitonium (Ferminoscala) brunneopictum* DALL, n. sp.

## Plate 8, figure 10.

Shell slender, acute, pale brownish, with broad peripheral band and basal disk of darker brown, and about eleven whorls, exclusive of the (lost) nucleus; sculpture of the same type as in the preceding species with, between the sutures, three primary and about six secondary spirals beside the spiral striae; the axial lamellae are very small and sharp, regularly spaced, little raised and about thirty-six on the penultimate whorl, they appear as whitish lines on a brown background; basal disk sharply spirally threaded, little raised; aperture as figured, when fully grown probably with a thick varix. Length of shell, 37; of last whorl, 14; of aperture, 8; diam. of basal disk, 9; max. diam. 10 mm.

U. S. S. "Albatross," station 2835, in 5½ fathoms, mud, off Lower California. U. S. N. Mus. 97,084.

This and the preceding species present an assemblage of characters not provided for in the existing series of sections proposed for members of this genus.

The nucleus is extremely minute in *E. ferminianum*, and the very earliest whorls show the sculpture normal except that the peripheral thread carinates the whorl. It is probable that *Scala mitchelli* Dall, of the Texas coast, forms a third member of the subgenus. It resembles the present form a good deal, but is much stouter and larger.

**Epitonium (Sthenorhytis) turbinum** DALL, n. sp.

Plate 9, figures 5, 6, 8.

Specimen decollate, as figured, but showing the specific characteristics sufficiently well; form depressed-turbinate, aperture circular, very oblique; whorls coherent, rapidly enlarging, probably four or five originally; smooth, except for incremental lines; last whorl with ten strong, broad, sharp-edged varices of triangular section, the posterior portion pressed back upon and concealing the suture; basal disk faintly developed, the varices confluent on the base; umbilicus absent; peritreme nearly circular. Height of last whorl, 22; diam. of last whorl, 28; of aperture exclusive of the varix, 11 mm.

U. S. S. "Albatross," station 4642, four miles S. 41° E. from the east point of Hood Island, Galapagos Islands, in 300 fathoms, broken shell, bottom temperature 48° 6 F. U. S. N. Mus. 110,568.

This is the most depressed species of this group (regarded by some authors as a genus) which has yet been described, as it is almost certain that the spire, when perfect, diminishes with proportionate rapidity to that of the portion figured. Its nearest relation, so far as known, is the *S. stearnsii* Dall, of the Pliocene of San Diego, California, but this is considerably more elevated than the Galapagos species.

**Gymnoglossa.**

*Eulimidae.*

**STILIFER** BRODERIP.

**Stilifer (Mucronalia) sp. ind.}**

*Mucronalia?* Hartlaub, Bull. Mus. Comp. Zool., 1895, 28, p. 146, pl. 4, fig. 25.

On a species of Bathymetra, dredged by the U. S. S. "Albatross," at station 3381, off Malpelo Island, Gulf of Panama, in 1772 fathoms, mud, bottom temperature 37° 2 F.

In Hartlaub's account of the crinoids of the "Albatross" above cited, he mentions and figures a species, referred by E. von Martens to *Mucronalia*, parasitic on a species of crinoid, later referred by Clark to *Bathymetra*. The specimen has not yet been submitted to the writer, and the figure is insufficient to

base a specific description upon. It resembles *Stilifer* (*Mucronalia*) *thomasiae* Sowerby, of the West Indies, and is fixed to one of the arms of the crinoid. If the species is hereafter recovered it might appropriately take the specific name of *bathymetrae*.

### *Janthinidae.*

#### **JANTHINA** (BOLTEN) LAMARCK.

*Janthina*, Bolten (first section) Mus. Boltenianum, 1798, p. 75; type, *Helix janthina* Linné; Lamarck, Prodrôme, 1799, p. 75, same type.

*Janthina* Jeffreys, 1867, p. 174.

The second section of Bolten's genus was composed of helices. Lamarck, the following year, adopted Bolten's genus with its first species as type, and this arrangement is universally accepted.

#### *Janthina pallida* HARVEY.

*Janthina pallida* Harvey, in Thompson's Annals of Nat. Hist., 1817, 5, p. 96, pl. 2, fig. 2; Thorpe, Brit. Marine Conch., 1844, p. 152.

U. S. S. "Albatross," station 3381, East of Malpelo Island, Gulf of Panama. U. S. N. Mus. 123,024.

This species of worldwide distribution was described from specimens cast up on the shores of Ireland, and has even been reported from the Straits of Magellan.

### **Taenioglossa.**

#### *Septidae.*

#### **DISTORSIO** BOLTEN.

*Distorsio* Bolten (first section) Mus. Boltenianum, 1799, p. 133; first species, *Murex anus* Gmelin.

*Distortrix* Link, Besch, Rostock Samml., 1807, p. 122.

In 1889, discussing the synonymy of this genus, I stated that the name given by Bolten was a "pure catalogue name," having neither description or figure, and for that reason did not adopt it. But Bolten gives references to Gmelin's description and the figures of Martini and Knorr, and names thus validated, by the general consent of naturalists and the development of the international code of rules for biological nomenclature, have come to be considered admissible, and I therefore have been obliged to modify my views based upon the original code of 1842.

Bolten's group was divided into two sections, one containing species of *Distorsio* (with one not dissimilar form *Triton tuberosum* Lamarek); the second containing Lamarekian Nassas of the *N. arcularia* group, which were afterward separated by Link as a distinct genus, *Arcularia*, which he credits to Bolten, though the name does not occur in Bolten's posthumously published system. Link was in the habit of changing the desinence of names which did not please him, and his *Distortrix* was one of these to which he places *Distorsio* Bolten, as a synonym, minus, of course (as he indicates later) the *Arcularia* group. The question, therefore, arises: are we to regard *Distortrix* and *Distorsio* as two things or one? At first I thought we could use both, and so in 1904 (*Frogshells and Tritons*, p. 133) retained *Distortrix*, thinking *Distorsio* might be retained for the remnant; but, after more mature consideration, I believe this was incorrect and that, following Tryon, we should adopt *Distorsio* in its original form, and regard *Distortrix* as an absolute synonym thereof.

If we do not do so, but proceed by elimination, *Distorsio* will supplant *Gutturium* Mörch as a designation for the "Tritons" of the *tuberosum* group.

#### *Distorsio decussatus* VALENCIENNES.

*Triton decussatum* Valenciennes, Humboldt Voy., 1833, 2, p. 306; Reeve, *Conch. Icon.*, 1844, *Triton*, pl. 12, fig. 41.

U. S. S. "Albatross," station 3355, Gulf of Panama, in 182 fathoms, mud, bottom temperature 54°.1 F. U. S. N. Mus. 123,026.

#### **TRITONOHARPA** DALL, nov.

Shell recalling *Eciothara* in shape, with a simple suture, the whorls axially ribbed and at intervals varicose, varices not continuous up the spire; surface with minute velvety sculpture; aperture with the peritreme elevated and continuous behind, the inner lip smooth, with the outer margin of the callus detached from the whorl; outer lip denticulate, varicose at resting stages; canal proximally more or less constricted, narrow, produced, and recurved; throat not liriate. Operculum?

Type, *Tritonoharpa vexillata* Dall.

This peculiar little shell has refused to be suitably placed in any known genus. The aperture is unlike that of any form of *Cymatium* known to me, and, in the absence of the soft parts, it is only referred provisionally to the *Septidae*. The sculpture recalls that of *Harpa* in miniature, except that the ribs do not spread over the suture and the varices stand out vertically from the surface. The denticulate outer lip recalls some forms of *Cassis* and the thin outer sculptured layer of shell forms a surface not unlike, in texture, that of *Cassis cameo* Stimpson. But none of the *Cassididae* has a continuous raised lamella without sculpture behind the aperture. If Mayer's genus *Silia* possesses in reality the characters allotted to

it by diagnosis, — but rendered doubtful in some respects by the fact that the genus is only known from an internal cast, — it would approach this form in some of its features.

***Tritonoharpa vexillata* DALL, n. sp.**

**Plate 8, figure 7.**

Shell small, six-whorled, with rather elevated spire, rounded and axially ribbed whorls, whitish in color, with seven or eight narrow, spiral brown bands on the last whorl and three between the sutures; nucleus flat-topped and more or less eroded; whorls succeeding with (on the last whorl fourteen) flexuous, rounded ribs extending clear over the whorl, crossed by rounded threads of about three different sizes, more or less attenuated, and the larger ones becoming swollen where they override the summits of the ribs; the threads are close together, and are also crossed by thin, almost microscopic, regular, elevated, incremental lines which, being closely adjacent, resemble the thread wound on a spool, over the whole surface; beside the ribs the whorls bear thin, sharp varices a little higher than the ribs, there being from six to eight ribs between every two varices; aperture narrow, the body and pillar with a continuous elevated callus with an edge free from the whorl; outer lip thin, entire, white, with small brown spots where the brown color bands terminate, and a small denticle on each spot; canal short, narrow, recurved, with a prominent fasciole. Alt. of shell, 15; of last whorl, 11; of aperture, 9; max. diam. of last whorl, 7.5; of aperture, 3.5 mm.

U. S. S. "Albatross," station 4642, four miles S. 41° E. from Ripple Point, Wood Island, Galapagos Islands, in 800 fathoms, broken shell, bottom temperature 48° 6. U. S. N. Mus. 110,580.

*Ranellidae.*

**BURSA** BOLTEN.

***Bursa (Lampadopsis) calcipicta* DALL, n. sp.**

Shell of moderate size, pale brown with a white, chalky, deciduous, thin, outer coating minutely spirally threaded (about six threads to a millimeter), the threads reticulated by about equal, minute, equidistant, raised lines in harmony with the lines of growth; this coating covers the whole shell except where eroded; whorls seven, rapidly increasing, the first three smooth, evenly convex, nuclear, abruptly followed by the adult sculpture; varices two to the whorl, lateral, nearly continuous on the spire; on each whorl, at the shoulder, four (except the last half of the last whorl which has five) rounded nodules in a spiral series, with in front of them on the spire a second smaller and slightly more numerous series; between the appressed suture and the shoulder are four small beaded spirals, with one between the two series of nodules, while the base of the shell is similarly but less

distinctly sculptured; aperture ovate with a wide, prominent semitubular canal at the suture; outer lip strongly varicose, with four large rounded nodules on the varix, the edge of the lip modified by the sculpture, not lirated within, white with a few inconspicuous brown spots; body with a thin varnish of callus wholly adherent, a narrow subsutural ridge near the middle, and a small brown spot at the left; pillar white, callous, arcuate, with six or eight low sharp spiral lirations; canal short, wide, bent to the right with a strong siphonal fasciole and a chink under the anterior edge of the columellar callus; throat pinkish. Lon. of shell, 44; of last whorl, 31; of aperture, 25; max. diam. 25 mm.

U. S. S. "Albatross," station 3368, near Cocos Island, Gulf of Panama, in 66 fathoms, rocky bottom, temperature 58°.4 F. U. S. N. Mus. 123,027.

Nearest to *B. caelata* Broderip, but of a totally different color and surface, and differing also in details of sculpture.

### *Cassididae.*

#### **OÖCORYS** FISCHER.

*Oöcorys* Fischer, Journ. de Conchyl., Feb., 1884, **31**, p. 392; type, *O. sulcata* Fischer, *op. cit.*

*Benthodolium* Verrill and Smith, Trans. Conn. Acad., May, 1884, **6**, p. 177; type, *B. abyssorum* Verrill and Smith, *loc. cit.*

In the Monograph of the Miocene of Astoria and Coos Bay, Oregon, I have fully explained my reasons for regarding *Oöcorys* as a member of the family *Cassididae*, rather than, as Fischer thought, entitled to a separate family of its own.

In the Blake Report (1889, p. 228) I divided the genus from Atlantic specimens into two sections as follows:

Section *Oöcorys* s. s. Type, *O. sulcata* Fischer.

Shell not umbilicate, pillar twisted, obliquely truncate, without a marked siphonal fasciole, outer lip smooth.

Section *Benthodolium* V. and S. Type, *B. abyssorum* V. and S.

Shell with a narrow but distinct umbilicus and a strong siphonal fasciole; outer lip obscurely denticulate when fully adult.

Since then, having seen more material, I am in doubt whether these sections should be maintained or not, though complete continuity between them is not yet established. The range of variation is hardly known. It will be observed that I agree entirely with Locard in his "Talisman" report as to the relations of the genus to the *Cassididae* and, I may add, in referring to it Watson's *Buccinum aquilarum* from near the Azores. The species now known are *O. aquilarum* Watson, *O. sulcata* Fischer, *O. abyssorum* V. and S., *O. watsoni* and *O. fischeri* Locard, from the Atlantic, and the following forms from the Pacific.

*Oöcorys rotunda* DALL, n. sp.

## Plate 4, figure 9.

Shell globose, with a moderately elevated, blunt-tipped spire, and about six whorls; suture distinct, not channelled, the whorl immediately in front of it a little flattened; spiral sculpture of (on the penultimate whorl between the sutures eleven, on the last whorl about thirty-seven) subequal, regular, flattish cords with narrower channelled interspaces; the cord in front of the suture is feeble, in front of it the next half dozen are a little stronger and more distant than the remainder, which are almost absolutely similar; axial sculpture of fine rather regularly spaced little elevated lines which occasionally override the cords but are mostly confined to the interspaces which they reticulate; there are also perceptible incremental lines; the substance of the shell is very pale flesh color, covered with a thin, smooth, olive-gray periostracum; the specimen has not formed the outer lip, but the aperture is lunate, ample, and with a short shallow canal; inner lip slightly erased and polished, not callous; pillar simple, twisted, anteriorly obliquely attenuated; axis not pervious; a moderately distinct siphonal fasciole; there is a very thin layer of callus on the pillar, this is broken anteriorly, showing a minute chink beneath it; throat white, the sculpture showing through the thin shell but not lirate. Length of shell, 45; of last whorl, 37; of aperture, about 25; max. diam. 29 + mm.

U. S. S. "Albatross," station 3360, Gulf of Panama, in 1672 fathoms, sand, bottom temperature 42°F. U. S. N. Mus. 123,029.

The operculum is like that figured in the aperture of *O. pacifica* (Plate 4, figure 7). The shell is not unlike that species, but is larger, and has not the large and deep umbilicus of *O. pacifica*, neither does it agree closely with any of the Atlantic species.

*Oöcorys elevata* DALL, n. sp.

## Plate 8, figure 9.

Shell thin, white, bucciniform, with a thin pale straw-colored dehiscent periostracum, with about five rounded whorls exclusive of the (lost) nucleus; suture distinct, not appressed; surface spirally sculptured with (between the sutures ten, on the last whorl about twenty-two flat spiral elevated bands separated by wider but distinctly channelled interspaces; the bands are somewhat irregular in size and occasionally bifid by a median moderately impressed line; axial sculpture comprising fine, regular, close elevated lines, equally spaced and, while absent from the flat tops of the broader spirals, yet crenulating their angular edges and more or less evident in the channels between them; aperture semilunate, outer lip simple, smooth, slightly reflected; body with a thin wash of minutely granular callus, which also covers the short twisted pillar, leaving a minute chink behind it; pillar obliquely truncate in front, twisted, not axially pervious; canal short, wide, slightly recurved, with no fasciole; operculum like that of *Lunatia* in form, comprising about one whorl. Alt. of shell, 60; of last whorl, 47; of aperture, 35; max. diam. 31 mm.

U. S. S. "Albatross," station 4649, between the Galapagos Islands and Sechura Bay, Peru, in S. Lat.  $5^{\circ} 17'$ , and W. Lon.  $85^{\circ} 20'$ , 2235 fathoms, mud, bottom temperature  $35^{\circ}.4$  F. U. S. N. Mus. 110,569.

There is a minute chink behind the elevated edge of the columellar callus anteriorly, but no umbilicus. This appears to be the largest shell from so great a depth of water that has yet been collected; the depths noted by the "Challenger" are somewhat inexact, owing to the use of hemp rope in dredging, and nearly all excessive; but taking them at their face value, a Dentalium, a Chiton, and a Pleurotomoid shell alone were obtained from greater depths.

### Oöcorys (*Benthodolium*) *pacifica* DALL.

Plate 4, figure 7.

*Benthodolium pacificum* Dall, Proc. U. S. Nat. Mus., 1896, 18, p. 11.

Shell resembling *B. abyssorum* Verrill and Smith, from the North Atlantic, from which it differs by its much more elevated spire with the same number of whorls, its smaller last whorl and aperture in proportion to the whole shell, its more slender pillar and larger umbilicus, and especially by having its spiral sculpture less crowded, and reticulated by narrow, flattened threads overrunning the spirals and in harmony with the lines of growth. Lon. of shell, 30; of last whorl, 24; of aperture, 20; max. diam. 20 mm.

U. S. S. "Albatross," station 3375, near Malpelo Island, Gulf of Panama, in 1201 fathoms, ooze, bottom temperature  $36^{\circ}.6$  F.

U. S. N. Mus. 123,031.

The operculum is narrower and less spiral than that of the Atlantic species.

A fragment probably belonging to this species was also dredged at station 3386, in 1067 fathoms, globigerina ooze, bottom temperature  $37^{\circ}$  F.

The fine reflected outer lip of this species is obscurely ribbed like that of *Eudolium*, but the difference in the nuclear shell and in the operculum are quite sufficient to make the distinction between them easy.

At station 3422, off Acapulco, Mexico, in 141 fathoms, mud, bottom temperature  $53^{\circ}.5$  F., a number of larval shells were obtained which appear to belong to a young stage of a species of *Doliidae*; even the genus cannot with our present knowledge be definitely determined.

### *Cypraeidae.*

#### TRIVIA GRAY.

#### *Trivia atomaria* DALL.

Plate 12, figures 8, 10, 11.

*Trivia atomaria* Dall, Nautilus, Aug., 1902, 16, p. 43.

Dredged in Panama Bay in 1888, in 18 fathoms, muddy bottom. U. S. Nat. Mus. 109,206.

This is one of the smallest species known.

**Trivia panamensis** DALL.

Plate 12, figures 7, 9, 12.

*Trivia panamensis* Dall, Nautilus, Aug., 1902, 16, p. 43.Dredged in Panama Bay with *T. atomaria*. U. S. N. Mus. 109,205.**ERATO** RISSO.**Erato oligostata** DALL.

Plate 11, figure 8.

*Erato oligostata* Dall, Nautilus, Aug., 1902, 16, p. 44.

This is one of the smallest, if not actually the very smallest, of the genus. It was dredged in Panama Bay in 1888, with the two preceding species. U. S. N. Mus. 109,207.

*Trichotropidae.***CERITHIODERMA** CONRAD.

*Cerithioderma* Conrad, Journ. Acad. Nat. Sci. Phila., March, 1860, 2d ser., 4, p. 295; type, *C. prima* Conrad, *op. cit.*, pl. 47, fig. 30; Dall, Trans. Wagner Inst., 1892, 3, p. 293; Harris, Bull. Amer. Pal., 1895, 1, p. 15, pl. 1, fig. 10. Eocene of Alabama.

*Mesostoma* Deshayes, An. s. Vert. bas. Paris, 1861, 2, p. 416; 1st sp. *M. pulchra* Deshayes, *op. cit.*, pl. 28, figs. 13-16. Parisian Eocene.

**Cerithioderma pacifica** DALL, n. sp.

Shell small, thin, pale olivaceous, with a thin, fibrous, adherent periostracum and about five whorls exclusive of the (lost) nucleus; suture distinct, somewhat constricted, not appressed; whorls well rounded, on the fourth with about sixteen slender low ribs extending vertically from suture to suture, and crossed by two prominent spiral ridges of about the same strength as the ribs, the anterior ridge at the periphery; on a third similar ridge bordering the base the suture is laid and the ribs cease; on the base are four spiral ridges, low and rounded, subequal with subequal interspaces, but the region of the canal is not sculptured; in the adult this sculpture is obsolete on the last whorl, and, on the spire, the intersections are sometimes nodulous; aperture wide, ovate, the outer lip thin, simple, the body with a faint callus; pillar short, twisted, straight; canal represented by a shallow hardly perceptible indentation. Lon. of defective adult, 11 +; of spire, four whorls, 7; max. diam. 7 mm.

U. S. S. "Albatross," station 3392, in the Gulf of Panama, in 1270 fathoms, hard bottom, temperature 36°.4 F. U. S. N. Mus. 123,032.

The description is written from an adult with base defective, and a young shell of four whorls. The adult aperture may therefore present some features not noted here.

This genus occurs in the Middle Eocene of both the Paris basin and Alabama. A recent species, *C. migrans* Dall, has been described from eighty fathoms in the Straits of Florida, and probably further researches into the deep-sea faunas will reveal others. So far no specimen with the soft parts or operculum has been obtained.

### *Seguenziidae.*

#### **SEGUENZIA** JEFFREYS.

##### **Seguenzia occidentalis** DALL, n. sp.

Shell small, pearly under an opaque dull white outer coat, with five turbinate whorls and a small globular, subtranslucent, glossy nucleus; whorls with three prominent spiral keels, the strongest at the periphery, the others at the shoulder and the edge of the base, about equidistant from the suture and each other; the base with three smaller more adjacent spirals, and between them and the umbilicus four or five still finer spiral threads; axial sculpture in the interspaces of almost microscopic elevated arcuate radial lines in harmony with the lines of growth and crossed by extremely fine microscopic spiral striae; base rounded, the umbilicus perforate, partly shadowed by the thin reflected edge of the pillar; aperture subquadrate, deeply widely notched near the suture; the body with a thin wash of callus, the pillar vertical, simple, lightly reflected, at the anterior end forming a right angle with the anterior margin of the aperture; operculum wanting. Lon. of shell, 2.9; of aperture, 1.7; max. diam. 3.1 mm.

U. S. S. "Albatross," station 3418, off Acapulco, Mexico, in 660 fathoms, sand, bottom temperature 39° F. U. S. N. Mus. 123,033.

The chief features of this species are the perforate umbilicus, the Trochoid form, and the three principal carinae, a combination quite sufficiently distinguishing it from any of the hitherto described Atlantic species.

##### **Seguenzia stephanica** DALL, n. sp.

Shell small, whitish, nacreous, shining through a translucent outer coating; with about six whorls and a minute translucent glossy subglobular nucleus; whorls with four strong spiral keels, the posterior pair somewhat nearer the suture and each other than they are to the anterior pair, that is, the peripheral interspace is widest; the anterior keel of the four forms the margin of the base of the last whorl, but the suture is wound on the third keel; base with about eight much smaller, adjacent, simple, spiral threads extending to the pillar, the

umbilicus imperforate; axial sculpture of very minute elevated, arcuate, radial lines, in harmony with the lines of growth which minutely but distinctly bead the keel nearest the suture, but do not affect the others; aperture subquadrate, outer lip modified by the sculpture, thin, concavely arcuate behind; body with a thin wash of callus; pillar thin, concave, strongly twisted, not reflected, truncate anteriorly, so that its junction shows a projecting point in front of a shallow sulcus. Lon. of shell, 4.0; of aperture, 1.5; max. diam. 3.5 mm.

U. S. S. "Albatross," station 3431, off Mazatlan, in 995 fathoms, mud, bottom temperature 37° F. U. S. N. Mus. 123,034.

This species is easily distinguished from the preceding by the different sculpture, its more elevated form, and the absence of the umbilical perforation. It is nearest among described species to the *monocingulata* of Seguenza, from which it may be instantly distinguished by the beaded ante-sutural keel and its somewhat broader and shorter conical form.

### *Vermetidae.*

#### **PETALOCONCHUS** LEA.

#### ***Petalocochus complicatus*** DALL, n. sp.

Coil at first closely wound and more or less obliquely bent in conformity with its situs, the first few turns with a subcircular section, very irregularly disposed, those following with a roughly hexagonal section closely coiled around a barely perforate axis, closely coherent to each other and running up to twenty or more in number, after which the tube once more becomes erect, with a circular section, and a slight dextral twist; aperture circular, often with a series of internal concentric lamellae as if the animal had attempted to contract the opening by secreting a succession of smaller tubes within it; sculpture irregular; apart from incremental lines, there is a longitudinal, irregular, but tolerably smooth ridge on the middle of the exposed whorl with strong wrinkles at right angles to it on each side but not crossing it. At resting stages there are sometimes angular projections of the margin of the temporary aperture; the wrinkles are sometimes reticulated by longitudinal subequal threads, which may be entirely wanting on other parts of the same individual; the erect portion is nearly smooth except for lines of growth; the color is a pale ferruginous brown; the length of the coiled portion may be about 16, and of the erect part 27 mm., the tube with a diameter at the aperture of 2.3 mm. There is one internal basal lamella and a smaller one projecting from the axial wall at about right angles to and a little above the former.

U. S. S. "Albatross," station 3368, near Cocos Island, on dead shells, at a depth of 66 fathoms, bottom temperature 58°.4 F. U. S. N. Mus. 123,035.

This has somewhat the habit of the typical species of the genus, but is smaller, less regular, and with a much smaller axial perforation.

*Turritellidae.***Turritella mariana** DALL, n. sp.

## Plate 11, figure 14.

Shell slender, pale pinkish-brown, acute, with about eighteen whorls; suture rather obscure, not appressed; whorls strongly constricted in the middle, a sharp keel on each side of the constriction, which in the last two or three whorls is undulate or obscurely beaded; nucleus lost; on the earlier whorls the keels are entire and the whorl slopes about the same distance from each to the adjacent suture; on the latter whorls there is a single thread behind the posterior keel and two in the trough between the two keels, all somewhat undulate, low, and inconspicuous; base of the whorl with a sharp carina upon which the suture is laid; within the carina deeply concave, with well-marked lines of growth and microscopic spiral striae; aperture rounded-quadrate, the outer lip with the margin at first retractive to a wide sinus nearly coincident with the posterior keel, then prominently protractive to the basal keel, thence in a deeply excavated curve to the pillar, which is thin and arcuate, short and gyrate, about a narrowly pervious axis. Lon. of shell, 25; of last whorl, 6; of aperture, 3; max. diam. 5 mm.

U. S. S. "Albatross," station 3427, near the Tres Marias Islands, in 80 fathoms, rocky bottom, temperature 51°.2 F. U. S. N. Mus. 123,036.

Although there is only a single specimen of this species, it is in excellent preservation, and on comparison with a large series of the Pacific Coast species could be identified with none among them.

*Solaridae.***ARCHITECTONICA** BOLTEN.

*Architectonica* Bolten, Mus. Boltenianum, 1798, p. 78; first species, *Trochus perspectivus* Gmelin.

*Solarium* Lamarck, Prodrôme, 1799, p. 74; sole ex., *Trochus perspectivus* Linné.

*Architectoma* Gray, P. Z. S. Lond., 1847, p. 151; *err. typ. pro Architectonica*.

**Architectonica radialis** DALL, n. sp.

Shell small, depressed, pale yellowish over a white inner layer, the apical whorls lost but about three whorls remaining; surface very badly eroded, only remaining in small patches, one of which on the last whorl shows four arcuate radial riblets on the top of the whorl in a space of 3.5 mm., with wider interspaces, crossed by faint indications of spiral striae; near the aperture these riblets (which presumably were present over most of the spire) are obsolete; and the spiral lines extend from a (very slightly) channelled suture to an obtuse angle

at the periphery and are represented on the rounded base by still fainter traces but without radial sculpture except incremental lines; umbilicus in width to the whorl near the aperture as 2.5 to 4.0; margin of the umbilicus with a double row of beads on the earlier whorls (visible inside the umbilicus), but on the last whorl all that remain are about ten very short radial ridges; verge of the umbilicus only feebly angular; aperture rounded, peritreme simple, sharp, continuous; operculum externally flat and multispiral, the edges of its whorls slightly overlapping; inner face with a central prominence, formed by the opercular layers being coiled loosely upon each in the manner of a paper "spill." Max. diam. of shell, 9.2; min. diam. 7.5; diam. of aperture, horizontally, 4.3; height of spire, 4.7 mm.

U. S. S. "Albatross," station 3392, in 1270 fathoms, hard bottom, temperature 36°.4 F., in the Gulf of Panama.

This is an interesting species notwithstanding its poor condition, having an easily recognizable sculpture, unlike that of any other known. The operculum is peculiar and apparently related to that of *Torinia*, but the opercula of all this family seem to be constructed on the same plan, notwithstanding superficial differences. I prefer not to attempt to refer this species to its subdivision of the genus without better material, though it is obvious that it is not a typical *Architectonica*.

### *Choristidae.*

#### **CHORISTES** CARPENTER.

*Choristes* Carpenter, Canadian Nat., 1872, 6, p. 392; type, *C. elegans* Cpr., *op. cit.*, pl. 7. fig. 13; Verrill, Trans. Conn. Acad. Sci., 1882, 5, p. 541.

#### **Choristes carpenteri** DALL.

##### Plate 3, figure 4.

*Choristes carpenteri* Dall, Proc. U. S. Nat. Mus., 1896, 18, p. 10.

Shell large, solid, of three and a half rounded whorls, white, covered with a pale olivaceous epidermis, sculptured only with somewhat irregular, rude, incremental lines; suture deep, the whorl in front of it slightly excavated; base rounded, the umbilicus narrow, deep; aperture subovate, not interrupted by the body; the inner lip nearly straight, the outer lip simple, sharp-edged; the interior of the aperture white. Height (somewhat eroded), 21; height of aperture, 14; diameter, 21 mm.

U. S. S. "Albatross," station 3382, Gulf of Panama, in 1793 fathoms, mud; bottom temperature 35°.8 F. U. S. N. Mus. 123,039.

Another specimen was dredged at station 3361 in 1471 fathoms, ooze, bottom temperature 36°.6 F. and a defective individual at station 3415, off the Mexican coast in Lat. 14° 46' N., in 1879 fathoms, ooze, bottom temperature 36° F.

This is the second species of this very interesting genus, and the first from the Pacific. It is larger, more elevated, and much more solid than the form from the North Atlantic on which Dr. P. P. Carpenter erected the genus.

The operculum of this species has about three whorls and is thin, brown, and wholly horny, the external surface extremely concave, so that the appendage has the form of a shallow bowl. The animal agrees in general appearance with that of *C. elegans*, var. *tenera* Verrill, as described by Verrill from deep water off the North Atlantic coast.

### *Capulidae.*

#### **CAPULUS** MONTFORT.

*Capulus (pars)* Montfort, Conch. Syst., 1810, 2, p. 55; Cuvier, Règne Anim., 1817, 2, p. 447; *Patella ungarica* (Linné).

*Galerite* (Brongniard) in Roissy, Hist. Nat. Moll., 1805, 5, p. 211.

*Galerita* (Brongniard) in Fischer, Tabl. Syst. Zoogn., 1808, p. 25; 1st. sp. *G. ungarica* Linné. Not *Galerita* Fabricius, *Coleoptera*, 1801.

*Amalthea* β. Schumacher, Essai, 1817, p. 181; *Patella ungarica* (Linné). Not *Amaltheus* Montfort, 1810.

*Cabocho*n Lamarck, Extr. d'un Cours, 1812, p. 114.

*Pileopsis (pars)* Lamarck, Anim. s. Vert., 1822, 6, p. 16.

*Actita* Fischer de Waldheim, Adversaria Zool., 1825, 3.

The first person to segregate this group was Bolten, who listed them as *Patellae uncinatae* in 1798, and the first to apply a generic name to them was Brongniard, whose name was published by Fischer, but unfortunately it had previously been used for a beetle. Montfort, in 1810, based his genus *Capulus* on a combination of *Patella ungarica* Linné, and *P. subrufa* (Lister, Conch., pl. 544, fig. 32), the latter being an Hipponix. Montfort's figure seems certainly to represent an Hipponix. But as Linné himself had made the same combination and the name of *Patella ungarica* had become fixed upon the European shell, by common consent the latter is regarded as the type of *Capulus*.

Later writers combined *Capulus* with *Hipponix* DeFrance, under the (pre-occupied?) name of *Amalthea*, and Lamarck under that of *Pileopsis*. It is truly remarkable how long it took the heterogeneous assembly of Linnean *Patella* to get subdivided into its natural groups.

#### **Capulus chilensis** DALL, n. sp.

Shell large, rather thin, yellowish-white, covered with a straw-colored branny periostracum, and comprising somewhat less than three whorls; nucleus subglobular, glassy, swollen, smooth; spire dextral, the shell, except a small part of the apex, symmetrically coiled; aperture subcircular; spire closely coiled, part of the arch extending behind the middle of the aperture, especially in young shells;

margin entire, simple, in the adult, in the young slightly crenulate by the radial sculpture; concentric sculpture feeble, chiefly of the incremental lines; radial sculpture of rather conspicuous threads with wider interspaces in the young; the threads flatten and become much wider and the interspaces mere grooves, in the adult; longer diam. of base about 25 mm., height 9 mm.

U. S. S. "Albatross," station 2781, off the Chilean coast, in 348 fathoms, mud, temperature 50° F. U. S. N. Mus. 96,926.

This species differs from *C. ungaricus* in its closely coiled spire and different periostracum, and from the Peruvian *C. ungaricoides* Orbigny, in its strong sculpture, symmetrical habit, and different color.

### *Hipponicidae.*

#### HIPPONIX DEFRANCE.

*Capulus (pars)* Montford, Conch. Syst., 1810, 2, p. 55, and figure.

*Amalthea a*, Schumacher, Essai, 1817, p. 181, sole ex. *A. conica* Schumacher = *Patella australis* Lam., *vide* Smith. Not *Amaltheus* Montfort, 1810.

*Hipponix* DeFrance, Bull. Soc. Philom. Paris, Jan., 1819, 3me sér, p. 8-9 (type, *H. cornucopiae* DeFr.) Journ. de phys., de chimie, d'hist. nat., etc., Mar., 1819, 88, p. 217; Ferussac, Tableau, 1821, p. xxxvii.; DeFrance, Dict. Sci. Nat., 1821, tom. 21, p. 185; Deshayes, Encyc. Méth., 1830, 8, p. 274; Anton, Verzeichniss, 1839, p. 28.

*Pileopsis (pars)* Lamarck, Anim. s. Vert, 1822, 6, 2, p. 19 (*Les hipponices* DeFrance), *Pileopsis cornucopiae* Lamarck; DeFrance, Tabl. Corps Organ., 1824, *Les hipponices*, pp. 13, 14, 111, 134.

*Hipponyx* Blainville, Dict. Sci. Nat., 1824, 32, p. 297; Man. Conch., 1825, p. 507; Sowerby, Genera, 1820, part 1, 1st ed., pl. 3; 1821, 2d ed., pl. 3; Bowdich, Elem. Conch, 1822, 1, p. 35, *H. cornucopiae* DeFr.; Swainson, Man. Malac., 1840, p. 356.

*Malluvium* Melvill, Proc. Mal. Soc. Lond., June, 1906, 7, p. 82; type, *Capulus lissus* E. A. Smith.

According to the proposed rule, which seems generally accepted by systematists (though to the writer it appears not only unnecessary but objectionable), the presence in nomenclature of Amaltheus precludes the use of Amalthea Schumacher. The name Hipponix was consistently used by DeFrance and others, and no derivation given in the original diagnosis; the alteration, therefore, by Blainville, five years later, was gratuitous, though not unnatural, according to the notions of the time.

Lamarck, ignoring Montfort's name of Capulus, evidently intended to include, as Montfort did, both Capulus and species of Hipponix in his genus Pileopsis, which thus becomes an exact synonym of Capulus Montfort. Lamarck's name, though not published, was evidently in use among the naturalists of the group associated at the Museum at Paris, and it was the discovery of the shelly support secreted by the *Hipponix cornucopiae* of the faluns of Hauteville, which led DeFrance

to consider the formation of a new genus. The discovery of a similar base in a living species *H. "mitrata" Gmelin* of DeFrance (*H. antiquata* Liuné) confirmed him in this opinion, and he proceeded to publish his new genus, leaving the other species of *Pileopsis* Lamarck, which were believed to form no shelly base, to be grouped separately. The shelly base alone might not be considered a sufficient character to found a genus upon, but the wide differences of anatomy which are claimed to exist between *Capulus* and *Hipponix*, if confirmed by more modern examination, are of even more than generic importance. *H. "mitrata"* being the first species in DeFrance's list, might naturally serve as type, though the genus is known really to have been founded on *H. cornucopie*; but as they are both without any doubt congeneric, the question becomes unimportant. As DeFrance in using his new name terminated his specific names in *a*, it follows that he regarded the name as feminine, and subsequent writers should not try to alter this on the basis of an assumption. The smooth, deep-water species separated by Mr. Melvill have a peculiar facies, but perhaps hardly of subgeneric value. The slight importance of surface sculpture as indicative of systematic differences of such value is illustrated by the following species which unites in a single individual the characteristics of two such discrepant species as *H. antiquata* and *H. subrufa*.

#### ***Hipponix delicata* DALL, n. sp.**

Shell solid, conical, the apex in the posterior third of the length, erect, blunt; the posterior slope steep, the anterior much longer, gentle, near the apex almost a little concave; shell substance porcellanous, greenish-white, the muscular impressions more translucent and darker colored; sculpture of the apical third concentrically lamellose, as in *H. antiquata* L., the remainder of the shell continuous with irregular but not lamellar narrow waves, delicately, evenly, radiately grooved; interior polished, with a thick smooth peritreme. Alt. 5; lon. 11; lat. 9 mm., the apex 3.5 mm. in front of the posterior edge.

U. S. S. "Albatross," station 3355, Gulf of Panama, in 182 fathoms, mud, bottom temperature 54° F. U. S. N. Mus. 123,041.

The curious combination of lamellose and radial sculpture, usually found in different species, marks this one as unique. The radial striation is finer than in any of the well-known shallow water species. The shell is fresh, though it did not contain the animal.

#### ***Hipponix barbata* SOWERBY.**

*Hipponyx barbatus* Sowerby, P. Z. S. Lond., 1835, p. 5; Thes. Conch., Brachiopoda, p. 369, pl. 73, figs. 26, 27.

Beach, Chatham Island, Galapagos Islands, U. S. S. "Albatross." U. S. N. Mus. 96,044.

This species is widely distributed and is reported as far north as the Gulf of California.

**Hipponix serrata** CARPENTER.*Hipponyx serratus* Carpenter, Maz. Cat., 1856, p. 296.

U. S. S. "Albatross," station 2798, in Panama Bay, in 18 fathoms, Mazatlan, Reigen. U. S. N. Mus. 110,654.

*Naticidae.***NATICA** SCOPOLI.

*Natica* Scopoli, Intr. Hist. Nat., 1777, p. 392 (after Adanson); type, *N. vitellus* (Linné); Lamarck, Prodr., 1799, p. 77; sole ex., *N. canrena* Linné.

The forms with calcareous opercula having been indicated by Lamarck as typical, we may, as I have indicated in my Report on the Oregon Miocene, subdivide the group in part as follows:

*Natica* s. s. Umbilicus open, with a spiral ridge internally; operculum externally spirally multisulcate. *N. vitellus* Linné.

*Cochlis* Bolten, 1798. Umbilicus similar to that of *Natica* s. s. Operculum with a very few, or only a single marginal sulcus. *N. spadicea* Gmelin.

*Cryptonatica* Dall, 1892. Operculum smooth, without spiral sulci, umbilicus completely closed with a smooth pad of callus. *N. clausa* Brod. and Sowerby.

The first and second groups are tropical or subtropical; the last is cool-temperate or arctic. There are several other groups, such as *Nacca*, *Stigmaulax*, and *Payreaudeautia*, but these are not represented in the present collection.

***Natica (Cochlis) othello*** DALL, n. sp.

Shell rather thin, elevated, with a rather pointed spire of four and a half whorls of which four are nuclear, smooth, and brownish, the remainder buff, very pale brown, or grayish-white, with a polished surface; suture very distinct, not channelled or appressed; periostracum debiscent, chaffy, pale yellowish-brown; an obscurely defined whitish band in front of the suture and at the base; axial sculpture of sharply incised, numerous retractive lines, forming a halo in front of the suture and behind the shoulder of the whorl; there are about two or three of these radii to the millimeter and they average about four millimeters long on the last whorl, with wider, radially striated interspaces; the remainder of the whorl is smooth, except for faint incremental lines, and more or less obscure, obsolete, spiral striation; umbilicus narrow, with a nearly vertical, strong spiral internal rib, nearer the anterior wall of the umbilicus; aperture oval, outer lip sharp, thin; body with a moderate white callus, interrupted in front by the umbilicus; pillar white, throat livid flesh-color; operculum shelly, of two and a half whorls, internally smooth and slightly convex, externally flattish, apically depressed, white, with

a single sharp sulcus at the extreme margin, running between two slightly elevated lamellae. Alt. of type specimen, 22; of aperture, 17; max. diam. 16.5 mm. A larger specimen is 23.5 by 20 mm.

U. S. S. "Albatross," stations 2799, 2800, 2801, 2803, 2804, in the Bay of Panama, in 7 to 47 fathoms, mud; also, dead specimens, at stations 3354 and 3392, in 322 to 1270 fathoms, muddy bottom. U. S. N. Mus. (types) 46,446.

The young shell has darker, faint brownish streaks obscurely disposed in two or three spiral bands. The adult is without perceptible pattern. The shell belongs to the group of "*maroccana*," under which so many distinct forms have been lumped by indiscriminating authors, and is perhaps nearest to some varieties of the West Indian *N. livida* Philippi, which has a differently sculptured operculum.

### ***Natica (Cochlis) scethra* DALL, n. sp.**

Plate 11, figure 5.

Shell small, moderately elevated, with about three whorls, exclusive of a smooth, polished nucleus of two and a half whorls, which changes abruptly into the adult sculpture; suture distinct; color pale brown with three obscure pale bands, one about the region of the shoulder, another a little in front of the periphery, and the third, less distinct, on the base; all rather ill defined; whorls smooth, except between the shoulder and the suture, where start numerous (on the last whorl twenty-six), sharp, very obliquely retractive, narrow wrinkles; aperture ovate, outer lip arcuate, thin, simple, sharp; body with a well-marked callus, terminating at a notch at the posterior end of the umbilicus; at the pillar is a pad, formed by the end of a flattish ridge, which winds into the depths of the umbilicus, leaving a narrow chink to the left of the pad; anterior lip slightly thickened; operculum flat, white, with brownish clouding, a small patch of roughened callus obscuring the spiral part externally; outer edge elevated, with two deep, very narrow sulci revolving within it, the interspace forming a single flat-topped rib. Height of shell, 17.0; of last whorl, 15.5; of aperture, 11.5; max. diam. 16.0 mm.

U. S. S. "Albatross," station 3391, Gulf of Panama, in 153 fathoms, mud, bottom temperature 55° 8 F. U. S. N. Mus. 123,048.

### **POLINICES MONTFORT.**

*Uber* (Anonymous) Mus. Calonn., 1797, p. 21.

*Albula* Bolten, Mus. Bolt., 1798, p. 20; not *Albula* Gronovius, 1763.

*Polinices* Montfort, Conch. Syst., 1810, 2, p. 223; type, *Nerita mamilla* Linné.

> *Neverita* Risso, Hist. Nat. Eur. MÉR., 1826, 4, p. 147; type, *N. josephinae* Risso.

> *Euspira* Agassiz, in Sowerby, Min. Conch., 1842, German ed., p. 14. First species, *N. glaucinoides* Sowerby, = *N. labellata* Lamarck, 1804.

> *Lunatia* Gray, P. Z. S. Lond., 1847, p. 149; type, *N. ampullaria* Lamarck (= *Euspira* Ag.).

- > *Cepatia* Gray, Syn. Brit. Mus., 1840; *ibid.*, 1844, p. 60; P. Z. S. Lond., 1847, p. 149; *N. cepacea* Lamarck, Eocene.  
*Velainia* Munier-Chalmas, Annal. de Malac., 1884, 1, p. 335 (= *Cepatia* Gray).  
 > *Naticina* Fischer, Man. de Conchyl., 1885, p. 766, not of Guilding, 1834.  
 > *Sigaretopsis* Cossmann, Cat. Illustr., 1888, 3, p. 172; type, *N. infundibulum* Wat. Eocene (section of *Cepatia*).

Polinices in the wide sense, as the oldest available name, includes all the Lamarckian Naticas with a horny operculum. In considering the subdivisions it appears that *Euspira* Agassiz, which has five years' priority, notwithstanding some discrepancies in the diagnosis, will have to be used in place of the more familiar *Lunatia* of Gray.

### *Polinices uber* VALENCIENNES, var. *intemerata* PHILIPPI.

*Natica uber* Val., in Humboldt, Geol. Obs., 1833, 2, p. 266.

*Natica intemerata* Philippi, P. Z. S. Lond., 1851, p. 233; Tryon, Man., 1886, 8, p. 46, pl. 18, fig. 83.

U. S. S. "Albatross," station 3355, Gulf of Panama, in 182 fathoms, mud, temperature 54°.1 F. U. S. N. Mus. 123,043. Also at Mazatlan, Mexico, and living in Panama Bay, at station 2805, in 51 fathoms.

Tryon and Carpenter regard this as probably a variety of *P. uber*, but the specimens I have seen seem sufficiently constant to be rated as a good species.

### *Polinices (Euspira) agujanus* DALL, n. sp.

#### Plate 9, figure 2.

Shell of moderate size, rather heavy, with five whorls, translucent white, with an olivaceous periostracum; suture distinct, very minutely channelled; nucleus eroded, whorls flattish in front of the suture, with a high, rounded shoulder and evenly rotund body; surface smooth except for faint, incremental lines, and, under the lens, obscure spiral markings; base rounded, with a wide, deep, sub-cylindric umbilicus; aperture semilunar, outer lip thin, simple; the sutural angle and the anterior part of the pillar-lip callous, a thin wash of callus on the body; operculum brown, horny, of two whorls. Alt. of shell, 26; of last whorl, 23; of aperture, 20; max. diam. 24 mm.

U. S. S. "Albatross," station 4653, 17 miles N. 61° W. from Aguja Point, Peru, in 536 fathoms, mud, bottom temperature 41°.3 F. U. S. N. Mus. 110,566.

The chief peculiarities of this species are the very minute channelling of the suture, the flat-topped whorls, and the singular want of callus on the thin, straight pillar. The last character may perhaps be altered when the shell is older, though otherwise our specimen seems fully adult. A dead and worn specimen, probably of this species, was dredged at station 3360, Gulf of Panama, in 1672 fathoms, sand, bottom temperature 42° F.

**Polinices (Euspira) solutus GOULD.**

Plate 8, figure 2.

*Natica soluta* Gould, Proc. Boston, Soc. Nat. Hist., July, 1847, 2, p. 229; Expedition Shells, 1850, atlas, fig. 257; Tryon, Man., 1886, 8, p. 39, pl. 9, fig. 71.

Shell small, heavy, translucent white with an olivaceous periostracum, moderately elevated spire, and five whorls; nucleus eroded, remaining whorls rounded from the margin of the narrow, deep suture, to the umbilical region; surface smooth, polished, with very fine, silky, incremental lines, and microscopic spiral striae; aperture semilunar, outer lip simple, body with a subsutural callus and a thin layer connecting with the pillar over the body; pillar lip thickened and slightly reflected; base rounded, with a very minute, umbilical perforation under the reflected callus. Alt. of shell, 17.0; of last whorl, 15.5; of aperture, 11.0; max. diam. 15.0 mm.

Operculum brown, horny, of two whorls.

U. S. S. "Albatross," station 4653, 17 miles N. 61° W. from Aguja Point, Peru, in 536 fathoms, mud, bottom temperature 41° 3 F. U. S. N. Mus. 110,567. Also at station 2791, on the southwest coast of Chile, in 667 fathoms, mud, temperature 38°; and young specimens at stations 2781, 2784, and 2785, in 194 to 449 fathoms, mud, temperatures 47° to 51° 9 F., from the vicinity of Magellan Straits northward to Chile.

This species was referred by Carpenter and Tryon to *Euspira pallida* Broderip and Sowerby, but this ascription is absurd, since the latter species is without the sutural channel and has a decidedly different outline, besides being a very much larger shell.

**Polinices (Euspira) crawfordianus DALL, n. sp.**

Plate 11, figure 7.

Shell small, white, smooth, covered by a conspicuous, brownish periostracum; whorls about four, the nucleus eroded; suture distinct, deep; the whorls rather full at the shoulder, giving a somewhat elongated aspect to the shell, rounded, the last much the largest; sculpture of incremental lines rather feeble and irregular, and, on the spire, numerous, not very regular, fine wrinkles radiating from the suture and becoming obsolete near the periphery, but absent from the last whorl; there are also a few faint, irregular, spiral markings, perhaps pathological; aperture ovate, outer lip thin, simple; body with a thin, whitish callus thicker on the pillar, which is arcuate, slightly reflected and with a very narrow umbilical chink open behind it; operculum dark brown, horny, with about two and one half whorls. Height of shell, 15.0; of last whorl, 14.0; of aperture, 11.5; max. diam. 11.5 mm.

U. S. S. "Albatross," station 3356, Gulf of Panama, in 546 fathoms, mud, bottom temperature 40° 1 F. U. S. N. Mus. 123,044. Also at station 3407,

near the Galapagos Islands, in 885 fathoms, ooze, temperature  $37^{\circ}.2$ ; station 3431, off Mazatlan, in 995 fathoms, mud, temperature  $37^{\circ}$ ; and station 4654, 24 miles NW. of Aguja Point, Peru, in 1036 fathoms, mud, temperature  $37^{\circ}.3$ . The National collection also contains a full-grown specimen from southern Chile, in about south latitude  $50^{\circ}$ , which has about six whorls and measures 32 mm. in height and 28 mm. in maximum diameter. This specimen was collected by Dr. Crawford, and has a heavily callous pillar with a deep chink, but no actual perforation, behind it in the umbilical region. The greatest diameter is well up on the whorl, which gives the species a peculiar "shouldered" aspect.

**Polinices (Euspira) pardoanus DALL, n. sp.**

Shell small, with about four whorls, white with a straw-colored periostracum, depressed turinate, smooth except for lines of growth and occasional obscure, irregular, slightly elevated spiral markings; spire (defective) probably blunt, the form of the shell rather wide and depressed; aperture ovate; outer lip thin, obliquely retractive, simple; body with a marked callus; pillar thick and rather wide behind, appressed against the upper part of the umbilicus, the thickened part narrower in front, terminating where an impressed spiral line starts at its entrance into the umbilical perforation near the anterior edge; umbilicus narrow, twisted; the margin of the aperture slightly thickened and compressed. Height (about), 13; of last whorl, 10; of aperture, 9; max. diam. 14 mm.

U. S. S. "Albatross," station 3361, in the Gulf of Panama, in 1471 fathoms, ooze, bottom temperature  $36^{\circ}.6$  F. U. S. N. Mus. 123,046. Also at station 3407, near the Galapagos Islands, in 885 fathoms, ooze, temperature  $36^{\circ}.2$  F., a young specimen apparently of the same species; and a worn but full-grown specimen at station 3366, off Cocos Island, Gulf of Panama, in 1067 fathoms, ooze, temperature  $37^{\circ}.0$  F.

Although the apex of each specimen is more or less eroded, it is still evident that this is a particularly flattened species, which with its milk-white shell and yellowish periostracum is sufficiently characteristic. The suture is distinct, but neither appressed nor channelled, though, when eroded, the latter is apt to be simulated by a channel of erosion.

**Polinices (Euspira) vaginatus DALL, n. sp.**

This species is represented by a number of more or less defective specimens and is best described comparatively with *P. solutus* Gould.

The shell is white with an olivaceous periostracum; the spire is much flatter than in *P. solutus*; the furrow at the bottom of which the suture lies is wider and is not channelled; in the young the whorls have a "shouldered" aspect, but in the adult they are evenly rounded; the umbilicus is cylindrical and reaches nearly to the apex of the shell, in *solutus* it is barely a narrow chink behind the reflection

of the pillar; there is a heavy callus on the body which is attenuated at the side of the umbilicus, while in *solutus* the callus is comparatively thin on the body and has a broad reflection nearly covering the narrow umbilicus. The shell has about four whorls, and an adult measures: alt. of shell, 22.0; of last whorl, 19.5; of aperture, 14.0; max. diam. 18.0 mm.

Stations 2778 and 2779, Magellan Strait, in 61 to 77 fathoms, ooze, bottom temperature 47° F. U. S. N. Mus. 97,126 and 106,873. Also at Laredo Bay in the strait.

After careful and repeated comparisons I cannot make this shell agree with any of those illustrated in Strebel's valuable account of the shells of this vicinity, and it is certainly not identical with the shell figured by Gould as his *Natica soluta*.

#### **Polinices (Euspira) constrictus** DALL, n. sp.

Shell solid, smooth except for lines of growth, polished white or grayish, having five and a half whorls; apex rather pointed, slightly elevated, with a closely appressed suture, immediately in front of which the whorl is slightly but distinctly constricted, beyond this the whorl is fully and evenly rounded; the edge of the whorl at the suture is vertically striated by the more emphatic incremental lines, but these striae do not pass in front of the constriction; under a good lens the entire surface is seen to be microscopically closely evenly striated; aperture ovate, outer lip thin and sharp, body with a thick callus, proximal end of the pillar heavily callous, but the callus, though partially overflowing the umbilicus, has no umbilical lobe or sulcus such as is seen in *Neverita*; anterior part of the pillar wide, depressed; umbilicus narrow, funicular, with a spiral impressed ascending line anteriorly. Alt. of shell, 20.0; of last whorl, 18.0; of aperture, 13.0; max. diam. 17.0 mm.

U. S. S. "Albatross," station 2780, Magellan Strait, in 369 fathoms, mud, bottom temperature 47° F. U. S. N. Mus. 97,065.

An elegant little species having somewhat the aspect of a small *Neverita*.

#### **Polinices (Euspira) litorinus** DALL, n. sp.

Shell small, solid, depressed, with almost exactly the form of *Littorina palliata* Say, milk-white with a pale straw-colored periostracum, and about three and a half whorls; surface smooth, except for faint incremental and occasional obsolete spiral lines, not polished; suture distinct, almost appressed; whorls rounded; aperture ample, ovate; outer lip sharp, body with a heavy white callus, which extends downward and almost entirely fills the umbilicus, leaving only a minute fissure open; the umbilical region but slightly indented; operculum paucispiral, light brown, horny, of about two whorls, the nucleus in the anterior fourth of its total length. Alt. of shell, 9; of last whorl, 8.5; of aperture, 7.5; max. diam. 8.5 mm.

U. S. S. "Albatross," station 2807, near the Galapagos Islands, in 812 fathoms, ooze, bottom temperature 38°.4 F. U. S. N. Mus. 96,481.

This shell recalls *Natica impervia* Philippi, but is proportionately wider, and has a horny operculum, while according to Strebel Philippi's species belongs to *Cryptonatica*, having a smooth shelly operculum.

**Polinices (*Euspira*) strebeli DALL, n. sp.**

Shell small, thin, rotund, polished, smooth except for incremental lines, and a great variety of irregular scratches which are probably pathological; periostracum pale brownish; whorls about four and a half, rounded, with an almost appressed suture, of the normal form; aperture oval, outer lip thin, sharp; body with a thin callus arcuately indented behind, thick and spreading in the umbilical region, where the umbilicus is completely filled, leaving only a chink distally, which does not lead to a definite perforation; pillar-lip in front of the callus, thickened, passing imperceptibly into the anterior and outer lips; operculum brown, two-whorled-horny, having a spirally striated glaze on the inner side and an elevated horny papilla at the nucleus. Alt. of shell, 12.0; of last whorl, 11.0; of aperture, 9.5; max. diam. 11.0 mm.

U. S. S. "Albatross," station 2783, off Southern Chile, in 122 fathoms, mud, bottom temperature 48°; station 2777, Magellan Strait, in 20 fathoms, gravel, and station 2808, near the Galapagos Islands, in 634 fathoms, coral sand, temperature 40°, the latter specimens fragmentary. Type, U. S. N. Mus. 97,093.

**Rhipidoglossa.**

*Bathysciadiidae.*

**BATHYSCIADIUM DÄUTZENBERG AND FISCHER.**

*Bathysciadium* D. and F., Bull. Soc. Zool. de France, 1901, 24, p. 207; type, *B. conicum* D. and F. l. c. (= *Lepeta costulata* Locard, Talisman Rep., Moll. Test., 1898, 2, p. 96, pl. 5, figs. 16, 17, 18).

*Lepeta* (sp.) Locard. Exp. Sci. Trav. et Tal., Moll. Test., 1898, 2, p. 96.

The species upon which this genus was founded was dredged off the Azores, by the Prince of Monaco, in 1888, in about 780 fathoms.

The specimens were seated upon the remains of a Cephalopod beak; and, like the species from the Pacific about to be discussed, the several individuals had gnawed an excavation of the size of the base of the shell in the substance of their pedestal, over which they were seated.

The *B. costulatum* is described as extremely thin and furnished with membranous periostracum which does not appear to have been ciliated; the shell is sculptured with twenty radiating ribs which are very prominent, take origin about half-

way up the cone of the shell and distally project prominently beyond the periphery of the base. The characteristics of the anatomy are described by Dr. Pelseener, in a paper following the description above cited, from which it appears that the animal is without eyes, possesses two very short tentacles, and on the right side from the base of the right tentacle extends a rather long, pointed verge, grooved on the outer ventral side. The mouth contains a single unpaired jaw, and a long radula with the formula  $1 \cdot 4 \cdot 0 \cdot 4 \cdot 1$ , the uncinial tooth being plate-like, and the third lateral larger than any of the others and furnished with a strong cusp. The rhachidian tooth is absent. The middle of the surface of the foot is produced or protruded, taking the form of the excavation upon which the animal rests. There are no gills either pallial or ctenidial, and Dr. Pelseener believes that respiration is performed, as in *Lepeta*, by the surface of the mantle. The nervous system recalls that of the Docoglossate Limpets, there are two otocysts, each containing a single otolith.

The animal appears, unlike most of the true Limpets, to be hermaphrodite, possesses a heart with a single ventricle, two renal organs, and a large hepatic gland. Dr. Pelseener concludes that the family belongs in the Docoglossa, to which so many of the anatomical characters point.

Desiring to have the most careful examination made of the Pacific species, specimens were sent to Dr. Johann Thiele, of the Royal Zoological Museum at Berlin, well known from his anatomical researches on Mollusca.<sup>1</sup> It will be noted that the *B. pacificum* is considerably larger than the Atlantic form, giving a better opportunity to the anatomist for studying the minor details.

### *Bathysciadium pacificum* DALL, n. sp.

Plate 9, figures 1, 3, 7.

Shell small, circular, conical, in every case with the apex eroded but evidently central or slightly in advance of the centre; color whitish, with a smooth, polished, concentrically faintly striated surface, a rather thick chalky layer being originally situated on a porcellanous inner coat; on the exterior the periostracum has a rather remarkable disposition and character; there are about twenty radial lines upon the surface on which the periostracum is developed in long fringe-like hairs which are not a continuous series but constitute a line of successive whorls extending somewhat beyond the margin of the shell; these are divided usually into groups of five radii, the lateral radii have the whorls of hairs extremely long and abundant, especially beyond the margin, where, when the animal raises itself to admit water and food between the shell and its *situs*, these fringes cloak the sides so no sediment can enter between the shell and its pedestal; the anterior and posterior groups of radii have the whorls short, not extending much beyond the margin, thus by ciliary action an anterior incurrent and posterior excurrent flow is doubt-

<sup>1</sup> Dr. Thiele's results will appear separately in the Bulletin Mus. Comp. Zoölogy.

less promoted; between the major radii in the wide interspaces there are in each case a pair of minor radii without whorls of hairs; these radii do not appear to cover any shelly ridges or ribs, the surface under them is not, in the specimens examined, perceptibly raised; the interior is porcellanous white, with a broad, strong muscular impression having a wide anterior hiatus; when the apex is not central it is more or less anterior to the centre. Diameter of average specimen, 5.0; height, 2.5 mm.

U. S. S. "Albatross," station 4656, off Sechura Bay, Peru, in S. Lat.  $6^{\circ} 55'$  and W. Lon.  $83^{\circ} 34'$ , in 2222 fathoms, green mud, bottom temperature  $35^{\circ}.2$  F. U. S. N. Mus. 110,570. Seated on cuttle beak, with *Cocculina*.

Another Cephalopod beak bearing similar excavations but no specimens was dredged off Aguja Point, Peru, at station 4654, in 1036 fathoms, mud, temperature  $37^{\circ}.3$  F.

### *Cocculinidae.*

#### **COCCULINA** DALL.

*Cocculina* DALL, Proc. U. S. N. Mus., 1881, p. 402; Bull. Mus. Comp. Zoöl., 1889, 18, p. 345; type, *C. rathbuni* Dall, 1881.

This genus is represented in nearly all parts of the deep sea which have been explored.

#### ***Cocculina agassizii* DALL, n. sp.**

Shell small, white, covered with a strong light, olive-colored periostracum, beneath which it is chalky, ovate-quadrate, high, with the apex about the posterior third, and the anterior longer slope roundly arcuate; the periostracum is finely, closely, radially threaded, the threads seem to bear very short projecting hairs, but neither the threads nor the hairs appear to correspond to any sculpture of the shell; on drying, the periostracum immediately detached itself from the upper part of the shell, showing beneath it only very fine, irregularly concentric lines; toward the margin it seemed to be more closely attached to the shell and, by its contraction in drying, began at once to split the shell, obliging me to return it at once to the liquid from which it had been taken, or it would have gone to pieces entirely; interior of the shell smooth, white, with a broad, short, horseshoe shaped muscular impression with a wide anterior hiatus at about the anterior third of the length; nucleus small, bulbous, produced, hardly spiral, but decurved; the shell enlarges suddenly on entering the nepionic stage; animal as usual, with a single posterior epipodial filament on each side. Alt., 2.0; length, 3.5; width, 2.5 mm.

U. S. S. "Albatross," station 4630, Gulf of Panama, in 556 fathoms, sand, temperature  $40^{\circ}.5$  F., on a fragment of wood. U. S. N. Mus. 110,660.

**Cocculina nassa** DALL, n. sp.

Plate 16, figures 3, 6.

Shell small, white, with a pale brownish periostracum, subquadrate, with the apex subcentral, the anterior slope slightly convexly arched, the posterior slope direct; apex eroded in all the specimens; sculpture of low, sharp, somewhat irregular concentric laminae, which have their height slightly increased by an added film of periostracum, and are stronger on the upper part of the cone; beside these there are fine lines of growth; the concentric sculpture is crossed by subequal fine radial threads extending from the apex to the margin, with few or no intercalaries; the radial threads are not laminar like the concentric sculpture, and near the apex are closer together, but diverge as they approach the margin, which is only crenulate by them in the adolescent stages; the intersections are not nodulous; interior polished, bluish white, the muscular impressions hardly visible. Length, 8.5; apex, 4.5 behind the anterior margin; breadth, 5.5; height, about 5.0 mm.

U. S. S. "Albatross," station 3392, Gulf of Panama, in 1270 fathoms, hard bottom, temperature 36°.4 F. U. S. N. Mus. 123,053.

This species has the sharpest sculpture of any yet described. It is more elevated and relatively less arcuate than the preceding species, while none of the Atlantic species is so sharply reticulated.

**Cocculina diomedae** DALL, n. sp.

Plate 16, figures 4, 7.

Shell rather large for the genus, white with a pale straw-colored periostracum, depressed conic, somewhat parallel sided, with rounded ends, apex nearly central, eroded; margin thin, sharp, entire; interior bluish-white, polished, the muscular impressions strong. Lon. of shell, about 13.0; height, 4.5; length of posterior slope, 6.0; width of shell, 8.5 mm.

U. S. S. "Albatross," station 3393, Gulf of Panama, in 1020 fathoms, mud, bottom temperature 36°.8 F. U. S. N. Mus. 123,052.

This species in form and size closely resembles *C. rathbuni* of the Atlantic, but on examination with a good lens the fine radial striation of the latter (which is not represented on the figures of the species, being too fine for the enlargement) is entirely absent, the periostracum is less continuous and not shining, and of a greenish tint, while that of *C. rathbuni* inclines to brown.

*Turbinidae.***TURBO** LINNE.**Turbo saxosus** WOOD.

A dead and broken specimen probably of this species was dredged near Cocos Island, at station 3368, in 66 fathoms, rocky bottom. U. S. N. Mus. 123,054.

This is a common and variable species from the Gulf of California to the Galapagos Islands.

### LEPTOTHYRA CARPENTER.

*Leptothyra* (Carpenter Ms.) Dall, Amer. Journ. Conch., 1871, 7, p. 130; type, *Turbo sanguineus* L. New name for *Leptonyx* Carpenter, preoccupied in vertebrates.

*Leptonyx* Carpenter and Adams, Proc. Cal. Acad. Sci., 1864, 3, p. 175; not of Gray, 1837.

*Collonia* Philippi, Handb. Conch., 1853, p. 206; not of Gray, 1852.

*Cantrainea* Jeffreys, P. Z. S. Lond., 1883, p. 109; type, *Trochus peloritanius* Cantraine; Monterosato, Nom. Conch. Medit., 1884, p. 49.

*Cantraineia* Fischer, Man. de Conch., 1885, p. 812.

*Homalopoma* Carpenter, Suppl. Rept. Brit. Assoc., 1863, pp. 588, 627, *olim.* for *Turbo sanguineus* Linné; name not validated, and withdrawn by Carpenter as preoccupied in Zoölogy.

The shell which Carpenter regarded as the *Turbo sanguineus* of Linné and upon which his genus was really based, is described by Pilsbry as a distinct (Californian) species under the name of *Leptothyra carpenteri*.

The *Anadema caelata* A. Adams was regarded as a subgenus of *Omphalius* by H. and A. Adams in 1854, but is considered to be a *Leptothyra* by Pilsbry. It has a very peculiar ample vaulted umbilicus and seems to me, though perhaps related to *Leptothyra*, to be sufficiently distinct to be retained. If not, the name would replace *Leptothyra*, having seventeen years priority, and not being, so far as I can discover, otherwise ineligible.

### *Leptothyra panamensis* DALL, n. sp.

#### Plate 5, figure 9.

Shell large for the genus, white, brilliantly pearly within, covered with an opaque creamy white outer coat and a brilliantly polished translucent periostracum; apex eroded, followed by about three subsequent turbinate whorls; major spiral sculpture of three strong distant keels, of which one appears on the spire; close to the second the suture is laid, giving the effect of a very minute channel; on the last whorl the second is at the periphery and more distant from the first keel than from the third, which forms the margin of the base; the relative distances of these keels may vary somewhat with the individual; beside the keels the whole surface is covered with fine spiral threads with wider interspaces, there are about a dozen between the first and second keels; there is no axial sculpture except lines of growth; base rounded; aperture round except where angulated by the keels; body with a thin callus; pillar thickened, with a small obscure tooth at the anterior end, where the adjoining lip is slightly patulous; outer lip simple, throat pearly, smooth; operculum lost. Height, 9.5; height of aperture, 5.5; max. diam. 11.0 mm.

U. S. S. "Albatross," station 3358, Gulf of Panama, in 555 fathoms, sand, bottom temperature 40°.2 F. U. S. N. Mus. 123,055.

This species is closest to *L. carinata* Cantraine, var. *tricingulata* Locard, of the Atlantic, from which it is most easily distinguished by its thinner shell and three sharp and elevated instead of blunt and low spiral keels.

These shells appear to be somewhat confused, and a little discussion of their characters may throw some light on the subject. A sketch of the synonymy may be prefixed to the other data.

#### *Leptothyra peloritana* (CANTRAINED) s. s.

*Turbo peloritanus* Cantraine, Bull. Roy. Acad. Sci. Belg., 1836, **2**, p. 387; Nouv. Mém. Roy. Acad. Sci. de Belgique, 1841, **13**, pl. 6, fig. 22.

*Trochus filusus* Philippi, En. Moll. Sicil., 1844, **2**, p. 155, pl. 25, fig. 24 (not *Trochus filusus* Wood, 1828), Bronn. Ind. Pal., 1848, **3**, p. 1300.

*Cantrainea peloritana* Jeffreys, P. Z. S., 1883, p. 108.

*Leptothyra carinata*, var. *peloritana* Pilsbry, in Tryon, Man., 1888, **10**, p. 252, pl. 63, fig. 24 (figure copied from Cantraine).

*Leptothyra filosa* Dautzenberg and Fischer, Mém. Soc. Zool. de France, 1896, **9**, p. 478.

*Turbo peloritanus* Locard, Exp. du Travailleur et du Talisman, Moll. Test., 1898, **2**, p. 17, **1**, pl. 21, fig. 31-32 (with variety *cingulata* Locard. The variety is identical with *T. filusus* Philippi).

#### *Leptothyra peloritana* var. *glabrata* PHILIPPI.

*Turbo carinatus* Cantraine, Bull. Roy. Acad. Sci. Belg., 1836, **2**, p. 387 (not *Turbo carinatus* Sowerby, 1821); Mal. Medit. in Nouv. Mém. de l'Acad. Belg., 1841, **13**, pl. 6, fig. 23.

*Trochus glabratus* Philippi, En. Moll. Sic., 1844, **2**, p. 226, pl. 28, fig. 10; Bronn. Ind. Pal., 1848, **3**, p. 1301.

*Turbo erythrinus* Galvani (fide Seguenza) in Nuovo Ann. d. Sc. nat. Bologna, 1845, 2d ser., p. 129.

*Cantrainea peloritana*, var. *carinata* Jeffreys, P. Z. S. Lond., 1883, p. 108; Monterosato, Nom. Conch. Medit., 1884, p. 49.

*Leptothyra carinata* Pilsbry in Tryon, Man., 1888, **10**, p. 252, pl. 63, fig. 35 (figure copied from Cantraine).

*Turbo peloritanus* varieties *major*, *minor*, *depressa*, *alta*, *tricingulata*, *attenuata*, and *angulosa* Locard, Exp. du Trav. et du Talisman, Moll. Test., 1898, **2**, p. 18, 1897, **1**, pl. 21, figures 28, 29, 30, 33, 34, 35, 36 (these varieties are all mutations of the original *T. carinatus*).

In the Jeffreys collection we have a fine series of this species both recent and fossil, as well as a large series of the *Leptothyra albida* Dall, from various localities in the vicinity of the West Indies, dredged by the "Albatross," "Blake," and others.

That the *carinatus* Cantraine is merely one of the numerous mutations of *peloritanus* (or *vice versa*) is not only shown by the measurements and figures given by Cantraine, but is generally admitted by naturalists familiar with the species.

I have not seen the unique specimen of *Leptothyra induta* Watson, figured in the "Challenger" report, but none of the specimens of either *albida* or *peloritana* have the beaded nepionic sculpture or the puckered folds in front of the suture shown in the figure of *induta*. The measurements, moreover, show that *induta* cannot be conspecific with *peloritana* in any of its mutations. I am inclined to believe that *induta* is a good species and distinct from *albida*, which does not show in any of its mutations the characteristics described and figured by Watson. It is, however, a fact, and probably accounts for the confusion in the literature, that *L. albida* Dall occurs in the Italian Pliocene with *L. peloritana*, and was sent to Jeffreys by Seguenza as a possible variety of *peloritana*. These specimens are now in the National Museum, and, with the series I have spoken of for comparison, are indubitably distinct from the others.

The average measurements of the three forms referred to are as follows, in millimeters:

Species.	Height.	Max. breadth.	
<i>L. peloritana</i>	14.00	14.62	(all varieties)
<i>L. induta</i>	6.75	6.25	(one specimen)
<i>L. albida</i>	7.00	7.50	(27 specimens)

The recent *peloritana* seem to tend to less height, greater width, and larger size than the fossils. In *albida* there is no great variation in sculpture, unlike *peloritana*.

### *Liotiidae.*

#### LIOTIA GRAY.

##### *Liotia (Arene) californica* DALL, n. sp.

Shell large for the genus, rude, yellowish-white, depressed, with about six whorls, carrying at the shoulder six blunt, large, projecting tubercles; nucleus small, the nepionic whorls reticulate, flattened; the later whorls keeled bluntly at the shoulder, behind which they are flattened; on the flat area are two strong, elevated, spiral threads (which later disappear) close together, with the channels on either side reticulated by subequal and subequally spaced radial threads; on the last whorl all the sculpture on the upper part of the whorl, except the keel connecting the tubercles at the shoulder, has disappeared; the surface of the shell is of a spongy nature and all the sculpture is obscure as if deliquescent; the base is rounded with a large spiral, deep umbilicus, having one entering spiral keel which ends at a projection of the pillar lip; the verge of the umbilicus is rounded

and spongy, outside of this ridge in the young it is constricted by a row of pits between which and the periphery are some obscure spirals in some specimens; aperture circular within, and when fresh brilliantly pearly, but the pearly coating is very thin and seems to disappear in dead shells; the outer margin of the aperture, which is very thick, is modified by the umbilical keel and other sculpture; operculum multispiral, with the external edges of the whorls fringed, very concave, and showing hardly any calcareous deposit. Alt. of adult, 15.0; of aperture, 9.0; max. diam. 23.0; min. diam. of base, 15.0; umbilicus, 3.0 mm.

U. S. S. "Albatross," station 2984, off Lower California, in 113 fathoms, sand, bottom temperature 49°.8 F. U. S. N. Mus. 110,662.

This species is usually covered with Polyzoa, Lithothamnion, and other adherent matter, which obscures its appearance, but the shell itself is so rude, spongy, and bleached in appearance that the actual surface is often discriminated only when examined with a lens. It is the largest species of its group and the first to be reported from the region, though there are several small species of typical *Liotia* named by Carpenter from Mazatlan and the Gulf, as well as the coast of Alta California.

#### *Liotia (Arene) pacis* DALL, n. sp.

This species is so similar to the preceding that it is best described by a comparative diagnosis.

Than *L. californica* it is smaller, flatter, and more distinctly sculptured; the specimens examined have three and a half whorls beside the (lost) nucleus; it has eight peripheral projections instead of six, and they are flat, triangular, and spinose instead of bluntly tubercular; each projection is at the distal end of a distinct radial rib; the base is flatter, the umbilical ridge lower, and broken up into obliquely radial tubercles without any row of pits outside of it; the aperture is subcircular and the discrepancy between the inner and outer margins much less than in *californica*. Alt. of shell, 10.0; of aperture, 6.0; max. diam. of base, 15.0; min. diam. 11.0 mm.

U. S. S. "Albatross," station 2996, off La Paz Bay, Lower California, in 112 fathoms, mud, bottom temperature 56° F. U. S. N. Mus. 110,663.

#### *Trochidae.*

#### CLANCULUS MONTFORT.

#### *Panocochlea* DALL, subg. nov.

Shell depressed-conic, aperture very oblique, the outer lip produced at the periphery; a single, strong tooth at the end of the pillar with a sulcus in front of it, a layer of smooth enamel, continuous with that of the outer lip, spread over the umbilical region (which is without pit or perforation) and a large part of the

body whorl; throat, pillar, and body smooth without liration. Type, *P. rubida* Dall.

**Clanculus (Panocochlea) rubidus** DALL, n. sp.

Plate 8, figures 3, 4.

The two specimens described below are believed to be young and adult of the same species, though in one case the color of the external shell is rose-pink and in the other brick-red or dull vermilion. Unfortunately the condition of the fragmentary adult is so extremely fragile, owing to decay, that it could not be entrusted to an artist for illustration, and the characters of the aperture in the adult are not shown in the figures of the young. Neither specimen contained the operculum or soft parts, but there is little doubt that the two specimens are conspecific. The shell appears to occupy in the system a place half-way between the Oriental *Clanculus* and the South American *Monodonta*, but rather nearer to the former.

Young shell small, pearly, with an opaque outer coat, and about four and a half whorls; above rose-pink, whitish at the apex, base cream-colored; form depressed turbinate; nucleus smooth, very minute, globular, followed by one and a half similar turns; the succeeding whorl rounded, gradually becoming flattish above, with a single, small, simple peripheral keel, the sculpture then gradually taking on the adult characters and the pinkish color; suture narrow, applied midway between the peripheral and next posterior keel, deeply channelled, with its anterior margin beaded; spiral sculpture on the last whorl of four, prominent, more or less distinctly beaded keels, one close to the beaded sutural margin, the next separated by a much wider space, the next two nearer, equidistant, the first peripheral, and the second at the margin of the evenly rounded base; the keels are more or less articulated by crimson dots; the whole surface is also finely spirally striated; axial sculpture only of incremental lines somewhat intensified at intervals; aperture rounded, very oblique, outer lip thin, sharp, a little crenulated by the keels; body with a wash of callus; pillar arcuate, short, very thick, with a prominent basal tooth, the axis imperforate. Height of shell, 4; of aperture, 2.5; max. diam. 6 mm.

U. S. S. "Albatross," station 3355, Gulf of Panama, in 182 fathoms, mud, bottom temperature 54°.1 F. U. S. N. Mus. 122,953.

Adult fragment. Specimen broken, but showing the characters sufficiently for description; general form depressed-turbinate, with four and a half whorls; color brick-red, paler on the prominences; suture closely appressed to a peripheral keel, which on the spire is smooth, on the last whorl undulate; the sutural margin of the last whorl is marked by a very strong, low, coarsely beaded spiral rib, in front of which the whorl is very flatly arched to the periphery; on this surface are six or seven rather strong beaded threads similar to that forming the periphery, their intervals appear irregular and contain many extremely fine, obscure, spiral threads; base forming an imperforate flattened dome, with one spiral thread near

the periphery, and numerous finer, obscure, spiral lirulae over the rest of the surface; aperture extremely oblique, outer lip produced along the suture, retractively arcuate between suture and periphery, produced and patulous at the periphery, thence obliquely arcuate to the base of the pillar; it is everywhere simple, smooth, not reflected, but loaded with a heavy layer of callus, which is also spread evenly and smoothly over the body and about two-thirds of the base; pillar extremely short, flattened, produced in a single large, flattened, heavy tooth, with a deeply excavated notch between the tooth and the anterior margin of the aperture; the callus entirely covers and conceals the umbilical depression if any existed. Height, 7.0; of aperture, 3.5; max. diam. about 15.0 mm.

U. S. S. "Albatross," station 3396, Gulf of Panama, in 259 fathoms, mud, bottom temperature 47°.4 F. U. S. N. Mus. 122,954.

The interior of the shell was once pearly, but has been dulled by decay. It is impossible at present to say whether the broad mass of callus on the base was originally opaque white or pearly.

#### GAZA WATSON.

*Gaza Watson*, Journ. Linn. Soc., 1879, 14, p. 601; Challenger Report, *Gastropoda*, 1885, p. 93; type, *Gaza daedala* Watson, *op. cit.*

#### *Gaza rathbuni* DALL.

Plate 2, figure 4; plate 3, figure 6.

*Gaza rathbuni* Dall, Bull. Mus. Comp. Zoöl., June, 1889, 18, p. 354; Proc. U. S. Nat. Mus., 1889, 12, p. 342, pl. 7, fig. 4 (immature).

U. S. S. "Albatross," station 2818, near the Galapagos Islands, in 392 fathoms, sand, bottom temperature 44° F. Also at station 3402, in 421 fathoms, ooze, temperature 42°.3, in the same vicinity. U. S. N. Mus. 122,955.

The original specimen was immature, not having formed the reflected lip. The species has therefore been refigured from the present material.

An additional note may be made that the nuclear whorls of all the species of *Gaza* which I have examined have a membranous consistency, so that when the shell has dried the nucleus shrivels up and drops off, leaving a cylindrical perforation which is continuous with the umbilicus.

The dimensions of the adult shell are: alt. 32; of last whorl, 28; of aperture, (vertical), 23; max. diam. of base, 45; min. diam. 38 mm.

The periostracum is olivaceous, polished, very thin, and readily dehiscent. In Watson's type it had, doubtless, been lost, thus accounting for his observation that it was wanting in *G. daedala*.

This genus affords, perhaps, the most exquisite gems of the abyssal shell fauna; in shape and iridescence nothing more lovely can be imagined.

## CALLIOSTOMA SWAINSON.

*Calliostoma iridium* DALL.

Plate 19, figure 5.

*Calliostoma iridium* Dall, Proc. U. S. Nat. Mus., 1895, **18**, p. 7; 1902, **24**, p. 552, pl. 39, fig. 3.

U. S. S. "Albatross," station 3387, Gulf of Panama, in 127 fathoms, sand, bottom temperature 56°.2 F. U. S. N. Mus. 122,957; and at station 3391, in 153 fathoms, mud, temperature 55°.8 F.

Color of the shell a waxy pink, the apex somewhat darker, with variable delicate brown flammules and darker brown ones on the periphery of the last whorl. The base is destitute of flammules and the pillar is white. In this, as in most shells not from the littoral region, the delicate colors are more or less evanescent. The nacre is very bright, especially when the shell is wet, showing through the translucent outer coat. The operculum is pale yellow, concave externally with an entire edge and about a dozen whorls.

## TURCICULA DALL.

*Turcicula* Dall, Bull. Mus. Comp. Zoöl., 1881, **9**, p. 42; type, *Margarita (Turcicula) imperialis* Dall, l. c.; *Ibid.*, June, 1889, **18**, p. 376, pl. 22, figs. 1, 1a; Pilsbry in Tryon, Man. Conch., 1889, **11**, pp. 14, 330; Dall, Bull. U. S. Nat. Mus., 1889, **12**, p. 162, pl. 22, figs. 1, 1a; Locard, Exp. du Trav. et du Talisman, Moll. Test., 1898, **2**, p. 21.

*Bembix* Watson, Journ. Linn. Soc. London, 1879, **14**, p. 603; Type, *B. aeola* Watson, *op. cit.*, p. 603; Challenger Rep., *Gastropoda*, 1886, p. 95, pl. 7, fig. 13; Japan; not *Bembix* De Koninck, 1844.

*Bathybembix* Crosse, Journ. de Conchyl., 1893, **40**, p. 288, new name for *Bembix* Watson, not De Koninck (the number, ostensibly for July, 1892, did not appear until March, 1893).

This group, at first instituted as a subgenus of *Margarita*, is now generally admitted to be of generic rank. It is not only represented by characteristic species in the Atlantic, eastern Pacific and Japanese seas, but is also known from the Tertiary of the Pacific Coast of North America, characteristic species being known from the Eocene and Oligocene.

The type species of *Bembix* Watson, not De Koninck, was established on a comparatively young shell from Japanese seas, but the adult has recently been figured by Schepman (Leyden Museum Notes, 1905, **25**, p. 100, pl. 8, figs. 4, 5), and the "Albatross," having dredged in Japanese waters a number of specimens of this species, of various ages, I was enabled, by the kind assistance of Mr. Edgar A. Smith of the British Museum, to confirm the decision of Schepman as to the identity of his shell with the adult *B. aeola*.

The species of this group now recognized among recent shells are as follows:

## ATLANTIC OCEAN.

*Turcicula imperialis* Dall.*Turcicula miranda* Dautzenberg and Fischer.

## EASTERN PACIFIC.

*T. macdonaldi* Dall.*T. bairdii* Dall.

## WESTERN PACIFIC, ETC.

*T. crumpii* Pilsbry.*T. aeola* Watson.*T. argenteonitens* Lischke.

## OLIGOCENE OF WASHINGTON.

*T. washingtoniana* Dall.

## EOCENE OF OREGON.

*T. columbiana* Dall.**Turcicula macdonaldi** DALL.

## Plate 19, figure 7.

*Turcicula macdonaldi* Dall, Proc. U. S. Nat. Mus., 1889, 12, p. 348, pl. 7, fig. 7.

U. S. S. "Albatross," station 2792, off Manta, Ecuador, in 401 fathoms, mud, bottom temperature 43° F; also at station 3356, Gulf of Panama, in 546 fathoms, mud, bottom temperature 40°.1 F. U. S. N. Mus. 122,953.

This is the largest and finest recent species yet described.

The species of *Turcicula* are found at considerable depths in the tropics and warm temperate zone, but in the cold waters of Bering Sea, *Turcicula bairdii* has recently been dredged by the "Albatross" in 25 fathoms, but always in the offshore fauna. No species has yet been described from any part of the shore fauna properly so called, and even the Miocene fauna of Oregon, where it might reasonably have been expected to occur, is without it, the assembly in that horizon being a shallow water coast fauna.

While the type of sculpture characteristic of *Turcicula* is also found in many other deep water Trochids, the species can easily be discriminated from the *Solariellas* which are its next allies by its imperforate base with no umbilical depression.

**SOLARIELLA** SEARLES WOOD.**Solariella nuda** DALL.

## Plate 3, figures 5, 7.

*Solariella nuda* Dall, Proc. U. S. Nat. Mus., 1896, 18, p. 9.

Shell turbinata, recalling Margarites, smooth, polished, except for obscure spiral markings which do not interrupt the surface, of about four whorls; color

white, with a pink or blue nacre glowing through; whorls rounded, flattened in front of the suture; base rounded; umbilical margin keeled; umbilicus wide, funicular; aperture rounded, oblique, hardly angulate by the umbilical rib, and with a very short interruption between the inner and outer lips; operculum light brown, thin, with about ten whorls. Height, 15; major diam. 19; minor diam. 15.5 mm.

U. S. S. "Albatross," stations 2928 (in Lat. 32° 47' N.); 3187 (Lat. 36° 14' N.); and 3348 (Lat. 39° 03' N.) off the coast of California, in 417, 298, and 455 fathoms, respectively on sandy or muddy bottom, temperature ranging from 41° to 47°.6 F. Also at station 2992, off Clarion Island, in 460 fathoms, sand, temperature 41°.8, and off the Santa Barbara Islands in 414 fathoms at station 2839, temperature 41°.4. Type, U. S. N. Mus. 122,580.

The operculum is thin, pale yellow and multi-spiral. The shell is remarkable on account of its total absence of ornament.

### *Solariella ceratophora* DALL.

#### Plate 3, figure 2.

*Solariella ceratophora* Dall, Proc. U. S. Nat. Mus., 1896, 18, p. 9.

Shell thin, with a pale olive, silky epidermis, and six whorls beside the (decolate) nucleus; early whorls smooth, gradually taking on two rows of projecting points or sharp nodules, which are, on the later whorls, connected by a slender spiral thread; periphery with a slender granular thread, on which the suture is laid; base with five similar threads, closer as they approach the umbilicus; umbilicus small, vertically striate; aperture rounded, slightly angulated by the sculpture; the outer lip thin, sharp; the inner reflected over part of the umbilicus. Height, 28; diam. 24 mm. The operculum has four or five whorls.

U. S. S. "Albatross," station 3432 in the Gulf of California, off La Paz, Mexico, in 1,421 fathoms, mud, bottom temperature 37°.8 F. U. S. N. Mus. 122,960.

The single specimen obtained has repaired an injury of the base so as to somewhat distort the umbilical region. Except for the presence of an umbilicus this might well be referred to *Turricula*. A few fragments, probably of this species, were dredged at station 3431, off Mazatlan, Mexico, in 995 fathoms, mud, temperature 37° F.

### *Solariella galapagana* DALL n. sp.

#### Plate 4, figure 2.

Shell turbinate, thin, creamy white with a fine greenish nacre showing through, with a globular large smooth nucleus and four and a quarter subsequent whorls; first nepionic whorl with two sharp spiral keels, one at the shoulder and one at the periphery, and two faint threads between the shoulder and the preceding

suture; these are crossed by subequal, fine, sharp, somewhat protractive axial threads, at first small and crowded, but becoming more distant, subequidistant, and sharp as the whorl grows; the spirals increase by intercalation, and on the second whorl the axial threads begin to fade out, until they are reduced to beadings on the spirals between the suture and shoulder, and finally on the last whorl the spiral next the suture alone is beaded, and the peripheral major spirals have increased to six, while on the slightly flattened base there are about eighteen, close-set, even, gradually diminishing in size toward the umbilicus, which is bordered by a small sulcus, inside of which is a square-topped keel of two threads notching the margin of the aperture where they intersect it; inside of this is a twisted funicular umbilicus with one entering spiral thread on its walls, also ending in a small notch at the aperture; mouth rounded except at the notches; outer lip sharp, thin, crenulated by the spirals; pillar thin, arcuate, slightly reflected; whorls rounded except where slightly turritid by the shoulder keel; operculum thin, brownish, concave, many whorled, the margins of the whorls projecting as laminae from the surface externally. Alt. of shell, 17; of last whorl, 13; of aperture, 8.5; max. diam. 15.5; min. diam. of base, 13.5 mm.

U. S. S. "Albatross," station 3413, near the Galapagos Islands, in 1360 fathoms, ooze, bottom temperature 36°F. U. S. N. Mus. 122,959.

This elegant little shell is well distinguished by its sculpture from any of the allied species. It is perhaps not quite mature, and the pillar lip in the fully adult shell may be somewhat modified.

### *Solariella equatorialis* DALL, n. sp.

#### Plate 5, figure 11.

Shell thin, pearly, the nacre shining through the translucent outer coating, and a pale yellowish, axially striated, silky periostracum; whorls six, exclusive of the (lost) nucleus; suture distinct, not channelled; whorl in front of it horizontal with a fine spiral thread at a short distance, giving a somewhat tabulate effect; somewhat more distant is a second stronger thread at the shoulder, and a similar one at the periphery, while a fourth forms the margin of the base against which the suture is laid; on the base are four more similar threads, becoming gradually more adjacent and feebly beaded or nearly simple, except the fourth, which is distinctly, minutely beaded, while a fifth, forming the brink of the large, wide, and deep umbilicus, is even more strongly beaded; axial sculpture of minute, feeble, radial wrinkles which at their intersection with the posterior thread crenulate it, and on the second and third threads produce, at intervals of about a millimeter, sharp, triangular, subspinose nodules; the entire shell is covered with axial, fine, retractive, silky striation; whorls full, base rounded; umbilicus very deep, funicular, the walls axially striated; aperture rounded-quadrate, the margins thin; pillar oblique, slightly excavated, not callous, slightly expanded; body and throat pearly. Alt. 21; of last whorl, 14; of aperture, 8.5; max. diam. of shell, 19.5; of umbilicus, 5.5 mm.

U. S. S. "Albatross," station 3376, off the Ecuador coast, in 1132 fathoms, ooze, bottom temperature 36°·3 F. U. S. N. Mus. 125,964. Also at station 3375, south of Malpelo Island, Gulf of Panama, in 1201 fathoms, ooze, temperature 36°·6; and station 3366, off Cocos Island, in 1067 fathoms, ooze, temperature 37° F. A fragment, taken off Mazatlan, at station 3421, in 995 fathoms, mud, may possibly belong to this species.

### GANESA JEFFREYS.

#### ? *Ganesa panamensis* DALL.

Plate 19, figure 4.

*Ganesa? panamensis* Dall, Proc. U. S. Nat. Mus., 1902, 24, p. 554.

Shell small, turbinate, smooth, whitish with a few grayish flecks and streaks which may not be normal to the shell, and about three and a half turgid whorls; nucleus eroded, apparently large and subglobular; subsequent whorls polished, smooth except for faint incremental lines, and a line at the anterior edge of the suture, caused by the appression of the edge of the whorl but which looks like a spiral thread; on the base around a very small, oblique, chink-like umbilicus there are spiral striae, much as in *Mölleria*, to the number of twelve to fifteen; base rounded; aperture nearly rounded, slightly angular at the posterior commissure; outer lip sharp, thin, simple; a thin wash of callus on the body; pillar-lip concavely arcuate, slightly thickened, passing imperceptibly into the anterior margin of the aperture; throat slightly pearly, smooth, without liration or opercular ledge such as is found in *Mölleria*. Operculum horny, thin, smooth outside, concave, with about four whorls. Alt. of shell, 4.7; of last whorl, 4.3; of aperture, 3.2; max. diam. of base, 4.5 mm.

U. S. S. "Albatross," station 3393, in 1020 fathoms, mud; Gulf of Panama, bottom temperature 36°·8 F. U. S. N. Mus. 109,029.

The position of *Ganesa* Jeffreys is more or less uncertain, but the present shell, though larger, resembles in general the species which Jeffreys included in his group; and there seems to be no other group defined into which this little shell would fit more appropriately.

### *Fissurellidae.*

#### EMARGINULINAE.

### PUNCTURELLA LOWE.

#### *Cranopsis* A. ADAMS.

*Cranopsis* A. Adams, Ann. Mag. N. Hist., 1860, ser. 3, 5, p. 602 (type, *C. pelex* Adams); Fischer, Man. de Conchyl., 1887, p. 862; Dall, Blake Report, Gastr., 1889, p. 404; Pilsbry, in Tryon, Man., 1890, 12, pp. 202, 240.

**Puncturella (Cranopsis) expansa** DALL. ✕

Plate 4, figures 5, 10, 11.

*Rimula? expansa* Dall, Proc. U. S. Nat. Mus., 1896, 18, p. 10.

Shell low, rounded, expanded; apex small, prominent, subcentral, recurved to the right; foramen like an exclamation point without the dot (!), the small end anterior, the suture in front of the foramen inconspicuous, marked by a narrow raised line on the interior of the shell; anterior slope convex, gently rounded; posterior a little excavated; sculpture of evenly spaced, similar, close, fine, rounded threads overrunning radiating, rounded, little elevated threads of three sizes, the larger starting at the apex, the others intercalary toward the periphery as the interspaces widen; margin of the shell slightly crenulated by the sculpture; interior smooth, yellowish white, the septum convexly arched without buttresses. Height, 10; length, 32; width, 26 mm.

U. S. S. "Albatross," station 3358, Gulf of Panama, in 555 fathoms, sand, bottom temperature 40°.2 F.; and station 3407, off the Galapagos Islands, in 835 fathoms, ooze, bottom temperature 37°.2 F. U. S. N. Mus. 122,966 and 122,967, the latter being the figured type.

This species recalls *P. asturiana* Fischer, but is larger, lower, and more expanded, a thinner shell, and with more delicate sculpture.

This appears to be the largest species of the genus yet described. A verge is present at the seat of the right tentacle in male specimens.

cf. *P. corvina* Verco. Trans. Roy. Soc. S. Austr. 1901, p. 100.  
 Dec. 1906. and *P. gigantea* Schepman. Siboga

**ISOPLEURA.****POLYPLACOPHORA.****Eochitonia** DALL, 1889.*Lepidopleuridae.***LEPIDOPLEURUS** RISSO.

*Lepidopleurus* (Risso) Hist. Nat. Eur. Mérid., 1826, 4, p. 267; not of Carpenter, 1863.

*Leptochiton*, Gray, P. Z. S. Lond., 1847, p. 127; Carpenter (Ms.) Dall, Proc. U. S. Nat. Mus., 1878, 1, p. 314.

*Lepidopleurus* Sars, Moll. Reg. Arct. Norv., 1878, p. 110; Pilsbry, Mon. Polyplacophora, 1892, p. 2.

The chitons of the deep sea and archibenthal regions almost exclusively belong to the present genus, and present an extremely uniform appearance.

**Lepidopleurus halistreptus, DALL.**

*Lepidopleurus halistreptus* Dall, Proc. U. S. N. Mus., 1902, **24**, p. 556.

U. S. S. "Albatross," station 3415, off Acapulco, Mexico, in 1879 fathoms, ooze, bottom temperature 36° F. U. S. N. Mus. 109,032; station 3417, in 493 fathoms, mud, temperature 40°; and station 3418, in 660 fathoms, mud, temperature 39°.

The specimen from deepest water, the type of the species, has the valves wider in a fore-and-aft direction and more distinctly mucronate than those from the other two stations.

The type has the first intermediate valve in front of the tail-valve with an axial length of 5.6 mm., a basal width of 10 mm., and an altitude above that base line of 4.5 mm.

The corresponding measurements from a specimen from station 3417 are 4.5, 10.0, and 3.5 mm.; and from station 3318, 3.5, 9.6, and 3.5 mm. It is obvious that the shallow-water specimens have the intermediate valves shorter and less elevated mesially and consequently a less angular back; there is also a pair of impressed lines which tend to differentiate the jugal from the pleural tracts. The measurements of the tail-valves did not differ like those of the intermediate valves. I was unable to discern any further differences, but, if those above indicated are held to have any systematic weight, the shallow-water specimens might be considered as a variety *abbreviatus*.

**Lepidopleurus opacus DALL, n. sp.**

Animal elongate, with a rather high subangular dorsum, a dirty-white coloration, and a narrow girdle closely set with very minute spinules, but with no marginal fringe of spines; the jugal is not perceptibly marked off from the pleural areas, and the lateral areas are only indicated by a feeble radial depression sometimes hardly visible; the sculpture consists of very minute ovate, flat, close-set granulations, like scales, obscurely arranged radiately with reference to the mucro, but otherwise uniform over the whole exterior of the valves; posterior valve with the jugum slightly arcuate longitudinally, ending in a prominent subcentral mucro; the posterior area slightly depressed, the sutural plates short, anteriorly directed, with an inclination of 45° laterally; interior white; intermediate valves with a wide sinus, short sutural plates, and an almost obsolete notch; anterior plate small, semilunate, simple; penultimate plate on the jugum 7.2 mm. long; base 10 mm.; alt. 6.0 mm.

U. S. S. "Albatross," station 4647, between the Galapagos Islands and the Peruvian coast, in 2005 fathoms, ooze, bottom temperature 35°.4 F. U. S. N. Mus. 110,664. Also at station 3392, Gulf of Panama, in 1270 fathoms, hard bottom, temperature 36°.4 F.

This species is perhaps nearest to *L. mesogonus* Dall, from the Pacific Ocean, west of the Queen Charlotte Islands, in 1588 fathoms; that species is, however,

even more angular dorsally, has the posterior mucro nearer to the posterior margin, and has the lateral areas of the intermediate valves prominently concentrically rippled.

**Lepidopleurus incongruus** DALL, n. sp.

Animal with the gills forming a very short posterior row; girdle narrow with extremely minute, close-set spines, giving the effect of a naked, velvety surface. Intermediate valves pale brown, the median line slightly obtusely angular; jugum slightly mucronate behind, the jugal area sculptured with very fine, close-set, rounded, longitudinal threads; pleural tracts with ten or twelve larger threads with wider, flat interspaces, the threads sometimes breaking off abruptly, leaving a double-width interval the rest of the way; lateral areas prominent, very finely granulose, conspicuously concentrically rippled; anterior plate with feeble concentric ripples and similar granulation; posterior valve with prominent subcentral mucro, the central area sculptured like the pleural tracts of the preceding valves, the posterior area like the anterior valve; penultimate valve with a length of 2.3, a width of 6.0, and an altitude of 2.5 mm. Articulations as usual in the genus.

U. S. S. "Albatross," station 3354, Gulf of Panama, in 322 fathoms, mud, bottom temperature 46° F. U. S. N. Mus. 122,969.

This species appears to have a unique sculpture. An examination of the valves figured in Pilsbry's monograph for the whole family reveals none like it.

**Lepidopleurus luridus** DALL.

*Lepidopleurus luridus* Dall, Proc. U. S. Nat. Mus., 1902, 24, p. 556.

U. S. S. "Albatross," station 3392, in Panama Bay, in 1270 fathoms, hard bottom, temperature 36°.4 F.; and station 3393, in 1020 fathoms, mud, temperature 36°.8. U. S. N. Mus. 109,027.

**Lepidopleurus farallonis** DALL.

*Lepidopleurus farallonis* Dall, Proc. U. S. Nat. Mus., 1902, 24, p. 557.

U. S. S. "Albatross," station 3104, near the Farallones Islands, off San Francisco, California, in 391 fathoms, coral, bottom temperature 41° F.; U. S. N. Mus. 109,025; and at station 3393, Panama Bay, in 1020 fathoms, mud, temperature 36°.8 F.

**Mesochitonia.**

*Chitonidae.*

**CALLISTOCHITON** CARPENTER.

**Callistochiton periconis** DALL, n. sp.

Animal small, of a pale brownish color with a narrow dark girdle covered with small, closely packed setose scales; middle valves with the sculpture of *C. pulchellus*

(Gray) Pilsbry, from Peru, but differing in the following particulars: the posterior ribs of the middle valves are transversely striate, not nodular, and do not serrate the suture; the anterior valve has thirteen rounded finely cross-striated ribs, the posterior has seven; this valve considerably overhangs the posterior part of the girdle, and the two anterior ribs are conspicuously larger and stronger than the five between them. The gills are prolonged, reaching the second valve.

Perico Island, Panama Bay, collected on the reefs by the "Albatross" party. U. S. N. Mus. 110,763.

### CHITON LINNÉ.

#### *Chiton* (*Chiton*), sp. indet.

A small species of the restricted group of true chitons was obtained at Taboguilla Island, Panama Bay. It cannot be identified with any of the known species from this locality, but the specimens may prove to be immature, and therefore it seems best to leave it for the present anonymous.

### SCHNOCHITON GRAY.

#### LEPIDOZONA PILSBRY.

#### *Ischnochiton ophioderma* DALL, n. sp.

Shell blackish or brown with blackish, usually on the central areas longitudinally disposed flecks; interior dark bluish green, with an olivaceous flush under the mucrones; anterior and posterior valves each with ten rather deep, sharply defined, narrow slits; middle valves with one slit on each side; girdle with numerous large, ovate, close-set, imbricated convex scales, smaller toward the periphery; sutural plates large, the sinus indistinct; sculpture of the central areas minutely quincuncially reticulate, but to the naked eye smooth; at the margin of the lateral areas the lines become stronger, forming as it were a narrow sculptured fringe just in front of the lateral areas; the latter, as well as the whole of the anterior plate and the posterior area of the posterior plate, are covered with rounded close-set low projections resembling scales; there are no radial ribs or ridges on any of the valves. Lon. of shell, 12; lat., 9; alt. of median ridge, about 2 mm.

On the shore at Perico Island, Panama Bay. U. S. N. Mus. 110,764.

The sculpture of this shell is quite remarkable. I do not remember seeing anything like it in any other *Chiton*.

This and a few other species were obtained on the reefs or near the shore by the "Albatross" party.

*Mopaliidae.***PLACIPHORELLA** CARPENTER.**Placiphorella blainvillei** BRODERIP.

*Chiton blainvillei* Broderip, P. Z. S. Lond., 1832, p. 27; Reeve, Conch. Icon., Mon.

*Chiton*, pl. 3, fig. 13.

*Mopalia blainvillei* Gray, P. Z. S. Lond., 1847, p. 69.

*Placiphorella blainvillei* Dall, Proc. U. S. Nat. Mus., 1886, 9, pp. 210, 211; Pilsbry, in Tryon, Man., 1892, 14, p. 310, pl. 66, figs. 26-32.

U. S. S. "Albatross," station 3368, near Cocos Island, Gulf of Panama, in 66 fathoms, rocky bottom; U. S. N. Mus. 122,968. Original locality of the species Lobos de Tierra Island, Peru, on a stone from seventeen fathoms (Cuming).

**SCAPHOPODA.****SOLENOCONCHIA.***Dentaliidae.***Dentalium megathyris** DALL.

Plate 19, figure 1.

*Dentalium megathyris* Dall, Proc. U. S. Nat. Mus., 1889, 12, p. 293, pl. 9, fig. 1;

Stearns, *op. cit.*, 1893, 16, p. 424; Pilsbry, Mon. Scaphopoda, Man. Conch., 1897, 17, p. 67, pl. 15, figs. 29, 30, 31.

The following table shows the distribution of this species as far as known:

Station.	Locality.	Depth.	Bottom.	Bottom temp. F.	Mus. Reg.
*3360	Gulf of Panama	1672	sand	36° 4	122,982
*3361	" "	1471	ooze	36° 6	122,977
*3381	" "	1772	mud	35° 8	122,975
3399	" "	1740	ooze	36° 0	122,980
3407	off Galapagos Ids.	885	"	37° 2	122,978
3413	" "	1360	"	36° 0	122,979
3431	Gulf of California	995	mud	37° 0	122,976
3432	" "	1421	"	37° 8	122,981
3414	off Tehuantepec	2232	"	38° 5	122,974
2788	off Chiloe Id.	1050	"	36° 9	110,665
2789	off S. W. Chile	1342	"	35° 9	87,558
2807	off Galapagos Ids.	812	ooze	38° 4	117,830

As in previous instances the specimens in nearly all cases were badly eroded. A considerable range of variation was observed in the matter of curvature, some being straighter than others taken in the same haul of the dredge, some thinner-shelled, in many individuals the aperture being almost absolutely circular.

The specimens from the stations above, to which is prefixed an asterisk, — in addition to being thinner-shelled, with a slightly more even curvature, circular aperture, with the longitudinal sculpture retaining its sharpness to the end, instead of flattening out as in typical *megathyris*, — have also at the anal end on the dorsal side a notch which varies from 1.0 mm. to 7.0 mm. in length, while in the best preserved typical *megathyris* observed in the young stages, the anal aperture is always entire. For this variety, which seems to grade into the type, the varietal name of *panamense* is proposed, though it may eventually prove to be a distinct species.

#### *Dentalium peruvianum* DALL, n. sp.

Shell white, straight, except for a slight curve near the anal end which is at its maximum about 20 mm. in front of the anal end; surface with an extremely thin, yellowish periostracum, finely longitudinally striated, with wider slightly rounded interspaces varying more or less in width; these interspaces rise into thread-like form near the anal end, where they alternate in size, but are never very strong; there are about twenty-six of them just in front of the slit; in advance of this point the intercalaries chiefly begin; the anal end is rounded, about 1.75 mm. in diameter, with a wide slit on the convexly arcuate or dorsal side, the slit at its beginning is 1.7 mm. wide, and has a length of 5.0 mm. The oral aperture is nearly circular, measuring 12.0 mm. wide and 11.25 mm. dorso-ventrally; the margin is very sharp and thin; the type specimen measures 90.0 mm. in length, of which two-thirds is nearly straight, the maximum deviation of the ventral surface from a chord connecting the two extremities is 2.5 mm., about 20.0 mm. in front of the anal end.

U. S. S. "Albatross," station 4656, in 2222 fathoms, mud, off the Peruvian coast in S. Latitude  $6^{\circ} 55'$  and W. Longitude  $83^{\circ} 34'$ ; bottom temperature  $35^{\circ}.2$  F. U. S. N. Mus. 110,667. Also at station 4649, in S. Latitude  $5^{\circ} 17'$  and W. Longitude  $85^{\circ} 20'$ , in 2235 fathoms, mud, temperature  $35^{\circ}.4$ , a fragment of the same species.

The type specimen had served as a pedestal for a large deep-water Actinia.

The species is straighter, more slender, and less tapering, and with a much feebler sculpture than *D. panamense*, which is also shorter in proportion to its oral diameter; *D. ceras* Watson, otherwise apparently its nearest relative, is quite distinct, on comparison.

#### *Dentalium agassizii* PILSBRY AND SHARP.

Plate 4, figure 8.

*Dentalium agassizii* Pilsbry and Sharp, Man. Conch., 1897, 17, p. 26, pl. 12, figs. 90-94.

The following table shows the various stations at which this species has been dredged by the "Albatross" on her various cruises.

Station.	Locality.	Depth.	Bottom.	Bot. temp. F.	Mus. Reg.
2839	Sta. Barbara Islands	414	sand	41°.4	122814
3354	off Panama	322	mud	46° 0	122983
3392	" "	1270	hard	36° 4	122984
3393	" " (Type)	1020	mud	36° 8	122985
3394	" "	511	"	41° 8	122986
3418	off Mexico	660	sand	39° 0	122987
3430	" "	852	"	37° 9	122988
3431	Gulf of California	995	mud	37° 8	122989
2923	off San Diego, Cal.	822	"	39° 0	110672

This is one of the most elegant and abundant species of the region with a geographical range of forty degrees in longitude and nearly 2000 miles in latitude.

### *Dentalium brevicornu* PILSBRY AND SHARP.

*Dentalium (Compressidens) brevicornu* Pilsbry and Sharp, Man. Conch., 1897, **17**, p. 125, pl. **22**, figs. 53, 54, 55.

U. S. S. "Albatross," station 2807, near the Galapagos Islands, in 812 fathoms, ooze, bottom temperature 38° 4 F.; at station 2808, in 634 fathoms, sand, temperature 40° (U. S. N. Mus. 122,809); and station 3431, off Mazatlan, Mexico, in 995 fathoms, mud, temperature 37° 0.

Very closely allied to the Atlantic *D. pressum* Pilsbry and Sharp, but the tube increases more rapidly in caliber, and is decidedly less compressed on the outer curve, according to Pilsbry, *op. cit.*

### *Dentalium dalli* PILSBRY AND SHARP.

*Dentalium (Rhabdus) dalli* Pilsbry and Sharp, Man. Conch., 1897, **17**, p. 114, pl. **21**, fig. 46.

U. S. S. "Albatross," station 3354, Gulf of Panama, in 322 fathoms, mud, bottom temperature 46° F. U. S. N. Mus. 122,991. Also at station 3418, off the coast of Mexico, near Acapulco, in 660 fathoms, sand, bottom temperature 39° F.; station 4654, off Aguja Point, Peru, in 1036 fathoms, mud, temperature 38° 5; station 3346, off Tillamook, Oregon, in 786 fathoms, mud, temperature 37° 3; station 3200, in the western entrance to the Santa Barbara channel, California, in 265 fathoms, mud, temperature 43° 1; and northward to Bering Sea, where it occurs north of Unalashka in from 109 to 350 fathoms.

Pilsbry notes that this species differs from specimens of *D. pretiosum*, which sometimes approach it very nearly in size and form, by its extreme thinness and fragility, beside lacking the apical striation of young *D. pretiosum*.

Specimens from off Acapulco reach a length of 66.0 with an oral diameter of 4.5-mm.

**CADULUS PHILIPPI.****GADILA GRAY.**

*Gadila Gray*, P. Z. S. 1847, p. 159; type *Dentalium gadus* Montagu.

*Helonyx* Stimpson, Am. Journ. Conch., 1865, 1, p. 63, *Dentalium clavatum* Gould.

**Cadulus (Gadila) striatus DALL.****Plate 5, figure 3.**

*Cadulus striatus* Dall (U. S. Nat. Mus. label), Pilsbry, in Man. Conch., 1897, 17, p. 179, pl. 35, figs. 9-13.

U. S. S. "Albatross," station 3354, Gulf of Panama, in 322 fathoms, mud, bottom temperature 46° F. U. S. N. Mus. 122,992. Also at station 3418, off the Mexican coast near Acapulco, in 660 fathoms, sand, bottom temperature 39° F.

Not unlike *C. albicomatus* Dall, but more slender, and with more delicate longitudinal striation.

**Cadulus (Gadila) albicomatus DALL.****Plate 19, figure 3.**

*Cadulus albicomatus* Dall, Proc. U. S. Nat. Mus., 1889, 12, no. 773, p. 295, pl. 9, fig. 8; Pilsbry, Man. Conch., 1897, 17, p. 178, pl. 35, fig. 15.

U. S. S. "Albatross," station 3360, Gulf of Panama, in 1672 fathoms, sand, bottom temperature 42° F. U. S. N. Mus. 122,993. Also off Manta, Ecuador, in West Longitude 81° just south of the Equator, at station 2792, in 401 fathoms, mud, bottom temperature 42° 9.

One of the largest and finest species of the genus.

**Cadulus (Gadila) californicus PILSBRY AND SHARP.**

*Cadulus californicus* Pilsbry and Sharp, Man. Conch., 1898, 17, p. 180, pl. 34, figs. 5, 6, 7, 8.

U. S. S. "Albatross," station 3392, Gulf of Panama, in 1270 fathoms, hard bottom, temperature 36°.4 F. U. S. N. Mus. 122,994. Also from the latitude of Tillamook Bay, Oregon, to San Diego, California, in from 218 to 222 fathoms, temperatures ranging from 37°.3 to 43°.2.

A large, stout species which varies somewhat in its degree of inflation. When complete, the anal aperture has two strong lateral sulci and a slight curved excavation in the medial line of the concave side between them.

**Cadulus (Gadila) platystoma** PILSBRY AND SHARP.

*Cadulus platystoma* Pilsbry and Sharp, Man. Conch., 1898, **17**, p. 180, pl. **35**, figs. 17, 18.

U. S. S. "Albatross," station 2792, off Manta, Ecuador, in 401 fathoms, mud, bottom temperature 42° 9 F. U. S. N. Mus. 107,699.

Somewhat like *C. poculum*, of the Atlantic, in being markedly bent, with the tube compressed anteriorly, but in the Pacific species the inflation is greater and not angulate, and the posterior part of the shell less attenuated. *C. peruvianus* is stouter, with a proportionately larger oral aperture.

**Cadulus (Gadila) peruvianus** DALL, n. sp.

Shell milk-white, smooth, polished, arcuate, inflated; aperture oblique, the form oval, with the dorsoventral diameter shorter; equator nearly at the anterior third, the anterior part contracting markedly from the equator forward but without angularity; posterior portion not greatly attenuated, rather unusually large for the genus, the anal aperture apparently circular and simple. Length, 12.3; anal end to equator, 8.3; perpendicular between shell and chord, 1.0; max. diam., 3.0; of oral aperture, 2.0; vertical of do., 1.6; anal aperture, 1.0 mm.

U. S. S. "Albatross," station 4654, off Point Aguja, Peru, in 1036 fathoms, mud, bottom temperature 38° 5 F. U. S. N. Mus. 110,671. Also at station 2807, near the Galapagos Islands, in 812 fathoms, ooze, temperature 38° 4.

The oral aperture is notably oblique, being inclined at an angle of some 40°.

The shortness and stout form of this species sufficiently differentiate it from others of the region.

**PELECYPODA.****PRIONODESMACEA.**

(*A. Margo edentato*.)

**Solenomyacea.**

*Solenomyacidae*.

**SOLEMIA** LAMARCK.

*Solemya* Lamarck, An. s. Vert., 1818, **5**, p. 488. 1st sp., *S. australis* Lam., l.c. selected as type by Bowdich, 1822, and Blainville, 1825.

This genus was first brought to notice in 1793, by Ulysses von Salis Marschlin in the second edition of his Neapel Reise, where he named a specimen from

Tarentum *Mytilus solen*, and gave a tolerable figure. Two years later in the second volume of Poli's *Testacea utriusque Siciliae* the author named the shell *Tellina togata* and figured it. In the same year it reappeared in the English translation of Ulysses' Travels. The Mediterranean species, which must take the name of *Solemya solen* (Ulysses), was named *S. mediterranea* by Lamarck in 1818, and was the subject of a remarkable anatomical study by Deshayes in his *Mollusques de l'Algerie*. In this work the shell is admirably figured, and an excellent photographic figure of the interior appears in the plates to the *Mollusques marins du Roussillon*.

In this connection it may be stated that no complete account of the hinge of this genus is, so far as I have been able to discover, anywhere to be found in print. Also that the hinge is by no means uniform in all the species, but by means of it they can be divided into groups.

*Solemya australis* has a very archaic type of ligament, as perhaps might be expected from the archaic features of the anatomy and the *situs* which the genus usually frequent. Yet it is true that the paleozoic relatives of this group have an external ligament. In the present species in a fresh state the periostracum and true ligament are continuous over the hinge and the gap between the two valves, as was the original protoconch in the embryo. The only distinction perceptible is that the ligament is a little darker in color. The hinge line is entirely free from any trace of provinculum or teeth. The functional part of the ligament is amphidetic, extending on both sides of the beaks and included in a deep groove between two shelly laminae forming the dorsal calcification of the valve, the ligament extending beyond the enclosing laminae both before and behind. If dry and broken, the section of the ligament has a glassy look, like a piece of glue. Under the middle of the ligament and between it and the inner lamina of attachment (or nymph) is the resilium, much thicker than the ligament, and of a more fibrous constitution and darker color. The resilium also extends backward of the beaks, but not so far as the ligament with which it is intimately cemented. The ligament extends in advance of the nymph and beaks, throwing down on the inner surface of the valve an oval, brown lobe like a dab of varnish. In *S. parkinsoni* Gray, this lobe is straight, elongated, and narrow.

The inner lamina or nymph is heavily reinforced with shelly matter, so as to bear the strains incident to the resilium which is seated upon it. As the two valves are not so closely adjacent as in most modern bivalves, the resilium is visible where it crosses the gap between the two valves to join the opposite nymph, and in an unbroken specimen an internal view of the hinge shows in brown, against the whiter shelly matter, an X-shaped mass composed of the soldered ligament and resilium, the anterior arms of the X being formed by the two ligamental lobes above described. The nymph on each side may be sustained by a prop or rib of shelly matter at each end, and between these ridges may be situated the posterior adductor, but in *S. australis* only the anterior ridge is developed, extended about half-way across the valve, much like the rib in *Siliqua*. The posterior muscular impression is directly behind this rib. In

*S. solen* (*mediterranea* Lamarck + *togata* Poli) the chondrophore has no anterior or posterior rib, and the anterior exposure of the internal part of the ligament is reduced to a narrow line directed obliquely backward to the upper anterior angle of the posterior adductor scar.

In *S. velum* Say, the most common species of New England, we find the ligament has become wholly opisthodetic, no part of it appears in advance of the beaks, and there is no exposure in front of the nymphs (or chondrophores) of the ligament on the interior surface of the shell. The chondrophore in each valve has an anterior and a posterior prop, neither being produced into a rib, and the posterior adductor scar is only partly included in the space between the two props, the posterior prop touching the middle of the dorsal edge of the scar. In *S. borealis* Totten, the same arrangement prevails, but the props are so strong and the nymph so projecting that a small cave under the nymph is created. On the anterior edge of the nymph is a small, narrow, elongate, muscular scar which may belong to one of the pedal retractors. *S. panamensis* Dall agrees with *S. velum*, except that the anterior prop is produced along the anterior edge of the adductor scar, as a feeble ridge.

In *S. agassizii* Dall there are no supports to the chondrophore and no interior exposure of the ligament, which is opisthodetic and wholly external. As far as can be judged from the material at hand, there seems to have been a series of muscular attachments for a considerable distance along the dorsal margin of the valves in front of the supposed pedal protractor scar above referred to. At least there are strong radial striations resembling the scar of adhesion of a muscle. *S. patagonica* E. A. Smith (Challenger Report, 1885) has a hinge apparently similar to that of *S. agassizii*, but in the unique specimen a thickening along the dorsal side, which I strongly suspect to be pathological. If this suspicion proves correct, it is probable that *S. macrodactyla*, which is of four years later date, will prove to be synonymous.

The groups into which the species fall, according to their characters, are as follows :

#### I. Ligament amphidetic, chiefly internal.

1. Subgenus SOLEMYA s. s. Ligament exposed internally, in advance of the chondrophore.
  - A. Proximal part of the chondrophore prolonged as a thickened ridge part way across the interior of the valve . . . . . *S. australis* Lam.
  - B. Base of the chondrophore divided, anterior part extended as a narrow ridge; posterior part forming a thickened prop to the chondrophore.  
*S. parkinsonii* Gray.
  - C. Chondrophore thickened, without props or extended rib. *S. solen* v. Salis.

#### II. Ligament opisthodetic, internal.

- 2 Subgenus PETRASMA Dall. Ligament not exposed internally in front of the chondrophore.

- A. Chondrophore supported by two strong props with a cavity between them . . . . . a. *S. borealis* Totten.  
 b. *S. velum* Say.
- B. Chondrophore with an anterior prop, extended as a small rib in front of the adductor scar, no posterior prop . . . a. *S. panamensis* Dall.  
 b. *S. occidentalis* Deshayes.  
 c. *S. pusilla* Gould.
- C. Chondrophore without props . . . . . *S. valvulus* Carpenter.

III. Ligament opisthodontic, wholly external.

3. Subgenus *ACHARAX* Dall. Ligament visible internally only where it crosses the gap between the margins of the valves. Nymphs without props.
- a. *S. macrodactyla* Rochbrune et Mabile.  
 (?) = *S. patagonica* Smith.
- b. *S. johnsoni* Dall.
- c. *S. agassizii* Dall.
- d. *S. ventricosa* Conr.
- e. *S. grandis* Verrill and Bush.

*S. japonica* Dunker is the adult of the shell named *S. pusilla* Gould. *S. mediterranea* Lamarck is a synonym of *S. solen*, as is *S. togata* "Poli."

The geographical distribution of the forms above referred to is as follows:

- I. { *S. australis* Lamarck, South Australia and New Zealand.  
*S. parkinsonii* Gray, New Zealand.  
*S. solen* von Salis, Mediterranean and Adriatic; southeastern coast of Spain; Madeira, and Senegal.
- II. { *S. borealis* Totten, Halifax, Nova Scotia, to Pensacola, Florida.  
*S. velum* Say, Halifax, Nova Scotia, to North Carolina.  
*S. occidentalis* Deshayes, Spezzia, Tripoli, Morocco, Florida Keys, Old Providence Island, West Indies, and the Yucatan Passage, 2-200 fathoms.  
*S. panamensis* Dall, Santa Barbara, California, south to Panama Bay, 30-60 fathoms.  
*S. pusilla* Gould, Hakodate, Japan, 5 fathoms.  
*S. valvulus* Carpenter, San Pedro, California, and south to the Gulf of California.

*S. protexta* Conrad, from the Miocene of Astoria, if not the young of *S. ventricosa* Conrad, may belong to this subgenus. *Modiola linea* Hedley, from the Tasman Sea, is suspiciously like a young *Acharax*.

- III. { *S. agassizii* Dall, from Tillamook Bay, Oregon, to Aguja Point, Peru, 1036-1800 fathoms.  
*S. macrodactyla* R. & M., Orange Harbor, Patagonia, northward to Chiloë Island, Southwest Chile, 20-369 fathoms.  
*S. johnsoni* Dall, Puget Sound to Panama Bay, 60-1740 fathoms.  
*S. ventricosa* Conrad, fossil, Miocene of Astoria, Oregon.  
*S. grandis* Verrill and Bush, off the eastern coast of the United States, between Chesapeake Bay and Nantucket, in 300 to 1600 fathoms.  
*S. patagonica* E. A. Smith, west coast of Patagonia.

**Solemya (Acharax) agassizii** DALL. n. sp.

## Plate 16, figure 10.

Shell large, elongated, heavy, chalky, with a strong blackish periostracum which, except near the middle of the base, is produced into long ragged processes beyond the margin of the valve; the surface of the valve is radially channelled with wide, deep channels which are reflected by prominent ribs on the inner surface of the valves; it is the portion of the periostracum which lies in the channels which forms the processes, and that which covers the interspaces which fails to retain its continuity except for a short distance beyond the edge of the valve; valves very inequilateral, posterior end very short, hinge line nearly straight, the sulcus for the ligament nearly parallel with the hinge line, and the nymph inconspicuous so that on a casual glance one might suppose there was none; beaks not raised, the hinge line below them thickened and flat, radially striated; anterior hinge line straight, thin; valves widest at the anterior margin; anterior part of the valve with six or seven strong radial channels, the interspaces wider, and often with their margins a little raised or with a slightly elevated border; beyond the channelled area there are a few faint radial furrows and a perfectly smooth unfurrowed space in the middle of the valve; posterior slope straight, furrow for the ligament long, deep, and wholly external; there is a wide triangular smooth space, in front of which are five or six channels radiating to the margin, much more shallow than those at the anterior end and defined chiefly by shallow furrows at each side of the obsolete channel and the raised margins of the wide interspaces; interior chalky, the anterior muscular impression feeble, the posterior stronger and ovate. Length of the valve, excluding periostracum, about 95; height, 30; and diameter, 25 mm. The species reaches a length of more than 150 mm.

U. S. S. "Albatross," station 3360, Gulf of Panama, in 1672 fathoms, sand, bottom temperature 36°.4 F. U. S. N. Mus. 106,885. Also at station 3381, in 1772 fathoms; 3382, in 1793 fathoms; 3399, in 1740 fathoms; 3434, in 1588 fathoms; and 4654, off Aguja Point, Peru, in 1036 fathoms, all on soft bottom with temperatures varying from 35°.8 to 37°.3. The range of the species, so far as known, extends from the Gulf of California south to the vicinity of Aguja Point, Peru.

Owing to the burrowing habit of the genus, only fragments and dead valves were obtained in the trawl.

This species belongs to the group of *S. macrodactyla* Rochebrune and Mabile, from Orange Harbor, Patagonia, but differs from it in the smooth middle area of the valves, proportionately shorter posterior end, and much larger size. It is the largest species I have seen in which the ligament is wholly external, or in which the shell is so solid as to survive the loss of the tough protective periostracum. *S. grandis* is a shorter and wider species. The young of *S. agassizii* are more cylindrical than the specimens of *S. macrodactyla* of equal size.

When first collected this species was confounded with the *Solemya johnsoni* Dall, a northern species described from a specimen collected off the coast of Ore-

gon, and which also extends to the Gulf of Panama, but that species, instead of having six or seven anterior radial channels like *S. agassizii*, has from nine to twelve; the projections of the periostracum are much longer on the anterior part of the shell than posteriorly, giving a subtriangular profile (as figured in Proc. U. S. Nat. Mus., 17, plate 25, fig. 1894).

It is difficult to be dogmatically confident as to specific limits in forms like these when one has only more or less imperfect valves without the soft parts, and especially modifiable by the results of drying. If in future these three species ever become known through abundant material and prove to be merely variations of a single type, it will show a marvellous distribution from Puget Sound, south to the Straits of Magellan. But I have not seen any unmistakable specimens of *S. macrodactyla* from north of the Island of Chiloë, on the Pacific side.

### *Solemya (Petrasma) panamensis* DALL, n. sp.

Shell thin, elongate-oval, the posterior end more pointedly, and the anterior end more bluntly, rounded; periostracum brown, brilliantly polished, recurved over the margins of the valves, not produced into long processes, though more or less broken up outside of the margins; anterior part of the shell radiately marked with eight or nine obscure rays, which are more crowded in front and dorsally; the middle of the valve with a few sparse rays, the posterior part having six or seven more closely adjacent, followed by a smooth unradiated area behind the beaks and above a line drawn from them to the middle of the posterior end of the valve; beaks flat, with a lozenge-shaped area of ligament visible behind them; interior bluish, translucent; the chondrophore strong, projecting obliquely into the cavity, its front margin prolonged as a narrow, elevated rib very obliquely backward in front of the posterior adductor scar; muscular impressions rather obscure; interior of the valves faintly radiately striated. Lon. of valve exclusive of the periostracum, 39.0; alt. 15.0; diameter, 8.0 +; the beaks in front of the posterior end, 14.0 mm.

U. S. S. "Albatross," station 2799, Panama Bay, in 29½ fathoms, mud. U. S. N. Mus. 110,678. Also at 2973, off Santa Barbara, California, in 63 fathoms, mud, bottom temperature 54° F.

This is more expanded in front and less sharply truncate in front than *S. agassizii* of the same length, and they may be separated at once by the difference in the hinges. *S. valvulus* Carpenter is a much smaller species and has no anterior prop to the chondrophore.

An examination of specimens of *Pthonia*, *Clinopistha*, *Dystactella*, and *Solemya*, from the Palaeozoic beds of the west, shows that all the groups except the last have the valves completely closed, the periostracum not extended beyond the valve margins, and the ligament external. *Solemya radiata* Meek and Worthen, a fine species from the Carboniferous of Illinois, has the ligament external and the hinge apparently very similar to that of *S. agassizii*. The other characters, however, would hardly allow it to be united in the same subgenus.

(B. TAXODONTA).

**Nuculacea.***Nuculidae.***Nucula** LAMARCK.

*Nucula* Lamarck, Prodrôme, 1799, p. 87; Syst. des an. s. Vert., 1801, p. 115; type, *Arca nucleus* Linné; Dall, Trans. Wagner Inst., 1898, 3, p. 571.

*Glycymeris* Da Costa, Brit. Conch., 1778, p. 170, *ex parte*.

*Nuculana* Link, Besch. Rostock Samml., 1807, p. 155. (New name for *Nucula* Lamarck).

***Nucula tanneri*** DALL, n. sp.

Shell oval, inequilateral, with low opisthocelous beaks, brownish periostracum with concentric zones of darker and lighter shade; sculpture of faint concentric ripples giving a rude aspect to the shell; interior pearly, the margins smooth and entire; the chondrophore small, obliquely anteriorly directed; anterior teeth, 14-17, posterior, 7-9; no defined lunule or escutcheon, a faintly impressed lanceolate area behind the beaks. Length, 22.5; of anterior part before the vertical of the beaks, 17.0; alt. 16.5; diameter, 10.0 mm.

Straits of Magellan at station 2780, in 369 fathoms, mud, bottom temperature 47° F. U. S. N. Mus. 96,243; stations 2781, 2783, 2784, and 2787, on the west coast of Patagonia, in 61 to 348 fathoms, mud, temperature 48° to 54°.

This species, named in honor of the late commander of the "Albatross," differs from *N. savatieri* in its less smooth surfaces, browner color, fewer hinge teeth; and slightly less ovate form, and, in proportion to its size, it is more turgid.

In this and the other diagnoses, the anatomically anterior, usually longer end is designated as anterior, and the truncated end as posterior.

***Nucula savatieri*** MABILLE AND ROCHEBRUNE.

Plate 18, figure 11.

*Nucula savatieri* Mabile et Rochebrune, Miss. du Cap Horn, Moll., 1889, p. H 112, pl. 8, figs. 2a-c.

Shell pale olive, brilliantly polished, compressed subovate, very inequilateral, with no defined lunule or escutcheon; posterior end short, attenuated, roundly pointed but hardly rostrate; anterior slope convexly arcuate, longer, rounded in front, the base evenly arcuate; beaks low, slightly opisthocelous; hinge with twenty-four anterior and about ten posterior teeth; interior of the disk pearly, smooth, with smooth entire margins; chondrophore narrow, anteriorly obliquely directed,

with a strong black resilium. Alt. 10-15; lon. of shell, 14-21; beaks in front of the posterior end, 4-5.5; diam. 5-8 mm.

U. S. S. "Albatross," station 3354, Gulf of Panama, in 322 fathoms, mud, bottom temperature 46° F. U. S. N. Mus. 122,893; station 4654, 24 miles off Aguja Point, Peru, in 1036 fathoms, mud, temperature 37° 3; station 2783, on the west coast of Patagonia, in 122 fathoms, mud, temperature 48°; station 2779, in the Straits of Magellan, in 77 fathoms, ooze, temperature 47°. Orange Harbor, Beagle Channel, Rochebrune.

This differs from *N. tanneri* as mentioned under that species; the most conspicuous character is the smooth, polished, and uniformly colored surface of the *savati* as compared with the concentric color zones and sculpture of *tanneri*.

The specimen figured is not fully mature, but except in size hardly differs from the larger adults. Their respective measurements follow the diagnosis above.

### *Nucula panamina* DALL, n. sp.

Plate 6, figure 11.

Shell large, thick, solid, with a dark, polished olivaceous periostracum, smooth surface, and rather donaciform outline; lines of growth irregular in strength; beaks low, small, opisthocelous, very posterior; no lunule or escutcheon; posterior dorsal slope short, direct, flattish; posterior end narrow, rounded; anterior slope long, evenly arcuate, anterior end rounded, the base gently arcuate; interior of disk pearly, more or less radiately striate, but the valve-margins smooth and entire; muscular scars deep, subequal; posterior hinge line with ten, anterior with about twenty, long slightly folded sharp teeth; chondrophore small, narrow, anteriorly directed; alt. 16; lon. 22; diam. 9 mm.

U. S. S. "Albatross," station 3360, Gulf of Panama, in 1672 fathoms, sand, bottom temperature 42° F. U. S. N. Mus. 122,894.

In general form this species exhibits a tendency toward that of the next species, but somewhat less divergent from the ordinary type of *Nucula*.

### *Nucula taeniolata* DALL, n. sp.

Plate 7, figures 3, 5.

Shell elongate, almost rostrate, thin, polished, dark olive color, paler on the umbones, subtruncate behind, produced and rounded in front, somewhat compressed; beaks small, pointed, slightly opisthogyrate, nearer the posterior end; lunule and escutcheon not defined, an obscurely defined depressed lanceolate area on the shorter side of the beaks with the dorsal margins compressed, descending, arcuate, terminating at a blunt subtruncate extremity beneath which the basal margin is slightly concavely arcuate; the anterior dorsal slope higher, longer, arcuate, descending to an evenly rounded extremity, the curve passing insensibly

into the convex arcuation of the basal margin; surface polished on the umbones, on the disk and periphery more or less minutely, irregularly wrinkled, especially near the truncation and the basal margin; there are also a few very faint, almost microscopic, irregularly distributed radial striae; interior of the valves slightly pearly, the muscular and pallial scars faint, the latter entire; margin of the valves simple, smooth; hinge with six cardinal teeth on the shorter and ten on the longer side; chondrophore small, narrow, directed obliquely forward; lon. of valve, 17; of the beaks before the truncation, 7; alt. 11; diam. 6.5 mm.

U. S. S. "Albatross," station 3417, off Acapulco, Mexico, in 493 fathoms, mud, bottom temperature 40°.6 F. U. S. N. Mus. 122,897.

There is more or less difference between individuals in regard to rostration, some having it more emphatic than others. In form this species somewhat approaches *Leda*, but there is not the slightest pallial sinuation.

### *Nucula iphigenia* DALL.

Plate 7, figures, 1, 4.

*Nucula iphigenia* Dall, Proc. U. S. Nat. Mus., 1895, 18, p. 15.

Shell large, solid, much like *Iphigenia brasiliiana* in outline, anterior end produced, rounded, longer than the posterior; hinder end obliquely truncate, attenuated; beaks elevated, somewhat pointed, opisthogyrous; sculpture of feeble, narrow, irregular concentric wrinkles, crossed by fine, sharp, rather distant incised lines; lunule narrow, elongate, bordered by a faint ridge; escutcheon small, broader than long, set off by an impressed line from the large posterior area, which is flattened but not definitely limited, the margin of the valve projecting somewhat in the middle line; base rounded in front, somewhat impressed posteriorly; interior brilliantly nacreous, with a strong pallial line and subequal adductor scars; the pallial area more or less punctate; basal margin denticulate; hinge with about thirty anterior and fifteen posterior teeth, strong, projecting, and somewhat angular; chondrophore narrow, pear-shaped, projecting forward from the hinge line. Height of shell, 22.5; length, 35; diameter, 16 mm.

U. S. S. "Albatross," station 3396, Gulf of Panama, in 259 fathoms, hard bottom; temperature, 47°.4 F. U. S. N. Mus. 122,895.

This fine shell is one of the largest known nucas, and peculiar from its elongated shape and posterior attenuation. The periostracum seems to have been thin, dull, and yellowish.

### *Nucula pigafettae* DALL, n. sp.

Shell small, blackish-brown or dark olivaceous, rude, inequilateral, concentrically irregularly striated, the striae more or less distributed in zones, very minutely, feebly, more or less radially striated, but not visibly reticulate; beaks rather posterior, turgid, moderately prominent; a heart-shaped escutcheon 5 mm. long

below the opisthogyrate beaks; no lunule; dorsal slopes and base arcuate, ends rounded; interior pearly with entire margins; hinge with 15-17 anterior, and 7 posterior teeth, the chondrophore narrow, small, obliquely anteriorly directed. Length of shell, 15; of posterior end, 5; alt. 10.5; max. diam. 7.5 mm.

U. S. "Albatross," station 2780, Magellan Straits, in 369 fathoms, mud, bottom temperature 47° F. U. S. N. Mus. 96,243.

Named in honor of Magellan's historiographer. A particularly rude and turgid species; all of the specimens were thickly encrusted with a ferruginous coating.

### *Nucula agujana* DALL, n. sp.

Plate 10, figures 6, 7.

Shell small, inequilateral, plump, polished, nearly black with paler olivaceous umbones, subtriangular in outline; umbones high, full, opisthocoelous; posterior dorsal slope flattened, but with no areal limitation, short; anterior slope longer, arcuate, without a defined lunule; anterior end rounded, posterior subangular; basal margin evenly arcuate: surface smooth at the umbones, over the rest of the disk with irregular, rather coarse concentric incremental lines; interior pearly, with deep muscular impressions, and smooth valve margins; hinge with nine posterior and fifteen anterior teeth, separated by a narrow, oblique chondrophore. Lon. of shell, 11, of beaks before the posterior end, 3; alt. 8; diam. 5.75 mm.

U. S. S. "Albatross," station 4654, twenty-four miles N. 68° W. from Aguja Point, Peru, in 1036 fathoms, mud, bottom temperature 37° 3 F. U. S. N. Mus. 110,571.

### *Nucula exigua* SOWERBY.

*Nucula exigua* Sowerby, P. Z. S. London, 1832, p. 198; Conch. Ill., figs. 24, 24\* (bad); Hanley, Thes. Conch. Nuculidae, p. 50, fig. 156 (*meliora*).

Bay of Panama, Cuming; U. S. S. "Albatross," station 3418, off Acapulco, Mexico, in 660 fathoms, sand, temperature 39°; station 2807, near the Galapagos Islands, in 812 fathoms, ooze, temperature 38° 4, station 4654, off Aguja Point, Peru, in 1036 fathoms, mud, temperature 37° 3; stations 2783, and 2784, on the west coast of Patagonia, in 122 and 194 fathoms, mud, temperatures 48° and 51° 9 F.

Hanley's figure, of all I have seen, is the only tolerably good one. All the extant figures are made from immature specimens; the fully adult specimens are less oblong, more triangular, and more inflated. *Nucula pisum* Sowerby and *N. semiornata* Orbigny are perhaps synonymous.

### *Nucula chrysocoma* DALL, n. sp.

Plate 18, figures 3, 4.

Shell small, plump, solid, subtriangular, brilliantly polished and of a light yellowish olive color; beaks moderately prominent, the prodissoconch showing

conspicuously as two whitish disks on the umbones, smooth and easily eroded; beaks subcentral, touching, not recurved; lunule and escutcheon large for the size of the shell, with no radial markings and faintly delimited but not distinctly impressed; ligament not visible externally; posterior dorsal slope straight, posterior end shorter and somewhat pointed; anterior slope slightly convexly arcuate, anterior end rounded; base very convexly arcuate; concentric sculpture only of a few irregularly distributed impressed lines indicating resting stages; radial sculpture of numerous very fine, slightly raised, close-set lines, with equal and regularly spaced interspaces, covering the disk; interior pearly, smooth, with entire valve margins, muscular scars distinct; hinge line with six posterior and ten anterior teeth, the two series separated by a deep pit containing the nearly vertical chondrophore. Lon. 5.0; alt. 4.5; diam. 3.0 mm.

U. S. S. "Albatross," station 4656, off the coast of Peru in S. Lat. 6°55' and W. Lon. 83° 34', in 2222 fathoms, green mud, bottom temperature 35°2 F. U. S. N. Mus. 110,572; station 2792, off Manta, Ecuador, in 401 fathoms, mud, temperature 42°9; and station 3418, off Acapulco, Mexico, in 660 fathoms, sand, temperature 39°.

This is an exceedingly elegant little shell with a wide range in latitude and depth.

#### *Nucula declivis* HINDS.

*Nucula declivis* Hinds, P. Z. S. London, 1843, p. 97; Zool. Voy. Sulph., 1844, Moll., p. 63, pl. 18, fig. 8.

U. S. S. "Albatross," station 2805, Panama Bay, in 51 fathoms, mud. Also at station 2778, in Magellan Straits, in 61 fathoms, sand, bottom temperature 47°9 F. U. S. N. Mus. 110,685.

The locality of this species is not given by Hinds, but his excellent figure and brief description agree well with the shell above referred to, and as his collections were largely made on the Pacific coast of south and middle America it is probable that the identification is correct.

#### *Nucula colombiana* DALL, n. sp.

Shell small, very inequilateral, ovate, white with an olivaceous pale periostracum, smooth, brilliantly polished, anterior dorsal margin and base convexly arcuate; posterior dorsal margin short, straight, subtruncate, with the valve-margins pouting a little in the middle of the flattened posterior area; posterior end attenuated, short, almost pointed; anterior end evenly rounded; beaks turgid, opisthogyrate; interior pearly, with smooth margins to the valves; posterior hinge line with seven, anterior with fourteen teeth, separated by a well-developed chondrophore. Length of whole shell, 4.5; of posterior segment, 1.0; alt. 3.0; max. diam. 2.2 mm.

West coast of Colombia, in Panama Bay at station 2799, in 29½ fathoms; U. S. N. Mus. 110,686. Also at station 2805, Panama Bay in 51 fathoms; station 2792, off Manta, Ecuador, in 401 fathoms, mud, bottom temperature 42° 9 F.; stations 2784, southern coast of Chile, in 194 fathoms, mud, temperature 51° 9, and 2783, in 122 fathoms, temperature 48°; and on the west coast of Patagonia, South latitude 51° 12', in 258 fathoms, mud, temperature 48°. An abundant, small and simple species unlike any other of the region, with a range of some 3600 miles in latitude.

### *Ledidae.*

#### LEDINAE.

#### **LEDA** SCHUMACHER.

In reviewing the synonymy of this genus I find a correction necessary to the statement which appears in Trans. Wagner Institute, 3, p. 579. It is stated there that the type of the genus is *Leda rostrata* Montagu. The early writers confused various species of *Leda* together and the *rostrata* of Montagu was not the species figured by Chemnitz (VII, figs. 550, 551) and Schumacher, and which was named *Mya pernula* by Müller in 1779. Of this species *rostrata* is a synonym. The species described and figured by Montagu as *Arca rostrata* and accepted as *Leda rostrata* by Hanley (Mon. Nuculacea) is a *Lembulus*. The type of *Leda* should therefore be cited as *Leda pernula* Müller (+ *L. rostrata* Gmelin and Schumacher but not of Montagu and Hanley).

#### *Leda (Jupiteria) gibbosa* SOWERBY.

*Nucula gibbosa* Sowerby, P. Z. S. Lond. 1832, p. 198; Conch. Icon., 1871, 18, Mon. *Laeda*, pl. 8, fig. 51.

*Leda gibbosa* Orbigny, Voy. Am. MÉR., 1846, Moll., p. 545.

U. S. S. "Albatross," stations 2799, 2803, and 2804, in Panama Bay, in 26 to 47 fathoms, mud. U. S. N. Mus. 96,307. Payta, Peru, Orbigny.

This fine, large, but rather coarse, species attains a length of 35 and a maximum diameter of 14 mm. It has a well-marked pallial sinus rounded behind. Even when living the greater part of the periostracum is usually wanting.

#### *Leda (Jupiteria) callimene* DALL, n. sp.

Plate-17, figures 3, 4.

Shell small, solid, plump, white, with a thin, pale brownish periostracum, equivalve, inequilateral; beaks small, pointed adjacent, vertically incurved; lunule and escutcheon not present, though by the presence of a strong radial

keel and the flattening of the straight dorsal slope the appearance of a large escutcheon is produced; anterior slope arcuate, passing insensibly into the curve of the rounded anterior end; from the beaks a narrow depressed ray extends to the anterior end of the base, slightly arcuating the sculpture which passes over it, and the basal margin where it intersects: sculpture of concentric, numerous rounded small ridges separated by subequal grooves; this sculpture covers the whole exterior pretty evenly, except a narrow space near the two radial keels, where it is obsolete; interior chalky white, muscular scars small, distinct; pallial sinus small, shallow, pointed behind; margins entire; resiliary pit deep, directly under the beaks, separating twenty-six anterior and about twenty posterior crowded angular hinge-teeth. Lon. of shell, 15.5; of beaks behind the anterior end, 7.0; alt. 10.5; diam. 7.0 mm.

U. S. S. "Albatross," station 3396, Gulf of Panama, in 259 fathoms, mud, bottom temperature 47°.4 F. U. S. N. Mus. 122,910. Also at Tome, Chile, in 14 fathoms.

This species resembles *L. dissimilis* Sowerby, but has the beaks more anterior and a somewhat differently sculptured rostrum. *L. caelata* (Hinds, non Conrad, = *L. taphria* Dall) is more swollen, shorter, and more polished.

#### *Leda* (*Jupiteria*) *agapea* DALL, n. sp.

Plate 6, figures 4, 5.

Shell large, thin, fragile, pale straw color, inequilateral, finely evenly, concentrically wrinkled; the wrinkles rounded, with subequal interspaces; beaks small, pointed, incurved, closely adjacent, over a chiefly internal, black, amphidetic ligament; lunule smooth, extremely narrow, lanceolate, depressed; escutcheon not defined, posterior dorsal area extending from the beaks to the end of the rostrum, lanceolate, nearly as wide as the shell, bounded by a rounded ridge on each side, which begins as a strong rounded fold near the beaks but gradually weakens; area inside of it depressed, sculptured like the rest of the shell, enclosing a second similar, but much smaller, lanceolate depression beginning close to the beaks and bounded by an indistinctly defined slight elevation of the floor of the main depression; outside the latter is a feebly depressed ray extending from the beaks to a slight insinuation of the basal margin, above and behind which the posterior end of the shell ends in a point or rostrum; anterior end of the shell evenly rounded, base evenly arcuate; interior opaque white, the margin entire, the hinge with about sixteen teeth on each side of a strong, triangular, black, backwardly inclined resilium. Lon. of shell, 21; of beaks behind anterior end, 9; alt. 12; diam. 8 mm.

U. S. S. "Albatross," station 3360, Gulf of Panama, in 1672 fathoms, sand, bottom temperature 42° F. U. S. N. Mus. 122,911. Also at station 3398, in 1573 fathoms, green ooze, bottom temperature 36° F., off the coast of Ecuador.

This species is most nearly related to *L. pontonia* Dall, but has the beaks more anterior and the sculpture coarser and more deeply incised.

The ligament reaches only the distal part of the chondrophore, which is occupied by the resilium.

**Leda (Jupiteria) pontonia DALL.**

*Leda pontonia* Dall, Proc. U. S. Nat. Mus., 1889, **12**, p. 257, pl. **13**, figs. 5, 5b.

LIST OF STATIONS.

Station.	Locality.	Fathoms.	Bottom.	Temperature.
2808	Off Galapagos Ids.	634	coral sand	39°·9 F. (types).
3360	Gulf of Panama.	1672	sand	36°·4
3393	" " "	1020	green mud	36°·8
2923	Off San Diego, Cal.	822	" "	39°·0·2

**Leda (Jupiteria) excavata HINDS.**

*Nucula excavata* Hinds, P. Z. S. London, 1843, p. 100; Zool. Voy. Sulphur, 1844, Moll., p. 64, pl. **18**, fig. 17.

Panama, in 30 fathoms, mud; Hinds. U. S. S. "Albatross," station 2794, in 62 fathoms, sand, bottom temperature 59°·5 F. U. S. N. Mus. 122,763.

By the emphasis on the posterior carinae visible in this species it begins to approach *Lembulus*.

**Leda (Jupiteria) elenensis SOWERBY.**

*Nucula elenensis* Sowerby, P. Z. S. London, 1832, p. 198; Hanley, Thes. Conch., **3**, Mon. Nuculacea, p. 121, pl. **223**, fig. 71.

U. S. S. "Albatross," station 2805, in 52 fathoms, mud, Panama Bay.

This species approaches *L. acuta* Conrad, but is less attenuated. According to Hanley the surface sculpture is subject to much variation.

**Leda (Jupiteria) acrita DALL, n. sp.**

Shell small, white or translucent, with a very pale straw-colored periostracum, subequilateral, swollen, acutely rostrate behind; beaks prominent, adjacent; anterior dorsal margin gently arcuate; posterior slope straight, the opposed margins of the valves slightly pouting in the middle of a longitudinally striate, depressed escutcheon, bounded by two well-marked but not acute radial ridges; these terminate at the slightly gaping posterior end; a shallow radial sulcus, sometimes accompanied by a faint ray, extends from the beaks to the anterior basal margin, with variable strength; middle of the valves prominent, with a variably strong series of short ripples from the beaks to the margin, these ripples absent or obso-

lete toward the ends of the shell; near the base are five close concentric striae which extend the length of the margin, decidedly finer than the ripples; interior polished, margins entire, pallial sinus distinct; hinge with about fifteen anterior and thirteen posterior teeth, separated by an inconspicuous chondrophore. Length of shell, 6.2; of anterior end, 3.0; alt. 3.8; max. diam. 3.0 mm.

U. S. S. "Albatross," station 2799, Panama Bay, in 29½ fathoms, mud. U. S. N. Mus. 110,690. Also at stations 2794, in 62 fathoms, sand, bottom temperature 59° 5 F.; 2801, in 14, and 2803 in 26 fathoms, mud.

The sculpture varies in strength a good deal for so small a shell; occasionally the concentric sculpture covers the whole of the valve, and now and then one is seen which seems almost wholly smooth.

### *Leda (Jupiteria) lobula* DALL, n. sp.

Shell small, olivaceous, slightly inequilateral, rounded at both ends, the anterior a little shorter; anterior dorsal slope slightly convexly arcuate, posterior straight; the beaks, capped with a distinct protoconch, low and nearly vertical; both ends rounded, the anterior broader; external sculpture of regular rounded, elevated concentric threads with wider intervals, evenly covering the whole disk but stronger in the middle of the shell; interior polished, hinge with nine teeth on the posterior side of the beaks, and about thirteen on the anterior, the chondrophoric pit confined to the hinge line and very inconspicuous. Length, 4.7; alt. 3.2; diam. 1.5 mm.

U. S. S. "Albatross" station, 3422, in 141 fathoms, mud, off Acapulco, Mexico, bottom temperature 53° 5.

This shell may not be fully mature, but as far as now appears it is not the young of any of the known species of this region. It is remarkable for its oval shape, which if characteristic of the fully adult would hardly allow it to be regarded as a member of this section of the genus.

### *Leda (Leda) costellata* SOWERBY.

*Nucula costellata* Sowerby, P. Z. S. London, 1832, p. 198; Conch. Ill., *Nucula*, fig. 8; Hanley, Thes. Conch., 3, Mon. Nuculacea, p. 111, pl. 228, fig. 59.

Gulf of California to Panama. U. S. S. "Albatross," station 2823, in 26 fathoms, sand. U. S. N. Mus. 96,424.

This species, with *L. decora* and *concinna* A. Adams, has a very different aspect from those of the *L. pernula* type with which they are associated.

### *Leda (Leda) cordyla* DALL, n. sp.

Plate 6, figures 6, 7.

Shell very small, very inequilateral, rostrate, olive green, strongly concentrically sculptured; beaks high, pointed, slightly opisthogyrate, showing a small

glassy prodissoconch; lunular depression striated, lanceolate, not circumscribed; escutcheon long, lanceolate, striated, the valve margins a little elevated, the area strongly impressed, bounded on each side by two flattened rays, separated by a feeble depression, extending from the beaks to the end of the rostrum, and crossed by a series of small, distant, evenly equally spaced, elevated lamellae; body of the shell swollen, the rostrum compressed; anterior end very short; sculpture of concentric, narrow, rounded ridges with wider channelled interspaces, about twenty-five between the beaks and the base; general form as figured. Lon. of shell, 8.5; of beaks behind the anterior end, 2.5; alt. 4.0; diam. 2.5 mm.

U. S. S. "Albatross," station 3354, Gulf of Panama, in 322 fathoms, mud, bottom temperature 46° F. U. S. N. Mus. 122,915. Also at station 2792, off Manta, Ecuador, in 401 fathoms, mud, temperature 42° 9.

There are fourteen anterior and about nineteen posterior very small and close-set teeth on the hinge line, the two series separated by a very small and inconspicuous chondrophore. The interior is brilliantly glossy, translucent, and with a low longitudinal ridge dividing the channel of the rostrum. The most nearly related species, from which this is sufficiently distinct, is *Leda hamata* Carpenter, of the coast of California.

***Leda (Leda) loshka* DALL, n. sp.**

Plate 17, figure 2.

Shell thin, olivaceous, paler toward the umbones, very inequilateral, polished, the disk oval, the posterior end produced in a long rostrum; beaks low, the prodissoconch not differentiated; lunule impressed, very narrow, lanceolate, bounded by a low but sharp carina; escutcheon narrow, impressed, striated, very long, extending from the beaks to the end of the rostrum, the valve margins more or less prominent; the area is bounded by two obscure flattish ribs, the lower wider, separated by a narrow furrow and extended to the end of the rostrum; disk apparently smooth, but under a lens showing fine concentric and a few irregular faint radial striations; dorsum and base gradually attenuated, the rostrum not separated by any marked constriction near its origin; interior glassy, the rostrum with an internal keel corresponding to the external furrow; resilium very small, wholly internal, obliquely directed backward; hinge with about fifteen anterior and twenty-two posterior very small, short, angularly folded teeth. Lon. of shell, 16.2; of beaks behind anterior end, 5.0; alt. 6.5; diam. 3.0 mm. The teeth were counted on a valve 13 mm. long.

U. S. S. "Albatross," station 3392, Gulf of Panama, in 1270 fathoms, hard bottom, temperature 36° 4 F. U. S. N. Mus. 122,916.

The most nearly related species is *Leda cestrota* Dall, from the Atlantic, which is a much larger form with a recurved rostrum.

***Leda (Leda) rhytida* DALL, n. sp.**

Shell small, elongate-ovate, slightly inequilateral, translucent white, covered with a pale olive-gray periostracum; beaks low, adjacent, lunule and escutcheon

not defined; anterior end evenly rounded, posterior more produced and attenuated but not acute; base evenly arcuate; surface with concentric riblets closely adjacent, finer near the umbones, coarser and rounded near the base, extending over the whole surface except the upper posterior part, where they become obsolete; interior polished, the scars hardly visible, the pallial sinus shallow; hinge with about eleven anterior and nine posterior, more or less folded teeth separated by a deep though small resiliary pit. Lon. 4.5; lon. of beaks behind the anterior end, 2.0; alt. 2.7; diam. 1.5 mm.

U. S. S. "Albatross," station 3422, off Acapulco, Mexico, in 141 fathoms, mud, bottom temperature 53°5 F. U. S. N. Mus. 122,918.

Easily distinguished from the preceding by its wrinkled surface and strongly recurved rostrum, and from the *Leda cordyla* group by its olivaceous instead of reddish brown periostracum.

#### *Leda (Leda) peruviana* DALL, nom. prov.

Shell large, slender, rostrate, with a dark brown periostracum, the surface mostly smooth but with a few coarse irregular wrinkles on the basal half of the disk anteriorly; with about fifteen anterior and thirty-eight posterior hinge teeth; with a large obliquely posteriorly directed chondrophore, a short but strong longitudinal septum in the channel of the rostrum, and no perceptible pallial sinus. Lon. 22, anterior segment, 7; alt. 9.5; double diam. 6.0 mm.

A single decayed valve was dredged in 1036 fathoms, mud, off Aguja Point, Peru, at station 4654.

This resembles one of the *pernula* group of Arctic Ledas, but is clearly distinct from any other, reported from the region under consideration.

#### *Spinula* DALL, subg. nov.

Shell rostrate, acute behind, smooth, with a well-developed short amphidetic ligament, an internal resilium supported by triangular chondrophores, a defined lunule and escutcheon; a long, slender, completely united siphon, no palpal tentacles; pallial sinus obsolete. Type, *Leda calcar* Dall.

The type of this group has a hinge and ligament so strong that it has been impossible to open a specimen without breaking the valves, and even then the hinge would not separate. The resilium is black, plainly visible from below within the shell.

The animal has a long, contractile, slender siphonal tube, but there are no pallial muscles for retracting it, and apparently no marked sinuation of the pallial line. Mantle margin simple. Foot like that of *Leda* proper, the sole fringed and rather short. Gills short, palpi strong but without any accessory tentacles. The valves closed accurately. The adductor muscles seemed slender. The ligament is well developed and distinctly defined, short and about equally extended on each side of the beaks.

The *Nucula excisa* of Philippi, called *Malletia excisa* by Jeffreys, is a species of this group; the chondrophore is between the two series of teeth and well-marked.

***Leda (Spinula) calcar* DALL, n. sp.**

**Plate 10, figures 1, 10.**

Shell compressed, tightly closed, acutely rostrate, brilliantly polished, smooth, covered with an olivaceous periostracum, inequilateral; beaks small, slightly elevated, adjacent, vertically overhanging a delicate, rather long, amphidetic ligament, which extends about equally in front of and behind the beaks; lunule lanceolate, long, narrow, compressed, the valve margins most prominent, delimited by faintly impressed lines; anterior dorsal margin gently arcuate; escutcheon similar to the lunule but smaller and limited by elevated lines, outside of which is a depressed space bordered externally by a strong radial keel extending from the beaks to the extremity of the rostrum; posterior dorsal margin nearly straight, posterior end acutely angular, with a wide shallow sulcus below, setting off the rostrum; anterior end rounded, slightly attenuated, basal margin exclusive of the rostrum, evenly arcuate; surface of the disk smooth or with faint concentric irregularities due to growth, and occasional faint microscopic radial striae which seem to be confined to the periostracum; interior porcellanous, polished; hinge with 16-17 anterior and about the same number of posterior teeth, the two series separated by a small triangular pit containing a well-developed though small black resilium, plainly visible from below in the closed valves; according to the lines of growth the young shells will be even more acutely rostrate than the adults. Lon. of shell, 15.2; of rostrum, 2.5; of posterior dorsal slope, 9.5; alt. 8.2; diam. 4.0 mm.

U. S. S. "Albatross," station 4658, off the Peruvian coast, in S. Lat. 8° 30', W. Lon. 85° 36', in 2370 fathoms, green mud, bottom temperature 35°.3 F. U. S. N. Mus. 110,573.

This is a remarkable form which I have found it difficult to place.

***Leda (Spinula) calcarella* DALL, n. sp.**

Shell resembling *L. calcar*, but smaller, more compressed proportionately, with a shorter rostrum and blunter posterior end, feebler dorsal keels, and with, on the disk near the base, six or eight impressed lines not coincident with the lines of growth, and more or less resembling the lines on *Yoldia lanceolata* of authors. Lon. of shell, 9.0; of rostrum, 0.7; of dorsal slope, 5.0; alt. 5.7; diam. 2.0 mm.

U. S. S. "Albatross," station 4656, off the coast of Peru, in S. Lat. 6° 55' and W. Lon. 83° 34', in 2222 fathoms, green mud, bottom temperature 35°.2 F. U. S. N. Mus. 110,575.

This form is not fully adult and might be regarded as the young of *Leda calcar* were it not that the profile of the latter, as indicated by lines of growth, is quite

different in the specimens collected; and also on account of the presence of the impressed lines on the disk. These differences would ordinarily be regarded as specific, and unless the range of variation in *Leda calcar* is much larger than usual, will prove to be specific in the present case.

## YOLDIINAE.

**YOLDIA MÖLLER.**

*Yoldia* Möller, Ind. Moll. Groenl., 1842, p. 18; 1st species, *Yoldia hyperborea* Lovén.

Möller's first species, which he erroneously identified with the *arctica* of Gray, is of the same group as the better known *Y. limatula* Say. His second and only other species, which he described under the name of *Y. angularis*, is synonymous with *Y. thraciaeformis* Storer.

The first species is generally recognized as the type of the genus. It has the ligament external, reduced to a mere film or obsolete nonfunctional remnant, sometimes focussed in a minute spot just behind the beaks, sometimes amphidetically spread along the hinge margin but distinguishable, if at all, only by its darker brown or blackish color from the periostracum with which it is continuous. In some of the southern species, however, there is a well-defined functional opisthodontic ligament, and for these it seems reasonable that the character should be recognized by a sectional name. For this the name *Katadesmia* is now proposed with the following species as type.

***Yoldia* (*Katadesmia*) *vincula* DALL, n. sp.**

## Plate 5, figure 5.

Shell having on a small scale much the form of *Sanguinolaria rosea*, equivalve inequilateral, white with a pale olivaceous periostracum, smooth, brilliantly polished; beaks low, very inconspicuous, nearer the anterior end; lunule and escutcheon narrow, sublanceolate, elongate, defined by small elevated ridges; external ligament about one fourth as long as the escutcheon, opisthodontic; anterior end evenly rounded from beaks to base; posterior end attenuated and pointed, the posterior basal margin obliquely truncated, extreme point gently rounded and laterally compressed; interior opaque white, showing little trace of muscular impressions, the margins entire; chondrophore and resilium, internal, triangular, vertical, not very large; anterior hinge margin with fifteen, posterior with about twenty-five teeth. Lon. of shell, 14; of beaks behind the anterior end, 6; alt. 8; diam. 4.5 mm.

U. S. S. "Albatross," station 3360, in 1672 fathoms, sand, Gulf of Panama, bottom temperature 42° F. U. S. N. Mus. 122,903. Also at stations 3354 and 3361, in 322 fathoms, mud, bottom temperature 46° F., and 1471 fathoms, green ooze, temperature 36° 6 F., respectively.

The species is notable for its pale color and brilliant polish.

## ORTHOYOLDIA VERRILL AND BUSH.

*Orthoyoldia* Verrill and Bush, Amer. Journ. Sci., 1897, ser. 4, 3, p. 55; type, *Yoldia scapania* Dall.

***Yoldia (Orthoyoldia) panamensis* DALL, n. sp.**

Shell small, narrow, elongate, very inequilateral, brilliantly polished, glassy with an olivaceous periostracum, rather compressed but not flattened; beaks very low, inconspicuous, adjacent; lunule and escutcheon almost linear, bounded by low but distinct ridges; surface absolutely smooth except for faint traces of incremental lines; dorsal slopes almost straight, the anterior much shorter; extremities subequally rounded, the posterior somewhat the most blunt; base a little more convex in front of and under the umbones; profile slightly attenuated behind the umbones; interior glassy, scars invisible, hinge plate with eighteen interior and 52-27 posterior, small, subequal teeth; margins entire. Lon. of shell, 16.5; of beaks behind anterior end, 6.5; alt., 7.5; diam., 4.0 mm.

U. S. S. "Albatross," station 3354, Gulf of Panama, in 322 fathoms, mud, bottom temperature 46° F. U. S. N. Mus. 122,900. Also at station 3355, in 182 fathoms, shelly bottom, temperature 54°.1 F.

The resilium is small, vertical, triangular, and wholly internal. There is no visible external ligament.

This species groups with the *Y. scapania* Dall, from the South Atlantic and *Y. solenoides* Dall, from the West Indies.

## YOLDIELLA VERRILL AND BUSH.

*Yoldiella* Verrill and Bush, Amer. Journ. Sci., 1897, ser. 4, 3, p. 55; type, *Yoldia lucida* Lovén.

***Yoldia (Yoldiella) chilena* DALL, n. sp.**

Shell small, tumid, white with a polished pale yellow periostracum, inequilateral, the anterior side shorter, rounded; posterior longer, rounded below, straight above, and almost pointed at the upper posterior angle; ligament obscure, amphidetic; beaks low, adjacent, showing the protoconch; no lunule, a feebly impressed escutcheon with the valve margins medially prominent; surface of the disk feebly, irregularly, concentrically striated; valves not gaping; interior white, porcelainous, with a wide but short pallial sinus, rounded in front; seventeen posterior and nineteen anterior hinge teeth separated by a short gap with a small, deep, triangular pit for the resilium. Length of shell, 11.5; of posterior end, 6.0; alt. 6.5; max. diam. 5.2 mm.

U. S. S. "Albatross," station 2731, on the southern coast of Chile (Lat. 51°

52' S.), in 348 fathoms, mud, bottom temperature 50° F. U. S. N. Mus. 96,923. Also at station 2782, in 258 fathoms, mud, temperature, 48° F.

This pretty little species looks something like the young of *Y. thraciaeformis* (cf. Hanley, Mon. Nuculacea, fig. 4), but is entirely unlike any species reported from the region mentioned.

#### **Yoldie (Yoldiella) indolens** DALL, n. sp.

Shell small, tumid, translucent, with a dull olivaceous periostracum, smooth surface and oval form, except that there is a slight angulation near the posterior end of the hinge line; anterior end shorter, rounded, base evenly arcuate; posterior end slightly compressed and angulated above; interior porcellanous; hinge-line with about a dozen teeth on each side of a deep, small pit for the resilium directly under the low beak; pallial sinus distinct but small. Length of shell, 5.25; of posterior end, 3.25; alt. 3.5; max. diam. 2.25 mm.

U. S. S. "Albatross," station 2784, on the southern coast of Chile, in 194 fathoms, mud, bottom temperature 51°.9 F. U. S. N. Mus. 122,740. Also at station 2785, in 122 fathoms, temperature 48° F.

A comparison of the young of *Y. chilénica* of the same size with adults of the present species shows that, although of very similar profile, in addition to the differences of color and surface *Y. chilénica* at that age is much less inflated.

#### **Yoldia (Yoldiella ?) infrequens** DALL, n. sp.

Shell very small, callistaeform, tumid, inequilateral, covered by an olivaceous periostracum; beaks prominent, tumid; both ends of the shell evenly rounded, the posterior not attenuated; anterior hinge line with about nine, posterior with thirteen teeth, separated by a very small pit for the resilium; interior chalky; exterior surface evenly, finely, concentrically striated, the sculpture fainter toward the ends of the shell. Length, 4.4; of anterior end, 2.0; alt. 3.5; max. diam. 2.0 mm.

U. S. S. "Albatross," station 2784, in 194 fathoms, mud, off the coast of southern Chile, bottom temperature 51°.9 F. U. S. N. Mus. 110,692. Also at station 2783, in 122 fathoms, mud, temperature 48° F.

A very simple little species which agrees with no other of the region and is evidently adult.

#### **Yoldia (Yoldiella ?) mantana** DALL, n. sp.

Shell small, elongate-oval, white, with a pale yellowish periostracum, nearly equilateral, the beaks opisthogyrate, showing the protoconch distinctly; anterior end expanded, evenly rounded; posterior end somewhat attenuated, at the end rounded; surface with a few irregular concentric striae, but mostly smooth and

polished; interior chalky, with a shallow but distinct pallial sinus; hinge with about nine anterior and ten or eleven posterior teeth between which the minute resilium is set apparently directly on the edge of the valve, no pit or chondrophore being visible under a lens. Length of shell, 5.0; of anterior end, 2.5; alt. 3.2; max. diam. 2.5 mm.

U. S. S. "Albatross," station 2792, in 401 fathoms, mud, off Manta, Ecuador, bottom temperature 42° 9 F. U. S. N. Mus. 122,756.

***Yoldia (Yoldiella) granula* DALL, n. sp.**

Shell minute, oval, equilateral, moderately tumid, smooth, covered with a polished straw-colored periostracum; interior porcellanous, with a very slight pallial sinus and smooth margins; hinge line with about six teeth on either side of a well-developed resilium, the most anterior tooth of all a little more distant and notably larger than any of the others. Length, 1.7; alt. 1.2; max. diam. 1.0 mm.

U. S. S. "Albatross," station 2778, in Magellan Straits, in 61 fathoms, bottom temperature 47° 9 F. U. S. N. Mus. 110,693.

Only a single valve was obtained of this very minute species, but the solidity of the specimen indicates that it is not the fry of one of the above described larger species.

***Yoldia (Yoldiella) dicella* DALL, n. sp.**

Shell small, solid, chalky-white, covered by a dark olive dull periostracum, slightly inequilateral, with low, adjacent beaks; of oval form, and with neither lunule nor escutcheon; anterior end broadly rounded, posterior narrower and longer, but also rounded, base evenly arcuate; surface nearly smooth at the umbones, but feebly concentrically striated on the disk, especially the lower part of it; without any radial sculpture; interior chalky-white, the margins entire, the muscular scars distinct, the pallial line with a shallow, hardly angular sinus; hinge line with about ten anterior and fifteen posterior small crowded teeth, separated by a deep pit occupied by the entirely internal resilium. Lon. of shell, 6; of beaks behind the anterior end, 3; alt. 4; diam. 3 mm.

U. S. S. "Albatross," station 3418, off Acapulco, Mexico, in 660 fathoms, sand, bottom temperature 39° F. U. S. N. Mus. 122,917.

This little spade-shaped species is clearly distinct from any of the others considered in this paper.

***Yoldia (Yoldiella) leonilda* DALL, n. sp.**

Shell small, smooth, oval, subequilateral, plump, white, covered with a polished pale straw-colored periostracum; beaks low, eroded, slightly nearer the anterior

end; no external ligament, lunule or escutcheon; ends subequal, the anterior more rounded, the posterior roundly pointed, the extremes slightly above the equator of the disk; surface smooth, except for lines of growth; interior white, dull, the scars hardly visible; margins entire and prominently arcuate basally; resilium strong, internal; hinge plate with about twelve anterior and fourteen posterior teeth, separated by a chondrophore large for the size of the shell. Lon. of shell, 8; alt. 5; diam. 3.75 mm.

U. S. S. "Albatross," station 3360, Gulf of Panama, in 1672 fathoms, sand, bottom temperature 42° F. U. S. N. Mus. 122,909.

MALLETIINAE.

**MALLETTIA** DESMOULINS.

*Mallettia* Desmoulins, Actes Soc. Linn. de Bordeaux, Feb., 1832, 5, p. 85; type, *M. chilensis* Desm.

*Solenella* Sowerby, P. Z. S. Lond., 1832 (Dec.), p. 197; type, *S. norrisii* Sowerby; Conch. Man., 1839, p. 99, fig. 138.

*Ctenoconcha* Gray, Syn. Brit. Mus., 1840; ed. 1842, pp. 77, 91; Sowerby, Conch. Man., 1842, 2d ed., p. 128; Orbigny, Voy. Amer. MÉR., Moll., 1846, p. 543.

*Neilo* A. Adams, P. Z. S. Lond., 1852, p. 92; type, *N. cumingi* Adams, l. c., p. 93, = *Nucula australis* Quoy et Gaim., Voy. Astrolabe, Zool., 1833, 8, p. 471, pl. 78, figs. 5-10.

The type is from Valparaiso, Chile, in 14 to 45 fathoms, mud; Cuming.

**Mallettia magellanica** MABILLE AND ROCHEBRUNE.

*Mallettia magellanica* Mabillet et Rochebrune, Miss. Sci. du Cap Horn, Mollusques, 1889, p. H 114, pl. 8, fig. 1.

*Mallettia hyadesi* Mabillet et Rochebrune, *op. cit.*, p. H 114, pl. 7, fig. 8.

Punta Arenas, Magellan Strait, Hyades. U. S. S. "Albatross," station 2779, Straits of Magellan, in 77 fathoms, ooze, bottom temperature 47° F. Also at station 2780, in 369 fathoms, mud, temperature 47°, and 2772, off Cape Virgins, in 31½ fathoms, sand. U. S. N. Mus. 96,238.

This species differs from *M. chilensis* Desmoulins, by its smaller size, more ovate form, less conspicuous marginal indentations, and a larger number of anterior hinge teeth. The *M. hyadesi* is only a somewhat larger and older specimen than that figured as *M. magellanica*. I have no doubt of their identity. *M. magellanica* Smith, is much more acutely pointed behind.

**Mallettia inequalis** DALL, n. sp.

Shell oval, compressed, the anterior side longer, surface smooth, or showing only incremental lines, covered with a thin polished brownish olive periostracum;

anterior dorsal margin evenly arcuate, posterior straighter, both ends rounded, the posterior more bluntly; posterior depressed ray obsolete, anterior wanting, though in its place are three or four very faint radial striae; base evenly arcuate, interior earthy, white, pallial sinus large, rounded behind, below mostly coincident with the pallial line; hinge line short with a wide gap under the beaks, three anterior and twenty-four posterior minute crowded teeth; beak low, pointed, opisthogyrate; no lunule or escutcheon. Length of shell, 26; of anterior end, 15; alt. 17; diam. 6 mm.

U. S. S. "Albatross," station 2772, off Cape Virgins, in 31 fathoms, sand, and 2778, Straits of Magellan, in 61 fathoms, mud, bottom temperature 47°.9 F.

The truncation behind, the coalescent pallial sinus, and the compressed form separate it from the other species.

***Malletia peruviana* DALL, n. sp.**

**Plate 10, figures 3, 5.**

Shell thin, oval, polished, of a very dark olivaceous tint, inequilateral, with a marked anterior basal gape; beaks low, eroded, inconspicuous, anterior, with a wholly external, elongated, chiefly opisthodontic ligament and no resilium; anterior dorsal slope short, compressed, slightly arcuate; posterior straight, much longer, compressed; no lunule or escutcheon; anterior end attenuated, roundly pointed, posterior broader, rounded, with a feebly impressed ray from the beaks ending in an inconspicuous insinuation of the posterior lower margin; surface smooth except for this ray and incremental concentric slight undulations; interior bluish white, porcellanous; museular scars distinct, pallial sinus small and very shallow, deepest near the adductor scar; a strongly impressed dorsally concave arcuate linear impression extending backward and upward from the anterior adductor scar into the back part of the umbonal cavity; hinge with small and crowded not always clearly differentiated teeth, anterior about ten, posterior about thirty-three; valve margins entire. Lon. of shell, 28; of part anterior to the beaks, 9; alt. 16.5; diam. 9.5 mm.

U. S. S. "Albatross," station 4654, N. 68° W., twenty-four miles from Aguja Point, Peru, in 1036 fathoms, mud, bottom temperature 37°.3 F. U. S. N. Mus. 110,574.

The species is remarkable for its almost blackish color and extremely shallow pallial sinus, which does not extend in front of the posterior adductor scar; the anterior end is unusually short and almost pointed.

***Malletia truncata* DALL, n. sp.**

**Plate 17, figure 1.**

Shell brilliantly polished, smooth, with a pale, olivaceous periostracum, inequilateral, subrectangular, with a strong, external, opisthodontic ligament and traces

of a minute, subinternal resilium; beaks small, low, adjacent, nearer the anterior end; lunule and escutcheon present but practically linear; anterior slope slightly convexly arcuate, anterior end evenly rounded; posterior dorsal slope slightly concavely arcuate to an angle near the end of the hinge plate; posterior end almost truncate, very bluntly rounded, compressed, wider than the anterior end; basal margin subparallel with the posterior dorsal, convexly gently arcuate; interior porcellanous white; scars moderately distinct, pallial sinus deep, wide, rounded in front; hinge with twenty anterior and about twenty-seven posterior, short, folded, delicate teeth; a smooth gap between the two series, in the upper edge of which can be detected traces of the obsolete resilium; valve margins entire. Lon. of shell, 22.5; of beaks behind anterior end, 8.5; alt. 12.5; diam. 8.0 mm.

U. S. S. "Albatross," station 3374, southwest of Malpelo Island, Gulf of Panama, in 1823 fathoms, ooze, bottom temperature 36° 4 F. U. S. N. Mus. 122,906. Also at station 3361, in 1471 fathoms, ooze, temperature 36° 6 F., and 3381, in 1772 fathoms, green mud, temperature 35° 8 F.

Remarkable for its light yellow color, its surface devoid of radial sculpture or indented margin, and its bluntly truncate posterior end. In the latter character and its subequal division of the hinge teeth it recalls *Neilo*, but is without the rostration of that form.

#### MINORMALLETIA DALL, sect. nov.

Shell small, blunt, plump, with amphidetic ligament, no resilium, the pallial sinus large, no radial depressions or sculpture.

#### *Malletia* (*Minormalletia*) *arciformis* DALL, n. sp.

##### Plate 15, figures 5, 6.

Shell very thin, inflated, rounded-quadrate, inequilateral, finely concentrically striated, of a dull olivaceous color; hinge line nearly straight, subangulate where it joins the semicircular arc of the posterior end; anterior end shorter, narrower, rounded; base rather straight; beaks low, very anterior, prosocoelous over a narrow amphidetic ligament; hinge line interrupted with ten anterior and about thirteen posterior teeth; muscular impressions deep, a large pallial sinus below the posterior scar, confluent with the pallial line below; interior of the valves whitish, earthy. Lon. 10.6; alt. 7.0; diam. 6.0; beak behind anterior end, 3.3 mm.

U. S. S. "Albatross," station 3417, off Acapulco, Mexico, in 493 fathoms, mud, bottom temperature 40° 6 F. U. S. N. Mus. 122,926.

Though more rounded below and behind, this has a profile not dissimilar to that of *Arca* (*Fossularca*) *adamsi* E. A. Smith.

The pallial sinus is notable in that the greater part of its basal scar is identical with the pallial line itself, whereas in most of the Malletinae the sinus tends to slope obliquely upward.

**Malletia (Minormalletia) benthima** DALL, n. sp.

Plate 15, figures 1, 2.

Shell small, thin, earthy, covered with a polished, thin, grayish periostracum; very inequilateral, bluntly rounded in front and behind; beaks pointed, recurved, prominent; situated at the anterior third; surface smooth, except for lines of growth and very sparse, faint, radial striations which appear confined to the periostracum; posterior hinge line and base nearly parallel; ligament very delicate, amphidetic but mostly behind the beaks; resilium minute, obscure, not interrupting the line of teeth; anterior teeth 12-13, posterior 17-18, small and closely crowded; interior earthy, polished, the muscular scars pronounced, small; pallial sinus large, deep, rounded behind, reaching nearly to the middle of the shell, rising obliquely from the entrance; no lunule or escutcheon. Beaks in front of the posterior end, 6.5; anterior end of sinus, 4.5; total length, 9.5; alt. 5.3; diam. 4.0 mm.

U. S. S. "Albatross," station 3417, off Acapulco, Mexico, in 493 fathoms, mud, bottom temperature 40°.6 F. U. S. N. Mus. 122,927.

A very plain and simple but rather peculiar looking species.

**NEILO A. ADAMS.**

**Malletia (Nelro) goniura** DALL.

Plate 18, figure 6.

*Malletia goniura* Dall, Proc. U. S. Nat. Mus., 1889, 12, p. 251, pl. 10, fig. 10.

Shell extremely thin and fragile, translucent whitish, covered with a rather dark olive periostracum, smooth and polished; beaks low, adjacent, nearest the anterior end of the shell, with a linear lunule and escutcheon, a long and strong external ligament but no internal resilium; anterior dorsal slope arcuate, short, passing insensibly into the curve of the evenly rounded anterior end; posterior longer, straight, ending in an obtuse angle at the posterior truncation; a single elevated small thread or keel extends from each beak to the lower posterior margin of the valve, above which the valve is somewhat excavated; the upper border of this trough or excavation is slightly prominent, though not indicated by a keel, and the margin between the radial thread and this prominence is somewhat concave, produced at the end of the prominence and thence obliquely truncate to the dorsal margin, which is compressed; the posterior end of the shell, except for the undulation mentioned, is abruptly truncate and meets the

base at a bluntly rounded angle, the base being nearly straight and the whole profile of the shell subrectangular; interior translucent whitish, scars perceptible, the pallial sinus shallow, rounded in front; hinge plate straight with about fourteen anterior and over thirty very small anterior teeth, the gap separating the two series very slight. Lon. of shell, 13.0; of beaks behind the anterior end, 5.5; alt. 8.0; diam. 5.0 mm.

U. S. S. "Albatross," station 3360, Gulf of Panama, in 1672 fathoms, sand, bottom temperature 42° F. U. S. N. Mus. 122,908. Also off the coast of Ecuador, at station 2793, in 741 fathoms, mud, temperature 38° 4 F.

### TINDARIA BELLARDI.

#### *Tindaria compressa* DALL, n. sp.

Plate 15, figures 7, 8; Plate 17, figures 15, 16.

Shell small, thin, cythereiform, pale yellow, moderately convex, inequilateral, the anterior end shorter, the entire surface minutely, evenly, concentrically striated; beaks low, prosocoelous, with no defined lunule but a flattish space in front of them; ligament small, amphidetic; posterior slope slightly arcuate, with a long lanceolate escutcheon, defined by an impressed line; anterior and posterior ends rounded, base evenly arcuate; interior white, porcellanous; hinge with about ten anterior and twenty-one posterior teeth, a rather wide mesial gap, between the two series; basal margin entire. Lon. 8.2; height, 6.0; max. diam. 4.3; beaks behind the anterior end, 3.0 mm.

U. S. S. "Albatross," station 3360, in 1672 fathoms, sand, bottom temperature 42° F. U. S. N. Mus. 122,921.

A larger specimen of the same species, but with twelve anterior and twenty-five posterior teeth, measures: lon. 11.5; alt. 8.5; diam. 6.0; and the beaks behind the anterior end, 4.7 mm. It was dredged at station 3414, southwest of the isthmus of Tehuantepec, in 2252 fathoms, green mud, bottom temperature 38° 5 F. U. S. N. Mus. 122,923.

This species recalls *Tindaria amabilis* Dall, of the Antilles, by its form and color, but it is less solid and inflated, and more attenuatedly compressed behind. In the former species the ligament is nearly equally distributed in front of and behind the beaks, but in *T. compressa* the larger part is posterior.

#### *Tindaria salaria* DALL, n. sp.

Shell pale cream color or white, nuculiform, smooth on the beaks, near the dorsal slopes and ends of the shell; basally concentrically striated, polished; the shell is very nearly the shape of a small *Nucula proxima* Say; ligament small, amphidetic, mostly posterior; resilium obsolete or none; there is no trace of a chondrophore; hinge line arched, with no lunule, the escutcheon narrow, long, feebly defined; interior white, porcellanous, polished; pallial line not sinuated, margins

entire; hinge with seven to eight anterior and eighteen to twenty posterior hinge teeth, small below the beaks, but forming an apparently continuous arch with no central gap. Length of shell, 5.5; alt. 4.5; max. diam. 3.0 mm.

A few dead valves and fragments dredged in Mid-Pacific, off Salar y Gomez Island, at U. S. S. "Albatross," station 4693, in 1142 fathoms, manganese nodules, bottom temperature 35° 4 F.

This species is more nuculiform than any of the other described species.

***Tindaria panamensis* DALL, n. sp.**

**Plate 17, figures 10, 12.**

Shell small, not polished, veneriform, evenly, closely, concentrically threaded, the grooves sharp; dark olivaceous green, darker near the margin, very thin, the valves slightly compressed at the posterior third, behind which the sculpture becomes suddenly finer; beaks low, plump, rather anterior, with no lunule and only a narrow, feebly defined escutcheon; ends rounded, the base arcuate with a faint inflection at the point of compression, ligament small, almost imperceptible; hinge with seven anterior and about thirteen posterior teeth; margins entire; ends subequally rounded. Lon. 5.5; alt. 4.3; max. diam. 2.8; beaks behind the anterior end, 2.0 mm.

U. S. S. "Albatross," station 3392, Gulf of Panama, in 1270 fathoms, hard bottom, temperature 36° 4 F. U. S. N. Mus. 122,922.

Of a more greenish color and dull surface than any of the previously described veneriform species.

***Tindaria atossa* DALL, n. sp.**

**Plate 15, figures 3, 4.**

Shell small, olivaceous, moderately polished, finely concentrically striated all over, with the beaks slightly anterior, the posterior end bluntly pointed, the anterior rounded; ligament small, amphidetic; anterior teeth six, posterior ten, the dorsal slopes gently, the basal margin roundly, arcuate; interior white, margin entire. Lon. 3.5; height, 2.2; max. diam. 1.7; beaks behind the anterior end, 1.7 mm.

U. S. S. "Albatross," station 3393, Gulf of Panama, in 1020 fathoms, mud, bottom temperature 36° 8 F. U. S. N. Mus. 122,924.

Resembling the last species, but with the whole surface sculptured and the posterior end less elongated and pointed.

At station 3392, Gulf of Panama, in 1270 fathoms, hard bottom, temperature 36° 4 F., was found another specimen, U. S. N. Mus. 122,920, which is apparently the adult form. It resembles the smaller ones above described, but measures: lon. 6.5; alt. 4.5; max. diam. 3.0; beaks behind anterior end, 2.5 mm. Since this is considerably larger than the specimens above referred to, it will be considered as the type.

**Tindaria smirna** DALL n. sp.

Plate 17, figures 6, 7.

Shell small, polished, subtriangular, of a blackish olive tint, plump, the beaks nearer the anterior end; posterior end acutely pointed, anterior bluntly rounded; beaks low, with a small black ligament extending on both sides of them; anterior slope short, straight, posterior longer, flattened; neither lunule nor escutcheon present; valves smooth on the beaks and over two thirds of the surface, but near the basal margin with about ten fine concentric grooves, crossed by very fine radial striae; basal margin evenly arcuate; interior dull pearly, the hinge with about eight anterior and twelve posterior teeth. Lon. 5.5; height, 4.0; max. diam. 2.7; beaks to anterior end, 2.0 mm.

U. S. S. "Albatross," station 3360, Gulf of Panama, in 1672 fathoms, sand, bottom temperature 42° F. U. S. N. Mus. 122,919.

Pretty close to *T. atossa*, but much more brilliantly polished, the shell shorter, more turgid, more nearly equilateral, and with the ligament distinctly and subequally amphidetic, while in *T. atossa* it appears, to the naked eye, to be entirely opisthodetic, though on opening the valves a small portion is seen to pass in front of the beaks.

**Tindaria mexicana** DALL, n. sp.

Plate 17, figures 11, 14.

Shell small, solid, rounded-triangular, subequilateral, olivaceous, polished; beaks prominent, prosocoelous, slightly anterior, inflated, concentrically minutely threaded; the sculpture extends to the middle of the base, is a little less conspicuous on the dome of the valve and almost entirely absent near both ends, ceasing rather abruptly; anterior slope short with no lunule, the anterior end rather attenuated, rounded; posterior end longer, somewhat attenuated, the dorsal slope flattish, the end rather abruptly rounded; base roundly arcuate; ligament minute, amphidetic; anterior hinge line with eleven, posterior with about twenty-one teeth, the central ones small and obscure; interior porcellanous. Lon. 5.2; alt. 4.0; diam. 2.8; beaks behind anterior end, 2.0 mm.

U. S. S. "Albatross," station 3418, off the Mexican coast in 660 fathoms, sand, bottom temperature 39° F. U. S. N. Mus. 122,925.

Very similar to *T. smirna*, but with more prominent beaks; shorter and blunter, in proportion to height, and decidedly less pointed and produced behind.

**Tindaria virens** DALL.

*Malletia (Tindaria) virens* Dall, Proc. U. S. Nat. Mus., 1889, 12, p. 254, pl. 13, fig. 3.

Coast of Southern Chile and Western Patagonia at U. S. S. "Albatross," stations 2781, 2782, 2783, 2784, and 2785, in 122 to 449 fathoms; mud, bottom temperatures 47° F. to 51° 9 F.

Lighter colored, with alternating zones and with sharper and deeper concentric sulci, than those exhibited by *T. atossa* of the Panama fauna, which is the most nearly related species.

***Tindaria thea* DALL, n. sp.**

Shell small, thin, equivalve, inequilateral, very dark olive, plump, polished; beaks anterior, high, slightly prosogyrate; lunule not defined, a lanceolate impression in the region for the escutcheon is not distinctly delimited; anterior slope short, slightly arcuate, the valve margins slightly raised, the anterior end rounded; posterior slope longer, straighter, posterior end attenuated and bluntly pointed; basal margin prominently arcuate; surface smooth except for minute concentric undulations extending from the beaks to the base over the whole disk, best seen under a lens; interior porcellanous, margins entire, scars distinct, hinge with eight anterior and twelve to fourteen posterior teeth, the series not separated by a pit containing a small, internal resilium. Lon. 6.5; anterior end, 1.5; alt. 4.0; diam. 3.0 mm., the posterior extreme somewhat compressed.

U. S. S. "Albatross," station 4654, N. 68° W., twenty-four miles from Aguja Point, Peru, in 1036 fathoms, mud, bottom temperature, 37° 3 F. U. S. N. Mus. 110,577.

Just about the color of dark wet tea-leaves after they have been steeped. Longer and more pointed, and more attenuated behind, than *T. smirna*, which has very similar sculpture but a more yellowish color. In looking from below, the series of hinge teeth seems uninterrupted, but the black color of the semi-internal resilium can be seen through the interstices, as it is situated above the tooth-line.

***Tindariopsis* VERRILL AND BUSH.**

*Tindariopsis* V. and B., Am. Journ. Sci., 1897, ser. 4, 3, p. 59; type, *T. agathida* Dall, Proc. U. S. Nat. Mus., 1889, 12, p. 252, pl. 13, fig. 10.

***Tindaria* (*Tindariopsis*) *sulculata* GOULD.**

*Nucula sulculata* Couthouy, in Gould, Wilkes' Expl. Exped., Moll., 1852, p. 424, pl. 37, figs. 539 a-e.

*Leda sulculata* Hanley, Thes. Conch., 1860, 3, Mon. Nuculacea, p. 25, footnote; not *Lembulus* (= *Leda*) *sulculatus* Risso, Eur. Mérid., 1826, 4, p. 320.

*Leda lugubris* A. Adams, P. Z. S. Lond., 1856, p. 49; E. A. Smith, P. Z. S. Lond., 1881, p. 39; Mabile et Rochebrune, Mission Cap Horn, 1889, 6, Moll., p. H 113.

*Leda orangica* Mabile et Rochebrune, Mission Cap Horn, 1889, 6, Moll., p. H. 113, pl. 8, fig. 3.

U. S. S. "Albatross," station 2778, Straits of Magellan, in 61 fathoms, mud, bottom temperature 47° 9 F. U. S. N. Mus. 110,697. Orange Harbor, Pata-

gonia, Couthouy; Port Rosario and Wolsey anchorage, 17-30 fathoms, Alert Expedition.

This species seems extremely abundant, and the hundreds of specimens collected by the "Albatross" enable the full range of variation to be traced, from which the above synonymy results. The color varies from nearly black to light yellowish brown. There is a small angular pallial sinus. There is no chondrophore, and, while a small gap intervenes between the anterior and posterior rows of teeth, the resilium, which seems to be obsolete, does not occupy it. The ligament doubtfully passes in front of the beaks, unless as a mere functionless film. I have compared Gould's type, still preserved in the National Museum, with the "Albatross" specimens. The species differs from the type of *Tindariopsis* (*T. agathida* Dall) in possessing a small angular pallial sinus, and might therefore be put in a separate section if such fine discriminations be regarded as desirable in so variable a group as this.

That this species, belonging to a different genus from Risso's shell, was erroneously referred to *Leda*, does not oblige us to reject the name of Couthouy and Gould.

#### PHASEOLUS JEFFREYS.

*Phaseolus* (Jeffreys MS.) Monterosato, Atti Accad. Scienze, Palermo, 1875, pp. 4, 11 (*nomen nudum*); von Martens, Zool. Record for 1875, p. 205; Jeffreys (*olim*) P. Z. S. Lond., 1879, p. 573; Seguenza, Nucul. Terz. Ital., 1877, p. 1182; type, *P. ovatus* Jeffr.

*Silicula* Jeffreys, P. Z. S. Lond., 1879, p. 573; type, *S. fragilis* Jeffreys. *l. c.*, p. 574, pl. 45, figs. 6, 6a; Seguenza, Form. Terz. de Reggio, 1879, p. 284; Verrill, and Bush, Am. Journ. Sci., 1897, ser. 4, 3, p. 62.

Jeffreys' manuscript name *Phaseolus*, applied to one or two fossil species from the Italian tertiaries, was printed by Monterosato and Seguenza before Jeffreys himself had given a diagnosis. The sole example of the genus illustrated by Seguenza in 1877 was *P. ovatus*. Apparently without knowing of this publication, in describing a recent shell from the Porcupine expedition dredgings, in 1879, Jeffreys substituted for his original manuscript name another, *Silicula*, with a single species *S. fragilis*. These shells, though having rather a similar hinge, are otherwise quite unlike, so that in 1897 Verrill proposed to retain both names as follows, the characters having been recast from authentic specimens.

PHASEOLUS (Jeffreys MS.) Seguenza, type *P. ovatus* Jeffreys.

Shell short-ovate, the hinge subequal on each side of the beaks, the two series meeting at an obtuse angle under the beaks, valve practically equilateral; no pallial sinus, ligament? teeth lamellar, few, subequally divided.

SILICULA Jeffreys, type *S. fragilis* Jeffreys.

Shell very inequilateral, beaks at the anterior third, calyculate; an oblique chondrophore and internal resilium, external ligament obsolete; hinge line nearly

straight; pallial sinus deep; valves soleniform, truncate behind and rounded in front; teeth lamellar, the posterior series much elongated, few in number.

Unless the differences, when all the characters of *Phaseolus ovatus* are known, prove greater than now appears, *Silicula* can hardly rank higher than as a subgenus of *Phaseolus*, especially if, as seems likely, species intermediate in form should turn up.

***Phaseolus (Silicula) patagonicus* DALL, n. sp.**

Shell small, thin, elongate-oval, very inequilateral, anterior side shorter, anterior end rounded, anterior dorsal slope nearly straight; posterior slope very slightly curved and descending; posterior end bluntly rounded, not truncate, not emarginate, slightly smaller than the anterior end; outer surface smooth except for faint incremental lines, covered with a thin, polished, pale olive periostracum; beaks (eroded); a well-marked internal pit under them; anterior hinge line with two short horizontal teeth; posterior with four elongate, straight, overlapping lamellae; interior of the valves white, porcellanous, with a large pallial sinus rounded behind, not very deep; muscular scars small; on the disk inside of the pallial line, extending backward and upward from the anterior adductor scar, is a series of somewhat irregular but more or less continuous small scars which enclose a large oval area of which the upper boundary is the hinge line, and which reaches back to about the middle of the shell. Length, 8.4; anterior end, 2.0; alt. 4.2; max. diam. 1.8 mm.

U. S. S. "Albatross," station 2783, on the west coast of Patagonia, southern Chile, in S. lat. 51° 2', in 122 fathoms, mud, bottom temperature 48° F. U. S. N. Mus. 96,914.

Only a single valve of this species came to light, the umbo being eroded, but the characters are abundantly sufficient to separate it from the North Atlantic species.

**Arcacea.**

*Limopsidae.*

**LIMOPSIS SASSO.**

*Limopsis* Sasso, Giorn. Ligustico, di Sci. Let. ed Arti, Genova, 1827, **1**, p. 476; type, *Arca aurita* Brocchi, *vide* Sacco.

*Pectunculina* Orbigny, Pal. Franc. Terr. Cret., 1844, **3**, p. 182; 1st species, *Pectunculus scalaris* Sowerby.

*Trigonocaelia* Nyst et Galeotti, Bull. Acad. Sci. Bruxelles, 1835, **2**, p. 289; 1st species, *Pectunculus granulatus* Lamarck.

*Felicia* Mabile et Rochebrune, Miss. du Cap Horn, Moll., 1889, **6**, p. H 115, sole ex. *F. jousseamei* M. & R., p. H 116, pl. 7, fig. 9a-b.

*Cosmetopis* Rovereto, Note prev. Pelecip. Tongr. Lig., Atti Soc. Ligust., 1898, **9**, p. 177; type, *Limopsis retifera* Semper.

Sacco proposes to retain D'Orbigny's name *Pectunculina* for those species with stronger sculpture and denticulate valve margins, while for those intermediate between these and the smooth-edged type of *L. aurita*, Rovereto has proposed the name *Cosmetopsis*. These mutations of sculpture are too feeble, and in one case too characteristic of different ages in the same individual, in my opinion, to be worthy of names.

*Felicia* is apparently founded on a misconception. A large number of specimens were dredged by the "Albatross," and the series shows the impression of the triangular fossette to vary exceedingly in strength and when slightly eroded to be in some cases very easy to overlook. Its supposed absence, in *Felicia* as claimed, is thus easily accounted for.

There is, however, one good subdivision of the genus, as follows :

#### EMPLECONIA DALL, sect. nov.

Valves with their upper posterior margins beyond the hinge line, deeply indented, forming a deep narrow pit between the valves when closed.

Type, *Limopsis vaginatus* Dall, Proc. U. S. Nat. Mus., 1891, **14**, p. 190; 1895, **17**, p. 713, plate **25**, figures 3, 6, 7. Bering Sea and North Pacific Ocean.

#### LIMOPSIS s. s.

(A. WITH ENTIRE MARGINS.)

#### *Limopsis zonalis* DALL, n. sp.

Plate 7, figures 6, 9.

Shell large for the genus, compressed, oblique, ovate, whitish, clothed with a dense elongate villous periostracum of a dark brown color with narrow concentric zones which are nearly black; beaks narrow, sharp, prominent, vertically incurved over a short lozenge-shaped ligament centrally situated in a rather short, narrow, flat amphidetic area; beaks nearly smooth, the greater part of the disk covered with small, low, slightly irregular, closely adjacent ridges, bearing fringes of periostracum, crossed by very faint radial incised lines, with rather wide interspaces, from which, over the lines project long hair-like processes in thick rows, extending beyond the margins of the shell; interior polished white with broad, flat, entire margin; hinge line with eight anterior and five or six posterior, radially arranged smooth teeth, the two series separated by a short gap; anterior adductor scar small, deep, adjacent to the hinge plate; posterior scar four or five times as large and distant from the hinge plate. Alt. 25; lat. of shell, 27; of hinge area, 11.5; max. diam. 10 mm.

U. S. S. "Albatross," station 3356, Gulf of Panama, in 546 fathoms, mud, bottom temperature 40° 1 F. U. S. N. Mus. 122,878 (type). Other specimens were obtained from stations 3357 and 3358, in 782 and 555 fathoms, green sand,

temperatures 38°.5 and 40°.2 and station 4630, off Mariato Point, Panama Bay in 556 fathoms, sand, temperature 38°.

The most striking thing about this species, apart from its oblique form, is externally, the dark zone in the periostracum near the margin and the clearly distinguished lines of the hairs; internally the very great discrepancy between the two adductor scars.

### *Limopsis compressus* DALL.

Plate 7, figures 7, 8.

*Limopsis compressus* Dall, Proc. U. S. Nat. Mus., 1896, 13, p. 16.

Shell large, thin, compressed, with a yellowish-brown, pale, pilose epidermis; surface reticulated with fine radiating striae and rather irregular elevated lines of growth; beaks low, but conspicuous, small and swollen; area narrow, long, about equal on each side of the beaks; dorsal line straight, anterior end rounded, posterior produced, rounded; interior white, smooth, with plain margins; posterior adductor scar larger and lower than the anterior; ligament central, lozenge-shaped, thin; hinge with about six posterior and eight anterior teeth, small, obscure, separated by a wide edentulous space, and obsolete in senile specimens. Length of shell, 45; height, 37; diam. 17.5 mm., exclusive of the hair-like processes of the periostracum.

U. S. S. "Albatross," station 3332, Gulf of Panama, in 1793 fathoms, mud, bottom temperature, 36° F. Type, U. S. N. Mus. 122,889.

Other stations are as follows:

Station.	Locality.	Fathoms.	Bottom.	Temperature F.
3360	off Panama	1672	sand	36°.4
3361	" "	1471	green ooze	36°.6
3362	" "	1175	mud	36°.8
3366	" "	1067	glob. ooze	37°.0
3374	" "	1823	green ooze	36°.4
3376	" "	1132	glob. ooze	36°.3
3414	off Mexican coast	2232	green mud	35°.8

The most conspicuous features of this species are its thin shell, very large size, short pelage, and pale color of the hairs. In general appearance it is not unlike *L. bassi* Smith, from New Zealand, which is smaller, more inflated, and thicker.

### *Limopsis jousseaumi* MABILLE ET ROCHEBRUNE.

*Felicia jousseaumi* Mabile et Rochebrune, Miss. du Cap Horn, Moll., 1889, 6, p. H 116, pl. 7, figs 9a, 9b.

Beagle Channel, Murray Narrows, Hyades; U. S. S. "Albatross," station 2780, off the southern coast of Chile in latitude 53° 1' south, in 369 fathoms,

mud, bottom temperature 46° 9 F. U. S. N. Mus. 118,241; and station 2783, in 122 fathoms, mud, temperature 48°.

This species, agreeing exactly with the figure in the report of the Mission to Cape Horn, above cited, has a pale brownish periostracum with rather short hairs, prominent though small beaks, and smooth flat valve-margins. The periostracum is less adherent than usual in this genus and often has dropped off entirely in comparatively fresh specimens. The hairs are much longer in the young than in the average adult. The area is very narrow; the ligament occupies a very narrow, lozenge-shaped area about equally in front and behind the beaks; the resilium is central, forming a minute triangle in each valve, and the depression in the amphidetic area to receive it is very shallow and sometimes, in a slightly eroded valve, imperceptible, which accounts for the error already alluded to. Another error, probably typographical, occurs in printing the measurements, as will be seen on comparing them with the figure. The average measurements are: length, 26; height, 24; diam. 9 mm., exclusive of the periostracum.

The sculpture consists of feeble, irregular incremental lines and obsolete numerous, rather distant radial striae, out of which the hairs grow, the interspaces being quite flat, and the striae, broken by the lines of growth, have here and there a faintly punctate aspect. There are ten anterior and about the same number of posterior teeth, sometimes forming a continuous arch, but usually with a faint medial depression, more conspicuous in the young shells.

Nothing corresponding to the unfigured *L. hirtella* Mabille et Rochebrune, from Orange Harbor, was discovered in the "Albatross" collections.

(B. WITH CRENULATE MARGINS.)

*Limopsis diegensis* DALL, n. sp.

Plate 15, figures 13, 15.

This small, oblique-ovate, and rather swollen species is light brown, rather sparsely pilose, thin, with a small resilium, about seven anterior and four to five posterior hinge teeth, which are small and delicate, the two series separated by a short edentulous gap. When the periostracum is removed, the sculpture is not unlike that of *L. jousseaumi*, but more emphatic, and the radii are distinctly punctate. The interior is faintly grooved and the ventral margin distinctly crenulate, or rather beaded.

Off San Diego, in 80 fathoms, F. W. Kelsey; U. S. S. "Albatross," station 2923, in 822 fathoms, mud, off San Diego, California, bottom temperature 39° F. U. S. N. Mus. 122,585.

*Limopsis mabilliana* DALL, n. sp.

Shell small, subquadrate, with pale brown periostracum sparsely arranged along the radial and concentric sculpture so as to form a fringed reticulum, the hairs

not pilose but individualized and distant; beaks small, prominent, with a very minute area and small resiliary groove, five anterior and six posterior hinge-teeth, the series hardly separated, the anterior teeth longer than the posterior; shell greenish white; base arcuate, inner margins strongly crenulate. Length, 6.0; alt. 5.5; diam. 3.0 mm.

U. S. S. "Albatross," station 2780, off the southern coast of Chile, in 369 fathoms, mud, bottom temperature 47° F. U. S. N. Mus. 110,703.

The single specimen was at first suspected to be the young of *L. jousseaumi*, with which it was dredged, but the crenulate margin showed this to be an error.

#### **Limopsis panamensis DALL.**

*Limopsis panamensis* Dall, Proc. U. S. Nat. Mus., Mar., 1902, 24, p. 559; 1903, 26, p. 951, pl. 62, fig. 8.

U. S. S. "Albatross," station 3393, Gulf of Panama, in 1020 fathoms, mud, bottom temperature 36° 8. U. S. N. Mus. 109,028.

The characteristics of this little species are its rotundity, its blackish olive periostracum, and crenulate margins. It is of an entirely different shape from *L. mabilliana*, or the following species.

#### **Limopsis stimpsoni DALL, n. sp.**

Shell ovate, inequilateral, anterior end shorter, attenuated; posterior convexly arcuate, produced; periostracum light brown, formed much as in *L. mabilliana*; area narrow, the resilium minute; interior greenish white, radiately grooved toward the margin, which is crenulate; teeth small and feeble, five anterior and four posterior, separated by an edentulous space; the muscular scars discrepant as usual. Length of whole shell, 6.5; of posterior part, 4.0; alt. 6.2; diam. 3.5 mm.

U. S. S. "Albatross," station 3392, Gulf of Panama, in 1270 fathoms, hard bottom, temperature, 36° 4 F. U. S. N. Mus. 122,881. Also at station 3393, in 1020 fathoms, mud, temperature 36° 8.

I have named this species in honor of the late Doctor William Stimpson. It is nearest *L. mabilliana*, but very different in profile.

#### **Limopsis juarezi DALL, n. sp.**

Plate 18, figure 8.

Shell small, solid, white, moderately compressed, with a dense fringed brown periostracum disposed in concentric lines, showing wide interspaces, in the young, with radial lines of fringe more conspicuous later; beaks small, pointed, prominent for the size of the shell; area narrow, the black ligament short and central below the beaks; surface polished, with hardly any apparent sculpture, notwith-

standing the periostracum is so conspicuously confined to certain lines; profile slightly oblique, nearly orbicular; hinge line straight, with four or five anterior and eight posterior teeth; interior of disk bluish white, smooth, with, close to the margin, a continuous series of minute tubercles; muscular scars distinct, the anterior very small and adjacent to the hinge plate, the other larger and more distant. Alt. of shell, 6.5; of beaks above the hinge line, 0.5; diam. 4.0 mm.

U. S. S. "Albatross," station 3360, Gulf of Panama, in 1672 fathoms, sand, bottom temperature 42° F. U. S. N. Mus. 122,891. Also from station 3418, off Acapulco, Mexico, in 660 fathoms, sand, temperature 39° F. U. S. N. Mus. 110,559.

***Limopsis diazi* DALL, n. sp.**

**Plate 18, figure 7.**

Shell closely resembling in general appearance *L. juarezi* Dall, but thinner, smaller, the hinge with four anterior and four posterior teeth, the cavity of the valve deeper and the interior of the disk radiately finely sulcate with subequal, rib-like interspaces which reach and feebly crenulate the margin, which bears no tubercles. Alt. 4.2; lat. 4.5; diam. 2.5 mm.

U. S. S. "Albatross," station 3418, off Acapulco, Mexico, in 660 fathoms, sand, bottom temperature 39° F. U. S. N. Mus. 122,892.

*Arcidae.*

**ARCA** (Linné) LAMARCK.

**Scapharca** GRAY.

BATHYARCA KOBELT.

*Bathyarca* Kobelt, Martini-Chemnitz Conch. Cab., zweite ausg., 1891, Mon. *Arca*, p. 214; type, *Arca pectunculoides* Scacchi.

***Arca* (*Bathyarca*) *nucleator* DALL, n. sp.**

**Plate 18, figure 9.**

Shell small, plump, subglobular, equivalve, inequilateral, white, with a dense villous periostracum; beaks full, prominent, adjacent, overhanging a long narrow amphidetic area; anterior part of the straight hinge line shorter than the posterior, each making an angle with the beginning of the valve margin which forms a slightly oblique subcircular arc, the posterior end being more rotund; sculpture very finely and subequally reticulate, the radial and concentric raised lines alike bearing long, furfureous fringes of periostracum; hinge line not quite as long

as the shell, the anterior part carrying six radiating minute teeth, the posterior part eight, which are somewhat more nearly horizontal; interior of the valve smooth, whitish, margins entire. Alt. 6; lat. of shell, 6; of hinge line, 5; max. diam. 4 mm.

U. S. S. "Albatross," station, 3392, Gulf of Panama, in 1270 fathoms, hard bottom, temperature 36°.4 F. U. S. N. Mus. 122,876.

Quite similar to the variety *orbiculata* of the *Arca pectunculoides*, but less extended laterally, less oblique, and with a finer and more delicate sculpture.

***Arca* (*Bathyarca corpulenta* var. ?) *pompholyx* DALL.**

Cf. *Arca* (*Barbatia*) *corpulenta* Smith, Challenger Rep., 1885, 13 (bivalves), p. 263, pl 17, figs. 5-5b.

Smith's *Arca corpulenta* ranged from North Australia to Juan Fernandez Island, and on the west, northward to Celebes, in 200 to 2425 fathoms, thus covering part of the range of the present shell, which differs from Smith's very full and careful description of *A. corpulenta* in the following particulars: The beaks are larger, fuller, and more conspicuous; the sculpture is composed of narrow, flat, smooth, concentric bands much wider than the radiating lirae, which are only visible in the interspaces and do not nodulate the intersections; in comparing an umbonal view of the present shell with the figure in the Challenger Report, the beaks of the specimen are much nearer the anterior end of the hinge line than in the figure. These lead me to think that the two may be distinct, or at least distinguishable varieties, as the specimens I have seen show variations. The present shell measures 23.5 mm. long; 26 high; diameter 22; hinge line 16.5, with the beaks 4.5 mm. from the anterior end of the hinge line. The hinge in this specimen has seven anterior and five posterior teeth with an edentulous gap 10 mm. long between them, but another specimen of the same species has the entire hinge line denticulate. The stations are as follows:

Station.	Region.	Fathoms.	Bottom temp.	Character of bottom.
*4390	off California	2182	35° 0	mud
4396	" "	2228	35° 0	"
4709	Mid Pacific	2035	35° 3	ooze
4721	" "	2084	35° 0	"
4740	" "	2422	34° 2	"

\*U. S. N. Mus. 110,704.

***Barbatia* GRAY.**

**CUCULLARIA CONRAD.**

*Cucullaria* Conrad, Amer. Journ. Conch., 1869, 5 p. 97; type, *Arca heterodonta* Deshayes, Eocene.

I pointed out in 1898 that the forms included by Conrad in his genus *Cucullaria* were probably not closely related to *Macrodon* Lycett, to which their hinges

bear a superficial similarity, and recently M. Cossmann has expressed the same opinion. There is a pretty gradual shading off from the Eocene type to that of the recent species, but the inequilateral shell, the V-shaped ligament, and the general aspect forbid us to refer these little species to the typical *Barbatia*, and it will therefore be convenient to retain Conrad's name.

***Arca (Cucullaria) endemica* DALL, n. sp.**

Plate 17, figure 8.

Shell small, thin, brownish, inequilateral, equivalve, moderately inflated; beaks small, pointed, slightly prosogyrate, situated at about the anterior third, separated by a long, narrow, flat, lozenge-shaped area on which the ligament, which is wholly opisthodontic, forms a long, very acute V; surface dull, minutely concentrically imbricate, radiately sculptured with numerous close, very fine rounded threads which become wider and flatter distally; periostracum fibrous, dehiscent; anterior end attenuated, short, pointed; posterior end broad, rounded, compressed; a shallow radial constriction extending basally from the beaks; base oblique, with a narrow gape for the byssus at the extremity of the constriction; interior porcellanous, white, the scars evident; hinge rectilinear, anterior teeth six, vertical, separated by a gap from the narrow oblique series of eight posterior teeth; margin forming an angle at each end of the hinge plate. Lon. of shell, 11.5; of beaks behind the anterior end, 3.0; max alt., 7.0; diam., 4.5 mm.

U. S. S. "Albatross," station 4721, Pacific Ocean, in S. Lat. 8° 07' and W. Lon. 104° 10', in 2084 fathoms, globigerina ooze, bottom temperature about 35° F. U. S. N. Mus. 110,578. Also at station 4685, in S. Lat. 21° 36' and W. Lon. 94° 56', in 2205 fathoms, radiolarian ooze, bottom temperature 35° 3 F.

This is very close to *Arca (Cucullaria) pteroëssa* E. A. Smith, of the Mid North Pacific, but has a coarser radial sculpture and less numerous teeth.

GLYCYMERINAE.

**GLYCYMERIS DA COSTA.**

*Glycymeris* Da Costa, Brit. Conch., 1778, p. 170; type, *Arca glycymeris* Linné.

*Pectunculus* Lamarck, Prodrôme, 1799, p. 87; not of Da Costa *et al.*

*Pseudaxinea* Monterosato, Nota int. *Pectunculus dei mari d'Europa*, 1892; type, *P. violascens* Lamarck.

***Glycymeris multicostatus* SOWERBY.**

*Pectunculus multicostatus* Sowerby, P. Z. S. Lond., 1832, p. 195; Reeve, Conch. Icon., 1, *Pectunculus*, pl. 5, fig. 26.

Bay of Guayaquil, Cuming. U. S. S. "Albatross," station 3368, near Cocos Island, in 66 fathoms, rocky bottom, temperature 58° 4 F. U. S. N. Mus. 122,877.

The single valve obtained as above has all the aspect of the specimens of *G.*

*multicostatus* in the collection, and many of them have about the same number of ribs, thirty-four, the maximum being about forty. On a close and careful inspection, however, certain differences appear, which lead to a doubt as to its identity.

The average specimens of *G. multicostatus* have the valves heavy, the scars marked by an elevated ridge, and almost always have more or less dark brown on the interior of the disk. The radiating costae are low, flat, and polished in most cases, not in any observed case sculptured, and the interspaces are narrow, shallow, and only crossed by incremental lines.

In the valve above mentioned the radial costae are elevated, their upper edges almost overhang the channels, and the upper surface is closely transversely threaded. The channels without exception are elegantly reticulated by concentric, regularly spaced, elevated lirae, about five to a millimeter. The interior of the shell is pure white, the adductor scars are very little raised; there are eleven anterior and thirteen posterior teeth forming a continuous arch on the hinge plate.

Whether these differences are merely individual, or whether we have to do with a species closely allied to but distinct from *G. multicostatus*, will require much more copious material to determine.

(C. ISODONTA.)

## Pectinacea.

### *Pectinidae.*

#### PECTEN MÜLLER, 1776.

Having seen somewhere a statement that the name *Pecten* was first used in a generic sense by Peter Osbeck, in his "Voyage to the East Indies and China," 1765, I took the trouble to hunt up the reference (p. 391, *op. cit.*), and found that Osbeck's name has no standing in systematic nomenclature, as no definition is given and no described species is referred to it. It is a *nomen nudum*, pure and simple. From the context it is evident that the name is used colloquially, as was long done by the pre-Linnean collectors, for Murices of the type of *Murex tenuispina* with a long canal having small spines at right angles to it, which among dealers and collectors was often called *pecten-veneris*, or Venus' comb. The first to use *Pecten* in the modern sense was Rumphius, in 1704, from whom it is probable Müller derived his generic name, and who preceded Osbeck by more than half a century.

PECTEN s. s.

#### *Pecten sericeus* HINDS.

*Pecten sericeus* Hinds, Zool. Voy. Sulphur, 1844, Moll., p. 60, pl. 17, fig. 1.

Panama Bay, 53 fathoms, Hinds. U. S. S. "Albatross," station 3368, near Cocos Island, Gulf of Panama, in 66 fathoms, rocky bottom, temperature 58°.4 F. U. S. N. Mus. 122,864.

Both valves were originally covered with fine, concentric, umbonally inflected, concrescent lamellae, which are usually entirely cleaned off in cabinet specimens.

**Chlamys** BOLTEN.

NODIPECTEN DALL.

**Pecten (Nodipecten) subnodosus** SOWERBY.

*Pecten subnodosus* Sowerby, P. Z. S. Lond., 1835, p. 109; Thes. Conch., 1843, Pecten, p. 65, pl. 15, figs. 97, 112.

Gulf of Tehuantepec, in 10-17 fathoms, Sowerby; U. S. S. "Albatross," station 3368, near Cocos Island, in 66 fathoms, rocky bottom, temperature 58°.4 F. U. S. N. Mus. 122,863. Also Gulf of California.

PALLIUM SCHUMACHER.

**Pecten (Pallium) miser** DALL, n. sp.

Plate 8, figure 6.

Shell small, flattish, dark reddish purple, with a narrow hinge line, striated disk and five strong radial ribs; anterior ear very short, oblique; posterior ear longer, triangular, with three radial threads near the hinge line, an excavated, concentrically striated space between them and the edge of the disk; right valve with five, strong, rounded ribs with subequal interspaces, and two much smaller, closer, and less prominent, near the anterior submargin, and a single, similar riblet near the posterior submargin; ctenolium rather long with about five free hooks; minor sculpture of the disk consisting of very numerous subequal radial threads with subequal interspaces crossed by still more numerous fine, imbricated, sharp lamellae which, when the surface is intact, coalesce, but when it is worn show as sharp concentric lamellae looped over sharp radial ridges with distinctly wider interspaces; distal margin of the valve suddenly and markedly contracted in the adult; hinge line with strong plicae on each side of the cartilage pit, strongly vertically striated; interior smooth, ridged by the sculpture, livid purple with strong lirations near the valve margin, on the lateral margins of each rib; valve margin minutely crenulate. Alt. 34.0; lat. of valve, 32.0; of hinge margin, 9.0; diameter of right valve, 6.0 mm.

U. S. S. "Albatross," station 3355, Gulf of Panama, in 182 fathoms, mud, bottom temperature 54°.1 F. U. S. N. Mus. 122,862.

Only two upper valves of this species were obtained, but as it belongs to a group totally distinct from any other on the Pacific Coast, so far known, it can be recognized without difficulty.

**Pecten (Chalmys) pasca** DALL, n. sp.

Shell (left valve) flat, irregular distally, rose-pink and white, irregularly clouded, somewhat inequilateral; anterior ear larger, with four crimson radial

threads on a light pink background covered with the superficial reticulum; posterior ear smaller, with two or three radial obscure threads; disk with about fourteen radial ribs (none intercalary) subequal and equally spaced; the whole surface covered with a fine, closely woven reticulum of minute rectangular scales, when perfect coalescent at the surface, when the surface is eroded presenting a minute cellular reticulum, when this is eroded the surface still shows fine regular reticular markings. When the crust is perfect over a rib it appears keeled, when the crust is removed the rib itself is seen to be rounded, the interspaces also are not channelled but roundly excavated; interior polished, the coloration shining through; hinge margin straight, with a small medial pit, the margin showing conspicuous traces of the provincial striation; there are no crura, the peripheral margin of the disk is irregular. Alt. of valve, 16; lat. of valve, 13; of hinge line, 8 mm.

Collected on the beach at Easter Island, by the "Albatross" party. U. S. N. Mus. 110,765.

This single valve would perhaps not have been worthy of description were it not that it seems to belong to the group of species called Hinnites, and possesses such a remarkable surface. I have elsewhere expressed the opinion that the different species of Hinnites are more intimately related to various groups of Pecten than they are to each other, and that probably there is no direct genetic relation between the fossil species. The "genus" Hinnites may be regarded as composed of "sports" from the Chlamys group of Pecten.

#### **Pseudamusium** H. AND A. ADAMS.

##### **Pecten (Pseudamusium) liriopae** DALL, n. sp.

Shell small, fragile, whitish, subcircular; convex (left) valve with small subequal ears finely concentrically lamellose; disk with extremely fine, close, radial threads with nearly equal interspaces; crossed by fine, concentric lamellae, with wider interspaces, more distant on the beaks, closer toward the margin; interior glassy, the sculpture shining through; right valve similarly sculptured, except that the radial threads are obsolescent and the concentric lamellae more obvious; anterior ear longer with a wide byssal sulcus and fasciole, a single radial thread bordering the fasciole; margin of the disk flexible. Alt. 7.5; lat. 8.0; hinge line, 4.5; diam. 2.5 mm.

U. S. S. "Albatross," station 3392, Gulf of Panama, in 1270 fathoms, hard bottom, temperature, 36°.4 F. U. S. N. Mus. 122,869.

A peculiar thing about the sculpture of this little shell is that, looked at in one light, only the radial, in another only the concentric sculpture is visible, and thus there is no effect of reticulation to speak of, yet there is little difference in the strength of the two kinds of sculpture.

##### **Pecten (Pseudamusium) neoceanicus** DALL, n. sp.

#### Plate 9, figure 4.

Shell small, thin, brownish white, concentrically undulate and with both valves similarly reticulately sculptured, equivalve, somewhat equilateral; beaks (showing

small, polished prodissoconch) small, pointed, the left one rising a little higher than the other; hinge line straight, ears subequal, sharply pointed, byssal notch and fasciole distinct, sculpture like that of the disk; surface of the valves with about four easy, wide, rounded undulations; surface sculptured with numerous fine, squarish, radial and concentric threads subequal and subequally distributed, so that the meshes are mostly square, without nodulation at the intersections, and the interspaces are wider than the threads; disk short, kite-shaped, a little produced in front, suddenly constricted at the margin; interior white, polished, the umbonal cavities extending under the hinge line; the pit and resilium small. Alt. 12.0; lat. of shell, 12.0; of hinge line, 7.7; diam. 4.0 mm.

U. S. S. "Albatross," station 4721, Pacific Ocean in South Lat.  $8^{\circ} 7'$ , and West Lon.  $104^{\circ} 10'$ , in 2084 fathoms, globigerina ooze, bottom temperature about  $35^{\circ}$  F. U. S. N. Mus. 110,579.

This is a most exquisite little gem of the sea.

### **Pecten (Pseudamusium) polyleptus DALL, n. sp.**

Plate 10, figure 9.

Shell small, thin, translucent white, compressed, having a marked "*Camptonectes*" striation, beside about thirty-six radial rows of minute, elevated, granule-like scales, very easily detached and more crowded near the middle of the base; hinge line straight; anterior ear in the right valve long, prominent, with five radial rows of scales and obvious concentric striation; byssal notch deep and wide, with a broad fasciole, the ctenolium with three free teeth; posterior ear not differentiated by a notch; profile of the valve, below and behind, a segment of a circle; interior with glassy polish, scar small and high up, hardly visible; margins entire; ligamentary pit small, shallow. Alt. of valve, 9.5; lon. of valve, 9.5; of hinge line, 6.5; diam. of right valve, 1.2 mm.

U. S. S. "Albatross," station 4642, Galapagos Islands, four miles S.,  $41^{\circ}$  E., from Ripple Point, Hood Island, in 300 fathoms, globigerina sand, bottom temperature  $48^{\circ}.6$  F. U. S. N. Mus. 110,586.

Only the right valve was obtained at this station, but at station 2781, on the west coast of Patagonia, Southern Chile, in South Lat.  $51^{\circ} 52'$ , in 348 fathoms, mud, bottom temperature  $50^{\circ}$  F., a left valve which probably belongs to the same species was dredged by the "Albatross" in 1888. The sculpture is essentially similar, except that the scales are fewer and more distant from each other; only 34 rows could be counted, and the umbonal part of the valve shows several concentric undulations. The ears are large, subequal, the anterior larger with six radial rows of scales. The "*Camptonectes*" sculpture is conspicuous upon the glassy shell.

### **Pecten (Pseudamusium) gelatinosus MABILLE ET ROCHEBRUNE.**

*Pseudamusium gelatinosum* M. et R., Miss. Cap Horn, Moll., 1889, 6, p. H 126.

Orange Harbor, Mabile; U. S. S. "Albatross," station 2785, in 449 fathoms, mud, temperature  $47^{\circ}$  F. U. S. N. Mus. 96,454.

This is the species which by some authors has been referred to *P. vitreus* Gmelin, from which it differs by sparser distribution of the scales and of the rows of scales, and by a slight but obvious obliquity. The two forms are, however, extremely similar. The "Challenger" dredged the present form in from 140 to 400 fathoms, off the southwest coast of Chile, or western Patagonia.

**Pecten (Pseudamusium) panamensis** DALL, n. sp.

Plate 6, figures 8, 10.

Shell translucent yellowish white, very thin, resembling mica in consistency, oblique, compressed; beaks small, low, polished, hardly projecting beyond the hinge line; ears small, subequal, the posterior feebly differentiated; the anterior right ear with a wide fasciole corresponding to the byssal sulcus, above which are five or more radial threads, the whole with strong incremental lines; on the lower margin of the fasciole is a line of minute beads, apparently a ctenolium which becomes obsolete at maturity; the other ears are sculptured like the rest of the disk; sculpture: on the left valve a feeble but distinct "*Camptonectes*" striation, rather coarse and irregular incremental lines, the whole crossed by 40-65 fine radial, sparsely, minutely scaly threads, the scales occurring usually at the intersection with a prominent incremental line; left valve with similar sculpture except that the "*Camptonectes*" striation is so fine as to require strong magnification and a good light to be seen at all; the valves are produced obliquely downward and backward; the surface sculpture yields readily to friction and many of the valves have lost it altogether, retaining only the concentric sculpture; left valve slightly more convex; interior glassy, the resilary pit very small, the margins entire. Height, 18; length, 18; max. diam. 2.5; hinge line, 9.5 mm. A very large specimen is 22 mm. high.

U. S. S. "Albatross," station 3354, Gulf of Panama, in 322 fathoms, mud, bottom temperature 56° F. U. S. N. Mus. 122,865. Also at stations 3389, 3396, 3407, and 3422, ranging from near Acapulco, Mexico, to the Galapagos Islands, in 141 to 885 fathoms, soft bottom, temperatures 37°2 to 53°5 F.

The shell was very abundant at some localities, the valves dead and separated, very few retaining the radial sculpture.

CYCLOPECTEN VERRILL.

**Pecten (Cyclopecten) rotundus** DALL, n. sp.

Shell very small, thin, white, suborbicular, with subequal ears, both valves nearly equally convex; right valve polished, minutely regularly concentrically striated, which sculpture is barely visible under a hand lens; posterior ear smooth, anterior finely radially threaded, with a narrow but clean-cut byssal sulcus and fasciole; left valve finely sharply radially striated, the anterior ear finely reticu-

lated, the posterior apparently nearly smooth; hinge line short, straight; interior smooth, a pair of small auricular crura present; the hinge line with a minute central pit and two relatively large transversely sharply striated, elongate areas representing a permanent provinculum. Height and length, 3; hinge line, 2.5; diameter, 1.0 mm. A single valve from near the Straits of Magellan, apparently the same species, measures 7 mm. in height.

U. S. S. "Albatross," station 2799, in Panama Bay, in  $29\frac{1}{2}$  fathoms; also at station 2784, in 194 fathoms, mud, bottom temperature  $51^{\circ}.9$  F. U. S. N. Mus. 110,708.

The hinge line of this species is very much like that of *P. (Pseudamusium) thalassinus* Dall, described in the "Blake" report.

### **Pecten (Cyclopecten) cocosensis** DALL, n. sp.

Plate 6, figures 1, 3.

Shell small, suborbicular, translucent whitish, irregularly painted with opaque white, red, and ferruginous brown, in lines, zigzags, or clouded patches; there are also visible on the right valve in some of the specimens whitish rays which would give the impression until the interior is examined that the shell belongs to the Propeamusium group; ears subequal, small, the anterior larger, in the left valve elegantly minutely reticulated and at the hinge line adorned by a series of small, close-set, short, sharp spines; in the right valve the sculpture of the ears is very similar, but the lines are less close and sharp and the anterior auricle has a deep triangular byssal sulcus, without a noticeable fasciole or a ctenolium; left valve with the umbo sharp, small, and prominent, the disk nearly smooth, with faint radial striae which near the submargins become more regular and sharp, especially behind; right valve with a less prominent umbo, the surface polished, the ventral margin flexible, and reflexed when closed; sculpture of fine, close, regular concentric lines with wider flat interspaces; interior smooth, polished, without radial lirae; the hinge line with two well-marked transversely striated provincular areas. Height of shell, 8.7; breadth, 9.0; hinge line, 5.0; diam. 2.0 mm.

U. S. S. "Albatross," station 3369, near Cocos Island, Gulf of Panama, in 52 fathoms, rocky bottom, temperature  $62^{\circ}.2$  F. U. S. N. Mus. 122,870.

The faint white rays on the right valve of this shell look so much like Propeamusium that until I separated the valves of one of the specimens I had no doubt it belonged to that group.

### **AMUSIUM** BOLTEN.

#### PROPEAMUSIUM DE GREGORIO.

### **Amusium (Propeamusium) malpelonium** DALL, n. sp.

Plate 6, figure 9.

Shell suborbicular, of a dirty white color, very thin and fragile, with small subequal ears, moderately convex; beaks low, prodissoconch small, swollen, slightly

irregular, often eroded; left valve with small subequal, minutely concentrically lamellose ears; posterior submargin smooth or only with incremental lines; disk with fine incremental lines crossed by numerous fine radial lines with wider interspaces, increasing by intercalation; these radii are arcuate, slightly convex on the anterior side, and bending gently toward the posterior; the radii are not scaly; right valve flexible toward the ventral margin, the portion beyond the internal lirae slightly reflexed when the valves are closed; ears similar and similarly sculptured, the anterior with no byssal sulcus, though there is a single feeble ray near the submargin and a slight inward flexuosity of the incremental lines; disk regularly concentrically striated, the striae with wider interspaces, the intact surface covered with a thin, dehiscent, coarsely fibrous layer; interior polished, the central part whiter, with nine regular, even white, elevated lirae extending all the way from the umbonal region without noticeable thickening distally; in each valve are also two short auricular crura. Height of shell, 18.2; breadth, 18.5; hinge line, 8.2; diam. 3.4 mm.

U. S. S. "Albatross," station 3360, Gulf of Panama, in 1672 fathoms, sand, bottom temperature 42° F. U. S. N. Mus. 122,871. Also abundantly, near Malpelo Island, at station 3374, in 1823 fathoms, ooze, temperature 36°.4; 3381, in 1772 fathoms, mud, temperature 35°.8; 3361, in 1471 fathoms, ooze, temperature 36°.6; and 3684, in Mid Pacific, latitude 0° 50' N., longitude 137° 54' W., in 2463 fathoms, ooze, temperature about 35° F.

This is an abundant but not particularly attractive abyssal species, sufficiently distinct from any of the Atlantic species.

### *Spondylidae.*

#### **Plicatula** LAMARCK.

##### **Plicatula dubia** SOWERBY.

*Plicatula dubia* Sowerby, Thes. Conch., 1847, 1, p. 436, pl. 91 (only), fig. 19.

U. S. S. "Albatross," station 2798, in Panama Bay, in 18 fathoms; U. S. N. Mus. 96,262. Cana Island, West Columbia, Cuming.

### *Limidae.*

#### **Lima** CUVIER.

##### **Lima** s. s.

*Lima* s. s. Dall, Trans. Wagner Inst., 1898, 3, p. 765; type *ostrea lima* Linné.

#### **Mantellum** ADAMS.

##### **Lima (Mantellum) hians** GMELIN.

*Ostrea hians* Gmelin, Syst. Nat., 1791, 1, pt. 6, p. 3332, no. 97.

*Lima hians* Hanley, Rec. Shells, 1843, p. 268, footnote.

*Lima fragilis* (pars), Sowerby, Thes. Conch., 1847, 1, p. 86, No. 14; pl. 22, fig. 34 (only).

U. S. S. "Albatross," at the Galapagos Islands. Panama, Cuming; Acapulco, Dall. U. S. N. Mus. 106,884.

The nomenclature of the *Limas* is much mixed up, and the range of the species is very great. *L. dehiscens* Conrad, 1838, is a good species, quite distinct, as *Limas* go, from *L. fragilis*.

*L. angulata* Sowerby was collected by me at Acapulco, Mexico, though described from Australia. I cannot distinguish the Galapagos shell from North European specimens.

#### Acesta H. AND A. ADAMS.

##### *Lima* (*Acesta*) *patagonica* DALL.

*Lima* (*Acesta*) *patagonica* Dall, Nautilus, June, 1902, 16, p. 16.

U. S. S. "Albatross," station 2781, southern Chile, on the west coast of Patagonia, in 348 fathoms, mud, bottom temperature 50° F. U. S. N. Mus. 95,462, 96,453, 96,931, 96,927, and 122,734. Also at station 2785, in 449 fathoms, mud, temperature 47°.

This has been called *L. excavata* variety, and also referred to as a variety, of the Japanese *L. goliath* Sowerby. The young shells are beautiful little polished translucent objects, with well-developed teeth on the hinge line, the formula being  $\frac{R\ 101\ L\ 101}{L\ 010\ L\ 010}$ . These teeth become obsolete or nearly so in the mature shells.

##### *Lima* (*Acesta*) *agassizii* DALL.

Plate 16, figure 1.

*Lima* (*Acesta*) *agassizii* Dall, Nautilus, June, 1902, 16, p. 16.

U. S. S. "Albatross," station 3354, in the Gulf of Panama, in 322 fathoms, mud, bottom temperature 46° F. U. S. N. Mus. 106,890.

Only one valve of this species was obtained.

##### *Lima* (*Acesta*) *diomedae* DALL, n. sp.

Plate 7, figure 2.

Shell short-ovate, of moderate size, white, with a pale yellowish periostracum, equivalve, inequilateral, radiately sculptured, polished; hinge line very short, straight, with a very oblique ligamental pit in the narrow, triangular, flattened area; beaks very low, hardly rising above the area, situated opposite the posterior

end of the hinge line, behind them a long, narrow, faintly radially striated, excavated escutcheon; anterior slope very short, straight; posterior long, oblique, slightly excavated; remainder of the valve margins evenly, ovately arcuate; disk sculptured with about fifty flat, polished, radial ribs with narrow, channelled interspaces, each about one third the width of the intervening ribs; concentric sculpture only of faint, incremental lines, and three or four lines indicating resting stages; interior polished, white, the margins slightly notched by the external sculpture but not internally crenulate; muscular scars rounded, faint, rather small; hinge with a single obsolete tubercle in each valve at each end; the valves do not gape perceptibly, except a narrow chink in the middle of the escutcheon. Alt. 35; lat. 32; diam. 14; hinge line, 11; posterior slope, 16 mm.

U. S. S. "Albatross," station 3404, near the Galapagos Islands, in 385 fathoms, rocky bottom, temperature 43°.2 F. U. S. N. Mus. 122,875.

Although a small shell when compared with such giants as *L. excavata*, the characteristics are such as to place it in the same section of the genus. It differs from the young of either of the large species, so far as known, by its short and broad shape, thick and heavy shell, and strong, radial sculpture.

#### *Lima (Limatula) similaris* DALL, n. sp.

This little shell appears, on a casual glance, exactly like *Limatula subauriculata* Montagu, but a careful comparison of specimens of the same size shows the following differences: the hinge line is slightly shorter, the auricular angles less prominent, and the area between the beaks less wide, the socket for the ligament consequently is shorter and more feeble; the surface is covered with radial threads which cover most of the disk instead of being strong only near the ventral margin; there is no radiating medial sulcus, so prominent in *L. subauriculata*, either within or without the shell, and the slight obliquity or lateral deviation of the ribs is in the opposite direction from that in *L. subauriculata*. Length of shell, 4.5; width, 2.7; diam. 2.0 mm.

U. S. S. "Albatross," station 2799, in 30 fathoms, mud, Panama Bay. U. S. N. Mus. 109,034.

Only one valve of this little shell was obtained, and that was unfortunately crushed by accident after the above diagnosis had been prepared. A second specimen, somewhat smaller, was obtained at 2983, in fifty-eight fathoms, sand, off Cerros Island, Lower California, bottom temperature 55° F. In this a slight trace of a mesial furrow between two small threads appears on the inside of the shell, but none on the external surface.

#### *Lima (Limatula) pygmaea* PHILIPPI.

*Lima pygmaea* Philippi, Arch. für Naturg., 1841, 1, p. 56.

*Radula (Limatula) pygmaea (ex parte)* E. A. Smith, Phil. Trans., 1870, 168, p. 191. Zool. Kerguelen Id. (Moll., p. 25), pl. 10, fig. 16.

*Lima martiali* Mabile et Rochebrune, Miss. du Cap Horn, Moll., 1889, p. H. 124; Orange Harbor.

*Lima (Limatula) pygmaea* Smith, Chall. Rep., Lamell., 1885, p. 292.

U. S. S. "Albatross," station 2777, Magellan Straits, in 20 fathoms, gravel; U. S. N. Mus. 96,192; also at station 2778, in 61 fathoms, bottom temperature 47° 9 F. Kerguelen Island, Smith; South Orkneys, Scottish Antarctic Expedition?

From the material available it seems that there are two species of *Limatula* in the Magellanic region, one of which was described as above indicated, by Philippi, as having smooth radial ribs and the submargins without radial sculpture.

One form, which I identify as *pygmaea*, has the smooth submargins large, and extending nearly to the ventral border, without any radial sculpture upon them whatever, and with the concentric sculpture of the disk confined to incremental lines. The number of ribs visible at the ventral margin does not exceed fifteen. In neither of the species is there any medial sulcus. The very young show a distinct though minute taxodont provinculum, but the adult does not show the hinge denticulations of *Limaea*; although the general form and sculpture recalls *Limaea* rather than the *Limatula* of the Northern hemisphere.

#### *Lima (Limatula) falklandica* A. ADAMS.

*Limatula falklandica* A. Adams, P. Z. S. Lond., 1863, p. 509.

? *Lima (Limatula) hodgsoni* E. A. Smith, Nat. Antaret. Exp., Nat. Hist., 1907, 2, Moll., p. 6, pl. 3, fig. 8.

U. S. S. "Albatross," station 2781, off the coast of Southern Chile, or Western Patagonia, in 348 fathoms, mud, bottom temperature 49° 9 F. U. S. N. Mus. 96,930. Also at stations 2783, 2784, and 2787, in 61 to 194 fathoms, mud, temperatures 48° to 54° F. Falkland Islands, A. Adams; South Orkneys, Scottish Antarctic Expedition.

This species, of which a good many specimens were collected, differs from *L. pygmaea* Philippi, by having short and very small, smooth submargins, and in having the radial ribs smaller, much more numerous, and obscurely divided into three areas; the median with about fifteen strong ribs; an anterior with about eleven gradually much smaller ribs; and a posterior with about fourteen similar ribs, gradually becoming obscure. All these ribs are elegantly sculptured by small concentric, regularly spaced lamellae, which in crossing the ribs rise to small vaulted scales exactly as figured by Smith for *L. hodgsoni*, as above cited (fig. 8b). In some cases the scales are closer than in others, but this seemed the only material variation. I am not sure that *L. hodgsoni* is specifically identical with *L. falklandica*, since the former is more than twice as large as the latter, but the beautiful figure of the former given by Smith seems identical in every other respect with our shells. I separate *falklandica* from *pygmaea* + *martiali*, because A. Adams especially mentions the concentric sculpture, while Philippi and Mabile declare their shells to have "smooth" ribs.

***Limia (Limatula) suteri* DALL, n. sp.**

Shell of about the size and form of *L. subauriculata*, with fine concentric incremental lines and feeble radial riblets, discrepant on the two valves, slightly deflected backward distally; both valves with a well-defined median sulcus, which on the interior of the valve is bordered on each side by a single distinct rib; right valve externally has one rib in front of the sulcus and seven to nine behind it; left valve with seven or eight ribs on each side of the sulcus; the ends of the ribs serrate the ventral margin; beaks small, prominent; hinge line subequally divided, the auricular angles prominent; the amphidetic area narrow; the resilary pit wide and short; color white or pale brownish. Length, 7.1; breadth, 4.5; diameter, 3.5 mm.

Stewart Island, New Zealand, in 18 fathoms, H. Suter. U. S. N. Mus. 195,290.

These little shells were sent to the Museum some time since by Mr. Suter, in whose honor they are named, and in working out the "Albatross" species were determined to be new.

**Mytilacea.***Mytilidae.***CRENELLA BROWN.*****Crenella divaricata* ORBIGNY.**

*Nuculocardia divaricata* Orbigny, Moll. Cubana, 1847, 2, p. 311, pl. 27, figs. 56-59.  
*Crenella divaricata* Dall, Trans. Wagner Inst. Sci., 1898, 3, p. 803.

On the Atlantic Coast this shell ranges from North Carolina to Barbados, and in time from the Oligocene of Santo Domingo to the recent fauna. On the Pacific it has been dredged by the "Albatross" in the Gulf of California and in Panama Bay, at station 2799, in 30 fathoms, and station 2805, in 51 fathoms, muddy bottom.

***Crenella megas* DALL.**

*Crenella megas* Dall, Proc. U. S. Nat. Mus., 1902, 24, p. 559; 1903, 26, p. 950, pl. 62, fig. 4.

Dredged by U. S. S. "Albatross," at station 2795, Panama Bay, in 33 fathoms, sand, one valve, bottom temperature 64° F. U. S. N. Mus. 96,256.

This is probably the largest species of the genus.

**TELEODESMACEA.**

(DIOGENODONTA).

**Astartacea.***Astartidae.***ASTARTE** SOWERBY.**Astarte longirostra** OREIGNY.

Falkland Islands, Orbigny, Straits of Magellan, U. S. S. "Albatross," at station 2778, in 61 fathoms, bottom temperature 48° F. U. S. N. Mus. 110, 711. Elsewhere in depths as little as 20 fathoms, but rare apparently everywhere.

The variations of this shell are considerable. Orbigny figured one with exceptionally long umbones, and the more common mutation with shorter beaks has received the name of *A. magellanica* from E. A. Smith.

**Cyrenacea.****CORNEOCYCLAS** FERUSSAC.

*Corneocyclas* Ferussac, *ex parte*, Dict. Sci. Nat., 1818, **12**, p. 278; Dall, Trans. Wagner Inst. Sci., 1903, **3**, p. 1459.

*Pisidium* C. Pfeiffer, Naturg. Conch., 1821, **1**, p. 123.

**Corneocyclas magellanicus** DALL, n. sp.

Shell small, whitish, with an olivaceous smooth periostracum, low, wide beaks, and polished surface with faint concentric indications of three or four resting stages; form inequilateral, anterior end shorter, bluntly subtruncate; base evenly rounded; posterior end slightly attenuated and rounded; external sculpture of faint incremental lines, chiefly obsolete between the resting stages; interior smooth, white; hinge of right valve with a single feeble horizontal tooth directly under the beak, and two well-developed lateral teeth rather distant from the beak, the posterior lateral stronger. Length of shell, 3.5; of posterior end of shell, 1.8; height, 2.5; diameter (of both valves), 2.0 mm.

U. S. S. "Albatross," station 2778, in Magellan Straits, in 61 fathoms; one right valve.

A single right valve, evidently washed into the sea from some stream, was obtained as above. As no species of this genus has been reported from this region I have thought it best to put it on record. The beak is not in any way differentiated or set off from the general surface of the shell.

**Carditacea.***Carditidae.***VENERICARDIA LAMARCK.**

## CYCLOCARDIA CONRAD.

**Venericardia (Cyclocardia) velutina SMITH.**

*Cardita (Actinobolus) velutinus* Smith, P. Z. S. Lond., 1881, p. 42, pl. 5, fig. 8.

*Venericardia (Cyclocardia) velutina* Dall, Proc. Acad. Nat. Sci. Phila., Jan., 1903, p. 708.

U. S. S. "Albatross," station 2780, Magellan Strait, in 369 fathoms, mud, temperature 47° F. U. S. N. Mus. 96,239. Also at various localities on the west coast of Southern Chile and in the straits in 17 to 77 fathoms, rather common.

**CARDITA (BRUGUIÈRE) LAMARCK.**

## GLANS MEGERLE.

**Cardita (Glans) sulcosa DALL.**

## Plate 6, figure 2.

*Cardita (Glans) sulcosa* Dall, Proc. Acad. Nat. Sci. Phila., 1903, pp. 707, 715.

U. S. S. "Albatross," station 2798, in Panama Bay, in 18 to 30 fathoms. U. S. N. Mus. 96,278. Also at station 2799 in 29½ fathoms.

A small quadrate species, with a deep sulcus in the posterior margin, and variegated color pattern of dark brown, red-brown, and white.

**Leptonacea.***Kelliellidae.***ALIGENA H. C. LEA.**

*Aligena* H. C. Lea, Trans. Amer. Phil. Soc., 1845, ser. 2, 9, p. 238; type, *A. striata* Lea, *op. cit.*, pl. 34, fig. 13; Dall, Trans. Wagner Inst. Sci., 1900, 3, p. 1175.

This genus in the eastern United States extends from the later Oligocene to the recent fauna. *Spaniodon* Reuss, 1867, from the Miocene of Galicia, should be compared with *Aligena*.

**Aligena borniana** DALL, n. sp.

Plate 10, figure 2.

Shell small, thin, white, subquadrate with a slight mesial contraction, the periostracum pale straw color, silky, microscopically concentrically closely striate; beaks low, posterior, prodissococonch distinct, minute, rounded; subsequent surface minutely concentrically sculptured; anterior end longer, wider, evenly rounded; posterior shorter, more rapidly descending and blunter; base nearly straight with a slight mesial inward curve; surface of the disk marked with minute, hardly visible, vermiculate, radial markings; interior, milk-white porcellanous, scars hardly visible; hinge edentulous, hinge line discontinuous below the beak, with a short, delicate, yellow-brown, narrow resilium, wholly internal. Lon. 14.2; of beak behind anterior end, 8.5; alt. 10.5; diam. 7.0 mm.

U. S. S. "Albatross," station 4732, Pacific Ocean, in South lat. 16° 32', and West long. 119° 59' in 2012 fathoms, globigerina ooze, bottom temperature 34° 8 F. U. S. N. Mus. 110,585.

This shell has very much the form of *Bornia*, but the hinge of *Aligena*. It is clearly distinct from any species of the group yet described.

**Aligena pisum** DALL, n. sp.

Shell very small, smooth, with a prominent, narrow, slightly prosogyrate umbo; valves suborbicular, feebly incrementally striated, covered with a pale periostracum which has a certain pearly lustre; there is no escutcheon or lunule, the margin is smooth and entire; ligament internal, opisthodontic, rather long; hinge line infolded under the beak with, in the left valve, a single obscure tooth or nodular prominence; pallial line entire. Length of shell, 2.5; alt. 2.7; diam. about 1.5 mm.

U. S. S. "Albatross," station 2778, Magellan Strait, in 61 fathoms, mud, bottom temperature 48° F. U. S. N. Mus. 110,715.

A single left valve of this minute species was obtained.

*Leptonidae.***ROCHEFORTIA** VÉLAIN.

(*Tellimya* H. and A. Adams and Carpenter, *Mysella* Angas, not *Tellimya* Brown. 1827.)

**Rochefortia mabiliei** DALL, n. sp.

Shell small, smooth, inequilateral, oblique, rather inflated; surface with faint lines of growth and obscure indications of one or two resting stages; the

anterior end short and roundly pointed; the posterior longer, obliquely produced, rounded; resilium subumbonal, short, internal, left valve with two strong divaricating cardinal lamellae, one on each side of the resilium, rather short and prominent; right valve with the margins so produced as to enclose the opposite pair; interior of valve polished, with a yellowish flush; margin entire and also the pallial line. Longest dimension, 2.2; width at right angles, 1.7; diameter, 1.4 mm.

Dredged with the preceding species in Magellan Strait. U. S. N. Mus. 110,714.

A small but rather solid and characteristic little species. It is named in honor of the senior author of the Mollusks of Cape Horn.

### **Rochefortia rochebrunei** DALL, n. sp.

Plate 17, figure 5.

Shell small, subquadrate, compressed, white, inequilateral, with low, rather anterior beaks, and a pale yellowish periostracum; anterior dorsal margin straight, sloping, anterior end rounded, basal margin nearly straight; posterior dorsal margin slightly convexly arcuate, near the end obliquely descending to a rounded point; outer surface somewhat irregularly concentrically striated; interior polished; resilium subumbonal, internal, with on each side of it a diverging lamella, stronger in the left valve. Length, about 4.5; height, 3.7; anterior end, 1.5; diam. 1.5 mm.

Dredged in Magellan Straits with the two preceding species. U. S. N. Mus. 110,713.

This species is named in honor of the junior author of the Mollusks of Cape Horn.

(CYCLODONTA)

**Cardiacea.**

*Cardiidae.*

**PROTOCARDIA** BEYRICH.

This genus, of Mesozoic origin, is not sparsely represented in the recent fauna of the deep sea, and some of the most lovely of molluscan gems of the ocean are found among these species. But the extremely fragile spinose ornamentation of the posterior area is almost always wanting, as a touch is enough to detach it even from the living shell.

**Protocardia panamensis** DALL, n. sp.

Plate 18, figure 1.

Shell small, very pale brown or dirty cream color, equivalve, subequilateral, plump, with elevated subprosoceolous beaks and a narrow thin ligament; sculpture, except on the posterior area, of small, flat, subequal radial ribs with narrower channelled interspaces crossed by numerous small, equal, and equally spaced concentric lamellae which do not rise above the ribs and are confined to the interspaces; on the average there are about thirty-three of the ribs with a smooth cordate lunular space in front of the beaks; the posterior area begins with a rib bearing minute spinules which are usually lost, leaving merely traces of their presence, behind this 21-23 similar ribs, narrower and slightly more elevated than those on the disk, with wider interspaces crossed by thinner and sharper concentric lamellae than on the disk; three or four of these interspaces instead of lamellae have minute, widely spaced spinules easily and usually lost, at the rate of about one spinule to four lamellae; these rows of spinules are not uniformly distributed on different individuals; a broad, smooth swollen fold borders the posterior hinge line; hinge normal, strong; interior polished, whitish; margin sharply serrate by the sculpture; the posterior area covers about one-fourth of the disk. Lon. 13.5; alt. 13.5; diam. 9.0 mm.

U. S. S. "Albatross," station 3355, Gulf of Panama, in 182 fathoms, mud, bottom temperature 54°.1 F. U. S. N. Mus. 122,928.

A rather simple and uninteresting little species with no particularly salient characters.

**Isocardiacea.***Vesicomycidae.***VESICOMYA** DALL.

? *Callocardia* (A. Adams, 1864) E. A. Smith, Chall. Rep., Lam., 1885, p. 157.

*Vesicomya* Dall, Bull. Mus. Comp. Zool., 1886, 12, p. 272; 1889, 18, p. 439. Type,

*Callocardia* (?) *atlantica* Smith, *op. cit.*, pl. 6, fig. 8.

*Callocardia* (subgenus *Vesicomya*) Dall, Proc. U. S. Nat. Mus., 1895, 17, p. 693; 1896, 18, p. 17.

The unusual character of the gill-filaments in this genus, as displayed in *V. stearnsii*, rendered it necessary to separate it from association with the Isocardiacea, and an investigation into the nomenclature of *Callocardia* Adams showed that the type really belongs to the Veneridae. The subgenus of 1889 was elevated to the rank of a genus in 1895 (Trans. Wagner Inst., 3, p. 551) under the name of *Callocardia*, though the true relations of *Vesicomya* were still regarded as doubtful. Finally further study and more material showed the relationship of the original *Vesicomya* and the so-called *Callocardia*, rendering it necessary to unite

them under the former name, while the genus of Veneridae was relegated to its proper family.

The shells of this family appear to be rather characteristic of the abysses, but unfortunately very few specimens of the larger forms have yet been obtained in the living state, and it is not yet certain that all the species belong to a single genus. In the typical forms the pallial line, while entire, joins the posterior adductor scar proximally, so that there is a small triangular space below the scar which in most unisinate bivalves would have been included in the area surrounded by the pallial line.

### *Vesicomya lepta* DALL.

Plate 18, figures 13, 14.

*Callocardia lepta* Dall, Proc. U. S. Nat. Mus., 1896, 18, p. 17.

Shell large, thin, earthy, white, compressed, with an olivaceous or yellowish, deliquescent epidermis, with concentric wrinkles and projecting laminae, which in the young are somewhat regularly spaced and distant, in the adult crowded and irregular; beaks small, low, not conspicuous, moderately inflated; valves evenly arcuate below, rounded at both extremities, the anterior shorter and less high than the posterior; lunule narrow, long, bounded by an incised line; ligament external, long, set in a groove, with the escutcheon narrow, its edges elevated above the dorsal margins of the valves and obtusely keeled, extending backward one half longer than the length of the ligament; interior smooth, or slightly radially striate, margins flattish, smooth; anterior adductor scar narrow, posterior wider, the pallial line joining it in front of its posterior edge, producing an indentation, though not a sinus, of the pallial line; hinge narrow; teeth small, compressed, three (more or less obscure) in each valve; in the right a long, strong anterior lamella, extending most of the way between the umbo and the adductor scar, with a socket around its posterior end; above this a short, small, thin lamina, joined around the socket with a thicker lamina, obscurely wavy and extended backward; in the left valve a stout subtriangular central, joined to a thin, short, anterior lamina, with a socket under it; a short, obscure, radial tooth behind the central one; no lateral teeth in either valve, and the cardinals, as usual in this group, somewhat variable, obscure, or ill-defined. Height of shell, 40; length, 58; diam. 23 mm.; the vertical of the beaks 17 mm. behind the anterior end of the shell.

U. S. S. "Albatross," station 3009, in the Gulf of California, off Concepcion Bay, in 857 fathoms, mud, temperature 38° F. U. S. N. Mus. 126,751. Also specimens from station 3346, off Tillamook, Oregon, in 786 fathoms, mud, temperature 37° 3 F.

This large, rather compressed species has somewhat the outline of the Indo-Pacific *Paphia*. The specimen figured was immature, but the magnified figure exactly represents the larger adult shell.

**Vesicomya ovalis** DALL.

*Callocardia ovalis* Dall, Proc. U. S. Nat. Mus., 1896, **18**, p. 18.

Shell resembling the *V. lepta* Dall, but smaller, more oval, the posterior dorsal border more arched, the proportional inflation greater, the lunule wider, the ligament proportionally and actually longer, the epidermis more adherent and without projecting fringes or lamellae; internally the teeth are smaller and more feeble, and the pallial line recedes less at the posterior adductor scar. Height, 26; length, 36; diam. 16 mm.; the vertical of the beaks 8 mm. behind the anterior end of the shell.

U. S. S. "Albatross," station 3360, in the Gulf of Panama, in 1672 fathoms, sand; temperature 36°.4 F. U. S. N. Mus. 106,898.

**Vesicomya donacia** DALL, n. sp.

Plate 17, figures 9, 13.

Shell swollen, cuneate, inequilateral, chalky white, covered with a pale olivaceous periostracum, finely concentrically striated; beaks high, inflated, markedly prosocoelous with a broadly cordate lunular space circumscribed by a strongly impressed line; ligament long, black, on a thin lamellar nymph; anterior end rounded, attenuated, short; posterior end longer, attenuated, slightly arcuate and obscurely rostrate; hinge line and base subequally arcuate; hinge in the left valve with two undifferentiated cardinal teeth almost parallel with the hinge line above them, from which they are separated by a shallow, widely V-shaped socket for the tooth of the right valve; under the nymph, and of about equal length, the hinge line shows an elongated narrow ridge, simulating a pseudolateral tooth; interior dull white, yellowish in the middle of the disk; margins and pallial line entire; the muscular scars distinct. Lon. 22; alt. 16.5; semi-diameter (left valve), 7.0 mm.

U. S. S. "Albatross," station 3392, Gulf of Panama, in 1270 fathoms, hard bottom, temperature 36°.4 F. U. S. N. Mus. 122,929.

Only one left valve was obtained, but the form is sufficiently unlike the other species to be readily recognizable.

**Vesicomya stearnsii** DALL.

*Callocardia stearnsii* Dall, Proc. U. S. Nat. Mus., 1895, **17**, p. 693, figs. 1A, 1B; 1896, **18**, p. 17.

U. S. S. "Albatross," station 3346, off Tillamook, Oregon, in 786 fathoms, mud, bottom temperature 37°.3 F. Also at station 3010, Gulf of California, in 1005 fathoms, mud, temperature 37°.6 F.

The species has much resemblance to *V. venusta* Dall, from the Atlantic, but

is larger, less inflated, the anterior end higher, the base more rounded, the posterior end more angular and proportionally longer.

The preceding species are all of a generally suboval form with convexly arcuate base, and with the hinge teeth compressed dorsoventrally, so as to seem almost parallel with the hinge plate. A single enormous form, known as yet only by dead valves, differs so much from the others, not only in size but general aspect, while retaining essentially all the fundamental characters of the genus, that it seems best to give it a sectional name to itself.

#### ARCHIVESICA DALL, nov.

Shell inflatedly modioliform, mesially slightly constricted, with the hinge plate short and broad and the hinge teeth radially disposed; lunule not circumscribed by an impressed line; pallial line without a sinus, but descending nearly vertically from the middle of the posterior adductor scar. Type, *Vesicomya gigas* Dall, Gulf of California.

#### *Vesicomya (archivesica) gigas* DALL.

Plate 16, figure 9.

*Callocardia gigas* Dall, Proc. U. S. Nat. Mus., 1896, 18, no. 1034, p. 18.

Shell large, rather thin, inflated, with a thin, wrinkled, olivaceous epidermis over an earthy, concentrically, irregularly striated surface; beaks low, inconspicuous; lunule and escutcheon somewhat impressed, but not limited by any distinct line; valves elongated, recalling the shape of *Modiola capax* Conrad, in a general way; the anterior side shorter and less high, the base impressed in the middle, more expanded in front and behind; dorsal margin rather evenly arched; both ends rounded; internally dentition strong, like that of *C. lepta*, but more distinctly developed; ligament short (about 20 mm.), set in a groove; interior of valve somewhat radially striate; posterior adductor scar somewhat larger, the pallial line set in below it, somewhat irregular but not forming a distinct angular sinus; margins of valve thin, smooth. Height, 63; length, 110; diam. 50 mm.; vertical of the beaks, 24 mm. behind the anterior end of the shell.

U. S. S. "Albatross," station 3009, off Concepcion Bay, in the Gulf of California, in 857 fathoms, mud, temperature 38° F. U. S. N. Mus. 110,557.

This relatively enormous shell was obtained only as a number of fresh valves without the soft parts, but from the shell characters it can hardly be anything but a giant *Vesicomya*.

#### *Callogonia* DALL.

*Callogonia* Dall, Bull. Mus. Comp. Zool., 1889, 18, p. 440; type, *C. leeana* Dall, l. c., from off Tobago, West Indies, in 880 fathoms. Proc. U. S. Nat. Mus., 1896, 18, p. 19.

This group differs from the typical *Vesicomya* chiefly by the possession of a distinct angular pallial sinus. The hinge and other characters in essentials are the same, but we may suppose, in the absence of any positive knowledge of the animal, that this indicates longer siphons than in such species as *V. stearnsii*, where they are known to be complete and papillose, longer than in *Isocardia*, but still quite short.

***Vesicomya (Callogonia) angulata* DALL.**

Plate 6, figure 12.

*Callogonia angulata* Dall, Proc. U. S. Nat. Mus., 1896, 18, p. 19.

Shell elongate, moderately inflated, the surface as in the other species; the anterior end rounded, shorter; the posterior end produced, pointed; ligament short, set in a groove; the posterior dorsal border marked by two obscure ridges radiating from the beak, the outer one of which terminates at the posterior extreme of the valve, angulating the margin; the epidermis is denser and lamellose in the interspaces between these ridges; lunule obscure; basal margin nearly straight, rounded up toward the ends; beaks low, anterior; interior white, with some radial striae; hinge narrow; right valve with two low cardinals coalescent above, and a third, higher, springing between them; pallial line distinct, with an angular, rather short sinus. Height, 35; length, 58; semidiameter, 10 mm.; the vertical of the beaks, 18 mm. behind the posterior end of the shell.

U. S. S. "Albatross," station 3392, in the Gulf of Panama, in 1270 fathoms, hard bottom, temperature 36°.4. U. S. N. Mus. 122,933. Also (fragments) at station 3360, in 1672 fathoms, sand, temperature 36°.4 F.

A single right valve of this distinct species was collected as above, and differs from *Vesicomya* especially by its angular pallial sinus.

(TELEODONTA)

**Tellinacea.**

*Tellinidae.*

**TELLINA (L.) LAMARCK.**

**Arcopagia** LEACH.

PHYLLODINA DALL.

***Tellina (Phyllodina) fluctigera* DALL, n. sp.**

Shell solid, elongate-ovate, nearly equilateral, of a yellowish white color; beaks low and flattish; anterior dorsal slope gentle, straight; anterior end

rounded, base gently and evenly arcuate; in the left valve a long, narrow, and deeply impressed lunule; posterior dorsal slope convexly arcuate, near the posterior end obliquely truncate, bluntly pointed below; a long, narrow ligament on a well-developed nymph lies in the furrow of a narrow, excavated escutcheon, twice as long as the ligament; disk polished, sculptured with numerous (about two to a millimeter), elevated, regularly spaced concentric lamellae, which are flattened down near the middle of the disk but more erect and crowded toward the ends of the shell; in the left valve a shallow channel extends from the umbo to the posterior basal angle of the shell; above the channel is a faint ridge, beyond which the concentric lamellae, near the dorsal margin, break up into short waves or segments which become more distant and elevated at the verge of the escutcheon; interior polished, hinge line narrow, with three small cardinals, of which the anterior pair are closely adjacent; the margin under the lunule with a projecting angle distally; pallial sinus obliquely ascending, large, subangular, extending in front of the beaks on a level with the anterior adductor scar, entirely free from the pallial line below. Lon. of shell, 32; of part behind the beaks, 19; alt. 20; diam. of left valve, 4.5 mm.

U. S. S. "Albatross," station 3355, in the Gulf of Panama, in 182 fathoms, mud, bottom temperature 54°.1 F. U. S. N. Mus. 122,935.

The only other species of this group known from the region is *T. (P.) pristi-phora* Dall, which cannot be confounded with the present shell, of which, unfortunately, only one left valve was obtained.

### Moerella FISCHER.

(*Moera* Adams, not of Leach; *Maera* Adams, not of Leach; *Donacilla* Gray, not of Lamarck.)

### *Tellina (Moerella) chrysogona* DALL, n. sp.

Plate 10, figures 4, 8.

Shell small, solid, subtriangular, equivalve, inequilateral, polished, bright yellow fading into white about the margins; beaks smooth, pointed, rather small, with a strong opisthodontic external ligament; about a third of the disk near the beaks smooth, the remainder gradually developing regular, concentric, gradually more adjacent incised lines, and flattish interspaces, which on the posterior dorsal area are close-set, more elevated and conspicuous; anterior slope arcuate, longer, posterior shorter, more direct; anterior end broadly rounded, posterior bluntly pointed and bent to the right; base evenly arcuate; interior smooth, the centre of the disk an intense yellow; scars distinct, pallial line coincident with the lower half of the sinus, the bight of the sinus almost reaching the anterior adductor scar in both valves; hinge normal, two strong laterals in the right valve. Lon. of shell, 13; of beaks behind the anterior end, 5; alt. 10; diam. 5 mm.

U. S. S. "Albatross," station 4642, Galapagos Islands, four miles S. 41° E. from Ripple Point, Hood Island, in 300 fathoms, broken shell, bottom temperature 48° 6 F. U. S. N. Mus. 110,581.

This very distinct little species has an unusually lively color for a shell from such a depth.

### **Angulus** MEGERLE.

#### **Tellina (Angulus) carpenteri** DALL.

*Tellina (Angulus) variegata* Carpenter, 1864, not *Tellina (Angulus) variegata* Gmelin, 1791.

*Tellina (Angulus) carpenteri* Dall, Proc. U. S. Nat. Mus., 1900, 23, p. 303.

U. S. S. "Albatross," station 3355, Gulf of Panama, in 182 fathoms, mud, bottom temperature, 54° 1 F. U. S. N. Mus. 122,934.

It was most unexpected to find this species, common in shallow water on the coast of California, so far south, but it must be observed that the temperature of the water at the depth stated above, in 182 fathoms, is almost exactly that of the shallow waters of Alta California. Though only a single valve was obtained, the identity of the Panama specimen is not doubtful.

### **MACOMA** LEACH.

#### **Macoma inornata** HANLEY.

*Tellina inornata* Hanley, P. Z. S. London, 1844, p. 144; Thes. Conch., 1847, 1, *Tellina*, p. 315, pl. 59, fig. 123. (Not *Tellina inornata* Hupé in Gay, Hist. de Chile, 1854, 8, p. 356, pl. 8, fig. 2.)

Tomé, Chile, brought up by the anchor of the "Albatross," from about 14 fathoms; young valves. U. S. N. Mus. 110,717.

The shell figured by Hupé under the name of *T. inornata* is clearly distinct from that originally so named by Hanley, being an entirely different and much more triangular shape. As the former does not appear to have been described, I propose for it the name of *Macoma hupeana*. It recalls *M. inquinata* Deshayes, but is even shorter, higher, and more triangular.

### **Psammacoma** DALL.

#### **Macoma (Psammacoma) hesperus** DALL, n. sp.

Shell yellowish white with occasional brownish, narrow, concentric zones and a pale yellowish flush internally; valves inequilateral, the posterior end shorter, the profile being an elongate oval; beak low, rather pointed, small; anterior dorsal margin nearly straight, gently descending, the anterior end evenly rounded into

the slightly arcuate base; posterior dorsal margin straight, more rapidly descending, the posterior end with a narrow, oblique truncation, slightly angular below; surface sculptured with close, minute, concentric lines giving it a silky lustre, and with occasional stronger sulci, indicating resting stages; above the posterior angle the lines are coarser and more elevated, and near the margins are traces of a thin, brownish periostracum; on the disk are also traces of opaque, fine radiating lines, but these do not seem to be reflected in the sculpture; hinge line narrow, within the left valve three small cardinals, the anterior pair closely adjacent, the other more distant; inner surface polished, pallial sinus large, ovate, horizontal, extending in front of the middle of the shell, only slightly coincident with the pallial line below. Lon. of shell, 34; of posterior end, 13; alt. 22; diam. of left valve, 5 mm.

U. S. S. "Albatross," station 2355, Gulf of Panama, in 182 fathoms, mud, bottom temperature 54°.1 F. U. S. N. Mus. 122,936.

Only a single left valve was obtained. The most nearly related species is *M. (Psammotreta) aurora* Hanley, which has a different hinge, and is a broader shell.

### *Semelidae.*

#### **CUMINGIA** SOWERBY.

#### **Cumingia mutica** SOWERBY.

At Tomé, Chile, from the mud upon the anchor, were obtained some fragments and small specimens of a *Cumingia* which are probably the young of *C. mutica*.

#### (ASTHENODONTA)

### **Myacea.**

### *Myacidae.*

#### **SPHENIA** TURTON.

The distinction between this genus and *Mya* is extremely slight. It has proportionately shorter siphons, and the species recognized are all of small size, but it seems impracticable to discover other differences and I am strongly tempted to relegate it to *Mya* as a subgenus.

#### **Sphenia subequalis** DALL, n. sp.

Shell small, inequilateral, compressed, bluntly rounded at both ends, covered by a yellowish periostracum; beaks low, nearly median, being 3.25 mm. from the

anterior, and 3.75 mm. from the posterior end; surface irregularly concentrically ridged, a line from the beaks to the lower posterior angle sets off a subtriangular space on which the periostracum is slightly rougher and darker than on the rest of the shell; posterior end slightly gaping; interior white, polished; left valve with a prominent chondrophore, the anterior ridge upon which is unusually strong; the chondrophore is arcuate somewhat obliquely downward; the pallial sinus is large, rounded, and reaches forward in a vertical sense about to the posterior end of the chondrophoric ridge alluded to. Lon. of shell, 7; alt. 4; diam. of left valve, 1 mm.

U. S. S. "Albatross," station 2779, in Magellan Straits, in about 20 fathoms, gravel, one left valve. U. S. N. Mus. 110,719.

No species of the genus has hitherto been reported from the Magellanic region, and so this solitary valve has a certain interest. It is more nearly equilateral than any of the other species.

*f. Sinatcheri* Pils. 1899  
*Jan. 1899, Cape Vail*  
*Corbulidae.*

### CORBULA (BRUGUIÈRE) LAMARCK.

#### CUNEOCORBULA COSSMANN.

#### *Corbula* (*Cuneocorbula*) *ira* DALL, n. sp.

Shell of moderate size, solid, short and high, whitish covered by a chestnut brown periostracum; valves inequilateral, the posterior end longer, nearly equilateral, the right valve smaller; disk uniformly sculptured with narrow concentric channels, separated by wider, rounded but not cordlike ridges, about two to a millimeter; beaks high, prominent; anterior slope 45°, short, the anterior end attenuated and rounded; base arcuate; posterior end acute, its dorsal slope formed by a wide truncation, bounded by a sharp angle outwardly; within, close to the dorsal margin, is a feeble rounded ridge on each valve, ending distally in an obtuse angle; between the outer and inner ridges the area is slightly concave and concentrically threaded; in front of the beaks there is a small depressed space but no circumscribed lunule; basal margin, with regard to a vertical longitudinal plane, slightly flexuous; left valve edentulous with a small triangular cartilage pit; right valve with a small recurved tooth in front of the pit; interior smooth, yellowish white; pallial line truncate behind but with no sinus; margins entire. Lon. of shell, 11.5; of anterior end, 3.2; alt. 7.5; diam. 6.0 mm.

U. S. S. "Albatross," station 3355, Gulf of Panama, in 182 fathoms, mud, bottom temperature 54° F. U. S. N. Mus. 122,944.

This species is unlike any of those from shallow water in the Panama region, and somewhat resembles *C. knoxiana* Adams, from Jamaica, which is more elongate and has three instead of two ridges on its posterior area.

*Saxicavidae.***SAXICAVA FLEURIAU DE BELLEVUE.****Saxicava antarctica PHILIPPI.**

*Saxicava antarctica* Philippi, Arch. f. Naturg. 1845, p. 51; E. A. Smith, P. Z. S. Lond., 1881, p. 40; Mabile et Rochebrune, Miss. Cap Horn, Zool., 1889 Moll., 6, p. H 102.

*Saxicava chilensis* Hupé, in Gay, Hist. de Chile, Zool., 1854, Moll., 8, p. 379, pl. 8, fig. 7.

*Saxicava frigida* Mabile et Rochebrune, Miss. Cap Horn, Zool., 1889, 6, p. H 101.

*Saxicava lebruni* Mabile et Rochebrune, *op. cit.*, p. H 101.

*Saxicava mollis* Mabile et Rochebrune, *op. cit.*, p. H 102.

U. S. S. "Albatross," station 2780, Straits of Magellan, in 369 fathoms, mud, bottom temperature 47° F. U. S. N. Mus. 96,248. Chonos Id., Philippi; Straits of Magellan at Punta Arenas, and Orange Harbor, New Year Sound and Cape Horn, Mabile; Calbuco, Chile, Hupé.

The genuine and unmistakable *Saxicava arctica* is found at Cape Delgado and Spiring Bay, in Eastern Patagonia, by the evidence of the "Albatross" dredgings. There would therefore be nothing improbable in the extension of its range to the straits and even northward on the other, western coast. I have seen only young specimens, and so can hardly express an opinion as to the validity of Philippi's species, since the similarity of the young is common to many distinct species. I agree with Mr. E. A. Smith in thinking them undistinguishable so far as any material I have seen furnishes evidence. Messrs. Mabile and Rochebrune give no evidence for the validity of their nominally new species. Their diagnoses are without differential or any other characters of consequence, and no figures are furnished. Their species cannot be said to be adequately or recognizably described; I have no doubt of their identity with *S. antarctica* and very little of the identity of that so-called species with *Saxicava arctica* (+ *rugosa*) of the northern hemisphere.

**Adesmacea.***Pholadidae.*

## PHOLADINAE.

**XYLOPHAGA TURTON.**

*Xylophaga* Turton, Dithyra Brit., 1822, p. 527; type, *X. dorsalis* Turton; not *Xylophagus* Meuschen, 1788.

*Xylotomea* Dall, Trans. Wagner Inst., 1898, 3, p. 821.

If the name *Xylophaga* be rejected on account of the existence of the ancient synonym *Xylophagus*, a practise which the writer emphatically disapproves, the name *Xylotomea* may take its place as above indicated.

**Xylophaga mexicana** DALL, n. sp.

Shell small, short, posterior area rounded behind, concentrically marked only with incremental lines; median furrow wide, channelled, in the adult bounded behind by a flattened thread, in front the elevated margin of the channel is obliquely serrate by the terminations of the sagittate sculpture of the anterior area, which a little more anteriorly becomes very fine, so as to require strong magnification to bring out its character; anterior margin of the valves with a rectangular sulcus, from whose apex an impressed line proceeds to the umbo, the angulation of the sculpture resting on this line; anterior auriculation small; anterior dorsal margin strongly reflected; interior smooth except for a strong flattish rib which extends from the umbo under the middle of the wider external channel; umbo much incurved; myophore small and slender. Alt. 4.2; lon. 5.2; diam. about 4.0 mm.

U. S. S. "Albatross," station 3422, off Acapulco, Mexico, in 141 fathoms, mud, bottom temperature 53.5.

Two right valves were dredged as above.

## JOUANNETINAE.

**PHOLADIDEA** TURTON.**Pholadidea (Penitella) minuscula** DALL, n. sp.

Shell extremely small, white, subequivalve, with rounded, reflected processes behind, that on the right valve slightly more concave and larger; posterior area sculptured only with incremental lines medial, sulcus shallow; anterior area sculptured with doubly arcuate paired elevated lines, more distant near the sulcus and more crowded anteriorly; these are angulate at a point corresponding to the anterior marginal sulcus, and crossed by sharply incised striae which break them up more or less into segments, especially in front; anterior dorsal margin recurved, with quite a space under the reflection in front of the umbo; mesoplax single, small, elongate; protoplax cordate, small, single; in the adult the callum completely closes the anterior hiatus. Lon. 4.0; alt. 2.5; diam. 2.5 mm.

Boring in the corky envelop of a large seed, dredged by the U. S. S. "Albatross," at station 3392, Gulf of Panama, in 1270 fathoms, hard bottom, temperature 36°.4 F.

That the species is adult is evident, because the anterior hiatus is completely closed by a well-calcified callum. It is perhaps the most minute adult pholad yet reported.

*Teredinidae.***TEREDO** LINNÉ.? **Teredo**, sp. indet.

A tube, belonging to *Teredo* or *Xylotrya*, was dredged by the "Albatross," at station 3393, Gulf of Panama, in 1020 fathoms; but it may have sunk from decayed driftwood disintegrating at the surface of the sea.

## ANOMALODESMACEA.

**Anatinacea.**

(A. EUSIPHONIA.)

*Periplomatidae.***PERIPLOMA** SCHUMACHER.**Periploma carpenteri** DALL.

Plate 16, figure 8.

*Periploma carpenteri* Dall, Proc. U. S. Nat. Mus., 1896, **18**, p. 20.

This species is of much the outline of *P. stearnsii* Dall, and is best described by comparison with it. In *P. stearnsii* the shell is somewhat less inflated and the beaks are nearer the posterior end, but nearer the anterior end in *P. carpenteri*; in the latter the surface granules are more crowded and coarser, and not arranged in rows separated by a clear space, as in *P. stearnsii*; the rostrum in *P. carpenteri* is less distinctly marked off from the arch of the base, the epidermis has a more greenish tint, the interior is more pearly, with a larger pallial sinus, and the chondrophore is wider and vertically, not obliquely, directed. The right valve is 10 mm. in diameter, with a height of 39 and a length of 47 mm.

Only one right valve was dredged, in the Gulf of Panama, at the U. S. S. "Albatross" station 3389, in 210 fathoms, mud, bottom temperature 48° 8 F. U. S. N. Mus. 106,891.

This is the third orbicular species from West America.

**Periploma stearnsii** DALL.

Plate 16, figure 5.

*Periploma stearnsii* Dall, Proc. U. S. Nat. Mus., 1896, **18**, p. 19.

Shell suborbicular, thin, whitish, with pale straw-colored epidermis, sculptured with faint concentric irregularities harmonizing with the lines of growth, and by very fine pustules arranged in radiating lines, stronger and more adjacent near and upon the rostrum; beaks not prominent, fissured; left valve slightly less convex than the right; rostrum about two thirds as wide as the shell, not strongly differentiated, but with the epidermis coarser, and, especially on the left valve, more raised and wrinkled, and the basal margin slightly excavated; interior faintly pearly; pallial sinus large, rounded, shallow; chondrophore strong, spoon-shaped, inclined obliquely forward. Length of shell, 46; height, 35.5; diameter of the right valve, 9 mm.; the rostrum, 20 mm. wide, rounded, and moderately gaping; total diam. 18 mm.

U. S. S. "Albatross," station 3034, off Point Fermin, at the head of the Gulf of California, in 24 fathoms, mud, bottom temperature 63°.5 F. U. S. N. Mus. 110,548.

This differs from *P. discus* Stearns, in the radial arrangement and larger size of its surface granules, its wider rostrum, and more compressed form. It needs no comparison with other species.

#### HALISTREPTA DALL.

*Halistrepta* Dall, *Nautilus*, March, 1904, **17**, p. 123; type, *Periploma sulcata* Dall.

#### *Periploma* (*Halistrepta*) *sulcata* DALL.

Plate 15, figure 10.

*Periploma sulcata* Dall, *Nautilus*, March, 1904, **17**, p. 122.

San Pedro, California, on the beach; collected by Mrs. Oldroyd.

I take this opportunity of illustrating this rare, interesting, and unfigured species.

#### *Lyonsiidae*.

#### LYONSIA TURTON.

#### *Lyonsia panamensis* DALL, n. sp.

Plate 18, figure 12.

Shell thin, slightly inequivalve, inequilateral, subquadrate, translucent whitish, with a very thin greenish-gray periostracum; beaks large, full, somewhat anterior, prosogyrate; no lunule or escutcheon; anterior end short, rounded, anterior dorsal slope rapidly descending; posterior dorsal slope more horizontal and longer; posterior end subtruncately rounded; base gently arcuate; surface covered with radiating close lines of granules, of which about every fourth line is more prominent than the others; numerous fine sand grains are adherent to the surface; interior perlaceous, finely radiately striate; scars conspicuous, the anterior larger; pallial sinus wide, shallow; hinge feeble, a single obscure tooth and short nymph in the right valve; ligament feeble, almost internal. Lon. 13.5; beaks behind anterior end, 6.5; alt. 10.0; diam. of right valve, 4.5 mm.

U. S. S. "Albatross," station 4630, Gulf of Panama, Mariato Point N. 70° E. fifty-one miles, in 556 fathoms, sand, bottom temperature 40°.5 F. U. S. N. Mus. 110,584.

Only the right valve was obtained.

*Verticordiidae.***LYONSIELLA** SARRS.**Lyonsiella pacifica** DALL, n. sp.

Shell small, plump, white, subquadrate, microscopically radiately closely granulately striate, covered more or less densely with adherent sand grains and foraminifera; beaks large for the size of the shell, high, prosogyrate with a small cordate impressed area in front of them; anterior end very short, small, posterior longer, wider, rounded; base arcuate, prominent in the middle; no external ligament; surface closely covered with radial rows of extremely minute granules. Lon. 3; alt. 2.7; diam. 1.8 mm.

U. S. S. "Albatross," station 4693, Mid Pacific, northwest point Sala y Gomez Island, bearing N. 82° E., fifteen miles, in 1142 fathoms, gravel, bottom temperature 35° 4 F. U. S. N. Mus. 110,583.

Only a single specimen of this finely granulose species was obtained. In form it is not unlike the much larger *L. papyracea* Smith, figured in the "Challenger" Report, but the sculpture is quite different and the shell is proportionately more compressed. It is impossible to determine whether the specimen is adult or not, but it has a mature aspect.

*Poromyacidae.***POROMYA** FORBES.

*Poromya* Forbes, Aegean Rep. Brit. Assoc., 1844, p. 103; type, *P. anatinoides* Forbes, l. c., = *P. granulata* Nyst (as *Corbula*).

*Embla* Lovén, Ind. Moll. Scand. Occ., 1846, p. 46; type, *E. koreni* Lovén (= *granulata* Nyst).

*Ectorisma* Tate, Trans. Roy. Soc. Austr., 1902, 15, p. 127, pl. 1, fig. 3; Hedley, Proc. Lin. Soc. N. S. Wales, 1906, p. 539; type, *E. granulata* Tate (not of Nyst). Hedley, Rec. Austr. Mus., 1907, 6, p. 302, makes Tate's species probably identical with *Poromya laevis* Smith, of the "Challenger" Report.

**Poromya perla** DALL, n. sp.

## Plate 18, figures 2, 5.

Shell small, globose, exceedingly thin, whitish, subequivalve, subequilateral, with very high swollen, strongly prosocoelous beaks; no lunule or escutcheon, but the posterior hinge margin of the right valve overlaps that of the left, with a single, strong, radial rib near the edge, which does not appear in the opposite valve; anterior margin of the valves evenly rounded into the nearly semicircular base; posterior slope straight; posterior end short, somewhat compressed and

attenuated; surface covered with almost microscopically minute granules arranged in radial lines except where removed by friction; the disk of the shell shows their scars on its otherwise polished surface. Lon. 5.7; alt. 5.3; diam. 4.4 mm.

U. S. S. "Albatross," station 3392, Gulf of Panama, in 1270 fathoms, hard bottom, temperature 36°.4 F. U. S. N. Mus. 122,931.

A single specimen of this minute, thin species was obtained. It is so fragile that it is impracticable to open the valves, so the hinge remains undescribed. The shell has the surface of a *Poromya*; another specimen, apparently identical but larger, measures: lon. 9.5; alt. from the basal margin to hinge line, 7.5; total alt. 9.0; diam. 8.0 mm. In this specimen a single delicate flattened right cardinal fits under the hinge margin of the left valve, while a long posterior lateral lamina in the latter underlies the right posterior hinge margin. These teeth differ from those of the typical *Poromya* in being thin and lamellar, but are similarly located. The second specimen is from the Ecuador coast, in 1132 fathoms, ooze, bottom temperature 36° F. U. S. N. Mus. 122,930.

### **Dermatomya** DALL.

*Dermatomya* Dall, Proc. U. S. Nat. Mus., 1889, 12, pp. 289, 291; type, *P. (D.) mactroides* Dall, l. c. p. 291, pl. 8, figure 8.

### **Poromya (Dermatomya) mactroides** DALL.

U. S. S. "Albatross," station 2781, southern coast of Chile, or western Patagonia, in 348 fathoms, mud, bottom temperature 49°.9 F. Type, figured in 1889, U. S. N. Mus. 122,733. Also at stations 2783, in 122 fathoms, temperature 48°, and 2785, in 449 fathoms, temperature 47° F.

When this species was first described the description and figure were made from the type above referred to, of which the measurements were: lon. 10; alt. 8; and diam. 7 mm. But a larger specimen turning up later, and being supposed to be an adult, the measurements were taken from that specimen which was from the coast of Ecuador. Now better specimens having become available, the large form proves to be distinct, and the measurements taken from it are therefore no longer applicable to *P. mactroides* and should be corrected accordingly, while the locality at station 2793, off the coast of Ecuador, should be expunged entirely so far as *P. mactroides* is concerned. It belongs to the next species.

### **Poromya (Dermatomya) equatorialis** DALL, n. sp.

Plate 5, figures 1, 2.

Shell subtrigonal, inflated, slightly inequivalve, white covered by a strong dark olive-gray periostracum, paler near the basal margin; surface smooth except for

lines of growth, without granulation or surface striation; form as figured; interior bluish white, slightly pearly; ligament and resilium combined, short, set obliquely, internally, under and behind the beaks; there is no lithodesma; hinge comprising one stout cardinal, prominent in the left valve entering a socket in the opposite valve in front of a long, nearly horizontal lamina, which forms the base of the resiliary pit; there is also one strong posterior left lateral, and a feeble anterior one on the same valve, which last is hardly to be distinguished from an angularity of the hinge margin; pallial sinus wide, rounded, rather short. Length of shell, 18; alt. 15; max. diam. 5 + 6.5 mm., the smaller dimension being that of the left valve, which basally fits inside the other and has a slightly tortuous margin behind.

U. S. S. "Albatross," station 3360, Gulf of Panama, in 1672 fathoms, sand, bottom temperature 42° F.; U. S. N. Mus. 122,942. Also at station 2793, off the coast of Ecuador, in 741 fathoms, mud, temperature 38° 4 F.

This species, beside its much greater size, has beaks more inflated and higher, and the posterior end blunter than we find in *P. mactroides*.

#### **Poromya (Dermatomya) chilensis DALL, n. sp.**

Shell small and rather thin, iridescent under a pale yellowish-olive periostracum; valves subequal; inequilateral; anterior end shorter, narrower, rounded; posterior longer, wider, also rounded; beaks inflated but not very high; a single small ridge or angle extends from the beak to the lower posterior end of the shell, forming a posterior dorsal area over which the periostracum is darker and more or less wrinkled; beaks three eighths of the total length from the anterior end; surface smooth and almost polished, except for faint incremental lines; interior pearly, pallial sinus shallow but wide and very distinct; hinge essentially as in the other species, but the cardinal long and slender, and the margins of its socket in the opposite valve prominent, almost like incipient teeth; the laterals are almost obsolete. Length of shell, 8; alt. 7.7; diam. 2.5 + 3.0 mm.

U. S. S. "Albatross," station 2785, off the coast of southern Chile, in 449 fathoms, mud, bottom temperature 47° F. U. S. N. Mus. 97,135.

This species has almost exactly the general form of *Kellia suborbicularis* and is about the size of the average adult *Kellia*. The radial keel and rounded form separate it from the young of the other species.

Another and still larger species than any of the above is found in deep water off the North Pacific Coast in about latitude 50°.

#### **CETOCONCHA DALL.**

*Cetoconcha* Dall, Bull. Mus. Comp. Zool., Sept., 1886, **12**, p. 280; type, *Lyonsia bulla* Dall, Bull. Mus. Comp. Zool., 1889, **18**, p. 452, pl. 39, figs. 2, 5; Trans. Wagner Inst., 1895, **3**, p. 536; Proc. U. S. Nat. Mus., 1889, **12**, p. 289.

*Silenia* E. A. Smith, Challenger Rept., 1885, Lam., p. 75; type, *S. sarsii* Smith (not *Silenia* Mulsant, *Coleoptera*, 1873).

**Cetoconcha smithii** DALL, n. sp.

Plate 18, figure 10.

Shell extremely thin, subequivalve, inequilateral, oval, white, with a very thin, dehiscent, pale brownish periostracum; hinge consisting of a minute obsolete tubercle in the right valve and two small, narrow nymphs bearing a slight, short ligament; beaks low, slightly prosocoelous, situated  $\frac{8}{9}$  of the whole length behind the anterior end; valves evenly convex, polished, with minute radiating lines of microscopic granules which are most apparent near the posterior end, but can be traced over the entire surface; ends of the shell of about equal rotundity, base evenly arcuate, margins entire; interior polished, the muscular scars hardly visible. Lon. 19.0; alt. 14.0; of beaks, 1.5; diam. 11.0 mm. The right posterior hinge margin, bordered by a closely adjacent radial ridge, slightly overlies the margin of the opposite valve along a length of about 7.0 mm.

U. S. S. "Albatross," station 3415, off Acapulco, Mexico, in 1879 fathoms, globigerina ooze, bottom temperature 36° F. U. S. N. Mus. 122,943.

Named in honor of the ever courteous and accomplished Mr. E. A. Smith of the British Museum of Natural History.

**Cetoconcha scapha** DALL.

*Cetoconcha scapha* DALL, Proc. U. S. Nat. Mus., 1902, 24, p. 561; 1903, 26, p. 951, pl. 62, fig. 13.

U. S. S. "Albatross," station 3367, Gulf of Panama, in 100 fathoms, rocky bottom, temperature 57° F. U. S. N. Mus. 109,026.

A single specimen only was obtained. It is smaller, more elongate and arcuate than the *C. smithii*.

*Cuspidariidae.***CUSPIDARIA** NARDO.

Nardo's genus dates from 1840, but ten years earlier Wilton had figured in the Quarterly Philosophical Journal (p. 73) a valve of a fossil bivalve apparently belonging to this genus, to which he gave the generic name Ryderia. Curiously enough, he did not name the species, and the generic name therefore was in the condition of having no named type or species belonging to it, which under the rules would appear to render the name Ryderia futile.

**Cuspidaria** s. s.**Cuspidaria patagonica** SMITH.

*Neaera patagonica* E. A. Smith, Challenger Rept., 1885, Lam., p. 39, pl. 7, fig. 5, 5a-b.

*Cuspidaria patagonica* (anatomy) Dall, Bull. Mus. Comp. Zool., 1889, 18, pp. 443, 447.

Challenger Expedition, Station 305, west coast of Patagonia, in 165 fathoms, mud.

U. S. S. "Albatross," station 2792, off Manta, Ecuador, in 401 fathoms, mud, bottom temperature 43° F. U. S. N. Mus. 95,418. Also at station 2780, 2781, and 2782, southern coast of Chile, in 258 to 369 fathoms, mud, temperatures 47° to 50°; and a broken specimen, probably of this species, at station 3360, in 1672 fathoms, sand, Gulf of Panama, temperature 42° F.

This widely distributed species is somewhat notable for its long, slender, and twisted rostrum, which is smaller in caliber, considering its length, than that of any other of the large species yet made known.

### *Cuspidaria panamensis* DALL, n. sp.

#### Plate 16, figure 2.

Shell large, inflated, rostrate, equivalve, subequilateral, white, covered with a yellowish-brown periostracum, paler toward the middle of the disk; surface sculptured only with lines of growth; rostrum small, short, somewhat recurved, gaping at the extremity; beaks inflated, high, opisthogyrate; lunule none, but a long, lanceolate, impressed, smooth escutcheon, the larger part of which is in the left valve; form as figured; interior white, the hinge as usual; in the right valve the ligamentary nymph (which is distinct from the resiliifer), is so prominent as to appear like a tooth; there is no pallial sinus. Lon. 42; alt. 25; diam. 23 mm. There is a small lithodesma.

U. S. S. "Albatross," station 3394, in the Gulf of Panama, in 511 fathoms, mud, bottom temperature, 41°.8 F. U. S. N. Mus. 122,937.

A large species, not in general unlike *C. glacialis* Sars, but with a smaller, more distinctly defined and proximally constricted rostrum.

### *Cuspidaria (Cardiomya) pseustes* DALL, n. sp.

Shell large for the genus, rostrate, inflated, nearly equivalve, inequilateral, whitish, with a thin, greenish-gray periostracum; beaks rather low, but full, distinct, situated in advance of the middle of the shell, and separated by a long, narrow, longitudinally faintly striated, amphidetic, impressed area, wider behind the beaks; anterior dorsal margin straight, abruptly declining to the rotundity of the anterior end; base evenly arcuate; posterior dorsal slope slightly concavely arcuate as the rostrum recurves a little; end of the rostrum gaping and roundly truncate; surface radially very finely threaded above, crossed by concentric wrinkles of the periostracum; proximal end of the rostrum somewhat constricted; disk radially threaded, the threads rounded, with wider interspaces and occasional more slender intercalary threads; the major threads near the middle of the base are about one millimeter apart; interior whitish, the sculpture reflected by grooves corresponding to the external ridges; hinge normal; interior

of the rostrum corresponding to the dorsal area smooth. Lon. of shell, 27; of posterior end, 16; alt. 17; diam. 15 mm.

U. S. S. "Albatross," station 3392, in the Gulf of Panama, in 1270 fathoms, hard bottom, temperature 36°.4 F.

It is possible that more material may show that this is merely a variety of *C. planetica*, but for the present it seems safer to keep them separate. As in all these species, the basal margins are somewhat flexuous. Measurements have been made for the length of the shell parallel to the hinge line, and the height of the shell is taken at right angles to this length.

### *Cuspidaria (Cardiomya) planetica* DALL, n. sp.

This species has a generally similar aspect to the *C. pseustes* above described and differs in the following particulars: the rostrum is less constricted at the proximal end, so that the whole shell is more attenuated backward; there is not so much distinction between the disk and the rostrum; the impressed area, along the dorsal margin, is smaller and is not amphidetic, but ceases to be defined in front of the beaks; the radial major threads appear stronger and less numerous; the chondrophore or fossette is much less conspicuous and is formed by a small pit in the cavity under and almost behind the hinge margin, while in *pseustes* it is a comparatively large vertically projecting spoon-shaped process; the general form of *C. planetica* is more elongate and the anterior patulous extension is directed forward rather than obliquely downward; lastly *C. planetica* is uniformly smaller. Length of shell, 24; of posterior part behind the beaks, 13; alt. 14; diam. 11 mm.

U. S. S. "Albatross," station 2925, off San Diego, California, in 339 fathoms, mud, bottom temperature 42°.9 F. Types U. S. N. Mus. 110,720. Also at station 3400, east of the Galapagos Islands, in 1322 fathoms, ooze, temperature 36°; station 3059, off Siletz Bay, Oregon, in 77 fathoms, mud, temperature 45°.1; and station 3609, in Bering Sea, southeast of the Pribiloff Islands, in 74 fathoms, mud and sand, bottom temperature 38° F. It has also been collected from deep water, 85 fathoms, in Captain's Harbor, Unalashka, Aleutian Islands. The extreme stations are about 3500 miles apart.

A few specimen stations have been selected to show the immense range of this widely distributed species. It will be noted that it descends from about 80 fathoms in the north to over 1300 fathoms in the tropics, following the sea isotherms, and this I may add without altering its appearance in the least, notwithstanding the immense difference in pressure. Living in these depths near the Galapagos Islands, it would be no surprise to find it anywhere still farther south.

### *Cuspidaria (Luzonia) chilensis* DALL.

*Cuspidaria (Luzonia) chilensis* Dall, Proc. U. S. Nat. Mus., 1889, 12, p. 282, pl. 13, fig. 13.

Shell small, thraciaeform, smooth, polished, greenish white, inequivalve, nearly equilateral, briefly rostrate; right valve larger, convex, rounded in front; beaks small, prominent, slightly incurved; neither lunule nor escutcheon present; posterior end strongly and suddenly compressed, the compressed portion bounded in front by a depressed ray extending from the beak to the posterior basal margin; posterior end short and rounded, somewhat narrower than the anterior; left valve similar but smaller and less convex, at the posterior hinge line underlying the margin of the right valve; hinge with a small roundish projecting chondrophore which extends under the margin of the left valve to which it is united by the resilium; there is no ossiculum; the periostracum is papery and caducous, visible chiefly at the posterior and basal margin. Lon. 6.0; alt. 4.5; diam. 2.7 mm.

U. S. S. "Albatross," station 4654, twenty-four miles N. 68° W. of Aguja Point, Peru, in 1036 fathoms, mud, bottom temperature, 37° 3 F. U. S. N. Mus. 110,582. The original type was obtained on the southwest coast of Chile, at station 2791, in 677 fathoms, mud, bottom temperature, 37° 9 F.

The specimen was badly smashed, but it was possible to determine, that it, in all probability, belonged to this species.

### MYONERA DALL.

#### *Myonera garretti* DALL, n. sp.

##### Plate 5, figure 4.

Shell extremely thin, white, polished, with a pale straw-colored periostracum, of general corbuloid form, and edentulous hinge; valves convex, compressed suddenly behind; anterior part convex, with about fifteen concentric sharp ripples, with much wider interspaces; these ripples start from the anterior margin, on the upper half of the disk, are obsolete on the dome of the valve; near the margin they extend further back, nearly reaching the first radial rib; the remaining concentric sculpture is of fine lines of growth over the whole surface; the radial sculpture consists of, on the left valve, a single strong radial rib extending from beak to basal margin and bounding in front the compressed triangular rostrum; on the right valve there is a weak rib separated by a wide, shallow, excavated channel or trough, from a second strong rib corresponding to that of the opposite valve; there is no lunule or distinct escutcheon, but the pointed, short, posterior, compressed end of the shell is triangular, bluntly rounded off at the extremity, rostrate, and a little flexuous; ligament thin, elongate; resilium short, with a narrow rather long rectangular ossiculum; the interior polished, the scars invisible; margins entire, except a small prominence at the end of the radial ribs. Lon. 13.5; alt. of shell, 11.0; of beaks, 1.5; diam. 9.0 mm.

U. S. S. "Albatross," station 3380, southeast from Malpelo Island, Gulf of Panama, in 899 fathoms, hard bottom, temperature 37° 2 F. U. S. N. Mus. 122,941.

This has a general similarity to *M. bicarinata* Smith and *M. paucistriata* Dall, of the Indian Ocean and Atlantic, but differs in details of sculpture. It is named in honor of the late commander of the "Albatross," who was unfortunately lost overboard during heavy weather, near the Hawaiian Islands.

### Notes on the Littoral Species.

Since the distribution of species upon islands is a matter of interest I add the following lists of littoral or beach shells collected by the "Albatross," party during visits to the islands in the Bay of Panama, to Malpelo and Cocos Islands, Manga Reva in the Paumotu group, and especially to Easter Island, which, from its isolated position as the most eastern outpost of the Polynesian archipelago, is seldom visited, and I believe has never been visited with the purpose of studying the molluscan fauna.

I may add that some slugs collected on the shore at Easter Island and submitted to Dr. H. A. Pilsbry were reported by him to be the ordinary European species, *Limax gagates*, probably introduced in the packing about freight consigned to local traders.

#### SHORE SHELLS FROM PANAMA BAY.

- Conus nux* Broderip. Perico Id.  
*Drillia aterrима* C. B. Adams. Perico Id.  
*Mangilia lineolata* Reeve. Taboguilla Id.  
*Mitra gigantea* Sowerby.  
*Mitra tristis* Broderip.  
*Mitra lens* Wood.  
*Leucozonia cingulata* Lamarck.  
*Latirus ceratus* Wood. Taboguilla Id.  
*Alectrion versicolor* C. B. Adams. Taboguilla Id.  
*Alectrion scabriusculus* Powis.  
*Anachis boivini* Kiener. Perico Id.  
*Anachis varia* Sowerby. Perico Id.  
*Anachis sulcosa* Sowerby. Taboguilla Id.  
*Columbella fuscata* Sowerby. Taboguilla Id.  
*Columbella major* Sowerby. Taboguilla Id.  
*Nitidella cribraria* Lamarck. Taboguilla Id. Perico Id.  
*Engina carbonaria* Reeve. Taboguilla Id. Perico Id.  
*Engina ferruginea* Reeve.  
*Cantharus gemmatus* Reeve. Taboguilla Id.  
*Cantharus sanguinolentus* Duclos. Taboguilla Id.  
*Murex humilis* Broderip. Perico Id.  
*Muricidea dubia* Swainson. Taboguilla Id.  
*Muricidea squamulata* Carpenter.  
*Thais melones* Duclos. Taboguilla Id.  
*Acanthina brevidentata* Gray. Taboguilla Id.

- Siphonium centiquadra* Valenciennes.  
*Turritella goniostoma banksii* Reeve.  
*Cerithium uncinatum* Gmelin. Taboguilla Id.  
*Cerithium stercus-muscarum* Valenciennes. Taboguilla Id.  
*Cerithium maculosum* Kiener. Taboguilla Id.  
*Cerithiopsis neglecta* C. B. Adams. Perico Id.  
*Triforis panamensis* Bartsch.  
*Planaxis planaxis* Wood. Taboguilla Id.  
*Rissoina fortis* C. B. Adams. Perico Id. Taboguilla Id.  
*Crepidula onyx* Sowerby.  
*Cypraea exanthema* Linné.  
*Cypraea punctulata* Gray.  
*Cypraea arabicula* Lamarck.  
*Cypraea (Pustularia) pustula* Swainson.  
*Acmaea fascicularis* Menke. Perico Id. Taboguilla Id.  
*Nerita scabricosta* Lamarck.  
*Nerita bernhardi* Recluz. Perico Id. Taboguilla Id.  
*Chlorostoma inerme* Gmelin.  
*Omphalius reticulatus* Gray.  
*Fissurella mexicana* Sowerby. Taboguilla Id.  
*Fissurella nigropunctata* Sowerby. Taboguilla Id.  
*Chiton stokesii* Broderip. Taboguilla Id.  
*Ischnochiton pectinulatus* Carpenter. Taboguilla Id.  
*Ischnochiton ophioderma* Dall. Perico Id.  
*Callistochiton periconis* Dall. Perico Id.  
*Mytilus multiformis* Carpenter. Taboguilla Id.  
*Myoforceps attenuatus* Deshayes. Perico Id.  
*Melina chemnitziana* Orbigny. Taboguilla Id. Perico Id.  
*Margaritiphora fimbriata* Dunker. Taboguilla Id.  
*Lima angustata* Reeve. Perico Id.  
*Anomia lampe* Gray.  
*Arca mutabilis* Sowerby. Taboguilla Id.  
*Arca illota* Sowerby. Taboguilla Id.  
*Arca alternata* Sowerby. Taboguilla Id.  
*Carditamera affinis* Broderip. Perico Id.  
*Chama buddiana* C. B. Adams. Taboguilla Id.  
*Protothaca grata* Say. Taboguilla Id.  
*Kellia suborbicularis* Montagu. Taboguilla Id.

## SHORE SHELLS FROM COCOS ISLAND.

- Melampus panamensis* C. B. Adams.  
*Siphonaria gigas* Sowerby.  
*Mitra lens* Wood.  
*Latirus tuberculatus* Broderip.  
*Murex humilis* Broderip.  
*Thais melones* Duclos.  
*Thais patula* Linné.

*Thais columellaris* Lamarck.  
*Cerithium maculosum* Kiener.  
*Littorina conspersa* Philippi. Also from Malpelo Island.  
*Planaxis planaxis* Wood.  
*Nerita scabricosta* Lamarck.  
*Chiton stokesii* Broderip.  
*Melina chemnitziana* Orbigny.

## SHELLS COLLECTED ON THE REEFS AND BEACHES OF EASTER ISLAND.

*Melampus philippii* Küster.  
*Smaragdinella viridis* Rang, both brown and green varieties.  
*Conus militaris* Hwass.  
*Mitra (Cylindra) nucea* Gronovius.  
*Columbella lutea* Quoy.  
*Thais nesiotes* Dall (n. sp.).  
*Colubraria (Taeniola) decollata* Sowerby.  
*Pascula citrica* Dall (n. sp.).  
*Vermetus* sp.  
*Triforis* sp.  
*Planaxis mollis* Sowerby.  
*Tectarius pyramidalis* Quoy.  
*Hipponix antiquatus* Linné.  
*Hipponix grayanus* Menke.  
*Hipponix barbatus* Sowerby.  
*Cheilea equestris* Linné.  
*Cypraea caput-draconis* Melvill.  
*Cassis vibex* Linné.  
*Strombus maculatus* Nuttall.  
*Polynices sebae* Souleyet.  
*Eulima cumingi* A. Adams.  
*Janthina communis* Lamarck.  
*Nerita atrata* Reeve.  
*Fissurella* sp. (immature).  
*Pecten (Hinnites ?) pasca* Dall (n. sp.).  
*Lima lima* Linné.  
*Jagonia ramulosa* Gould.  
*Chama broderipii* Reeve.  
*Semele australis* Sowerby.

## SPECIES COLLECTED FROM THE REEFS AND BEACHES OF MANGA REVA ISLAND, PAUMOTU GROUP.

*Conus miliaris* Hwass.  
*Thais hippocastanea* Linné.  
*Rissoina ambigua* Gould.  
*Cypraea moneta* Linné.  
*Cymatium tuberosum* Lamarck.

*Tectarius coronaria* Lamarck.  
*Planaxis lineata* Da Costa.  
*Littorina obesa* Sowerby.  
*Nerita polita* Linné.  
*Nerita plicata* Linné.  
*Lima angustata* Reeve.  
*Pecten (Chlamys) pallium* Linné.  
*Melina costellata* Conrad.  
*Margaritiphora radiata* Pallas.  
*Tridacna intermedia* Stearns.  
*Circe pectinata* Lamarck.

While on the subject of Polynesian faunas I may add the following list from Flint Island, near Tahiti; collected by members of the Smithsonian Solar Eclipse Expedition in charge of Mr. C. G. Abbott, in December, 1907:

*Conus lividus* Hwass.  
*Conus vexillum* Gmelin.  
*Conus miles* Linné.  
*Conus catus* Hwass.  
*Conus hebraeus* Linné.  
*Conus tulipa* Linné.  
*Conus pusillus* Lamarck.  
*Conus archiepiscopus* Bruguière.  
*Vasum ceramicum* Linné.  
*Mitra limbifera* Lamarck.  
*Mitra ambigua* Swainson.  
*Murex adustus* Lamarck.  
*Thais hippocastanea* Lamarck.  
*Ricinula digitata* Lamarck.  
*Ricinula ricinus* Linné.  
*Ricinula horrida* Lamarck.  
*Sistrum morus* Linné.  
*Sistrum cancellatum* Quoy.  
*Iopas sertum* Linné.  
*Vexilla vexillum* Lamarck.  
*Rhizochilus madreporarum* Gould.  
*Cassis rufa* Linné.  
*Cypraea isabella* Linné.  
*Cypraea poraria* Linné.  
*Cypraea cicercula* Linné.  
*Cypraea scurra* Linné.  
*Cypraea arabica* Linné.  
*Cypraea arabicula* Linné.  
*Cypraea moneta* Linné.  
*Cypraea testudinaria* Linné.  
*Cypraea irrorata* Solander.

Bursa cruentata Sowerby.  
 Cymatium aquatile Reeve.  
 Cymatium rubecula Lamarck.  
 Cerithium echinatum Lamarck.  
 Littorina obesa Sowerby.  
 Modulus tectum Gmelin.  
 Cheilea equestris Linné.  
 Nerita plicata Linné.  
 Turbo argyrostomus Linné.  
 Astraea confragosa Gould.  
 Pecten (Chlamys) pallium Linné.  
 Melina costellata Conrad.  
 Arca reeveana Orbigny.  
 Jagonia ramulosa Gould.  
 Tridacna squamosa Lamarck.  
 Trapezium guiniacum Lamarck.

For assistance in identifying the species in the above lists, I am indebted to Mr. W. B. Marshall of the National Museum.

## BRACHIOPODA.

### NEOTREMATA.

#### Discinacea.

#### *Discinidae.*

#### DISCINISCA DALL.

#### DISCINISCA s. s.

#### *Discinisca lamellosa* BRODERIP.

A dead valve was dredged off the Peruvian coast at U. S. S. "Albatross" station 4672, in 2845 fathoms, but it is probable that it was drifted from shallow water, or was disgorged by a fish, as these common species of *Discinisca* are known to live only in very moderate depths.

#### *Discinisca strigata* BRODERIP.

A specimen of this species was obtained on the shore, between tides, on one of the islands of Panama Bay, by the "Albatross," party. The species ranges from the Gulf of California to Peru and has been found at San Diego, California, in the vicinity of the marine railway, where it is believed to have been scraped off the bottom of one of the small vessels which trade in the Gulf of California from San Diego, and which are cleaned there frequently; at all events it has not become acclimated in San Diego harbor.

## PELAGODISCUS DALL, nov. sect.

*Discinisca atlantica* KING.

Collected by the "Challenger" expedition, at station 299, off Valparaiso, in 2160 fathoms, mud, bottom temperature 34° F. U. S. S. "Albatross," station 4709, southwest of the Galapagos Islands, in 2035 fathoms, temperature 35° 3 F.

The typical *Discinisca* has the distal ends of the brachia coiled, but in this widely distributed abyssal form the brachia form two simple loops with no spiral whatever. The lower valve is very thin and fragile; it is almost impossible to detach it from the animal, owing to the hourglass shape and great solidity of the peduncular muscles. It is smooth and without the concentric or radial sculpture found in the shallow-water species. It is also markedly smaller than the upper valve, and the closely adherent lower half of the mantle bears peripherally only short setae, the very long setae with prickly surfaces, characteristic of this species, are confined to the edge of the upper lobe of the mantle. The rather poorly preserved specimen upon which these observations were made was collected in the North Atlantic, off Martha's Vineyard, by the "Albatross." One young specimen was obtained from the Pacific in the "Albatross" dredgings, on a manganese nodule.

*Craniidae.*

## CRANIA RETZIUS.

*Crania patagonica* DALL.

*Crania patagonica* Dall, Proc. U. S. Nat. Mus., 1902, 24, p. 562; 1903, 26, p. 950, pl. 62, figs. 1, 3.

U. S. S. "Albatross," station 2783, west coast of Patagonia, in 122 fathoms, mud, bottom temperature 48° F. U. S. N. Mus. 96,913.

The single upper valve upon which this species was founded is quite sufficient to distinguish it from any other. No other species of *Crania* has been described having the upper surface of the valve decorated with little sharp tubercles, which under the lens have the appearance of very short spines.

In his report of the Belgica Antarctic expedition brachiopods (Anvers, Dec., 1901) Joubin states that *Crania pourtalesii* Dall has been reported from Cape Horn, and in fact I find the name cited without comment in the list of species from Cape Horn given by Fischer and Oehlert as collected by the Mission to Cape Horn. Whether a specimen too imperfect to afford material for study was provisionally referred to the West Indian *Crania*, or why no further remark was made about it, I am unable to say, but it may have been a specimen or fragment of the present species, as it seems improbable that *C. pourtalesii* should extend from the tropics to the Antarctic. It is quite evident from the excellent magnified figure given by Joubin that his *Crania lecointei* from south latitude 70° 23', in

about 250 fathoms, of which two specimens were obtained, is a distinct species, which so far as we know does not reach the Magellanic region.

## TELOTREMATA.

### Rhynchonellacea.

#### *Rhynchonellidae.*

#### HEMITHYRIS D'ORBIGNY.

##### *Hemithyris craneana* DALL.

*Hemithyris craneana* Dall, Proc. U. S. Nat. Mus., 1894, **17**, p. 717, pl. **31**, figs. 5, 6.

U. S. S. "Albatross," station 3362, off Cocos Island, Gulf of Panama, in 1175 fathoms, mud, bottom temperature 36°.8 F. U. S. N. Mus. 122,861.

A species of the general type of *H. cornea* Fischer, of the North Atlantic. Only one specimen was obtained.

##### *Hemithyris strebeli* DALL, n. sp.

Shell extremely thin and fragile, of a translucent very pale gray color, markedly wider than high, smooth and polished, except for occasional concentric lines due to resting stages; the surface under a lens shows a coarse prismatic structure, the imbricating ends of the prisms almost giving the effect of fine punctation; beak low, sharp, small, with a wide delthyrium, widely triangular discrete deltidial plates, and a small foramen, incomplete below; dorsal valve in the young flattish, in the adult deeply widely excavated mesially, with the anterior margin prominently extended into a correspondingly wide sinus in the margin of the ventral valve; ventral valve convex, in the adult almost trilobed with a broad, prominent mesial anterior convexity and corresponding marginal sulcus; interior of dorsal valve with a short, very low, thread-like septum about equal to one fourth the height of the valve; the hinge teeth close together, small, short, without props; muscular impressions obscure; crura short, blade-like, recurved, very easily detached; ventral valve with no septum, the hinge teeth propped by plates between which and the valve are narrow recesses. Alt. 17; lat. 19; lat. of median sulcus, 11; max. diam. 9.5 mm.

U. S. S. "Albatross," station 4721, in Mid Pacific, in 2084 fathoms, globigerina ooze, bottom temperature 35°.1 F. U. S. N. Mus. 110,741. Also at station 4709, southwest of the Galapagos group, in 2035 fathoms, ooze, temperature 35°.3 F.

This shell is distinguishable from any other described species by its low beak, wide trilobate form, and especially by having the median sulcus concave in the

dorsal valve, a feature characteristic of no other described recent species. It is named in honor of Dr. Hermann Strebel of Hamburg, Germany, whose admirable contributions to the knowledge of the Mollusca of the Antarctic region and Mexico are known to all malacologists.

In this connection it seems not improper to notice here another remarkable member of this family which was dredged by the "Albatross" on the west coast of Hawaii, in about 200 fathoms, in 1903.

### BASILIOLA DALL, n. gen.

A Hemithyris in which the deltidial plates join in the middle line before the foramen of the ventral valve, then are reflected backward and upward within the cavity of the beak until they meet each other, thus forming in the cavity of the beak a wide tube with free anterior edges (except in the senile stage of the shell) and soldered to the inside of the umbonal cavity laterally and near the foramen. The posterior free edges of the deltidia, which form part of the margin, anteriorly, of the foramen are produced and funicular; the dorsal anterior margin of the internal tube is produced beyond the margin of the deltidium as seen externally, in two small pointed folds of a W shape, which perhaps serve as a myophore. There is no septum in either valve; in youth and middle age the hinge teeth are supported by high props in the ventral valve, the cavity behind which, on each side, becomes in the senile stage more or less filled with a shelly deposit; the hinge plate and crura as in Hemithyris, but the hinge teeth sharply cross-striated. The valves are situated in front, and the surface of the shell is smooth.

Type, *Hemithyris beecheri* Dall, 1895.

This remarkable form will be described and illustrated in my forthcoming report on the Mollusks of the Hawaiian voyage of the "Albatross."

## Terebratulacea.

### *Terebratulidae.*

### TEREBRATULINA D'ORBIGNY.

#### *Terebratulina* n. sp.

This species, under the name of *T. crossei* Davidson, originally described from Japan, is reported by Fischer and Oehlert as obtained in the Magellanic region in New Year Sound and near Punta Arenas, in 9 to 184 fathoms, temperature 7° to 8°.2 C. (44°.6-46°.7 F.). I am informed by Dr. Blochmann of Tübingen, who is engaged in a critical study of the species of this genus, that the Magellanic species is distinct from that of Japan, as might be expected. It resembles somewhat *T. kiiensis* Dall and Pilsbry, but is not yet named.

**LIOTHYRINA** OEHLERT.***Liothyrina uva*** BRODERIP.

This species was originally described from shallow water, 8 to 12 fathoms, off the west coast of Mexico, near the Isthmus of Tehuantepec. This being the case, it must live there in water of high temperature, probably about 65° F. I have an authentic specimen from shallow water on the coast of Peru. One characteristic of this species, almost unique in its group, is the presence of slightly elevated radiating lines visible only with a good light and under the lens. Fischer and Oehlert, in their report on the brachiopods of Cape Horn, figure some shells under the name of *Liothyrina moseleyi* Dav., which are lately referred by Blochmann,<sup>1</sup> on the strength of a specimen received from the Paris Museum, to *L. uva*. It is entirely possible that the specimens referred to *L. moseleyi* were mixed, and that a specimen of *L. uva* was sent to Blochmann; but the specimens figured by Fischer and Oehlert are, as they state, more nearly circular in outline than typical *L. uva*, and come from water of a temperature between 6° and 8° C. (42° 8–44° 4 F.), which is much colder than that in which *L. uva* is known to occur. Moreover, the "Albatross" dredged a specimen, agreeing almost exactly with the *L. moseleyi* of the Antilles, 150 miles off the coast of Peru, in 2222 fathoms, temperature 35° 2 F., and dead valves near Cocos Island. So the presence of *L. moseleyi* in the cold waters of Cape Horn would not be extraordinary, while if *L. uva* is also present in that region one would expect to find it in the comparatively shallow water, which is somewhat warmer than that of the deeps. I have not seen any specimens of *L. uva* from south of Peru.

***Liothyrina moseleyi*** DAVIDSON.

U. S. S. "Albatross," station 4656, in south latitude 6° 55' and west longitude 83° 34', in 2222 fathoms, mud, bottom temperature 35° 2 F. U. S. N. Mus. 110,744. Also (dead valves, probably of this species) at station 3370, in 134 fathoms, near Cocos Island, temperature 54° 8 F.

The original locality of this species was west of Kerguelen Island, "Challenger" expedition, station 148, in 210 fathoms, rocky bottom.

A specimen believed to be of the same species was obtained off Martinique, West Indies, in 169 fathoms, temperature 51° F. It was identified by Mr. Davidson as being his species.

***Liothyrina clarkeana*** DALL.

*Liothyrina clarkeana* Dall, Proc. U. S. N. Mus., 1895, 17, p. 718, pl. 31, figs. 9, 10.

U. S. S. "Albatross," station 3362, Gulf of Panama, in 1175 fathoms, mud, bottom temperature 36° 8 F. U. S. N. Mus. 107,275. Also at station 4709, southwest of the Galapagos Islands, in 2035 fathoms, ooze, temperature 35° F.

A single specimen was obtained in each instance.

<sup>1</sup> Zool. Anzeiger, Sept., 1906, 30, p. 698.

**Liothyryna wyvillii** DAVIDSON.

*Terebratula wyvillii* Davidson, Challenger Report, 1880, Zool., **1**, p. 27, pl. **2**, figs. 7-9.

"Challenger" station 299, off Valparaiso, in 2160 fathoms, bottom temperature (34° F.) 1°.1 C., and station 302, off the coast of Patagonia, in 1450 fathoms, temperature 1°.5 C. Also at various other localities in from 1035 to 2900 fathoms, and from latitude 42° 43' south to 35° 22' north.

U. S. S. "Albatross," station 4709, southwest of the Galapagos Islands, in 2035 fathoms, ooze, attached to manganese nodules, bottom temperature 35° 3 F. U. S. N. Mus. 110,745.

Several specimens, mostly broken by the nodules in the trawl net, were obtained. The brachia are small compared with those of the shallow-water species, but a small spiral median lobe and two lateral loops were found to be present.

*Terebratellidae.***TEREBRATELLA** D'ORBIGNY.**Terebratella dorsata** GMELIN.

*Anomia dorsata* Gmelin, Syst. Nat., 1791, **6**, p. 3348.

*Terebratella dorsata* Davidson, Challenger Report, Zool., 1880, **1**, p. 44, pl. **4**, fig. 4; Fischer and Oehlert, Brach. Cap Horn, 1892, p. 20, pl. **9**, fig. 1-30; pl. **10**, fig. 1-30.

*Terebratula patagonica* Gould, Expl. Exp. shells, 1856, fig. 583.

Mission to Cape Horn, various localities in the Patagonian and Fuegian region in 8 to 120 fathoms, temperatures 6° 2 to 8° 2 C. (42° 7-46° 7 F.).

This is really a species of moderate depths, but occasionally lives at a depth exceeding 100 fathoms.

**MAGELLANIA** BAYLE.**Magellania wyvillii** DAVIDSON.

*Waldheimia wyvillii*, Davidson, Challenger Report, Zool., 1880, **1**, p. 44, pl. **3**, fig. 13a-b.

"Challenger" station 299, off Valparaiso, in 2160 fathoms, ooze, bottom temperature 1° 1 C. (34° F.).

Only a single defective specimen was obtained, notable for its extremely thin and fragile shell.

**MACANDREVIA** KING.**Macandrevia americana** DALL.

*Eudesia fontaineana* Dall (not D'Orbigny), Proc. U. S. Nat. Mus., 1889, **12**, p. 231.

*Macandrevia americana* Dall, Proc. U. S. Nat. Mus., 1895, **17**, p. 721, pl. **32**, figs. 1, 4, 7.

U. S. S. "Albatross," station 2783, off the west coast of Patagonia, Southern Chile, in 122 fathoms, mud, bottom temperature 48° F. U. S. N. Mus. 87,547. Also at station 3360, Gulf of Panama, in 1672 fathoms, sand, temperature 42° F.

**Macandrevia diamantina DALL.**

*Macandrevia diamantina* Dall, Proc. U. S. Nat. Mus., 1895, **17**, p. 723, pl. **30**, fig. 5; pl. **32**, figs. 3, 6.

U. S. S. "Albatross," station 3362, Gulf of Panama, in 1175 fathoms, mud; bottom temperature 36° 8 F.; also at station 4656, in 2222 fathoms mud, off Sechura Point, Peru, temperature 35° 2 F. U. S. N. Mus. 122,860.

**Macandrevia craniella DALL.**

*Macandrevia craniella* Dall, Proc. U. S. Nat. Mus., 1895, **17**, p. 722, pl. **30**, fig. 1.

U. S. S. "Albatross," station 3362, off Cocos Island, Gulf of Panama, in 1175 fathoms, mud, bottom temperature 36° 8 F. U. S. N. Mus. 122,858.

Only one specimen was obtained. It somewhat resembles *Waldheimia wyvillii* Davidson, but is larger, more solid, wants the medial septum in the dorsal valve, and differs in other minor details.

RECORD OF DREDGING AND TRAWLING STATIONS OF THE UNITED STATES FISH COMMISSION STEAMER  
 "ALBATROSS" IN THE PANAMIC DISTRICT, FEBRUARY TO MAY, 1891.

Serial Number.	DATE.	TIME.	POSITION.		TEMPERATURES.	Depth in Fathoms.	Character of Bottom.	REMARKS.
			Latitude North.	Longitude West.				
	1891.	h. m.	° ' "	° ' "	°			
3353	Feb. 22	8 0 P.M.	7 6 15	80 34 0	73	695	gn. M.	} Surface tow-net.
3354	" 23	8 56 A.M.	7 9 45	80 50 0	78	322	gn. M.	
3355	" 23	1 25 P.M.	7 12 20	80 55 0	81	182	bk. sh.	} Surface tow-net. } Mariato Point. } Surface tow-net.
3356	" 23	3 1 P.M.	7 9 30	81 8 30	83	546	sft. bl. M.	
3357	" 24	7 30 P.M.	6 35 0	81 44 0	83	782	gn. S.	} Surface tow-net. } Mariato Point. } Surface tow-net.
3358	" 24	6 17 A.M.	6 30 0	81 44 0	83	555	gn. S.	
3359	" 24	11 38 A.M.	6 22 20	81 52 0	83	465	rky.	} Surface tow-net. } Intermediate net of Chun and Petersen. } Surface tow-net.
3360	" 24	2 4 P.M.	6 17 0	82 5 0	83	1672	fne. bk. dk. gn. S.	
3361	" 24	5 20 P.M.	6 10 0	82 6 0	82	1471	gn. Oz.	} Surface tow-net. } Intermediate net of Chun and Petersen. } Surface tow-net.
3362	" 25	7 33 A.M.	6 10 0	83 6 0	82	36.6	gn. Oz.	
3363	" 26	7 20 A.M.	5 56 0	85 10 30	84	1175	gn. M. S. rky.	} Surface tow-net. } Surface tow-net.
3364	" 26	4 37 P.M.	5 43 0	85 50 0	83	978	wh. glob. Oz.	
3365	" 27	6 58 A.M.	5 30 0	86 8 30	81	902	yl. glob. Oz.	} Surface tow-net. } Surface tow-net.
3366	" 27	1 30 P.M.	5 31 0	86 31 0	85	1010	yl. glob. Oz.	
3367	" 27	8 4 P.M.	5 30 0	86 45 0	84	1067	yl. glob. Oz.	} Surface tow-net. } Surface tow-net.
3368	" 28	6 38 A.M.	5 31 30	86 52 30	82	57.1	rky.	
3368	" 28	7 21 A.M.	5 32 45	86 54 30	82	66	rky.	Surface tow-net.

3369	"	28	8	7 A.M.	5 32 45	86 55 20	82	62.2	52	Nullipore or rky.	
3370	"	28	10	3 A.M.	5 36 40	86 56 50	84	54.8	134	{ At Cocos Island. Surface tow-net at night.	
3371	March	1	7 49	A.M.	5 26 20	86 55 0	82	39.0	770	8 P.M. Surface tow-net.	
3372	"	1	5 51	P.M.	4 40 0	86 11 20	84	38.8	761	Surface tow-net.	
3373	"	2	10 33	A.M.	4 2 0	84 58 0	82	36.6	1877		
3374	"	3	10 35	A.M.	2 35 0	83 53 0	80	36.4	1823		
3375	"	4	6 36	A.M.	2 34 0	82 29 0	77	36.6	1201		
3376	"	4	4 27	P.M.	3 9 0	82 8 0	78	36.3	1132		
3377	"	5	8 38	A.M.	3 56 0	81 40 15	77	38.0	764		
3378	"	5	11 45	A.M.	3 58 20	81 36 0	78	55.9	112		
3379	"	5	2 15	P.M.	3 59 40	81 35 0	78	..	52		
3380	"	5	4 51	P.M.	4 3 0	81 31 0	79	37.2	899		
3381	"	6	8 38	A.M.	4 56 0	80 52 30	77	35.8	1772		
3382	"	7	10 46	A.M.	6 21 0	80 41 0	75	35.8	1793	{ Submarine tow-net. 8.30 P.M., surface tow-net.	
3383	"	8	6 51	A.M.	7 21 0	79 2 0	74	36.0	1832		
3384	"	8	1 20	P.M.	7 31 30	79 14 0	74	42.0	458		
3385	"	8	3 7	P.M.	7 32 36	79 16 0	72	45.9	286		
3386	"	8	4 54	P.M.	7 33 12	79 17 15	73	48.0	242		
3387	"	8	7 21	P.M.	7 40 0	79 17 50	74	56.4	127		
3388	"	9	6 41	A.M.	7 6 0	79 48 0	73	36.2	1168		
3389	"	9	2 10	P.M.	7 16 45	79 56 30	74	48.8	210		
3390	"	9	4 25	P.M.	7 26 10	79 53 50	74	62.6	56		
3391	"	9	7 15	P.M.	7 33 40	79 43 20	73	55.8	153		
3392	"	10	6 30	A.M.	7 5 30	79 40 0	73	36.4	1270		
3393	"	10	1 21	P.M.	7 15 0	79 36 0	74	36.8	1020		
3394	"	10	5 43	P.M.	7 21 0	79 35 0	73	41.8	511		
3395	"	11	2 20	P.M.	7 30 36	78 39 0	70	38.5	730		
3396	"	11	5 15	P.M.	7 32 0	78 36 30	70	47.4	259		

RECORD OF DREDGING AND TRAWLING STATIONS OF THE UNITED STATES FISH COMMISSION STEAMER  
 "ALBATROSS" IN THE PANAMIC DISTRICT, FEBRUARY TO MAY, 1891. — *Continued.*

Serial Number.	DATE.	TIME.	POSITION.		TEMPERATURE.		Depths in Fathoms.	Character of Bottom.	REMARKS.
			Latitude North.	Longitude West.	Sur-face.	Bot-tom.			
	1891.								
3397	March 11	h. m. 6 32 P.M.	7 33 0	78 34 20	° ' "	°	85	stf. gn. M. brk. sh.	Surface tow-net.
3398	" 23	3 16 P.M.	1 7 0	80 21 0	° ' "	°	1573	gn. Oz.	Surface tow-net, off Galera Point.
3399	" 24	6 37 A.M.	1 7 0	81 4 0	° ' "	°	1740	gn. Oz.	Surface tow-net.
3400	" 27	6 10 A.M.	0 36 0	86 46 0	South.	°	1322	lt. gy. glob. Oz.	Surface tow-net.
3401	" 28	4 45 A.M.	0 59 0	88 58 30	° ' "	°	395	glob. Oz.	
3402	" 28	7 13 A.M.	0 57 30	89 3 30	° ' "	°	421	R. glob. Oz.	
3403	" 28	10 19 A.M.	0 58 30	89 17 0	° ' "	°	384	fine. gy. S. bk. sp.	
3404	" 28	1 16 P.M.	1 3 0	89 28 0	° ' "	°	385	R.	
3405	" 28	3 42 P.M.	0 57 0	89 38 0	° ' "	°	53	R. Co. Sh.	Tangles.
3406	April 3	6 47 A.M.	0 16 0	90 21 30	° ' "	°	551	R.	
3407	" 3	10 48 A.M.	0 4 0	90 24 30	° ' "	°	885	glob. Oz.	Tangles.
3408	" 3	4 7 P.M.	0 12 30	90 32 30	North.	°	684	glob. Oz.	Tangles.
3409	" 3	7 24 P.M.	0 18 40	90 34 0	° ' "	°	327	bk. S.	Tangles. Surface tow-net. Off
3410	" 3	8 48 P.M.	0 19 0	90 34 0	° ' "	°	331	bk. S.	Bindloe Island, 4 miles west.
3411	" 4	7 35 A.M.	0 54 0	91 9 0	° ' "	°	1189	yl. glob. Oz.	
3412	" 4	6 11 P.M.	1 23 0	91 43 0	° ' "	°	918	R.	{ 9 P.M., surface tow-net, 5 miles off Wenman Island.

3413	"	5	8 34 A.M.	2 34 0	92 6 0	82	36.0	1360	glob. Oz. dk. sp.	At noon, surface tow-net. { Submarine tow-net and surface tow-net.
3414	"	8	11 14 A.M.	10 14 0	96 28 0	82	35.8	2232	gn. M.	
3415	"	10	9 39 A.M.	14 46 0	98 40 0	82	36.0	1879	br. M. glob. Oz.	Surface tow-net.
3416	"	11	9 46 A.M.	16 32 30	99 42 40	81	40.5	419	fine. br. M.	
3417	"	11	11 44 A.M.	16 32 0	99 48 0	82	40.6	493	gn. M.	
3418	"	11	2 57 A.M.	16 33 0	99 52 30	82	39.0	660	br. S. bk. sp.	
3419	"	11	5 59 P.M.	16 34 30	100 3 0	81	39.6	772	gn. M. bk. sp.	
3420	"	12	7 48 A.M.	16 46 0	100 8 20	82	39.6	664	dk. gn. M.	
3421	"	12	11 32 A.M.	16 47 20	100 0 10	82	42.9	388	dk. gn. M.	
3422	"	12	12 35 P.M.	16 47 30	99 59 30	83	53.5	141	gn. M.	
3423	"	12	1 31 P.M.	16 47 30	99 59 20	83	56.0	94	gn. M.	
3424	"	18	11 18 A.M.	21 15 0	106 23 0	76	38.0	676	gy. S. bk. Sp. glob.	
3425	"	18	2 14 P.M.	21 19 0	106 24 0	76	39.0	680	gn. M. & S.	
3426	"	18	3 45 P.M.	21 21 0	106 25 0	76	51.2	146	rky.	
3427	"	18	4 3 P.M.	21 22 15	106 25 0	75	51.2	80	rky.	
3428	"	18	6 40 P.M.	21 36 30	106 25 0	76	48.1	238	dk. gy. S. glob.	
3429	"	19	5 39 A.M.	22 30 30	107 1 0	73	37.0	919	gn. M. glob. Oz.	
3430	"	19	3 27 P.M.	23 16 0	107 31 0	73	37.9	852	bk. S.	
3431	"	20	6 33 A.M.	23 59 0	108 40 0	70	37.0	995	lt. br. M. glob.	
3432	"	20	2 38 P.M.	24 22 30	109 3 20	70	37.8	1421	br. M. bk. sp.	
3433	"	21	6 34 A.M.	25 26 15	109 48 0	69	36.5	1218	br. M. bk. sp.	
3434	"	21	10 14 A.M.	25 29 30	109 48 0	70	36.4	1588	br. M. bk. sp.	
3435	"	22	8 56 A.M.	26 48 0	110 45 20	70	37.3	859	br. M. bk. sp.	
3436	"	22	3 10 P.M.	27 34 0	110 53 40	72	37.2	905	br. M. bk. sp.	
3437	"	23	5 4 A.M.	.....	.....	70	40.0	628	br. M. bk. sp.	

Tangles.

Surface tow-net.

Submarine tow-net and surface tow-net.

Submarine tow-net dragged on the bottom. About 50 miles south of Guaymas.

RECORD OF PELAGIC STATIONS OF THE UNITED STATES FISH COMMISSION STEAMER "ALBATROSS" BETWEEN SAN FRANCISCO, CAL., AND PANAMA DURING OCTOBER, 1904.

Serial Number.	DATE.	TIME.	POSITION.		Temperature at Surface.	Depth in Fathoms at nearest Sounding.	Time in Minutes.	Distance from Land.	REMARKS.
			Lat. North.	Long. West.					
U.S.F.C.	1904.		° ' "	° ' "	°		h. m.	miles.	
4567	Oct. 6	1 30 P.M.	37 25	122 26	60-63	28	3 30	4.25	{ Pump filter No. 20 silk. Started at 10 A.M., at 37° 50' N. and 122° 30' W.
4568	"	5 30 P.M.	36 45	122 02	60-63	486	4 00	10.0	{ Pump filter. Started at 1.30 P.M., at 37° 25' N. and 122° 26' W.
4569	"	6 00 A.M.	34 45	120 15	60-63	38	12 30	11.5	{ Pump filter No. 20. Started at 5.30 P.M., Oct. 6, at 36° 45' N. and 122° 02' W.
4570	"	9 00 A.M.	34 20	120 20	63-64	187	3 00	6.8	{ Pump filter. Started at 6 A.M., at 34° 45' N. and 120° 15' W.
4571	"	4 23 P.M.	33 40	119 35	71	825	18 00	18.3	{ Surface haul. Vertical haul. Started at 3.04 P.M.
4572	"	5 30 P.M.	33 30	119 25	64-66	899	8 30	13.4	{ Pump filter. Started at 9 A.M., at 34° 20' N. and 120° 20' W.
4573	"	7 00 A.M.	31 35	118 10	64-67	1076	13 30	62.6	{ Pump filter. Started at 5.30 P.M., at 33° 30' N. and 119° 25' W.
4574	"	3 45 P.M.	30 35	117 15	69	330	42 00	69.3	{ Vertical hauls.
4575	"	5 30 P.M.	30 15	117 10	67-70	1466	10 30	56.0	{ Pump filter.
4576	"	8 51 P.M.	29 52	116 56	69	1466	21 00	55.2	{ Surface haul.
4577	"	7 00 A.M.	28 25	115 55	66-70	1279	13 30	17.3	{ Pump filter. Started at 5.30 P.M., Oct. 8, at 30° 15' N. and 117° 10' W.

4578	"	9	7 00 P.M.	27 02	114 40	70-71	543	12 00	14.4	{ Pump filter. Started at 7.00 A.M. at 28° 25' N. and 115° 55' W. Pump filter. Started at 7.00 P.M., Oct. 9, at 27° 02' N. and 114° 40' W. Vertical hauls. Pump filter. Started at 7 A.M., at 25° 20' W. and 113° 13' N. Pump filter No. 20. Started at 24° 15' N. and 111° 52' W. Vertical hauls. Pump filter. Started at 7 A.M., at 23° 12' N. and 110° 32' W. Pump filter. Started at 7 P.M., Oct. 11, at 22° 05' N. and 109° 10' W. Pump filter. Started at 10 A.M., at 20° 42' N. and 107° 25' W. Vertical hauls. Surface haul. Pump filter. Started at 19° 52' N. and 106° 22' W., at 7.30 P.M., Oct. 12. Vertical hauls. Pump filter No. 20. Started at 10.30 A.M., at 18° 50' N. and 104° 50' W. Surface hauls. Pump filter. Started at 7.00 P.M., Oct. 13, at 18° 20' N. and 104° 40' W.
4579	"	9-10	7 00 A.M.	25 20	113 13	70-72	75	12 00	45.0	
4580	"	10	11 20 A.M.	24 55	112 45	76	19	20 00	14.4	
4581	"	10	7 00 P.M.	24 15	111 52	72-77	40	12 00	5.1	
4582	"	10-11	7 00 A.M.	23 12	110 32	77-82	323	12 00	19.5	
4583	"	11	10 30 A.M.	22 45	110 5	83	1048	23 00	8.2	
4584	"	11	7 00 P.M.	22 05	109 10	81-87	1624	12 00	62.3	
4585	"	11-12	7 00 A.M.	21 00	107 37	80-83	1747	12 00	64.3	
4586	"	12	7 30 P.M.	19 52	106 22	83	1923	9 30	28.7	
4587	"	12	10 39 A.M.	20 42	107 25	82	1885	24 00	58.0	
4588	"	12	8 50 P.M.	19 52	106 22	81-83	1923	20 00	28.6	
4589	"	12-13	10 30 A.M.	18 50	104 50	82-83	1038	13 00	21.8	
4590	"	13	10 40 A.M.	18 50	104 50	82-83	1038	22 00	21.8	
4591	"	13	7 00 P.M.	18 20	103 40	83-87	30	8 30	4.5	
4592	"	13	7 54 P.M.	18 20	103 40	84	30	24 00	4.5	
4593	"	14	7 00 A.M.	17 25	101 50	82-85	627	12 00	19.0	

RECORD OF PELAGIC STATIONS, ETC., — *Continued.*

Serial Number.	DATE.	TIME.	POSITION.		Temperature at Surface.	Depth in Fathoms at nearest Sounding.	Time in Minutes.	Distance from Land.	REMARKS.
			Lat. North.	Long. West.					
U. S. F. C.	1904.	h. m.	° ' "	° ' "	°		h. m.	miles.	
4594	Oct. 14	10 30 A.M.	17 20	101 32	84	627	30 00	16.0	Vertical hauls.
4595	" 14	7 00 A.M.	16 47	100 27	84-85	838	9 00	14.4	{ Pump filter. Started at 10 A.M., at 17° 26' N. and 101° 32' W.
4596	" 14	7 24 P.M.	16 47	100 27	84	838	24 00	14.4	Surface haul.
4597	" 15	7 00 A.M.	16 10	98 37	81-84	30	12 00	7.1	{ Pump filter. Started at 7 P.M., Oct. 14, at 16° 47' N. and 100° 27' W.
4598	" 15	10 35 A.M.	15 58	98 13	84	99	30 00	4.5	Surface haul.
4599	" 15	7 00 P.M.	15 36	97 00	80-85	160	12 00	5.3	{ Pump filter. Started at 7.00 A.M., at 16° 10' N. and 98° 37' W.
4600	" 15	7 25 P.M.	15 36	97 00	82	160	25 00	5.3	Surface haul. Started at 7.00 P.M.
4601	" 16	7 00 A.M.	14 58	95 17	81-83	120	12 00	61.2	{ Pump filter. Started at 7.00 P.M., Oct. 15, at 15° 36' N. and 97° 00' W.
4602	" 16	7 00 P.M.	13 37	93 52	79-82	2166	12 00	103.2	{ Pump filter. Started at 7.00 A.M. at 14° 58' N. and 95° 17' W.
4603	" 17	7 30 A.M.	12 30	92 30	81-83	2166	12 30	110.0	{ Pump filter. Started at 7.00 P.M., Oct. 16, at 13° 37' N. and 93° 52' W.
4604	" 17	11 30 A.M.	12 21	92 13	84	2166	30 00	110.1	Surface haul.
4605	" 17	1 30 P.M.	12 21	92 13	85	2166	30 00	110.1	Vertical hauls. Started at 1 P.M. Pump filter No. 20. Started at 7.30 A.M., at 12° 30' N. and 92° 30' W.
4606	" 17	7 00 P.M.	12 00	91 30	81-83	2500	11 30	116.0	{ Pump filter. Started at 7.00 P.M., Oct. 16, at 13° 37' N. and 93° 52' W.

4607	"	17	7 22 P.M.	12 00	91 30	83	2500	22 00	116.0	Surface haul. Pump filter. Started at 7 P.M., Oct. 17, at 12° 00' N. and 91° 30' W.
4608	"	18	8 00 A.M.	11 15	89 48	82-83	2052	13 00	130.4	Vertical hauls.
4609	"	18	10 30 A.M.	11 05	89 35	81	1970	30 00	132.2	{ Pump filter. Started at 8.00 A.M., at 11° 15' N. and 89° 48' W.
4610	"	18	7 00 P.M.	10 33	88 30	78-83	1792	11 00	135.0	Surface haul.
4611	"	18	7 23 P.M.	10 33	88 30	78	1792	23 00	135.0	{ Pump filter. Started at 7.00 P.M., Oct. 18, at 10° 33' N. and 88° 30' W.
4612	"	19	7 00 A.M.	9 50	86 40	78-80	1833	12 00	66.7	Vertical hauls. Started at 10 A.M.,
4613	"	19	10 30 A.M.	9 45	86 20	80	1833	30 00	54.4	{ Pump filter. 9° 50' N. and 86° 40' W.
4614	"	19	7 00 P.M.	9 7	85 11	79-82	1708	12 00	26.2	Surface haul. Started at 7 P.M.
4615	"	19	7 20 P.M.	9 7	85 11	80	1708	20 00	26.2	{ Pump filter. Started at 7 P.M., Oct. 19, at 9° 7' N. and 85° 11' W.
4616	"	20	7 00 A.M.	8 10	83 33	79-80	956	12 00	17.2	Vertical haul. Started at 4.00 P.M.
4617	"	20	4 25 P.M.	7 45	82 25	78	1185	25 00	10.0	{ Pump filter. Started at 7.00 A.M., at 9° 7' N. and 82° 11' W.
4618	"	20	7 00 P.M.	7 15	82 8	77-80	792	12 00	12.8	Surface haul. Started at 7.00 P.M.
4619	"	20	7 20 P.M.	7 15	82 8	79	792	20 00	12.8	{ Pump filter. Started at 7.00 P.M., Oct. 20, at 7° 15' N. and 82° 8' W.
4620	"	21	8 00 A.M.	6 45	81 47	78-79	782	13 00	27.0	Vertical haul.
4621	"	21	10 26 A.M.	6 36	81 44	79	581	36 00	36.4	Vertical haul.
4622	"	21	12 50 P.M.	6 31	81 44	81	581	74 00	40.8	{ Pump filter. Started at 8 A.M., at 6° 45' N. and 81° 47' W.
4623	"	21	7 00 P.M.	6 58	80 46	78-81	592	11 00	12.8	Surface haul.
4624	"	21	7 30 P.M.	6 58	80 46	79	592	30 00	12.8	{ Pump filter. Started at 7 P.M., Oct. 21, at 6° 58' N. and 80° 46' W.
4625	"	22	7 00 A.M.	8 00	79 33	79-80	75	12 00	37.6	Surface haul. Started at 7 A.M., at 8° 00' N. and 79° 33' W.
4626	"	22	7 00 P.M.	8 55	79 32	80-84	5	12 00	0.7	

RECORD OF DREDGING, TRAWLING, AND PELAGIC STATIONS OCCUPIED BY THE UNITED STATES FISH COMMISSION STEAMER "ALBATROSS" IN THE EASTERN TROPICAL PACIFIC FROM NOVEMBER, 1904, TO MARCH, 1905.

Serial Number.	DATE.	TIME.	POSITION.		TEMPERATURES.		Depth in Fathoms.	Character of Bottom.	REMARKS.
			Latitude North.	Longitude West.	Surface.	Bottom.			
	1904.	h. m.	o. '.	o. '.	o.	o.			
4627-4640 PANAMA TO GALAPAGOS ISLANDS.									
4627	Nov. 2	7 P.M.	7 21.3	79 55.8	81.5	...	....	.....	Surface haul.
4628	" 2	9 P.M.	7 15	80 5.5	80-83	...	....	.....	Pump filter.
4629	" 3	8† A.M.	6 52	81 42.5	81 }	40.5	556	gn. S., lrg. glob.	{ Pump filter. Trawling for the green sand collected in 1891.
4630	" 3	8 A.M.	6 53	81 42.5	81 }	38.0	774	gn. S.	{ Pump filter. Trawling for the green sand collected in 1891.
4631	" 3	1 P.M.	6 26	81 49	82	36.4	1885	fine gn. M.	Pump filter.
4632	" 3	8† P.M.	5 48.5	82 16.3	79-83	...	....	.....	Trawl.
4504*	" 3	10 P.M.	5 36	82 28	80	...	....	.....	Pump filter.
4633	" 4	8 A.M.	4 40	83 24.4	79-80	35.9	1729	.....	{ Trawl. Towed at 300 fathoms.
4634	" 4	10 30 A.M.	4 35.4	83 32.3	80	...	....	.....	Surface haul; pump filter.
4635	" 4	8 P.M.	3 52.5	84 14.3	79	...	....	.....	

4505*	"	5	3	A.M.	3 11.6	84 57.4	78	36.4	1705	gn. M., glob.	Pump filter. § Globigerinae similar to those found in pump filter on surface (8 A.M.). Thermometer did not trip. Towed at 300 fathoms and vertical haul to surface. Thermometer did not trip.
4636	"	5	8	A.M.	2 44.5	85 23.5	78	...	....	.....	
4637	"	5	9	P.M.	1 31	86 32	76	no record	1541	sml. & lrge. glob., lt. gn. glob. Oz.	At Stn. 4638 also made a surface haul and towed with open net at 300 fathoms and vertically to surface. Pump filter.
4638	"	6	7	A.M.	0 27	87 13	75	no record	1450	lt. gn. glob. Oz.	
4639	"	6	1	P.M.	0 4	87 39.5	76	35.4	1418	lt. gy. glob. Oz., br. M.	} Surface haul poor.
4506*	"	6	5	P.M.	0 21	87 57.5	75	no record	1433	gy. glob. Oz., br. M.	
4640	"	6	8	P.M.	0 39.4	88 11	75	37.4	1061	no sample	{ Pump filter, and extraordinarily rich surface haul, with a large number of pelagic fishes.

\* Hydrographic Stations where soundings alone were made.

† Stations occupied at 8 A.M. are usually trawling stations at which temperature serials were also taken and intermediate tows at 300 fathoms and to the surface.

‡ At 8 P.M. a surface haul was usually made daily.

§ When not mentioned to the contrary, the pump filter was run each day.

RECORD OF DREDGING, TRAWLING, AND PELAGIC STATIONS. — *Continued.*

Serial Number.	DATE.	TIME.	POSITION.		TEMPERATURE.		Depth in Fathoms.	Character of Bottom.	REMARKS.
			Latitude South.	Longitude West.	Surface.	Bottom.			
	1904.	h. m.	° ' "	° ' "	°	°			
4641-4644 SOUTHEAST FACE OF GALAPAGOS ISLANDS.									
4641	Nov. 7	8 A.M.	1 34.4	89 30.2	74	39.5	633	lt. gy. glob. Oz.	{ Trawl haul, 10 miles from Hood Island, Galapagos.
4642	" 7	10 30 A.M.	1 30.5	89 35	74	48.6	300	brk. Sh. & glob.	{ 5 miles from southeast end of Hood Island; Tangles.
4643	" 7	1 30 P.M.	1 28.7	89 48.5	74	67.2	100	brk. Sh. & glob.	{ About 4½ miles southwest by south from the west end of Hood; Tangles and Trawl.
4644	" 7	8 30 P.M.	2 13.3	89 42.2	72	35.4	1752	fine lt. gy. glob. Oz.	{ Surface haul with many fishes; pump filter.
4645-4654 GALAPAGOS TO AGUJA POINT.									
4645	Nov. 8	8 00 A.M.	3 37.6	89 43.1	70	36.0	1955	fine lt. gy. glob. Oz.	{ Trawl came up empty. Pump filter.
4646	" 8	7 00 P.M.	4 1.6	89 16.3	72	35.4	2058	fine lt. gy. glob. Oz. and br. M.	{ Towed 20 minutes with open net at 300 fathoms and vertically to surface.

4647	"	9	8 00 A.M.	4 33	87 42.5	70	35.5	2005	very lt. gy. glob. Oz.; large glob., br. M.	{ Trawl, magnificent haul of Holothurians, open net tow to surface from 800 fathoms. Surface haul and towed 20 minutes at 300 fathoms and vertically to surface. Swarm of Cytacis on surface.
4648	"	9	7 00 P.M.	4 43	87 7.5	71	...	....	.....	
4649	"	10	8 00 A.M.	5 17	85 19.5	70	35.4	2235	stky. gy. M., very few glob.	{ Trawl haul. Octacnemus in the trawl. Pump filter. Open net tow from 800 fathoms to surface.
4650	"	10	7 00 P.M.	5 22	84 39	71	...	....	.....	{ Surface haul; mass of Sal- pae; towed 20 minutes at 300 fathoms and up to surface.
4651	"	11	8 00 A.M.	5 41.7	82 59.7	66	35.4	2222	stky. fine gy. S.; trace of shore M.	{ Trawl, fine lot of silicious sponges; net towed open at 800 fathoms and to surface.
4652	"	11	7 00 P.M.	5 44.7	82 39.5	66	...	....	.....	{ Surface haul. Towed 20 min. at 400 fathoms and to surface. Towed 20 min. at 200 fathoms and to surface (Dissoma). Towed 20 min. at 100 fathoms and to surface.

## RECORD OF DREDGING, TRAWLING, AND PELAGIC STATIONS. — Continued.

Serial Number.	DATE	TIME.	POSITION.		TEMPERATURES.		Depth in Fathoms.	Character of Bottom.	REMARKS.
			Latitude South.	Longitude West.	Surface.	Bottom.			
	1904		° ' .	° ' .	°	°			
4507*	Nov. 12	7 00 A.M.	5 43.6	81 43.8	64	34.9	2312	fine sky. blue M. shore M., Pumice.	{ Trawl, much vegetable matter 17 miles from land, Nonuna Pt. }
4653	"	10 27 A.M.	5 47	81 24	65	41.3	536	dk. br. gy. shr. M., many Diatoms.	{ Trawl. }
4508*	"	1 00 P.M.	5 46.5	81 26.9	65	38.5	685	dk. gn. shore M.	
4654	"	1 50 P.M.	5 46	81 31.9	65	37.3	1036	dk. br. M., veg. Mat., many Diatoms.	{ Trawl. }
4655-4661. LINE FROM AGUJA POINT TOWARDS THE OUTER WESTERN EDGE OF THE CHILLI-PERUVIAN STREAM.									
4655	Nov. 12	7 P.M.	5 57.5	80 50	65	...	....	.....	{ Surface haul. Towed at 400 fathoms, 20 min. and to surface; Pump filter. }
4656	"	8 A.M.	6 54.6	83 34.3	69	35.2	2222	fine gn. M. mxtd. with gy. Oz., min. part. Sponge spic., many Diatoms.	{ Trawl; Octacnemus in trawl. }
4657	"	7 00 P.M.	7 12.5	84 9	69	...	....	.....	{ Surface haul. Towed at 300 fathoms and vertically to surface. }

4658	"	14	8 00 A.M.	8 29.5	85 35.6	70	35.3	2370	fine gn. M., Mang. nod.; Rad. Oz.	<p>{ Trawl full of Manganese nodules 3 to 5" in diameter. Sharks' teeth. Cetacean carbonates. Towed with Tanner closing net at 300 fathoms, 20 minutes, failed to close.</p> <p>{ Surface haul and towed 20 min. at 300 fathoms and vertically to surface.</p> <p>{ Trawl, pump filter.</p> <p>{ Surface haul. Salpa soup. Towed at 300 fathoms, 20 min. and to surface.</p>
4659	"	14	7 00 P.M.	8 54.5	86 5.5	69	...	....	.....	
4660	"	15	8 00 A.M.	9 55.6	87 30	69	35.4	2425	fine br. M.; Mang. nod.; Rad., a few Diatoms; Sponge spic.	
4661	"	15	7 00 P.M.	10 17	88 2	69	...	....	.....	
4662-4669. FROM THE WESTERN PART OF THE PERUVIAN CURRENT TO THE WESTERN EDGE OF MILNE-EDWARDS DEEP.										
4662	Nov.	16	8 00 A.M.	11 13.8	89 35	69	35.2	2439	br. Rad. Oz., Mang. nod.	<p>{ Pump filter; towed net at 800 fathoms and to surface.</p> <p>{ Pump filter, surface haul; Salpa soup. Towed at 300 and to surface. Yellow Pelagoneurtes.</p>
4663	"	16	7 00 P.M.	11 20.3	88 55.2	69	...	....	.....	

\* Hydrographic Stations.

## RECORD OF DREDGING, TRAWLING, AND PELAGIC STATIONS. — Continued.

Serial Number.	DATE.	TIME.	POSITION.		TEMPERATURES.		Depth in Fathoms.	Character of Bottom.	REMARKS.
			Latitude South.	Longitude West.	Surface.	Bottom.			
	1904.	h. m.	° /	° /	°	°			
4664	Nov. 17	8 00 A.M.	11 30.3	87 19	68	...	....	.....	{ Pump filter, surface haul, towed at 300 fathoms and to surface, Tanner closing net at 400 fathoms. { Surface haul, poor tow at 300 and vertical to surface. Pump filter.
4665	" 17	7 00 P.M.	11 45	86 5.2	68	...	....	.....	{ Trawl, angular fragments of rocks. Pump filter. { Surface haul. Towed at 300 fathoms and to surface.
4666	" 18	8 00 A.M.	11 55.5	84 20.3	67	34.9	2600	lt. gy. Oz., floe. débris, few Mang. nod., Cetacean ear-bones.	{ Trawl, angular fragments of rocks. Pump filter. { Surface haul. Towed at 300 fathoms and to surface.
4667	" 18	7 00 P.M.	11 59.5	83 40.4	68	...	....	.....	{ Surface haul. Towed at 300 fathoms and to surface. { Tanner net towed at 300 fathoms, 20 minutes.
4668	" 19	8 00 A.M.	12 9.3	81 45.2	67	no record	2620	fine gy. Oz., few Diatoms & Rad., glob.	{ Surface haul. Tow at 300 fathoms and to surface. Pelagonemertes.
4669	" 19	7 00 P.M.	12 12.7	80 25.6	67	...	....	.....	{ Surface haul. Tow at 300 fathoms and to surface. Pelagonemertes.

## 4670-4675 FROM THE WESTERN EDGE OF MILNE-EDWARDS DEEP OFF CALLAO.

4670	Nov. 20	8 00 A.M.	12 8.7	79 2.4	66	35.4	3209	sft. lt. br. M.	Trawl. Serial temp. and towed net at 800 fathoms to surface. { Water of late discolored by Diatoms. Surface haul and tow at 300 fathoms to surface. Pump filter.
4671	" 20	7 00 P.M.	12 6.9	78 28.2	66	35.4	1490	fine gn. clay; infus. earth full of Diatoms.	
4672	" 21	7 00 A.M.	13 11.6	78 18.3	65	35.2	2845	similar to above	Trawl. Fine haul of Holothurians. Tanner net tow at 400. Pump filter. { Surface haul, and tow at 300 fms.
4673	" 21	7 00 P.M.	12 30.5	77 49.4	67	42.5	458	rky.	
4509*	" 22	7 00 A.M.	12 26.6	78 34.5	67	35.2	1949	fine dk. gn. M., many Diatoms. fine dk. gn. M.,	Large angular fragments of rock in trawl.
4674	" 22	9 00 A.M.	12 14.4	78 43.4	68	35.1	2338	Sponge spic.; few Diat. & few Rad.; Diat. Oz. in mud-bag.	
4675	" 22	7 00 P.M.	12 54.0	78 33.0	68	no record	3120	fn. dk. gn. M., flocc. organic matter, Diat. debris, Silicious infus. earth.	Surface haul tow at 30 fathoms and to surface.

\* Hydrographic Station.

## RECORD OF DREDGING, TRAWLING, AND PELAGIC STATIONS. — Continued.

Serial Number.	DATE.	TIME.	POSITION.		TEMPERATURE.		Depth in Fathoms.	Character of Bottom.	REMARKS.
			Latitude South.	Longitude West.	Surface.	Bottom.			
	1904.		° /	° /	°	°			
4510*-4514*; 4676-4693 CALLAO TO EASTER ISLAND.									
4510*	Dec. 4	7 00 P.M.	13 48.2	80 13.0	70	35.2	2543	fine lt. gy. clay Oz; floc. mat.; few Rad., Sponge spic.; Diat. Oz.	
4676	" 5	8 00 A.M.	14 28.9	81 24	69	35.4	2714	fine dk. br. Oz., Diat. Rad. Mang. nod.	{ Pump filter every A.M. at 8. Lost trawl frame and bag; serial temp. and tow at 300 fms. Poor surface haul.
4677	" 5	7 00 P.M.	14 37.5	81 41	68	...	....	lt. br. Rad. Oz.; Rad. filled with M., no Diat.	
4511*	" 6	8 00 A.M.	15 39	83 27.4	69	35.2	2620	lt. br. stky. Oz., Sponge spic., few Rad. or glob.	{ Surface haul very poor. { Tow at 300 fathoms. { Water has been a most { intense ultramarine to- { day.
4678	" 6	7 30 P.M.	16 31.2	85 3.8	68	...	....		
4679	" 7	8 00 A.M.	17 26.4	68 46.5	69	35.3	2485		

4680	"	7	7 00 P.M.	17 55	87 42	68	...	.....	Very little in tangles. Very fine surface haul. Cymbulia soup. Tow at 300 fathoms, serial temp.; trawl came back torn to pieces; a few manganese nodules left in bag; must have been too heavy a load. Surface haul; Cymbulia soup again.
4681	"	8	8 00 A.M.	18 47.1	89 26	68	35.4	choc. br. clay, Mang. nod., few glob., few Rad.	
4682	"	8	7 30 P.M.	19 7.6	90 10.6	69	...	.....	
4683	"	9	8 00 A.M.	20 2.4	91 52.5	70	35.2	dk. choc. col. clay, no Diat., very few glob. Mang. nod.	Serial temp., tow at 300 fathoms.
4684	"	9	8 00 A.M.	20 40.3	93 19.2	71	...	.....	Poor surface haul. Tow at 300 fathoms and to surface; very poor haul. Serial temperature.
4685	"	10	8 00 A.M.	21 36.2	94 56	72	35.3	few Rad., a gd. many glob., dk. br. clay, no Diat., Orbulinae partly decomposed.	Trawl haul; small trawl came up with 1½ tons of manganese nodules, very little animal life.
4686	"	10	8 00 A.M.	22 2.2	95 52	71	...	.....	Very poor surface haul. Tow at 300 fathoms, very poor. Tow at 2125 fathoms; nothing not taken before; very little in net, not more than in 300 fms. haul. Surface haul very poor here, out of current. 1260 miles from Callao and 500 from Sala y Gomez.
4687	"	11	8 00 A.M.	22 49.5	97 30.6	73	35.4	dk. choc. col. clay, few more glob., few Rad., very few Sponge spic.	

\* Hydrographic Stations.

## RECORD OF DREDGING, TRAWLING, AND PELAGIC STATIONS. — Continued.

Serial Number.	DATE.	TIME.	POSITION.		TEMPERATURES.		Depth in Fathoms.	Character of Bottom.	REMARKS.
			Latitude South.	Longitude West.	Sur-face.	Bottom.			
4688	1904. Dec. 11	h.m. 8 00 A.M.	23 17.2	98 37.5	°	°	....	.....	Surface haul very poor. Tow at 300 fathoms, extremely poor haul. Serial temperatures. Surface haul extremely poor. Tow at 300 fathoms; very poorest haul of all; trawl came up torn, with lot of angular fragments of volcanic rocks, pumice, and manganese nodules. Nothing in surface haul. Off Sala y Gomez. Did not dare to trawl. Sharks' teeth and cetacean earbones in trawl.
4689	" 12	8 00 A.M.	24 5	100 20	72	35.4	2185	dk. br. choc. clay, mrkd. incr. in glob, few Rad.	
4690	" 12	8 00 P.M.	24 45	101 45	73	...	....	.....	
4691	" 13	8 00 A.M.	25 27.3	103 29.3	73	35.3	1939	lt. yl. br. glob. Oz., few Rad., Sponge spic.	
4692	" 13	8 00 P.M.	25 40.4	104 1.3	72	...	....	.....	Nothing in surface haul. Off Sala y Gomez. Did not dare to trawl. Sharks' teeth and cetacean earbones in trawl.
4512*	" 14	8 00 A.M.	26 17.3	105 25.2	71	36.4	885	rky.	
4693	" 14	11 00 A.M.	26 30.1	105 45.2	73	35.4	1142	rky., fine glob. from mudbag of trawl. Lava rk. & Mang. nod.	
4513*	" 15	2 00 A.M.	26 50	107 30	71	35.4	1696	rky., no bot. spec. yl. clay, Mang. nod., few glob. & Rad.	
4514*	" 15	1 00 P.M.	27 1.6	108 56	74	35.4	1552	rky., no bot. spec. yl. clay, Mang. nod., few glob. & Rad.	

## 4515\*-4518\*, 4694-4716 EASTER ISLAND TO CHATHAM ISLAND, GALAPAGOS.

4515*	Dec. 22	11 00 A.M.	26 58.7	109 20.3	72	35.5	1145	fine vol. S., few glob., Sponge spic.	{ 5 miles off N. Pt. of Easter Id.
4516*	"	12 30 P.M.	26 54.8	109 16.4	74	35.4	1627	fine vol. S., Obstdian fgt., many glob.	{ 10 miles off N. Pt. of Easter Id.
4517*	"	1 30 P.M.	26 50.9	109 12.5	74	35.4	1723	lt. br. Oz., many glob. Orbulina, a few Rad., vol. part.	{ 15 miles off N. Pt. of Easter Id.; serial temperatures.
4518*	"	3 30 P.M.	26 47.3	109 9.3	75	35.3	1770	lrge. & sml. glob., Sponge spic., few Rad.	{ 20 miles, off Easter Id., too rough to trawl.
4694	"	8 00 P.M.	26 34	108 57.3	72	...	....	.....	{ Surface haul fair; very many Radiolarian colonies.
4695	"	8 00 A.M.	25 22.4	107 45	74	...	2020	in mudbag fine lt. br. Oz., very many glob., few Rad.	{ Lost thermom. and 90 fms. wire. Trawl haul, very little in bag. Manganese nodules, sharks' teeth.
4696	"	8 00 P.M.	24 40.3	107 5.3	74	...	....	.....	{ Very poor surface haul. Tow at 300 very poor.
4697	"	8 00 A.M.	23 24.4	106 2.2	75	35.5	2188	dk. br. choc. clay, few Rad., very few glob., fine min. part.	{ Trawl tripped, probably from load of manganese nodules.
4698	"	8 00 P.M.	22 50.4	105 31.7	75	...	....	.....	{ Wretchedly poor surface haul.

\* Hydrographic Stations.

RECORD OF DREDGING, TRAWLING, AND PELAGIC STATIONS. — *Continued.*

Serial Number.	DATE.	TIME.	POSITION.		TEMPERATURE.		Depth in Fathoms.	Character of Bottom.	REMARKS.
			Latitude South.	Longitude West.	Surface.	Bottom.			
	1904.								
4699	Dec. 25	8 00 A.M.	21 39.5	104 29.8	75	35.5	2168	dk. br. choc. clay, very few Rad., arenaceous Foram.	Tow at 300 fathoms; very poor haul.
4700	" 25	8 00 P.M.	20 28.8	103 26.3	74	...	....	.....	Surface haul, very marked improvement in catch; getting into trade wind region.
4701	" 26	8 00 A.M.	19 11.5	102 24	72	35.3	2265	dk. br. choc. clay, sharks' teeth, ear-bones, Mang. nod., very few glob. & Rad.	Tow 300 fathoms; very much better haul, more like those half way from Callao to Easter Id., poor trawl haul, bottom still very barren. Serial temperatures.
4702	" 26	8 00 P.M.	18 39.5	102	73	...	....	.....	Surface haul very poor, some increase in the fine stuff in the water.
4703	" 27	8 00 A.M.	17 18.6	100 52.3	73	35.3	2228	dk. choc. col. Oz., some glob.	Tow at 300 fathoms, hauls continue poor, a few more Copepods. Trawl obtained nothing; barren bottom.

4704	"	27	8 00 P.M.	16 55.3	100 24.6	73	...	.....	Surface haul quite good. Tow at 300 fathoms and to surface, excellent haul; are in the western edge of the Humboldt current. Brought up very little in the trawl.
4705	"	28	8 00 A.M.	15 5.3	99 19	72	35.3	very lt. gy. yl. glob. Oz., some Diat. & very many Rad.	Very fair surface haul.
4706	"	28	8 00 P.M.	14 18.7	98 45.8	72	...	dk. choc. br. Oz., very many glob. & Rad. & Coscinod.	Tow at 300 fathoms, excellent haul.
4707	"	29	8 00 A.M.	12 33.2	97 42	72	35.3	.....	Very good surface haul.
4708	"	29	8 00 P.M.	11 40	96 55	72	...	.....	Fair haul towing at 300 fathoms. Trawl tripped, but good trawl haul in bag. Earbones, sharks' teeth, and Manganese nodules.
4709	"	30	8 00 A.M.	10 15.2	95 40.8	72	35.3	lt. gy. glob. Oz., very many Rad. & Diat.	Surface haul. Salpa soup.
4710	"	30	8 00 P.M.	9 30.5	95 8.3	74	...	.....	Tow at 300 fathoms, very good haul. Ring trawl sent to tow at bottom. Brought up large load of Manganese nodules and a few sharks' teeth and earbones.
4711	"	31	8 00 A.M.	7 47.5	94 5.5	75	35.3	lt. gy. glob. Oz. with many Rad. & Diat. all dead.	Fair surface haul.
4712	"	31	8 00 P.M.	7 5	93 35.5	74	...	lt. br. glob. Oz. at top. of cylind., lt. gy. glob. below, few glob. at top, many Rad., few Diatoms.	Serial temperatures. Tow at 300 fathoms, good haul.
4713	1905 Jan. 1		8 00 A.M.	5 35.3	92 21.6	73	35.3	.....	

RECORD OF DREDGING, TRAWLING, AND PELAGIC STATIONS. — *Continued.*

Serial Number.	DATE.	TIME.	POSITION.		TEMPERATURES.		Depth in Fathoms.	Character of Bottom.	REMARKS.
			Latitude South.	Longitude West.	Surface.	Bottom.			
	1905.								
4714	Jan. 1	8 00 P.M.	4 19	91 28.5	75	...	....	.....	Surface haul, fair catch. Serial temperatures, at base of rim of rise of the Galapagos. Splendid haul at 300 fathoms. Trawl, fair haul. Surface haul excellent, about 55 miles from Hood Island, Galapagos. Anchored Wreck Bay, Chatham Island, Galapagos, January 3, at 11 A.M.
4715	"	8 00 A.M.	2 40.4	90 19.3	75	failed to register	1743	lt. gy. glob. Oz., many Diat. and many Rad.	
4716	"	8 00 A.M.	2 18.5	90 2.6	75	...	....	.....	
4519*-4526*, 4717-4739 GALAPAGOS TO MANGA REVA.									
4519*	Jan. 10	7 00 P.M.	1 31	91 4	76	35.5	1385	hard.	{ 40 miles from abeam P. O. Bay, Charles Island, Galapagos.
4520*	"	12 06 A.M.	1 46.8	91 36	74	35.5	1815	gy. glob. Oz., very many Rad. & Diat.	{ About 75 miles from last station, on course to Manga Reva.

4521*	"	11	8 00 A.M.	2 14.3	92 29.9	75	failed to trip	1871	glob. Oz. as at St. 4520.*	{ About 143 miles from Charles Island.
4522*	"	11	4 00 P.M.	2 42.4	93 30	77	35.4	1924	lt. gy. glob. Oz., gt. many Rad. and Diatoms.	{ Pump filter collected on this line at 8 A.M. daily.
4523*	"	12	8 00 A.M.	3 34	95 35.4	77	35.3	2031	wh. glob. Oz., very many Rad. & Diat.	
4717	"	13	8 00 A.M.	5 10	98 56	75	35.2	2153	red br. glob. Oz., glob. much brok. up, many Diat. & many Rad. filled with blk. min. part.	{ Tow at 300 fathoms, very fine haul. Trawl excellent catch. Serial temperatures.
4718	"	13	8 00 P.M.	5 32.4	99 32.2	76	...	....	.....	{ Excellent surface haul.
4719	"	14	8 00 A.M.	6 29.8	101 16.8	75	Th. failed to reg.	2285	Red clay, cup cut Mang. nod., no glob. or Rad.	{ Excellent haul 300 fms. to surface; did not dare to trawl, mang. nodules.
4720	"	14	7 30 P.M.	7 13.3	102 31.5	76	...	....	.....	{ Surface haul, Salpa soup.
4721	"	15	8 00 A.M.	8 7.5	104 10.5	75	failed to reg.	2084	lt. br. glob. Oz., Sponge spic., many Diat., few Rad.	{ Tow 300 fms. and up to surface; excellent trawl haul; temp. serial. Huge Psychropotes 55 cm. long.
4722	"	16	8 00 A.M.	9 31	106 30.5	75	35.1	1923	rky.	{ Good haul 300 fms. to surface.
4723	"	16	7 30 P.M.	10 14.3	107 45.5	76	...	....	.....	{ Fair surface haul.
4724	"	17	8 00 A.M.	11 13.4	109 39	79	35.1	1841	hrd., col. cup empty.	{ Tow at 300 fms. to surface; rather poor, serial temp., trawl came up empty.
4725	"	17	7 30 P.M.	11 38.3	110 5	77	...	....	.....	{ Poor surface haul.

\* Hydrographic Stations.

RECORD OF DREDGING, TRAWLING, AND PELAGIC STATIONS. — *Continued.*

Serial Number.	DATE.	TIME.	POSITION.		TEMPERATURES.		Depth in Fathoms.	Character of Bottom.	REMARKS.
			Latitude South.	Longitude West.	Surface.	Bottom.			
	1905	h. m.	° ' "	° ' "	°	°			
4726	Jan. 18	8 00 A.M.	12 30.1	111 42.2	78	35.1	1700	choc. br. M. full of glob., aren. For. Sponge spic., few Diat. Coscin., few Rad.	About half way to Manga Reva from the Galapagos. <i>Garrett Ridge</i> ; trawl came up empty.
4727	" 18	7 30 P.M.	13 03	112 44.9	77	...	....	.....	Fair surface haul. Tow at 300 fms. to surface, trawl empty, mud-bag full of glob. sand, temp. serial, <i>Garrett Ridge</i> .
4728	" 19	8 00 A.M.	13 47.5	114 21.6	77	35.8	1055	glob. S. pkd. hrd. in mudbag. Few Diat. & Rad.	Rather poor surface haul. Tow at 300 fms. to surface, fair haul, dropped back to general level of oceanic plateau ("Albatross").
4729	" 19	7 30 P.M.	14 15	115 13	78	...	....	.....	Very poor surface haul.
4730	" 20	8 00 A.M.	15 7	117 1.2	79	35	1912	clasper did not close.	Serial temperatures, tow at 300 fms. to surface, very poor; little in trawl.
4731	" 20	7 30 P.M.	15 47.2	118 22.5	79.5	...	....	.....	Very poor surface haul.
4732	" 21	8 00 A.M.	16 32.5	119 59	79	34.8	2012	lt. gy. glob. Oz., sharks' teeth, and carbonates, mang-nod., very few Diat. & Rad., Sponge spic.	Serial temperatures, tow at 300 fms. to surface, very poor; little in trawl.

4733	"	21	7 30 P.M.	16 57.4	120 48	80	...	.....	Fair surface haul.
4734	"	22	8 00 A.M.	17 36	122 35.6	81	34.9	nothing in cup	{ Tow at 300 and up to surface, very poor haul.
4735	"	22	7 30 P.M.	18 16	123 34.4	81	...	.....	{ Surface haul very poor.
4736	"	23	8 00 A.M.	19 0.4	125 5.4	81	34.8	dk. br. choc. M. full of glob., very few Rad., in trawl sharks' teeth, ear-bones, pumice & Mang. slabs.	{ Tow at 300 and up to surface, very poor. Trawl frame badly twisted, net torn. Mudbag full of brown sticky mud.
4737	"	24	8 00 A.M.	19 57.5	127 20.3	81.5	34.8	very little in clasper, dk. br. choc. M. full of glob.	{ Tow at 300 and up to surface, very poor haul. Towed Petersen closing net from 550 to 400, fathoms, nothing in net.
4738	"	24	7 30 P.M.	20 26.5	128 30.2	81	...	.....	{ Very poor surface haul.
4524*	"	25	8 00 A.M.	21 3	130 10.3	80	34.5	dk. br. choc. M. glob., Mang. nod. stky. red clay with glob., no Diat., very few Rad., fine min. part.	{ Too rough to work.
4525*	"	25	7 00 P.M.	21 36.1	131 35.3	80	34.8	dk. gy. glob. Oz., no Diat., very few Rad. in mudbag, obsidian like frag.; large & sml. Mang. nod.	{ Tow at 300 very poor haul, trawl tripped. Bag empty. Little in mudbag. Serial temp.
4739	"	26	8 00 A.M.	22 11.1	133 21	79	34.9	2042	

\*Hydrographic Stations.

## RECORD OF DREDGING, TRAWLING, AND PELAGIC STATIONS. — Continued.

Serial Number.	DATE.	TIME.	POSITION.		TEMPERATURES.		Depth in Fathoms.	Character of Bottom.	REMARKS.
			Latitude South.	Longitude West.	Surface.	Bottom.			
	1905.	h. m.	o. '.	o. '.	o.	o.			
OFF EAST FACE OF MANGA REVA.									
4526*	Jan. 27	6 45 A.M.	11 m. N. E. off Mt. Duff		78	34.6	2070	lt. br. glob. Oz.	{ Very steep off the group. { No plateau here.
4527*-4530* TAKEN ON LEAVING MANGA REVA.									
4527*	Feb. 5		Reef flat about $\frac{1}{4}$ m. from the ship		77	53.5	225	coralline & wh. S.	Off Tekava.
4528*	" 5		Reef flat about $\frac{1}{4}$ m. from the ship		78	50.4	245	coralline S., brk. Sh. Pteropods, Nullip.	{ Off East Point of barrier reef. { Off Vaitekeue.
4529*	" 5		Reef flat less than $\frac{1}{4}$ m. from ship		77	51.5	241	hard.	
4530*	" 5		About $3\frac{1}{2}$ m. N. E. from last station		77.5	35.0	1394	coral S. & coralline.	

## 4531\*-4547\*, 4740-4743 MANGA REVA TO ACAPULCO.

4531*	Feb. 6	8 00 A.M.	21 4.5	133 1.2	79	35.0	2225	rd. clay M., many min. part., very few glob., no Rad. or Diatoms.	} Very little in the tubes.
4532*	" 7	8 00 A.M.	18 29.4	130 50.8	81	34.5	2319	dk. br. choc. M., few lrg. glob., Sponge spic., Mang. nod. same bot. as Stn. 4532*	
4533*	" 8	8 00 A.M.	16 20.3	128 46	82	34.5	2194	dk. gy. glob. Oz., lrg. glob., many blk. Mang. part. few crystals. Aren. Foram, Sponge spic., very few Rad.	} Very little in claspers.
4534*	" 9	8 00 A.M.	13 51	126 53.5	82	34.6	2185	lt. gy. glob. Oz., very few blk. min. part, quite a no. of Rad., some Diat. & Coscinod. Euodia.	
4535*	" 10	8 00 A.M.	11 20	125 1.3	80	34.5	2215	dk. gy. glob. Oz., lrg. glob., very few blk. min. part., very many dead Rad. belonging to the surface colonial types, lrg. no. of Diat. 10° from equator.	} Excellent trawl haul, ear-bones, Manganese nodules. Superb sharks' teeth, very fair tow at 300 fathoms and up.
4740	" 11	8 00 A.M.	9 2.1	123 20.1	81	34.2	2422		

\* Hydrographic Stations.

## RECORD OF DREDGING, TRAWLING, AND PELAGIC STATIONS. — Continued.

Serial Number.	DATE.	TIME.	POSITION.		TEMPERATURES.		Depth in Fathoms.	Character of Bottom.	REMARKS.
			Latitude South.	Longitude West.	Surface.	Bottom.			
	1905.		°	°	°	°			
4741	Feb. 11	7 30 P.M.	8 29.7	122 56	80	...	....		Very fair surface haul; fine stuff in net very thick; haul resembles those of the northern part of Eastern lines.
4536*	" 12	8 00 A.M.	7 10.3	122 13.2	80	34.3	2380	nothing in tubes prob. looser glob. Oz. than yesterday.	
4537*	" 13	8 00 A.M.	4 50.5	120 45.7	79	34.3	2350	very lt. gy. fine. glob. Oz., few blk. min. part, gd. no. of Rad., some Diatoms. Coscinod.	
4538*	" 14	8 00 A.M.	2 14	118 55.1	79	34.3	2291	very fine lt. gy. glob., very many Rad. & Diatoms, Cosc. Euodia; few min. part.	
4742	" 15	8 00 A.M.	North. 0 3.4	117 15.8	77	34.3	2320	very lt. fine gy. glob. Oz., very few blk. min. part., much silicious debris; great many Rad. & Diat. Cosc. Euodia, Synedra; short silic. needles, some Silico-flagellates.	
									Tow at 300, very good haul. Trawl; superb haul: Rhizocrinus stems, viviparous Benthodytes. Strange egg cluster. Squid?

4743	"	15	7 30 P.M.	0 21.3	117 2.6	78	...	.....	Excellent surface haul.
4539*	"	16	8 00 A.M.	1 35	116 38	78.5	34.4	2189	Physalia sailed by.
4540*	"	17	8 00 A.M.	3 25.6	115 5.4	79	34.4	2200	Large Velella sailed by; from surface net: Appendiculariae, Pteropods, Copepods, Coscomidiscus, Euodia, Synedra, Acantharian Radiolaria, Pyrocystis Ceratium Planktoniella; approaching westerly warm current. Diatoms have disappeared; are in warm western tropical current.
4541*	"	18	8 00 A.M.	4 55	112 27	80	34.4	2174	Dk. gy. glob. Oz., lrg. glob., Rad. filled with blk. mud.
4542*	"	19	8 00 A.M.	7 8.7	110 45.3	80	34.5	2225	
4543*	"	20	8 00 A.M.	8 52.2	108 54	79.5	34.7	2058	no sample in tubes. rd. cly. dk. choc. br. stky. M., few glob., many sm. blk. Mang. part., few Rad., Sponge spic., transp. min. cryst. mass of yel. flocc. mat.

\* Hydrographic Stations.

RECORD OF DREDGING, TRAWLING, AND PELAGIC STATIONS. — *Continued.*

Serial Number.	DATE.	TIME.	POSITION.		TEMPERATURES.		Depth in Fathoms.	Character of Bottom.	REMARKS.
			Latitude North.	Longitude West.	Surface.	Bottom.			
	1905.								
4544*	Feb. 21	8 00 A.M.	10 38	106 47.6	80	34.4	1955	stky. dk. choc. br. M., many blk. Mang. part.	
4545*	" 22	8 00 A.M.	12 42.5	104 45	79	34.9	1753	stky. dk. choc. br. M., blk. part. of Mang.	
4546*	" 23	8 00 A.M.	14 50	101 31	81	35.2	2050	stky. dk. choc. br. M., many blk. part. of Mang.	
4547*	" 24	4 00 A.M.	16 20.2	99 58.4	83	35.2	2474 <sup>o</sup>	shot brought back.	{ About 29 miles south of Acapulco Light; western extension of deep hole east of Acapulco. Last sounding.

\* Hydrographic Stations.

NOTE. — Owing to an error in the records of the "Albatross," the hydrographic numbers 4504\* to 4547\* are incorrect; they should be Nos. 4802\* to 4847\*. As a mass of pelagic material was labelled to correspond to these stations as originally recorded, it was found impossible to change the record, and to prevent confusion we can only call attention to the discrepancy.

## INDEX.

References to the lists of species, p. 212-223 and p. 437-441 are not included. The names of the new species are in italics; the pages, on which each species, section, genus, etc., is diagnosed, are also in italics.

- ABRETIA**, 245, 249.  
**Acesta**, 407.  
**Acharax**, 364, 365.  
**Actaeon**, 235, 236.  
     *wetherilli*, 238.  
**Actaeonidea**, 236.  
**Acteocina**, 238.  
**Acteon**, 235, 236, 237, 238.  
     *breviculus*, 237, 238.  
     *curtulus*, 236, 238.  
     *estuarinus*, 238.  
     *mazatlanicus*, 237, 238.  
     *panamensis*, 236.  
     *perconicus*, 237, 238.  
     *punctocoelatus*, 236.  
     *tornatilis*, 236.  
**Actinobolus**, 412.  
**Actita**, 329.  
**Acumina**, 246, 249.  
**Acus**, 245, 249.  
     *rushii*, 248.  
**Adelomelon**, 297, 298.  
     *benthalis*, 298.  
     *magellanica*, 298.  
     *stearnsii*, 298.  
**Admete**, 296, 297.  
**Aesopus oldroydi**, 286.  
**Aforia**, 257.  
     *hypomela*, 273.  
**Albula**, 333.  
**Alectrion**, 306, 307, 308.  
     *ambiguus*, 307.  
     *catallus*, 307.  
     *exsarcus*, 308.  
     *goniopleura*, 308.  
     *miser*, 307.  
**Aligena**, 412, 413.  
     *borniana*, 413.  
     *pisum*, 413.  
     *striata*, 412.  
**Alipurpura**, 313.  
**Amalthea**, 329.  
     *conica*, 330.  
     *Amaltheus*, 329.  
     *Amusium*, 405.  
         *malpelsonium*, 405.  
**Anachis**, 309.  
**Anadema caelata**, 342.  
**Ancistrosyrinx cedonulli**, 273.  
     *elegans*, 273.  
     *radiata*, 273.  
**Angulus**, 421.  
**Anomia**, 230.  
     *dorsata*, 444.  
     *tridentata*, 230.  
**Antiplanes**, 258.  
**Antistreptus**, 314.  
     *magellanicus*, 314, 315.  
**Arca**, 397.  
**Arca adamsi**, 385.  
     *aurita*, 392.  
     *corpulenta*, 398.  
     *endemica*, 399.  
     *glycymeris*, 399.  
     *heterodonta*, 398.  
     *nucleator*, 397.  
     *nucleus*, 367.  
     *orbiculata*, 398.  
     *pectunculoides*, 397, 398.  
     *pompholyz*, 398.  
     *pteroëssa*, 399.  
     *rostrata*, 372.  
**Architectoma**, 327.  
**Architectonica**, 327, 328.  
     *radialis*, 327.  
**Archivesica**, 418.  
**Arcopagia**, 419.  
**Arene**, 344, 345.  
**Argonauta**, 224, 225, 226, 227, 228, 229.  
     *agglutinans*, 227.  
     *americana*, 226, 228.  
     *argo*, 224, 225, 226, 227.  
     *aurita*, 228.  
     *bibula*, 226, 228.  
     *boettgeri*, 226, 229.  
     *bulleri*, 226, 228.

- Argonauta compressa, 225, 227.  
 conradi, 226, 229.  
 cornuta, 224, 226, 228.  
 crassicostata, 229.  
 cygnus, 226, 227.  
 dispar, 226, 228, 229.  
 expansa, 224.  
 fragilis, 226, 229.  
 geniculata, 226, 229.  
 gondola, 229.  
 gracilis, 228.  
 grandiformis, 225, 227.  
 grüneri, 224.  
 haustum, 227.  
 hians, 226, 229.  
 kochiana, 229.  
 maxima, 227.  
 mutica, 224.  
 navicula, 226, 229.  
 naviformis, 227.  
 nitida, 229.  
 nodosa, 226, 228, 229.  
 nouryi, 224, 226, 228.  
 obtusangula, 227.  
 oryzata, 228.  
 oweni, 229.  
 pacifica, 225, 226, 228.  
 papyracea, 227.  
 papyria, 226, 227.  
 polita, 229.  
 raricostata, 229.  
 rotunda, 228.  
 rufa, 226, 229.  
 sulcata, 227.  
 tuberculata, 228.  
 tuberculosa, 228.
- Aspella, 312.  
 Assula, 238.  
 Astarte longirostris, 411.  
 magellanica, 411.  
 Astyris, 310.  
 saintpairiana, 310.
- BARBATIA, 398, 399.  
*Basiliola*, 442.  
 Bathyarca, 397.  
 Bathybembix, 348.  
 Bathysciadium, 338, 339.  
 conicum, 338.  
*pacificum*, 339.  
 Bellardia, 259, 267.  
 Bellardiella, 259, 260, 261.  
 Bembix aeola, 348.  
 Benthodolium, 321.  
 abyssorum, 321.  
 pacificum, 323.  
 Beringius, 305.
- Boreofusus berniciensis, 303.  
 Bornia, 413.  
*Borsonella*, 258, 275, 276, 277.  
 Borsonia, 258, 275, 276, 277.  
*agassizii*, 275.  
*coronadoi*, 277.  
 dalli, 258, 275, 278.  
*diegensis*, 275.  
 hooveri, 276.  
 prima, 258.  
*saccoi*, 277.
- Buccinopsis, 304.  
 Buccinum aquilarum, 321.  
 dimidiatum, 245.  
 filosum, 304.  
 lanceatum, 245.  
 maculatum, 245.  
 mutabile, 306.  
 papillosum, 306.  
 reticulatum, 306.  
 subulatum, 245.
- Bulla, 243, 244.  
 abyssicola, 244.  
 ampulla, 244.  
 bidentata, 241.  
 lignaria, 238.
- Bullaria, 243, 244.  
 Bullea, 244.  
*morgana*, 244.  
 Bullina, 241.  
 Bullinella, 241, 242.  
 Bullus, 244.  
 Bursa, 320.  
 caelata, 321.  
*calcipicta*, 320.
- CABOCHON, 329.  
 Cadulus, 360, 361.  
 albicomatus, 360.  
 californicus, 360.  
*peruvianus*, 361.  
 platystoma, 361.  
 striatus, 360.
- Calliostoma iridium, 348.  
 Calliotectum vernicosum, 257, 274.  
 Callistochiton *periconis*, 355.  
 Callocardia, 415.  
 atlantica, 415.  
 gigas, 418.  
 leeana, 418.  
 lepta, 416, 418.  
 ovalis, 417.  
 stearnsii, 417.
- Callogonia, 418, 419.  
 angulata, 419.
- Camptonectes, 403, 404.  
 Cancellaria, 294.

- Cancellaria californica*, 296.  
   *centrota*, 295.  
   *clavatula*, 294.  
   *corbicula*, 294.  
   *exopleura*, 294.  
   *io*, 295.  
   *melanostoma*, 295.  
   *microsoma*, 296.  
   *mitraeformis*, 294.  
*Cantrainea*, 342.  
   *peloritana*, 343.  
*Cantraineia*, 342.  
*Capulus*, 329.  
   *chilensis*, 329.  
   *lissus*, 330.  
   *ungaricoides*, 330.  
   *ungaricus*, 330.  
*Cardiomya*, 433.  
*Cardita*, 412.  
   *sulcosa*, 412.  
   *velutina*, 412.  
*Cassia cameo*, 319.  
*Cavlina*, 230.  
*Cavolina*, 230, 232.  
   *gibbosa*, 234.  
   *inflexa*, 235.  
   *longirostris*, 235.  
   *natans*, 230.  
   *occidentalis*, 233.  
   *telemus*, 230, 231, 232.  
   *uncinata*, 235.  
*Cavolinia*, 230.  
   *tridentata*, 231.  
*Cepatia*, 334.  
*Cerithioderma*, 324.  
   *migrans*, 325.  
   *pacifica*, 324.  
   *prima*, 324.  
*Cetoconcha*, 430, 431.  
   *scapha*, 431.  
   *smithii*, 431.  
*Chiton*, 353.  
   *blainvillei*, 357.  
*Chlamys*, 401.  
   *pasca*, 401.  
*Choristes*, 328.  
   *carpenteri*, 328.  
   *elegans*, 328.  
   *tenera*, 329.  
*Clanculus*, 345, 346.  
   *rubidus*, 346.  
*Clathurella*, 259, 260, 288.  
   *orariana*, 288.  
   *panamella*, 288.  
   *plicatella*, 289.  
*Cleodora*, 231, 232.  
*Clinopistha*, 366.  
*Clinura*, 261, 292, 293.  
   *monochorda*, 292.  
   *peruviana*, 293.  
*Clio*, 235.  
   *sulcata*, 235.  
   *volitans*, 230.  
*Clione*, 232.  
*Clionella*, 270.  
*Clistaxis*, 241.  
*Cocculina*, 340, 341.  
   *agassizii*, 340.  
   *diomedae*, 341.  
   *nassa*, 341.  
   *rathbuni*, 340.  
*Cochlespira*, 257, 273.  
*Cochlis*, 332, 333.  
*Collonia*, 342.  
*Columbella*, 309.  
   *fusidens*, 309.  
   *iodostoma*, 309.  
*Comarmondia*, 259.  
*Cominella brunneocincta*, 304.  
*Compressidens*, 359.  
*Conus*, 254.  
   *gradatus*, 254.  
   *regularis*, 254.  
   *sieboldi*, 254.  
*Corbula*, 423.  
   *granulata*, 428.  
   *ira*, 423.  
   *knoxiana*, 423.  
*Cordieria*, 258.  
*Corneocyclas magellanicus*, 411.  
*Corolla*, 232.  
*Cosmetopsis*, 392.  
*Crania*, 440.  
   *lecointii*, 440.  
   *patagonica*, 440.  
   *pourtalesii*, 440.  
*Cranopsis*, 352.  
   *pelex*, 352.  
*Crenella*, 410.  
   *divaricata*, 410.  
   *megas*, 410.  
*Cryptaxis*, 241.  
*Cryptonatica*, 332, 338.  
*Ctenoconcha*, 383.  
*Cucullaria*, 398, 399.  
*Cumingia mutica*, 422.  
*Cuneocorbula*, 423.  
*Cuspidaria*, 431, 432, 433.  
   *chilensis*, 433.  
   *glacialis*, 432.  
   *panamensis*, 432.  
   *patagonica*, 431.  
   *planetica*, 433.  
   *pseustes*, 432, 433.

- Cyclina, 241.  
 Cyclinus, 241.  
 Cyclocardia, 412.  
 Cyclopecten, 404, 405.  
 Cyclostoma, 315.  
 Cylichna, 239, 241, 242, 244.  
     *marmorata*, 242.  
 Cylichnella, 241, 242, 243.  
     *atahualpa*, 243.  
     *bidentata*, 242.  
     *cylindracea*, 242.  
     *inca*, 242.  
     *pizarro*, 243.  
 Cylichnium, 242.  
 Cylichnus, 239, 241, 242.  
 Cyllindrella, 241, 242.  
 Cymatium, 319.  
 Cymbium, 227, 244.  
     *maximum*, 227.  
     *tenue*, 227.  
 Cythara, 259.
- DAFHNELLA**, 260, 291, 292.  
     *blanda*, 291.  
     *cortezi*, 292.  
     *imparella*, 291.  
     *limacina*, 260.  
 Deep sea brachiopods, List of, 223.  
 Deep sea mollusks, List of, 212.  
 Defrancia, 259, 260.  
     *pagoda*, 259, 260.  
     *suturalis*, 259.  
 Dentalium, 357, 358, 359.  
     *agassizii*, 358.  
     *brevicornu*, 359.  
     *ceras*, 358.  
     *clavatum*, 360.  
     *dalli*, 359.  
     *gadus*, 360.  
     *megathyris*, 357.  
     *panamense*, 358.  
     *peruvianum*, 358.  
     *pressum*, 359.  
     *pretiosum*, 359.  
 Dermatomya, 429, 430.  
 Discinisca, 439, 440.  
     *atlantica*, 440.  
     *lamellosa*, 439.  
     *strigata*, 439.  
 Distorsio, 318.  
     *decussatus*, 319.  
 Distortrix, 318.  
 Donacilla, 420.  
 Drillia, 256, 263, 265.  
     *alesidota*, 263.  
     *decenna*, 265.
- Drillia polytorta, 263.  
     *umbilicata*, 256.  
 Duplicaria, 246, 248, 250.  
 Dystactella, 366.
- ECTORISMA GRANULATA**, 428.  
 Embla koreni, 428.  
 Eupleconia, 393.  
 Eocithara, 319.  
 Eocyclina, 241.  
 Epitonium, 245, 315, 316, 317.  
     *brunneopictum*, 316.  
     *ferminianum*, 316.  
     *turbinum*, 317.  
 Erato oligostata, 324.  
 Eubela, 260, 291.  
     *limacina*, 261.  
 Eudesia fontaineana, 444.  
 Euryta, 245, 246, 247, 250.  
 Euspira, 333, 334, 335, 336, 337, 338.  
     *pallida*, 335.  
 Euthria, 314.  
     *cornea*, 314.  
     *meridionalis*, 314.  
 Exilia pergracilis, 302.
- FELICIA**, 393.  
     *jousseamei*, 392, 394.  
 Ferminoscala, 315, 316.  
 Fusinus, 262, 301, 302, 306.  
     *fragilissimus*, 301.  
     *panamensis*, 301.  
     *rufocaudatus*, 302.  
 Fusoterebra, 246, 248.  
 Fusus, 246, 248, 255, 301.  
     *berniciensis*, 303.  
     *calathiscus*, 304.  
     *rufocaudatus*, 302.  
     *setosus*, 304.  
     *terebrinus*, 246, 248.
- Gadila, 360, 361.  
 Galerita, 329.  
 Galerite, 329.  
 Ganesa panamensis, 352.  
 Gastropteron, 244.  
 Gaza, 347.  
     *daedala*, 347.  
     *rathbuni*, 347.  
 Gemmula, 256, 258, 265, 266, 267, 268, 269.  
     *benthima*, 267.  
     *eldorana*, 268.  
     *esuriens*, 265, 266, 267.  
     *exulans*, 265.  
     *herilda*, 266.  
     *pernodata*, 266.  
     *serilla*, 269.

- Gemmula vicella*, 268.  
 Glans, 412  
*Glycymeris*, 367, 399, 400.  
     *multicostatus*, 399, 400.  
*Glyphostoma*, 260, 289, 290.  
     *dentifera*, 260.  
     *immaculata*, 289.  
     *thalassoma*, 290.  
*Glypteuthria*, 314, 315.  
     *contraria*, 315.  
 Gondole, 244.  
 Gutturnium, 319.  
*Gymnobela*, 258, 261, 278, 279, 280.  
     *curta*, 258.
- HALISTREPTA**, 427.  
 Harpa, 319.  
*Hastula*, 245, 247, 249.  
*Helix janthina*, 318.  
*Helonyx*, 360.  
*Hemipleurotoma*, 256.  
*Hemithyris*, 441, 442.  
     *beecheri*, 442.  
     *craneana*, 441.  
     *cornea*, 441.  
     *strebeli*, 441.  
 Hima, 306, 307.  
 Hinnites, 402.  
*Hipponix*, 330, 331.  
     *antiquata*, 331.  
     *barbata*, 331.  
     *cornucopiae*, 330.  
     *delicata*, 331.  
     *mitrata*, 331.  
     *serrata*, 332.  
     *subrufa*, 331.  
*Hipponyx*, 330.  
*Homalopoma*, 342.  
*Homotoma*, 260.  
     *producta*, 261.  
*Hyalaea*, 230, 234, 235.  
     *cornea*, 230.  
     *cumingi*, 234.  
     *limbata*, 235.  
     *longirostris*, 235.  
     *tridentata*, 230.  
     *truncata*, 234.  
     *uncinata*, 235.
- IANTHINA**, 318.  
*Impages*, 245, 247, 250.  
*Iphigenia brasiliiana*, 369.  
*Irenosyrinx*, 257, 271, 272, 274.  
     *crebristriata*, 272.  
     *goodei*, 272.  
     *leonis*, 272.  
     *persimilis*, 271.
- Ischnochiton ophioderma*, 356.  
**JANTHINA**, 318.  
     *pallida*, 318.  
*Jupiteria*, 372, 373, 374, 375.  
**KANILLA**, 236.  
*Katadesmia*, 379.  
*Kellia suborbicularis*, 430.  
**LAMPADOPSIS**, 320.  
*Leda*, 369, 372, 373, 374, 375, 376, 377, 378,  
 390, 391.  
     *acrita*, 374.  
     *acuta*, 374.  
     *agapea*, 373.  
     *caelata*, 373.  
     *calow*, 377, 378, 379.  
     *calcarella*, 378.  
     *callimene*, 372.  
     *concinna*, 375.  
     *cordyla*, 375, 377.  
     *costellata*, 375.  
     *decora*, 375.  
     *dissimilis*, 373.  
     *elenensis*, 374.  
     *excavata*, 374.  
     *gibbosa*, 372.  
     *hamata*, 376.  
     *lobula*, 375.  
     *loshka*, 376.  
     *lugubris*, 390.  
     *orangica*, 390.  
     *pernula*, 372, 375, 377.  
     *peruviana*, 377.  
     *pontonia*, 373, 374.  
     *rhytida*, 376.  
     *rostrata*, 372.  
     *sulculata*, 390.  
     *taphria*, 373.  
*Leiodomus coeruleus*, 245.  
*Lembulus*, 372, 390.  
     *sulculatus*, 390.  
*Lepeta costulata*, 338.  
*Lepidopleurus*, 353, 354, 355  
     *abbreviatus*, 354.  
     *farallonis*, 355.  
     *halistreptus*, 354.  
     *incongruus*, 355.  
     *luridus*, 355.  
     *mesogonus*, 354.  
     *opacus*, 354.  
*Lepidozona*, 356.  
*Leptochiton*, 353.  
*Leptonyx*, 342.  
*Leptothyra*, 342, 343, 344.  
     *albida*, 343, 344.  
     *carinata*, 343.  
     *carpenteri*, 342.

- Leptothyra cingulata, 343.  
   filosa, 343.  
   glabrata, 343.  
   induta, 344.  
   panamensis, 342.  
   peloritana, 343, 344.  
   tricingulata, 343.  
*Leucophysema*, 244.  
*Leucosyrinx*, 256, 269, 270, 271, 272.  
   *clionella*, 270.  
   *erosina*, 269.  
   *pacifica*, 270.  
   *persimilis*, 271, 272.  
 Lima, 406, 407, 408, 409, 410.  
   agassizii, 407.  
   angulata, 407.  
   dehiscens, 407.  
   *diomedae*, 407.  
   excavata, 407, 408.  
   falklandica, 409.  
   fragilis, 407.  
   goliath, 407.  
   hians, 406.  
   hodgsoni, 409.  
   martiali, 409.  
   patagonica, 407.  
   pygmaea, 408, 409.  
   *similaris*, 408.  
   *suteri*, 410.  
 Limacina, 232, 235.  
   inflata, 235.  
 Limaea, 409.  
 Limatula, 408, 409, 410.  
   falklandica, 409.  
   subauriculata, 408.  
 Limax gagates, 435.  
 Limopsis, 392, 393, 394, 395, 396, 397.  
   aurita, 393.  
   bassi, 394.  
   compressus, 394.  
   diazii, 397.  
   diegensis, 395.  
   hirtella, 395.  
   juarezi, 396, 397.  
   jousseamei, 394, 395, 396.  
   mabilliana, 395, 396.  
   panamensis, 396.  
   retifera, 392.  
   stimpsoni, 396.  
   vaginatus, 393.  
   zonalis, 393.  
 Liomesa, 304.  
 Liothyryna, 443, 444.  
   clarkeana, 443.  
   moseleyi, 443.  
   uva, 443.  
   wyvillei, 444.  
 Liotia, 344, 345.  
   *californica*, 344.  
   *pacis*, 345.  
 Lunatia, 333.  
 Luzonia, 433.  
 Lyonsia, 427, 430.  
   bulla, 430.  
   panamensis, 427.  
 Lyonsiella, 428.  
   *pacifica*, 428.  
   papyracea, 428.  
 MACANDREVIA, 444, 445.  
   americana, 444.  
   craniella, 445.  
   diamantina, 445.  
 Macoma, 421, 422.  
   aurora, 422.  
   *hesperus*, 421.  
   *hupeana*, 421.  
   inornata, 421.  
   inquinata, 421.  
 Macrodon, 398.  
 Maera, 420.  
 Magellania, 223, 444.  
   venosa, 223.  
   wyvillei, 444.  
 Malletia, 378, 383, 384, 385, 386, 389.  
   *arciformis*, 385.  
   *benthima*, 386.  
   chilensis, 383.  
   excisa, 378.  
   goniura, 386.  
   hyadesi, 383.  
   *inequalis*, 383.  
   magellanica, 383.  
   peruviana, 384.  
   truncata, 384.  
 Malluvium, 330.  
 Mangilia, 257, 259, 285, 286, 287.  
   *cetolaca*, 286.  
   costulata, 259.  
   encella, 287.  
   enora, 286.  
   genilda, 286.  
   movilla, 285.  
   oldroydi, 286.  
   sedillina, 287.  
   striolata, 259.  
 Mantellum, 406.  
 Margarita imperialis, 348.  
 Marseniidae, 244.  
 Mazatlanina, 245, 246, 247, 250.  
 Merica, 294, 295, 296.  
 Mesostoma pulchra, 324.  
 Microglyphis, 236, 237, 238.  
 Minormalletia, 385, 386.

- Miomelon, 298.  
 Mnestia, 241.  
 Modiola, 418.  
     capax, 418.  
     linea, 364.  
 Moera, 420.  
 Moerella, 420.  
 Mohnia, 257, 274.  
     frielei, 274.  
 Monoculus telemus, 230.  
 Monodonta, 346.  
 Mopalia blainvillei, 357.  
 Mucronalia, 317, 318.  
 Murex, 255, 256, 261, 301, 312, 313, 400.  
     anus, 318.  
     babylonius, 255.  
     centrifuga, 313.  
     colus, 301.  
     diomedaeus, 313.  
     erinaceus, 313.  
     gracilis, 261.  
     humilis, 313.  
     javanus, 256.  
     nebula, 259.  
     tenuispina, 400.  
     textilis, 260.  
 Mya, 372, 422.  
     pernula, 372.  
 Myonera, 434.  
     bicarinata, 435.  
     garretti, 434.  
     paucistriata, 435.  
 Mysella, 413.  
 Mytilus solen, 362.  
 Myurella, 245, 246, 248, 249, 250.  
  
 NACCA, 332.  
 Narona, 294.  
 Nassa, 306, 309, 319.  
     arcularia, 319.  
     ephamilla, 309.  
     incrassata, 306.  
 Natica, 332, 333, 334, 335, 337, 338.  
     ampullaria, 333.  
     canrena, 332.  
     cepacea, 334.  
     clausa, 332.  
     glaucinoides, 333.  
     impervia, 338.  
     infundibulum, 334.  
     intemerata, 334.  
     labellata, 333.  
     livida, 333.  
     maroccana, 333.  
     othello, 332.  
     scethra, 333.  
     soluta, 335, 337.  
  
 Natica spadicea, 332.  
     uber, 334.  
     vitellus, 332.  
 Naticina, 334.  
 Nautilus papyraceus, 228.  
 Neaera patagonica, 431.  
 Neilo, 383, 386.  
     cumingi, 383.  
 Neptunea, 304.  
 Nerita mamilla, 333.  
 Neverita, 333, 337.  
     josephinae, 333.  
 Nodipecten, 401.  
 Noditerebra, 246, 247, 248.  
 Nucula, 367, 368, 369, 370, 371, 372, 374,  
     375, 378, 383, 387, 390.  
     agujana, 370.  
     australis, 383.  
     chrysocoma, 370.  
     colombiana, 371.  
     costellata, 375.  
     declivis, 371.  
     elenensis, 374.  
     excavata, 374.  
     excisa, 378.  
     exigua, 370.  
     gibbosa, 372.  
     iphigenia, 369.  
     panamina, 368.  
     pigafettae, 369.  
     pisum, 370.  
     proxima, 387.  
     savatieri, 367, 368.  
     semiornata, 370.  
     sulcata, 390.  
     taeniolata, 368.  
     tanneri, 367, 368.  
 Nuculana, 367.  
 Nuculocardia divaricata, 410.  
 Nudibranchs, 244.  
  
 OCENEBRA, 313.  
 Ocinebra, 313.  
 Omphalius, 342.  
 Onchorhynchus, food of, 232.  
 Oöcorys, 321, 322, 323.  
     abyssorum, 321.  
     aquilarum, 321.  
     elevata, 322.  
     fisheri, 321.  
     pacifica, 322, 323.  
     rotunda, 322.  
     sulcata, 321.  
     watsoni, 321.  
 Orbignya, 230.  
 Orthogoriscus mola, 232.  
 Orthoyoldia, 380.

- Ostrea*, 406.  
   *hians*, 406.  
   *lima*, 406.  
*Oxymyris*, 246, 249.
- PALLIUM**, 401.  
*Panocochlea*, 345, 346.  
*Pascula*, 311.  
*Patella*, 330.  
   *australis*, 330.  
   *subrufa*, 329.  
   *ungarica*, 329.  
*Payreaudeautia*, 332.  
*Pecten*, 400, 401, 402, 403, 404, 405.  
   *cocosensis*, 405.  
   *gelatinosus*, 403.  
   *liriope*, 402.  
   *miser*, 401.  
   *neoceanicus*, 402.  
   *panamensis*, 404.  
   *pasca*, 401.  
   *polyleptus*, 403.  
   *rotundus*, 404.  
   *sericeus*, 400.  
   *subnodosus*, 401.  
   *thalassinus*, 405.  
   *vitreus*, 404.  
*Pectunculina*, 392.  
*Pectunculus*, 392, 399.  
   *granulatus*, 392.  
   *multicostatus*, 399.  
   *scalaris*, 392.  
   *violascens*, 399.  
*Pelagodiscus*, 440.  
*Penitella*, 425.  
*Periploma*, 426, 427.  
   *carpenteri*, 426.  
   *discus*, 427.  
   *stearnsii*, 426.  
   *sulcata*, 427.  
*Perirhoe*, 246, 248, 253.  
*Petalonchus complicatus*, 326.  
*Petrasma*, 363, 366.  
*Phaseolus*, 391, 392.  
   *ovatus*, 391, 392.  
   *patagonicus*, 392.  
*Pholadidea minuscula*, 425.  
*Phos*, 306.  
   *beaui*, 306.  
   *cocosensis*, 306.  
*Phyllodina*, 419.  
*Phyllonotus*, 313.  
*Phymorhynchus*, 258, 283, 284, 285.  
*Pileopsis*, 329, 330.  
   *cornucopiae*, 330.  
*Pisidium*, 411.  
*Placiphorella blainvillei*, 357.
- Pleurotoma*, 255. (See *Turris*.)  
   *aulaca*, 273.  
   *calloiope*, 261.  
   *cedonulli*, 273.  
   *clara*, 272.  
   *cristata*, 257.  
   *emarginata*, 259.  
   *exulans*, 265.  
   *gemmata*, 256.  
   *goodei*, 257.  
   *gracilis*, 259, 260.  
   *hooveri*, 276.  
   *intorta*, 256.  
   *linearis*, 259.  
   *pagoda*, 259.  
   *verrilli*, 257.
- Pleurotomella*, 258, 278, 279, 280, 281, 282, 283, 284, 285.  
   *agonia*, 278, 279.  
   *altina*, 278.  
   *argeta*, 283, 284.  
   *castanea*, 283, 284.  
   *cingulata*, 283, 284.  
   *clarinda*, 285.  
   *dinora*, 281.  
   *egregia*, 279.  
   *esilda*, 282.  
   *isogonia*, 279.  
   *oceanica*, 284.  
   *packardii*, 258, 285.  
   *parella*, 282.  
   *polystephanus*, 281.  
   *suffusa*, 282.  
   *zylona*, 280.
- Plicatula dubia*, 406.  
*Pneumodermon*, 232.  
*Polinices*, 333, 334, 335, 336, 337, 338.  
   *agujanus*, 334.  
   *constrictus*, 337.  
   *crawfordianus*, 335.  
   *intemerata*, 334.  
   *litorinus*, 337.  
   *pardoanus*, 336.  
   *solutus*, 335, 336.  
   *strebeli*, 338.  
   *uber*, 334.  
   *vaginatus*, 336.
- Poromya*, 428, 429, 430.  
   *anatinoides*, 428.  
   *chilensis*, 430.  
   *equatorialis*, 429.  
   *granulata*, 428.  
   *laevis*, 428.  
   *mactroides*, 429, 430.  
   *perla*, 428.
- Propeamusium*, 405.  
*Proscaphella gracilior*, 298.

- Protocardia, 414, 415.  
     *panamensis*, 415.  
 Psammacoma, 421.  
 Psammotreta, 422.  
 Pseudamusium, 402, 403, 404, 405.  
 Pseudaxinea, 399.  
 Pseudotoma, 256.  
 Pthonia, 366.  
 Ptychatractus, 299.  
     *californicus*, 299.  
     *ligatus*, 300.  
     *occidentalis*, 300.  
 Puncturella, 352, 353.  
     *asturiana*, 353.  
     *expansa*, 353.  
 Purpura, 306, 311. (See Thais.)  
 Pyryla anomala, 300.  
 RADULA PYGMAEA, 408.  
 Rhabdus, 359.  
 Rheda, 230.  
 Rictaxis, 236.  
 Rimula expansa, 353.  
 Rochfortia, 413.  
     *mabillei*, 413.  
     *rochebrunei*, 414.  
 Rouaultia, 258.  
 Ryderia, 431.  
 SABATIA, 240.  
     *Sabatina*, 240, 241.  
 Sanguinolaria rosea, 379.  
 Saxicava, 424.  
     *antarctica*, 424.  
     *arctica*, 424.  
     *chilensis*, 424.  
     *frigida*, 424.  
     *lebruni*, 424.  
     *mollis*, 424.  
     *rugosa*, 424.  
 Scala, 315, 317.  
     *ferminiana*, 315.  
     *mitchelli*, 317.  
 Scaphander, 238, 239, 240, 241.  
     *cylindrellus*, 239, 240.  
     *decapitatus*, 240.  
     *gracilis*, 239.  
     *interruptus*, 239.  
     *lignarius*, 241.  
     *planeticus*, 241.  
 Scapharca, 397.  
 Scaphella, 297, 298.  
     *benthalis*, 298.  
 Seguenzia, 325, 326.  
     *monocingulata*, 326.  
     *occidentalis*, 325.  
     *stephanica*, 325.  
 Sigaretopsis, 334.  
 Silenia sarsii, 430.  
 Silia, 319.  
 Silicula, 391, 392.  
     *fragilis*, 391.  
 Solariella, 349, 351, 352.  
     *ceratophora*, 350.  
     *equatorialis*, 351.  
     *galapagana*, 350.  
     *nuda*, 349.  
 Solarium, 327.  
 Solemya, 361, 363, 364, 365, 366.  
     *agassizii*, 364, 365, 366.  
     *australis*, 361, 362, 363, 364.  
     *borealis*, 363, 364.  
     *grandis*, 364.  
     *japonica*, 364.  
     *johnsoni*, 364, 365.  
     *macroductyla*, 363, 364, 365, 366.  
     *mediterranea*, 362, 363, 364.  
     *occidentalis*, 364.  
     *panamensis*, 363, 364, 366.  
     *parkinsoni*, 362, 363, 364.  
     *patagonica*, 363, 364.  
     *protexa*, 364.  
     *pusilla*, 364.  
     *radiata*, 366.  
     *solen*, 362, 363, 364.  
     *valvulus*, 364, 366.  
     *velum*, 363, 364.  
     *ventricosa*, 364.  
 Solenella, 383.  
     *norrisii*, 383.  
 Solenosteira, 300.  
     *anomala*, 300.  
     *elegans*, 300.  
 Solidula, 236.  
 Spaniodon, 412.  
 Speo bifasciatus, 236.  
 Sphenia subequalis, 422.  
 Spineoterebra, 246, 247, 248, 250.  
 Spinula, 377.  
 Steiraxis, 257, 273.  
     *aulaca*, 273.  
 Sthenorhytis stearnsii, 317.  
 Stigmaulax, 332.  
 Stilifer, 317, 318.  
     *bathymetrae*, 318.  
     *thomasiae*, 318.  
 Strioterebrum, 246, 248, 250, 251, 252, 253.  
 Strombina, 310.  
     *edentula*, 310.  
     *turrita*, 310.  
 Subula, 245, 249.  
 Surcula, 256, 261, 262, 263, 264, 272.  
 Surculina, 260, 291, 292.  
     *blanda*, 261.  
 Surgula, 256.

- TELLIMYA**, 413.  
**Tellina**, 362, 419, 420, 421.  
     *carpenteri*, 421.  
     *chrysozona*, 420.  
     *fluctigera*, 419.  
     *pristiphora*, 420.  
     *togata*, 362.  
     *variegata*, 421.  
**Terebra**, 245, 247, 248, 249, 250, 251, 252,  
     253, 254, 255.  
     *aciculata*, 245, 250.  
     *affinis*, 246.  
     *armillata*, 245.  
     *balaenorum*, 252.  
     *basteroti*, 246, 248.  
     *benthalis*, 248.  
     *bridgesi*, 253.  
     *bruguiéri*, 253.  
     *cerithina*, 245, 249.  
     *circumcincta*, 248.  
     *coerulescens*, 245, 250.  
     *dimidiata*, 246, 249.  
     *dislocata*, 248.  
     *duplicata*, 248, 250.  
     *geniculata*, 246.  
     *hindsii*, 252, 253.  
     *insignis*, 254.  
     *laevigata*, 253.  
     *lanceata*, 249.  
     *lingualis*, 254.  
     *lucana*, 252.  
     *maculata*, 246, 249.  
     *myuros*, 245, 247, 249.  
     *panamensis*, 250.  
     *pedroana*, 251.  
     *plicata*, 251.  
     *robusta*, 254.  
     *serotina*, 252.  
     *spinulosa*, 246, 248, 250.  
     *strigillata*, 245, 247, 249.  
     *stylus*, 253.  
     *subulata*, 246, 247, 248.  
     *triseriata*, 248.  
**Terebraria**, 245.  
**Terebrum**, 245.  
**Terebratella dorsata**, 444.  
**Terebratula**, 444.  
     *patagonica*, 444.  
     *wyvillei*, 444.  
**Terebratulina**, 442.  
     *crossei*, 442.  
     *kiiensis*, 442.  
**Teredo**, 425.  
**Thais nesiotés**, 311.  
**Thalassoplanes**, 303.  
**Tindaria**, 387, 388, 389, 390.  
     *agathida*, 390, 391.  
     *amabilis*, 387.  
         *atossa*, 388, 389.  
         *compressa*, 387.  
         *mexicana*, 389.  
         *panamensis*, 388.  
         *salaria*, 387.  
         *smirna*, 389, 390.  
         *sulculata*, 390.  
         *thea*, 390.  
         *virens*, 389.  
**Tindariopsis**, 390, 391.  
**Toledonia limnaeiformis**, Pl. 15, fig. 9.  
**Torinia**, 328.  
**Tornatella**, 236.  
**Tornatellaea bella**, 236.  
**Tornatelle**, 236.  
**Tornatina**, 238.  
**Tractolira sparta**, 299.  
**Tricla**, 230.  
**Trigonocoelia**, 392.  
**Triplostephanus**, 246, 248.  
**Tritia**, 306, 308.  
**Triton**, 319.  
     *decussatum*, 319.  
     *tuberosum*, 319.  
**Tritonalia**, 313.  
     *erinaceus*, 313.  
**Tritonella**, 306.  
**Tritonoharpa**, 319, 320.  
     *vevillata*, 319, 320.  
**Trivia**, 323.  
     *atomaria*, 323.  
     *panamensis*, 324.  
**Trochus**, 343.  
     *filosus*, 343.  
     *glabratus*, 343.  
     *peloritanus*, 342.  
     *perspectivus*, 327.  
**Trophon**, 311.  
     *citricus*, 311.  
     *clathratus*, 312.  
**Troschelia mörchii**, 303.  
**Truncaria**, 304, 305.  
     *brunneocincta*, 304.  
**Turbo**, 343.  
     *carinatus*, 343.  
     *erythrinus*, 343.  
     *peloritanus*, 343.  
     *sanguineus*, 342.  
     *saxosus*, 341.  
     *scalaris*, 315.  
**Turricula**, 348, 349.  
     *aeola*, 349.  
     *argenteonitens*, 349.  
     *bairdii*, 349.  
     *columbiana*, 349.  
     *crumpii*, 349.

- Turricula imperialis*, 349.  
     *macdonaldi*, 349.  
     *miranda*, 349.  
     *washingtoniana*, 349.
- Turricula*, 245.
- Turris*, 255, 256, 257, 261, 262, 263, 264.
  - armilla*, 262.
  - babylonica*, 255.
  - circinata*, 257.
  - dolenta*, 262.
  - dotella*, 263.
  - fusinella*, 261, 262, 263.
  - notilla*, 263.
  - resina*, 264.
- Turritella*, 255, 327.
  - mariana*, 327.
- Typhis martyria*, 314.
- UBER, 333.
- Utriculus domitus*, 242.
- VELAINIA, 334.
- Venericardia velutina*, 412.
- Vertagus*, 245.
- Vesica*, 244.
- Vesicomya*, 415, 416, 417, 418, 419.
  - angulata*, 419.
  - donacia*, 417.
  - gigas*, 418.
  - lepta*, 416, 418.
  - ovalis*, 417.
  - stearnsii*, 417.
  - venusta*, 417.
- Voluta*, 297.
  - alta*, 299.
  - ancilla*, 297.
  - gracilis*, 298.
  - reticulata*, 294.
- Voluta solidula*, 236.
  - tornatilis*, 235.
  - undulata*, 297.
  - vespertilio*, 297.
- Volutilithes philippiana*, 298.
- Volutopsius amabilis*, 305.
- WALDHEIMIA WYVILLEI, 444.
- XYLOPHAGA, 424, 425.
  - dorsalis*, 424.
  - mexicana*, 425.
- Xylophagus*, 424.
- Xylotomea*, 424.
- Xylotrya*, 425.
- YOLDIA, 379, 380, 381, 382.
  - angularis*, 379.
  - arctica*, 379.
  - chilenica*, 380, 381.
  - chilensis*, 381.
  - dicella*, 382.
  - granula*, 382.
  - hyperborea*, 379.
  - indolens*, 381.
  - infrequens*, 381.
  - lanceolata*, 378.
  - leonilda*, 382.
  - limatula*, 379.
  - lucida*, 380.
  - mantana*, 381.
  - panamensis*, 380.
  - scapania*, 380.
  - solenoides*, 380.
  - thraciaeformis*, 379, 381.
  - vincula*, 379.
- Yoldiella*, 380, 381, 382.





PLATE 1.

- FIG. 1. *Pleurotomella (Phymorhynchus) castanea* Dall; alt. 53 mm.; p. 284.  
FIG. 2. *Cancellaria (Merica) io* Dall; alt. 43 mm.; p. 295.  
FIG. 3. *Pleurotomella (Phymorphynchus?) clarinda* Dall; alt. 39.0 mm.; p. 285.  
FIG. 4. *Cancellaria (Merica) corbicula* Dall; alt. 21.5 mm.; p. 294.  
FIG. 5. *Borsonia (Borsonella) agassizii* Dall; alt. 23.0 mm.; p. 275.  
FIG. 6. *Pleurotomella (Gymnobela) agonia* Dall; alt. 25 mm.; p. 278.  
FIG. 7. *Gemmula benthima* Dall; alt. 28.0 mm.; p. 267.  
FIG. 8. *Cancellaria (Merica) centrota* Dall; alt. 35 mm.; p. 295.  
FIG. 9. *Glyphostoma immaculata* Dall; alt. 10.4 mm.; p. 289.

The drawings for this plate were made by the late Dr. J. C. McConnell.

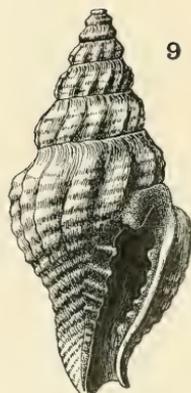
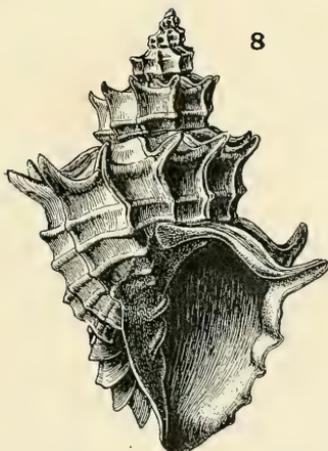
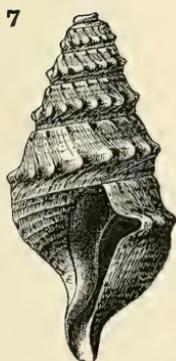
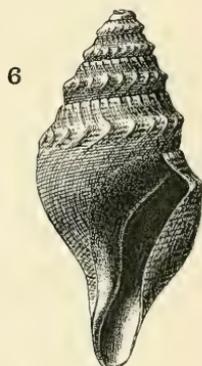
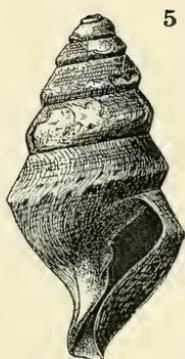
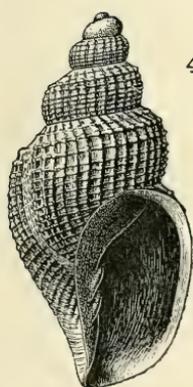
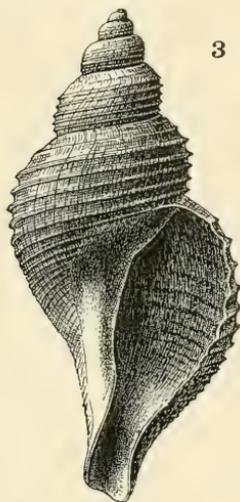
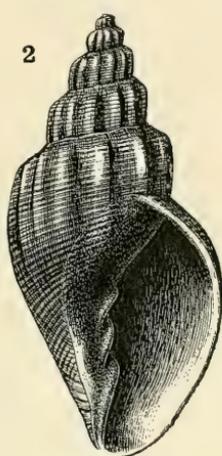
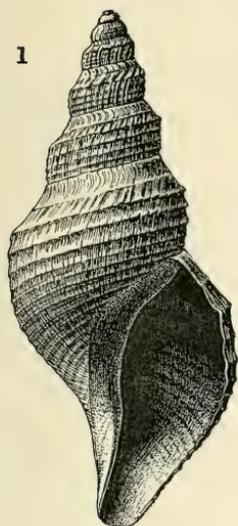






PLATE 2.

- FIG. 1. *Leucosyrinx erosina* Dall; alt. 28.0 mm.; p. 269.  
FIG. 2. *Daphnella (Eubela) imparella* Dall; alt. 12.7 mm.; p. 291.  
FIG. 3. *Pleurotomella (Gymnobela) xylona* Dall; alt. 27 mm.; p. 280.  
FIG. 4. *Gaza rathbuni* Dall, basal view; diam. 45 mm.; p. 347. See also plate 3,  
figure 6.  
FIG. 5. *Steiraxis aulaca* Dall; alt. 60 mm.; p. 273.  
FIG. 6. *Truncaria brunneocincta* Dall; alt. 31.5 mm.; p. 304.  
FIG. 7. *Tractolira sparta* Dall; alt. 60 mm.; p. 299.

The drawings for this plate were made by the late Dr. J. C. McConnell.



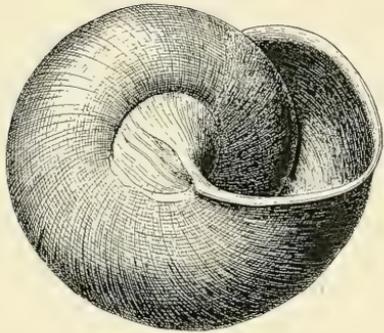
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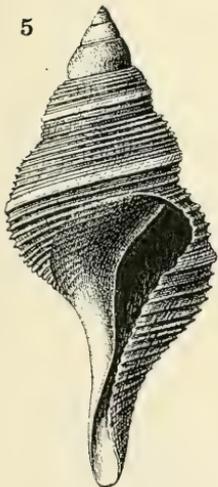
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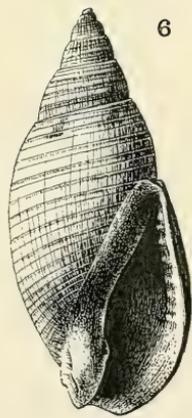
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PLATE 3.

- FIG. 1. *Daphnella (Surculina) blanda* Dall ; alt. 26.5 mm. ; p. 291.  
FIG. 2. *Solariella ceratophora* Dall ; alt. 28 mm. ; p. 350.  
FIG. 3. *Fusinus (Exilia?) rufocaudatus* Dall ; alt. 30 mm. ; p. 302.  
FIG. 4. *Choristes carpenteri* Dall ; alt. 21 mm. ; p. 328.  
FIG. 5. *Solariella nuda* Dall, basal view ; diam. 19 mm. ; p. 349.  
FIG. 6. *Gaza rathbuni* Dall, profile ; alt. 30 mm. See also plate 2, figure 4 ;  
p. 347.  
FIG. 7. *Solariella nuda* Dall, profile ; alt. 15 mm. ; p. 349.

The drawings for this plate were made by the late Dr. J. C. McConnell.

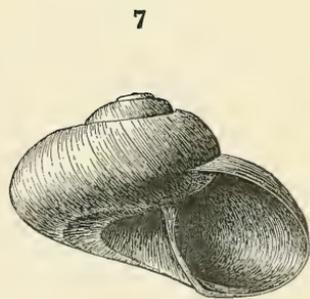
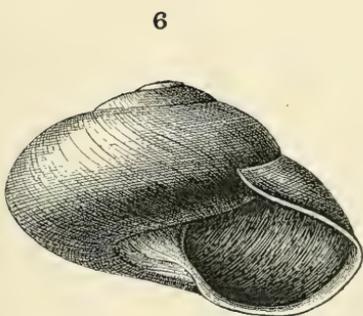
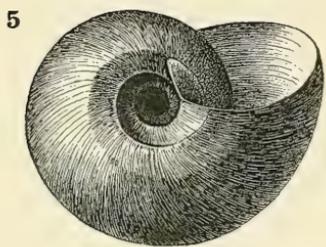
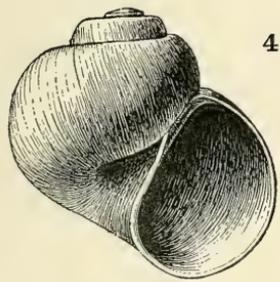
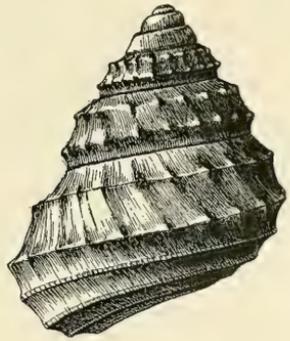
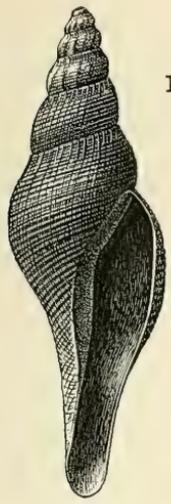






PLATE 4.

- FIG. 1. *Alectrion (Hima) miser* Dall; alt. 20.0 mm.; p. 307.  
FIG. 2. *Solariella galapagana* Dall; alt. 17.0 mm.; p. 350.  
FIG. 3. *Pleurotomella (Gymnobela) isogonia* Dall; alt. 12.5 mm.; p. 279.  
FIG. 4. *Cancellaria (Admete?) californica* Dall, adolescent specimen; alt. 9. mm.; p. 296.  
FIG. 5. *Puncturella (Cranopsis) expansa* Dall, profile; alt. 10 mm.; p. 353.  
FIG. 6. *Mangilia enora* Dall, alt. 9.5 mm.; p. 286.  
FIG. 7. *Oöccrys (Benthodolium) pacifica* Dall, with operculum; alt. 30 mm.; p. 323.  
FIG. 8. *Dentalium agassizii* Pilsbry and Sharp; lon. 65 mm.; p. 358.  
FIG. 9. *Oöccorys rotunda* Dall, immature; alt. 45 mm.; p. 322.  
FIG. 10. *Puncturella (Cranopsis) expansa* Dall, from below; width 26 mm.; p. 353.  
FIG. 11. The same from above; length, 32 mm.

The drawings for this plate were made by the late Dr. J. C. McConnell:

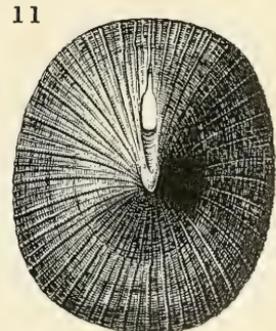
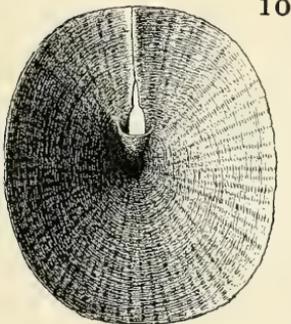
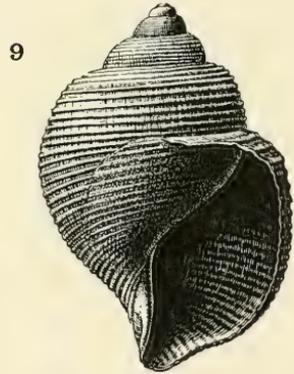
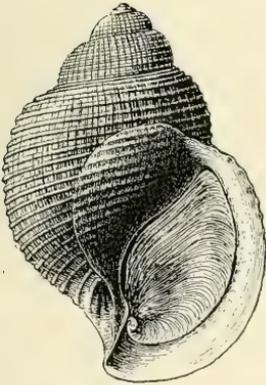
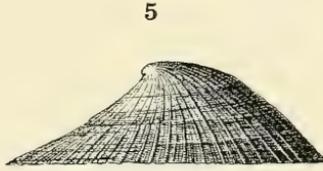
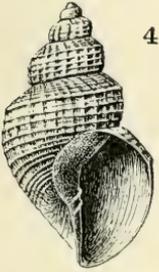
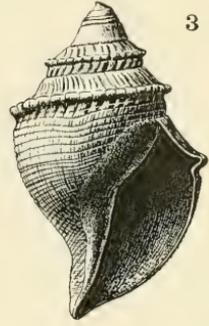
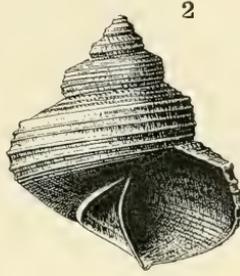
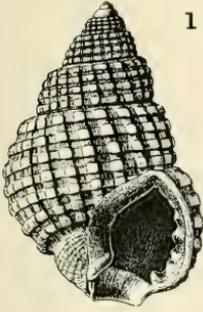






PLATE 5.

- FIG. 1. *Poromya (Dermatomya) equatorialis* Dall, side view; lon. 6.5 mm.; p. 429.  
FIG. 2. The same, left valve from above, showing the projecting lateral tooth.  
FIG. 3. *Cadulus striatus* Dall; lon. 24.8 mm.; p. 360.  
FIG. 4. *Myonera garretti* Dall, profile; lon. 13.5 mm.; p. 434.  
FIG. 5. *Yoldia (Katadesmia) vincula* Dall; lon. 14 mm.; p. 379.  
FIG. 6. *Solenosteira elegans* Dall; alt. 38 mm.; p. 300.  
FIG. 7. *Acteon (Microglyphis) mazatlanicus* Dall; alt. 5.5 mm.; p. 237.  
FIG. 8. *Adelomelon benthalis* Dall (the entire surface is slightly eroded); alt. 125 mm.; p. 298.  
FIG. 9. *Leptothyra panamensis* Dall; alt. 9.5 mm.; p. 342.  
FIG. 10. *Terebra (Strioterebrum) panamensis* Dall; alt. 22.0 mm.; p. 250.  
FIG. 11. *Solariella equatorialis* Dall; alt. 21 mm.; p. 351.

The drawings for this plate are by the late Dr. J. C. McConnell.

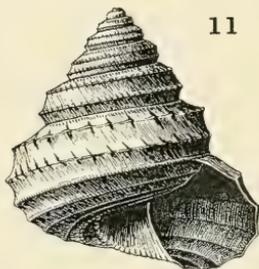
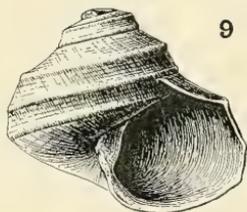
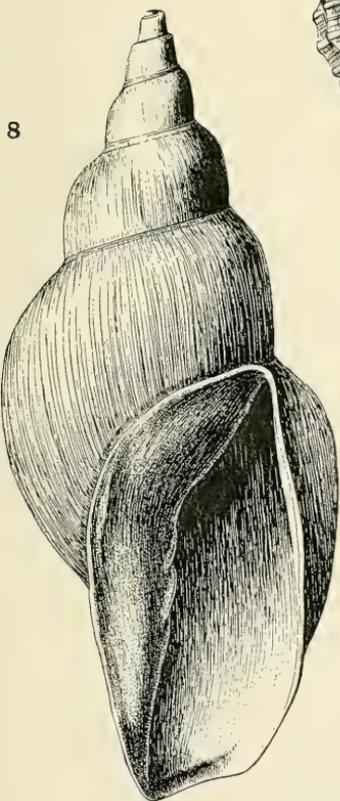
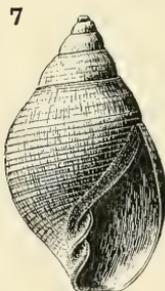
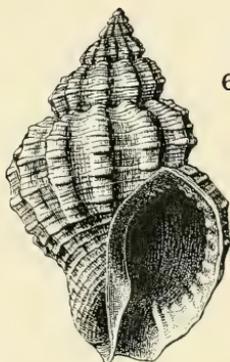
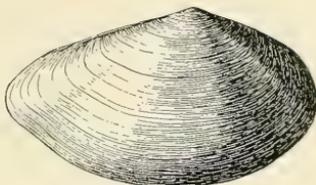
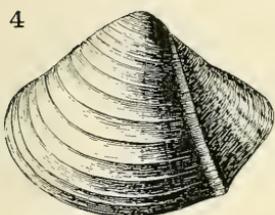
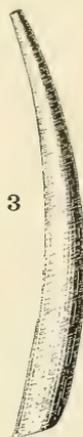
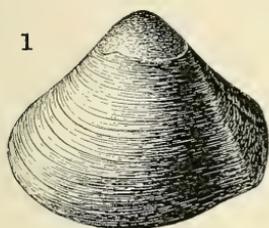


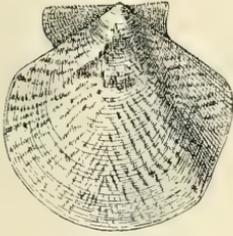




PLATE 6.

- FIG. 1. *Pecten (Pseudamysium) cocosensis* Dall, left valve ; alt. 8.7 mm. ; p. 406.  
FIG. 2. *Cardita (Glans) sulcosa* Dall, right valve ; lon. 8.5 mm. ; p. 412.  
FIG. 3. *Pecten (Pseudamysium) cocosensis* Dall, right valve ; alt. 8.7 mm. ; p. 405.  
FIG. 4. *Leda (Jupiteria) agapea* Dall, dorsal view ; lon. 21.0 mm. ; p. 373.  
FIG. 5. The same in profile.  
FIG. 6. *Leda cordyla* Dall, dorsal view ; lon. 8.5 mm. ; p. 375.  
FIG. 7. The same in profile.  
FIG. 8. *Pecten (Pseudamysium) panamensis* Dall, exterior of left valve ; lat. 18.0 mm. ; p. 404.  
FIG. 9. *Pecten (Propeamysium) malpelonium* Dall, exterior of left valve ; alt. 18.2 mm. ; p. 405.  
FIG. 10. *Pecten (Pseudamysium) panamensis* Dall, exterior of right valve ; lat. 16.0 mm. ; p. 404.  
FIG. 11. *Nucula panamina* Dall ; lon. 22.0 mm. ; p. 368.  
FIG. 12. *Vesicomya (Callogonia) angulata* Dall, interior of right valve ; lon. 58 mm. ; p. 419.

The drawings for this plate are by the late Dr. J. C. McConnell.



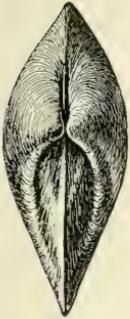
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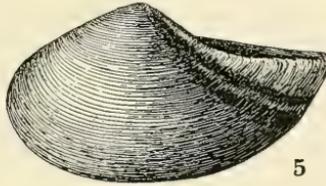
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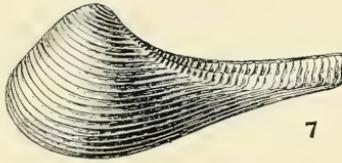
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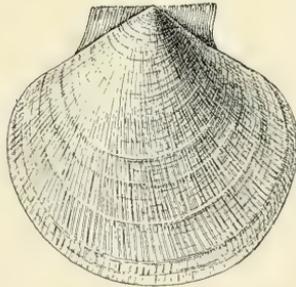
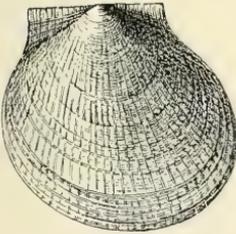
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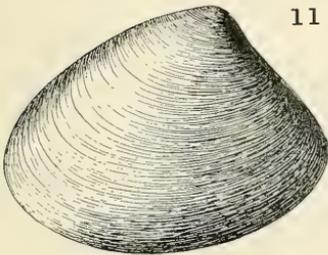
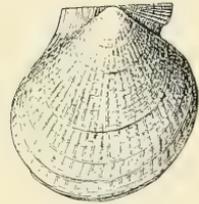
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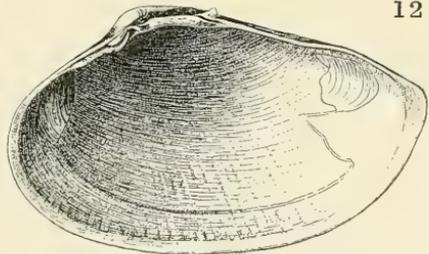
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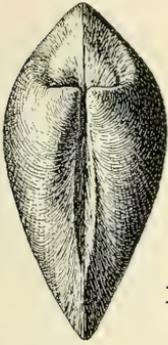




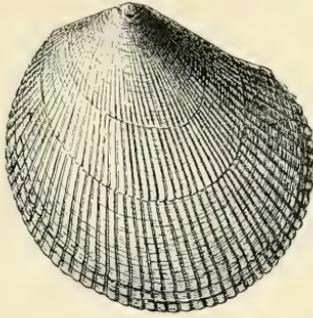
PLATE 7.

- FIG. 1. *Nucula iphigenia* Dall, dorsal view ; lon. 35.0 mm. ; p. 369.  
FIG. 2. *Lima (Acesta) diomedae* Dall ; alt. 35.0 mm. ; p. 407.  
FIG. 3. *Nucula taeniolata* Dall, dorsal view ; lon. of shell, 17.0 mm. ; p. 368.  
FIG. 4. *Nucula iphigenia* Dall, profile of right valve ; lon. 35.0 mm. ; p. 369.  
FIG. 5. *Nucula taeniolata* Dall, profile ; lon. 17.0 mm. ; p. 368.  
FIG. 6. *Limopsis zonalis* Dall, interior view, margins entire ; lon. 27.0 mm. ; p. 393.  
FIG. 7. *Limopsis compressus* Dall, view of interior of left valve ; lon. 45.0 mm.,  
exclusive of the hairs ; p. 394.  
FIG. 8. The same, exterior of left valve ; with hairy periostracum.  
FIG. 9. *Limopsis zonalis* Dall, exterior ; lon. 27.0 mm. ; p. 393.

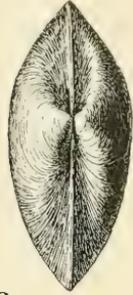
The drawings for this plate are by the late Dr. J. C. McConnell.



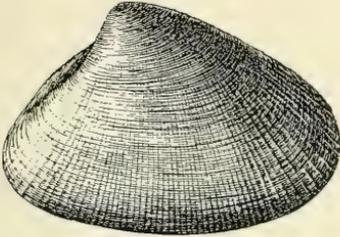
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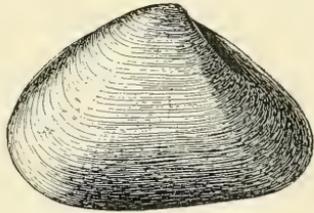
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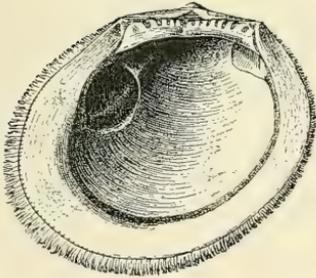
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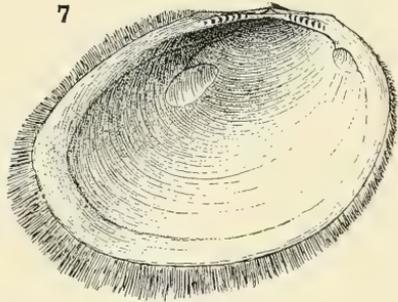
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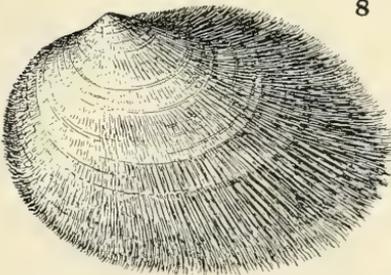
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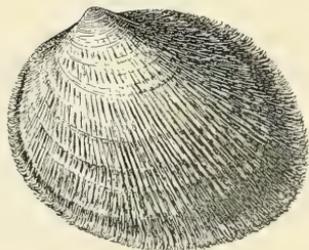
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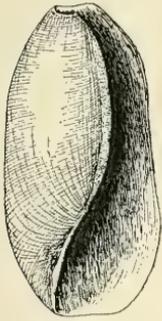




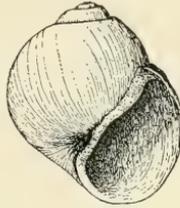
PLATE 8.

- FIG. 1. *Scaphander cylindrellus* Dall ; alt. 33.0 mm. ; p. 239.  
FIG. 2. *Polynices (Euspira) solutus* Gould ; alt. 17.0 mm. ; p. 335.  
FIG. 3. *Clanculus (Panocochlea) rubidus* Dall, young shell, the aperture not fully formed ; max. diam. 6.0 mm. ; p. 346.  
FIG. 4. The same, from above.  
FIG. 5. *Phos cocosensis* Dall ; alt. 47.0 mm. ; p. 306.  
FIG. 6. *Pecten (Pallium) miser* Dall ; alt. 34.0 mm. ; p. 401.  
FIG. 7. *Tritonoharpa vexillata* Dall (the color bands of the shell are not shown) ; alt. 15.0 mm. ; p. 320.  
FIG. 8. *Epitonium (Ferminoscala) ferminianum* Dall (this specimen is not quite mature and does not show the final varix) ; alt. 38.0 mm. ; p. 316.  
FIG. 9. *Oöcorys elevata* Dall ; alt. 60.0 mm. ; p. 322.  
FIG. 10. *Epitonium (Ferminoscala) brunneopictum* Dall ; alt. 37.5 mm. ; p. 316.

Figures 1, 2, 7, and 9 were drawn by Miss Evelyn Mitchell ; the others by the late Dr. J. C. McConnell.



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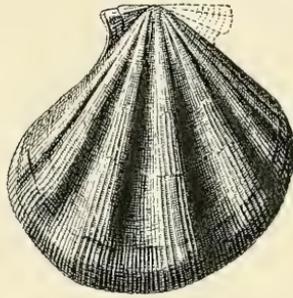
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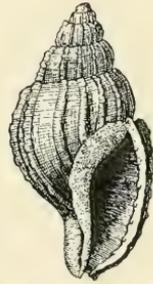
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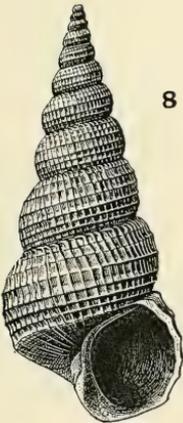
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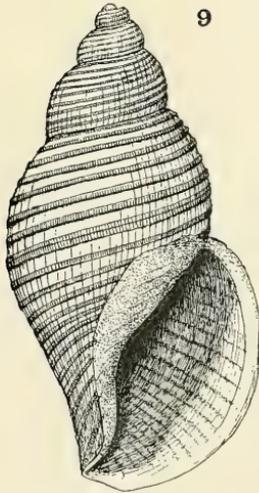
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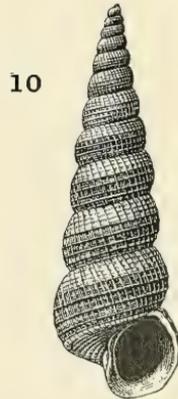
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PLATE 9.

- FIG. 1. Cephalopod beak, showing excavations made by *Bathysciadium pacificum* (circular) and *Cocculina* (ovoid) ?; p. 339.
- FIG. 2. *Polynices (Euspira) agujanus* Dall; alt. 26.0 mm.; p. 334.
- FIG. 3. *Bathysciadium pacificum* Dall, viewed from above; diameter of base 5.0 mm.; p. 339.
- FIG. 4. *Pecten (Pseudamusium) neoceanicus* Dall; alt. 12.0 mm; p. 402.
- FIG. 5. *Epitonium (Sthenorhytis) turbinum* Dall; basal view; diameter 28.0 mm.; p. 317.
- FIG. 6. The same, viewed from above, showing the decollation of the spire.
- FIG. 7. *Bathysciadium pacificum* Dall, in profile, showing fringes of periostracum; p. 339.
- FIG. 8. *Epitonium (Sthenorhytis) turbinum* Dall, profile of decollate specimen; diameter 28.0 mm.; p. 317.

Figure 4 was drawn by the late Dr. J. C. McConnell, the others by Miss Evelyn Mitchell.

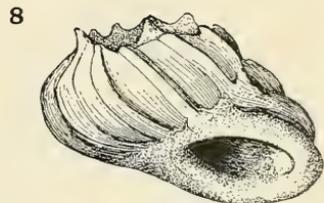
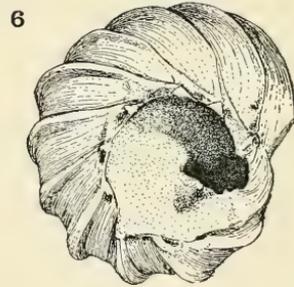
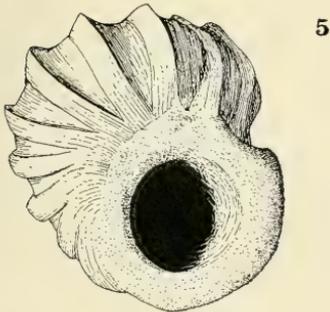
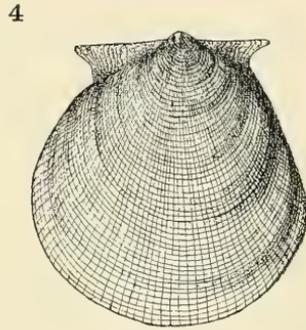
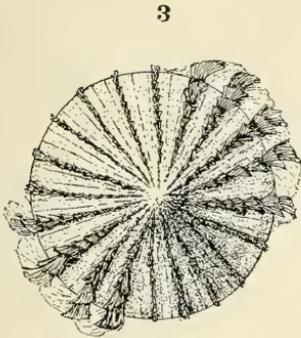
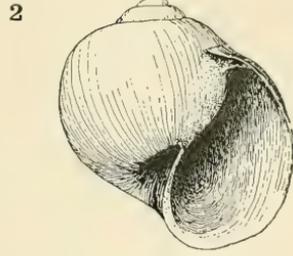
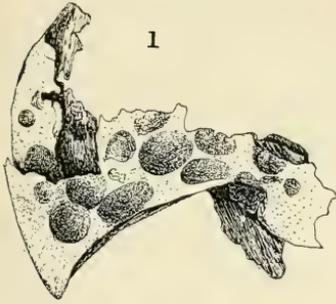


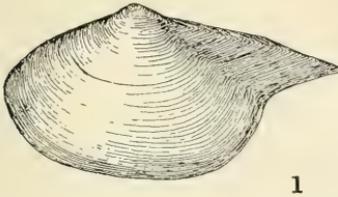




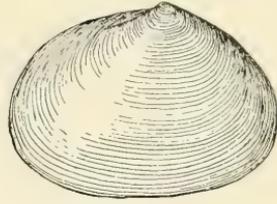
PLATE 10.

- FIG. 1. *Leda (Spinula) calcar* Dall; lon. 15.2 mm.; p. 378.  
FIG. 2. *Aligena borniana* Dall; lon. 14.2 mm.; p. 413.  
FIG. 3. *Malletia peruviana* Dall, profile; lon. 28.0 mm.; p. 384.  
FIG. 4. *Tellina (Moerella) chrysogona* Dall, profile; lon. 13.0 mm.; p. 420.  
FIG. 5. *Malletia peruviana* Dall, dorsal view; lon. 28.0 mm.; p. 384.  
FIG. 6. *Nucula agujana* Dall, in profile; lon. 11.0 mm.; p. 370.  
FIG. 7. The same, umbonal view.  
FIG. 8. *Tellina (Moerella) chrysogona* Dall, umbonal view; lon. 13.0 mm.; p. 420.  
FIG. 9. *Pecten (Pseudamusium) polyleptus* Dall; alt. 9.5 mm.; p. 403.  
FIG. 10. *Leda (Spinula) calcar* Dall, dorsal view, showing external ligament, lunule, and escutcheon; lon. 15.2 mm.; p. 378.

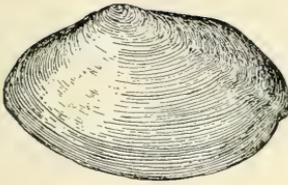
The figures for this plate were drawn by Miss Evelyn Mitchell.



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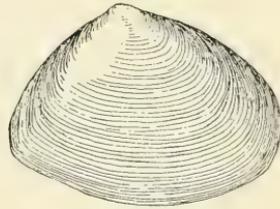


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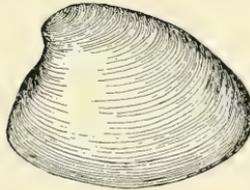
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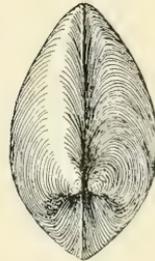
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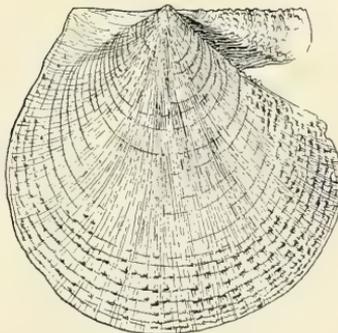
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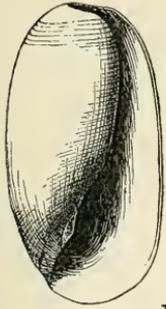




PLATE 11.

- FIG. 1. *Cylichnella* (*Cylichnium*) *pizarro* Dall; alt. 9.75 mm.; p. 243.  
FIG. 2. *Cylichnella* (*Cylichnium*) *atahualpa* Dall; alt. 9.0 mm.; p. 243.  
FIG. 3. *Cylichnella* (*Bullinella*) *inca* Dall; alt. 6.0 mm.; p. 242.  
FIG. 4. *Bullaria* (*Leucophysema*) *morgana* Dall; alt. 5.5 mm.; p. 244.  
FIG. 5. *Natica* (*Cochlis*) *scethra* Dall; alt. 17.0 mm.; p. 333.  
FIG. 6. *Acteon panamensis* Dall; alt. 7.0+ mm.; p. 236.  
FIG. 7. *Polinices* (*Euspira*) *crawfordianus* Dall; alt. 15.0 mm.; p. 335.  
FIG. 8. *Erato oligostata* Dall; alt. 3.2 mm.; p. 324.  
FIG. 9. *Volutopsius?* *amabilis* Dall; alt. 10.5 mm.; p. 305.  
FIG. 10. *Cancellaria* (*Merica?*) *microsoma* Dall; alt. 3.5 mm.; p. 296.  
FIG. 11. *Alectrion* (*Hima*) *catallus* Dall; alt. 14 mm.; p. 307.  
FIG. 12. *Alectrion* (*Tritia*) *exsarcus* Dall; alt. 9.0 mm.; p. 308.  
FIG. 13. *Columbella* (*Anachis*) *fusidens* Dall; alt. 15.0 mm.; p. 309.  
FIG. 14. *Turritella mariana* Dall; alt. 25.0 mm.; p. 327.

Figure 8 was drawn by the late Dr. J. C. McConnell, the others by Miss Evelyn Mitchell.



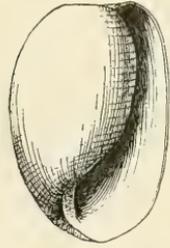
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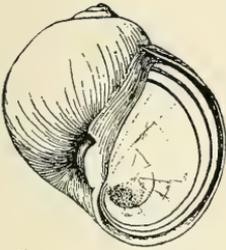
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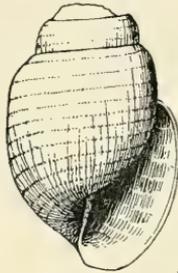
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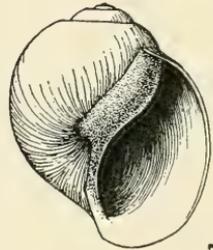
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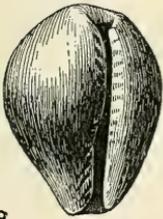
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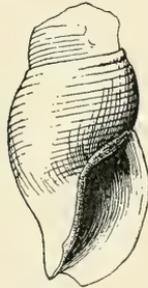
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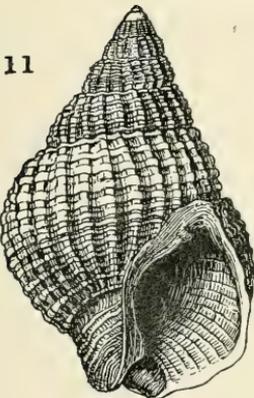
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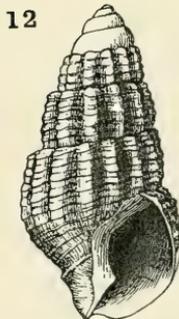
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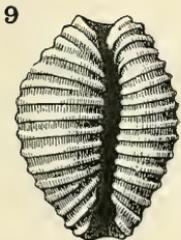
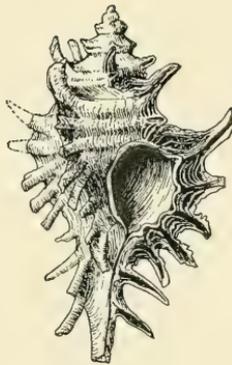
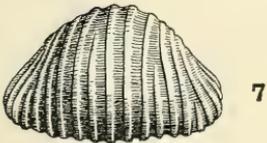
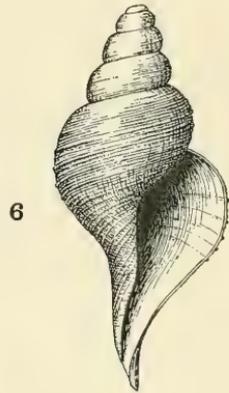
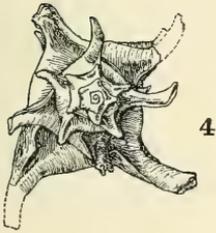
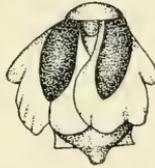
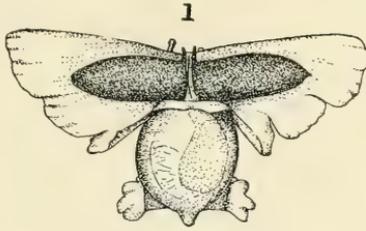
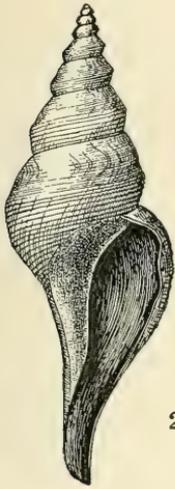




PLATE 12.

- FIG. 1. *Cavolina occidentalis* Dall, with the animal fully expanded, drawn from life by W. H. Dall; max. lat. 22.0 mm.; p. 233.
- FIG. 1b. The same with the pteropodia partly folded preparatory to their withdrawal into the test; width about 12 mm.
- FIG. 1c. View of the "head" from above, showing the notched junction of the pteropodia and the strongly contrasted asymmetrical eye pedicels, much magnified.
- FIG. 2. *Irenosyrinx persimilis* Dall; alt. 100.0 mm.; p. 271.
- FIG. 3. *Leucosyrinx? pacifica* Dall; alt. 23.0 mm.; p. 270.
- FIG. 4. *Murex (Tritonalia) diomedaeus* Dall, vertical view showing varices; p. 313.
- FIG. 5. The same, alt. 29.0 mm.; p. 313.
- FIG. 6. *Fusinus fragilissimus* Dall, alt. 21 mm.; p. 301.
- FIG. 7. *Trivia panamensis* Dall, profile view, lon. 4.2 mm.; p. 324.
- FIG. 8. *Trivia atomaria* Dall, profile view, lon. 3.2 mm.; p. 323.
- FIG. 9. *Trivia panamensis* Dall, basal view, p. 324.
- FIG. 10. *Trivia atomaria* Dall, basal view, p. 323.
- FIG. 11. The same, dorsal view.
- FIG. 12. *Trivia panamensis* Dall, dorsal view, p. 324.

Figures 3 and 7-12 were drawn by the late Dr. J. C. McConnell, the others by Miss Evelyn Mitchell.



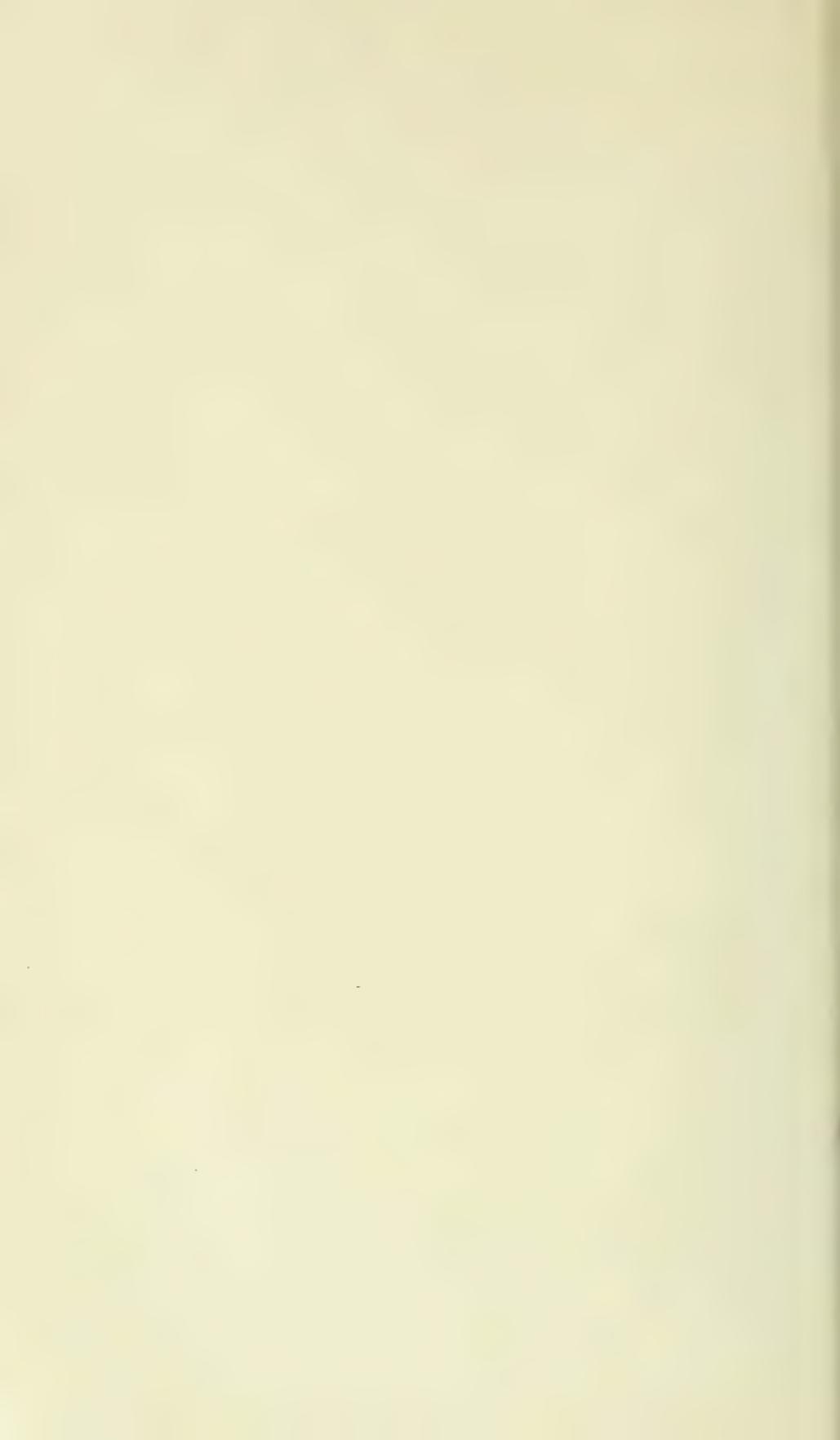
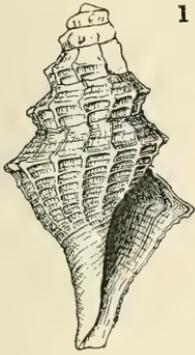




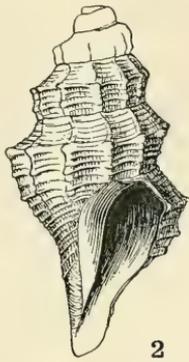
PLATE 13.

- FIG. 1. *Clinura monochorda* Dall; alt. 11.5 mm.; p. 292.  
FIG. 2. *Clinura peruviana* Dall; alt. 9.0 mm.; p. 293.  
FIG. 3. *Mangilia? genilda* Dall; alt. 10.5 mm.; p. 286.  
FIG. 4. *Gemmula benthina* Dall; alt. 28.0 mm.; p. 267.  
FIG. 5. *Gemmula exulans* Dall; alt. 17.0 mm.; p. 265.  
FIG. 6. *Gemmula serilla* Dall; alt. 8.3 mm.; p. 269.  
FIG. 7. *Borsonia (Borsonella) hooveri* Arnold; alt. 14.7 mm.; p. 276.  
FIG. 8. *Mangilia sedillina* Dall.; alt. 8.0 mm.; p. 287.  
FIG. 9. *Borsonia (Borsonella) dalli* Arnold; alt. 23.0 mm.; p. 275.  
FIG. 10. *Irenosyrinx cerebristriata* Dall; alt. 48.0 mm.; p. 272.  
FIG. 11. *Borsonia (Borsonella) diegensis* Dall; alt. 15.0 mm.; p. 275.

Figures 9, 10, and 11 were drawn by the late Dr. J. C. McConnell, the others by Miss Evelyn Mitchell.



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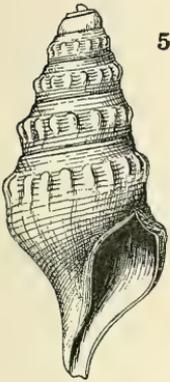
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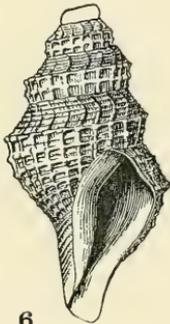
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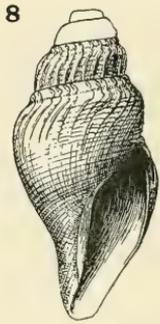
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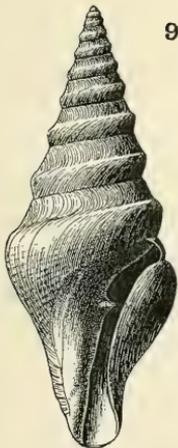
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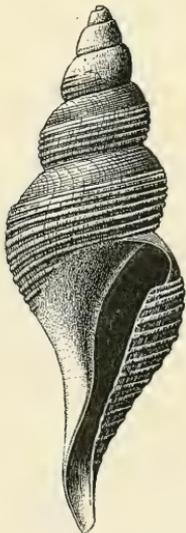
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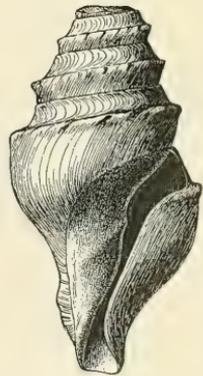
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PLATE 14.

- FIG. 1. *Clathurella panamella* Dall ; alt. 14.0 mm. ; p. 288.  
FIG. 2. *Borsonia (Borsonella) coronadoi* Dall ; alt. 29.0 mm. ; p. 277.  
FIG. 3. *Leucosyrinx? clionella* Dall ; alt. 35.0 mm. ; p. 270.  
FIG. 4. *Pleurotomella parella* Dall ; alt. 41.0 mm. ; p. 282.  
FIG. 5. *Gemmula vicella* Dall ; alt. 8.5 mm. ; p. 268.  
FIG. 6. *Mangilia movilla* Dall ; alt. 4.9 mm. ; p. 285.  
FIG. 7. *Surcula fusinella* Dall ; alt. 17.0 mm. ; p. 261.  
FIG. 8. *Gemmula eldorana* Dall ; alt. 8.0 mm. ; p. 268.  
FIG. 9. *Pleurotomella agonia* var. *altina* Dall ; alt. 24.0 mm. ; p. 278.  
FIG. 10. *Pleurotomella suffusa* Dall ; alt. 31.5 mm. ; p. 282.  
FIG. 11. *Mangilia encella* Dall ; alt. 11.25 mm. ; p. 287.  
FIG. 12. *Clathurella orariana* Dall ; alt. 12.0 mm. ; p. 288.

The figures for this plate were drawn by Miss Evelyn Mitchell.

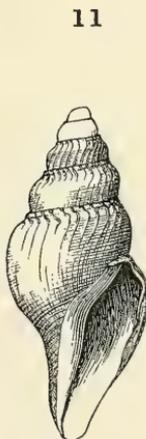
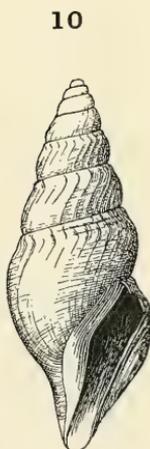
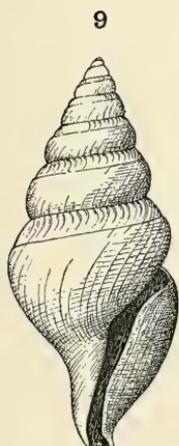
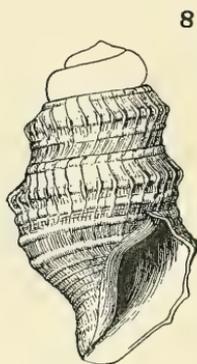
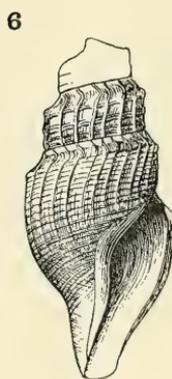
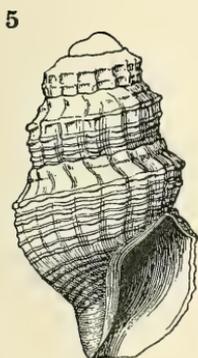
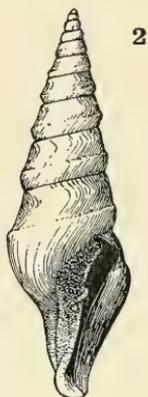
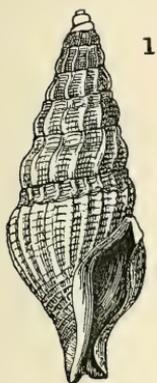


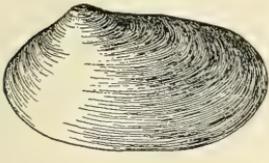




PLATE 15.

- FIG. 1. *Malletia (Minormalletia) benthima* Dall, profile; lon. 9.5 mm.; p. 386.  
FIG. 2. The same, dorsal view of the same valve.  
FIG. 3. *Tindaria atossa* Dall, profile; lon. 3.5 mm.; p. 388.  
FIG. 4. The same, dorsal view.  
FIG. 5. *Malletia (Minormalletia) arciformis* Dall, profile; lon. 10.6 mm.; p. 385.  
FIG. 6. The same, dorsal view of the same valve.  
FIG. 7. *Tindaria compressa* Dall, dorsal view; lon. 8.2 mm.; p. 387.  
FIG. 8. The same, in profile, not quite adult.  
FIG. 9. *Toledonia limnaeiformis* (Smith), in profile; alt. 3.2 mm.  
FIG. 10. *Periploma (Halistrepta) sulcata* Dall; lon. 32.0 mm.; p. 427.  
FIG. 11. *Typhis martyria* Dall; alt. 27.0 mm.; p. 314.  
FIG. 12. *Acteon (Microglyphis) breviculus* Dall; alt. 3.6 mm.; p. 238.  
FIG. 13. *Limopsis diegensis* Dall, exterior; lon. 13.0 mm.; p. 395.  
FIG. 14. *Antistreptus magellanicus* Dall; alt. 4.5 mm.; p. 315.  
FIG. 15. *Limopsis diegensis* Dall, interior view of the same valve; the crenulation of the margin not well shown; lon. 13 mm.; p. 395.

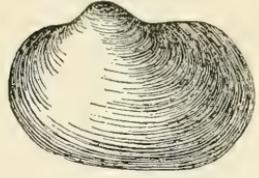
Figures 1 to 8 were drawn by Miss Evelyn Mitchell; the others by the late Dr. J. C. McConnell.



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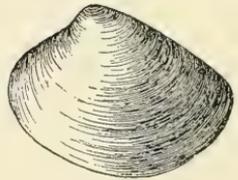
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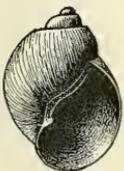
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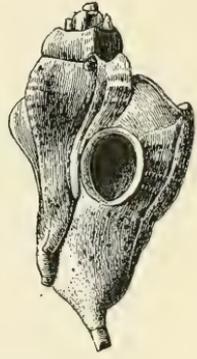


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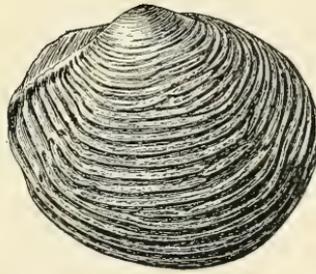
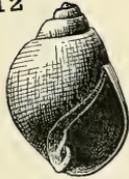


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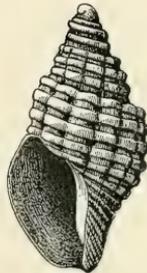
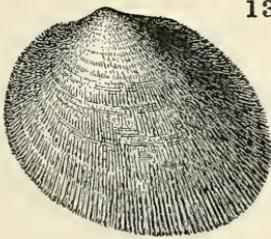


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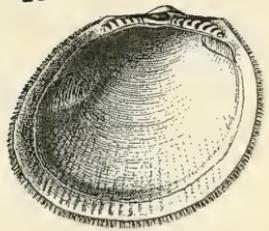


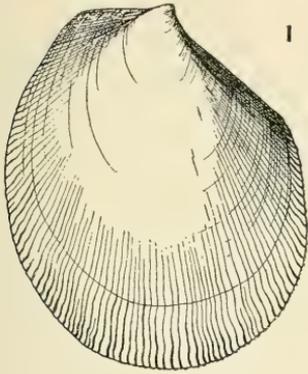




PLATE 16.

- FIG. 1. *Lima (Acesta) agassizii* Dall; alt. 98.0 mm.; p. 407.  
FIG. 2. *Cuspidaria panamensis* Dall, interior of right valve; lon. 42.0 mm.;  
p. 432.  
FIG. 3. *Cocculina nassa* Dall; lon. 8.5 mm.; p. 341.  
FIG. 4. *Cocculina diomedae* Dall, profile; alt. 4.5 mm.; p. 341.  
FIG. 5. *Periploma stearnsii* Dall; lon. 46.0 mm.; p. 426.  
FIG. 6. *Cocculina nassa* Dall, profile view; alt 5.0 mm.; p. 341.  
FIG. 7. *Cocculina diomedae* Dall, view from above; lon. 13.0 mm.; p. 341.  
FIG. 8. *Periploma carpenteri* Dall; lon. 49.0 mm.; p. 426.  
FIG. 9. *Vesicomya (Archivesica) gigas* Dall; lon. 115.0 mm.; p. 418.  
FIG. 10. *Solemya (Acharax) agassizii* Dall, valve stripped of the periostracum;  
lon. 145.0 mm.; p. 365.

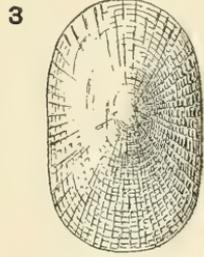
The figures for this plate were drawn by Miss Evelyn Mitchell.



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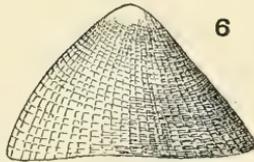
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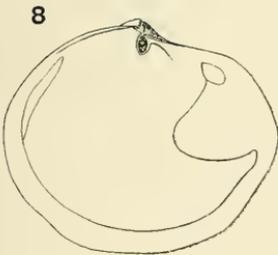
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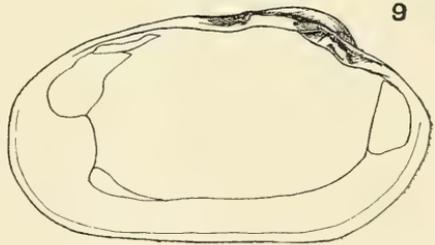
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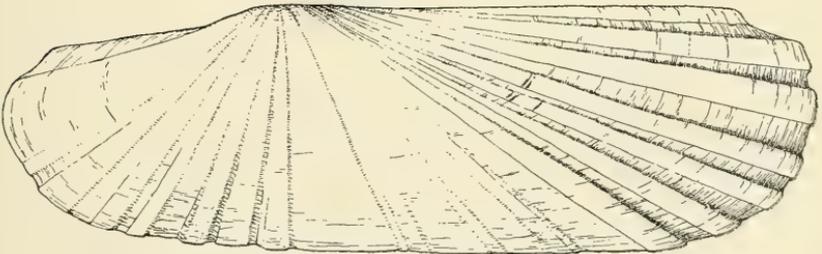


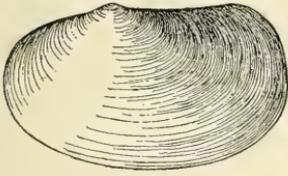




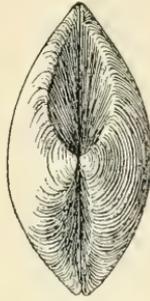
PLATE 17.

- FIG. 1. *Malletia truncata* Dall, profile; lon. 22.5 mm.; p. 384.  
FIG. 2. *Leda loshka* Dall; lon. 16.2 mm.; p. 376.  
FIG. 3. *Leda (Jupiteria) callimene* Dall, profile; lon. 15.5 mm.; p. 372.  
FIG. 4. The same, dorsal view.  
FIG. 5. *Rochefortia rochebrunei* Dall; lon. 4.5 mm.; p. 414.  
FIG. 6. *Tindaria smirna* Dall; lon. 5.5 mm.; p. 389.  
FIG. 7. The same, dorsal view.  
FIG. 8. *Arca (Cucullaria) endemica* Dall; lon. of hinge, 9.5 mm.; p. 399.  
FIG. 9. *Vesicomya donacia* Dall, profile; lon. 14.5 mm.; p. 417.  
FIG. 10. *Tindaria panamensis* Dall; lon. 5.5 mm.; p. 388.  
FIG. 11. *Tindaria mexicana* Dall, dorsal view of valve; lon. 5.2 mm.; p. 389.  
FIG. 12. *Tindaria panamensis* Dall, profile; lon. 5.5 mm.; p. 388.  
FIG. 13. *Vesicomya donacia* Dall, left valve from above; lon. 14.5 mm.; p. 417.  
FIG. 14. *Tindaria mexicana* Dall, profile; lon. 5.2 mm.; p. 389.  
FIG. 15. *Tindaria compressa* Dall, adult, dorsal view; lon. 11.5 mm.; p. 387.  
FIG. 16. The same, in profile.

The figures for this plate were drawn by Miss Evelyn Mitchell.



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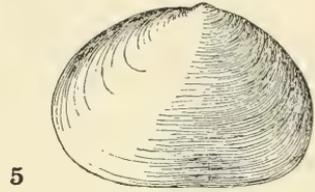
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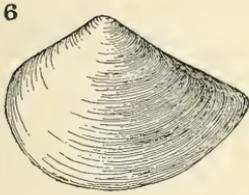
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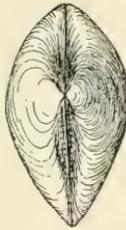
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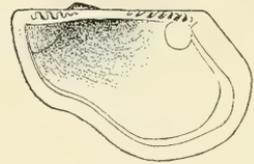
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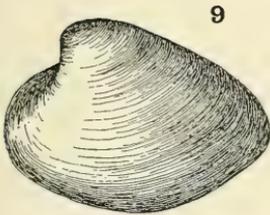
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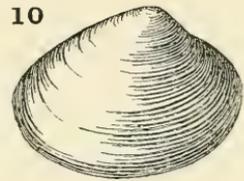
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8



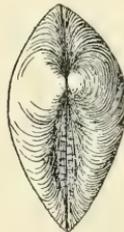
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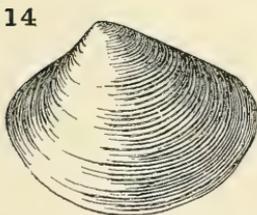
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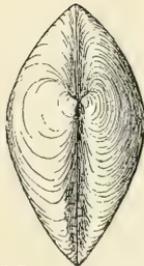
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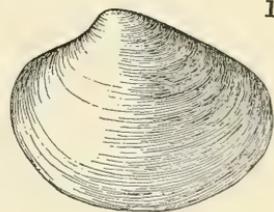
13



14



15



16





PLATE 18.

- FIG. 1. *Protocardia panamensis* Dall; lon. 13.5 mm.; p. 415.  
FIG. 2. *Poromya perla* Dall, side view; alt. 9.0 mm.; p. 428.  
FIG. 3. *Nucula chrysocoma* Dall; lon. 5.0 mm.; p. 370.  
FIG. 4. The same, dorsal view, showing prodissoconch.  
FIG. 5. *Poromya perla* Dall, profile of left valve from in front; alt. 9.0 mm.; p. 428.  
FIG. 6. *Malletia (Neilo) goniura* Dall; lon. 13.0 mm.; p. 386.  
FIG. 7. *Limopsis diazi* Dall, view of interior; lon. 4.5 mm.; the crenulation of the margin was indistinct on this specimen; p. 397.  
FIG. 8. *Limopsis juarezi* Dall, exterior; lon. 6.2 mm.; p. 396.  
FIG. 9. *Arca (Bathyarca) nucleator* Dall; lon. 6.0 mm.; p. 397.  
FIG. 10. *Cetoconcha smithii* Dall, profile; lon. 18.5 mm.; p. 431.  
FIG. 11. *Nucula savatieri* Mabille & Rochebrune; lon. 14.0 mm.; p. 367.  
FIG. 12. *Lyonsia panamensis* Dall; lon. 12.0 mm.; p. 427.  
FIG. 13. *Vesicomya lepta* Dall, interior of right valve; lon. 15.0 mm. (young specimen); p. 416.  
FIG. 14. External view of the same valve, about natural size for the adult.

Figures 13 and 14 were drawn by the late Dr. J. C. McConnell, the others by Miss Evelyn Mitchell.

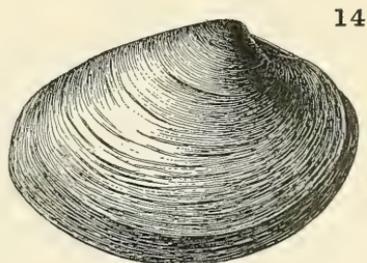
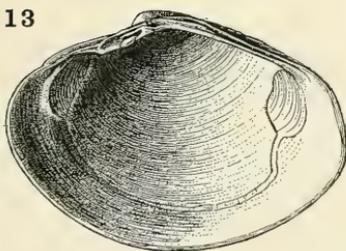
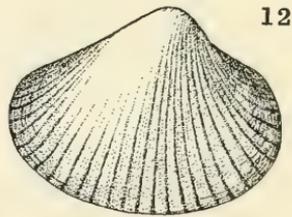
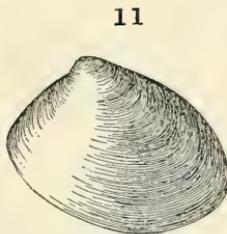
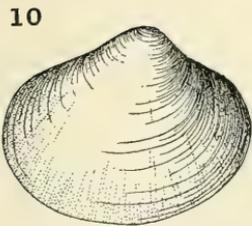
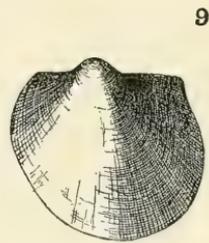
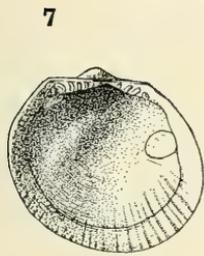
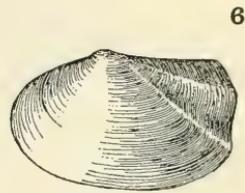
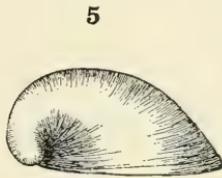
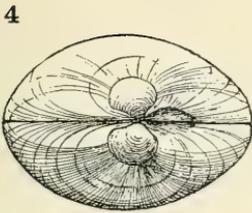
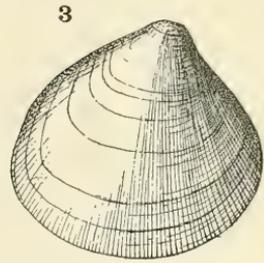
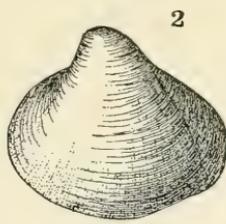
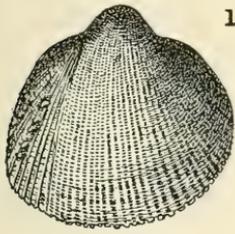






PLATE 19.

- FIG. 1. *Dentalium megathyris* Dall ; lon. 95.0 mm. ; p. 357.  
FIG. 2. *Irenosyrinx goodei* Dall ; alt. 80.0 mm. ; p. 272.  
FIG. 3. *Cadulus albicomatus* Dall ; lon. 24.0 mm. ; p. 360.  
FIG. 4. ? *Ganesa panamensis* Dall ; alt. 4.7 mm. ; p. 352.  
FIG. 5. *Calliostoma iridium* Dall ; alt. 20.0 mm. ; p. 348.  
FIG. 6. *Pleurotomella (Phymorhynchus) cingulata* Dall ; alt. 73.0 mm. ; p. 283.  
FIG. 7. *Turricula macdonaldi* Dall ; lat. 60.0 mm. ; p. 349.  
FIG. 8. *Pleurotomella (Phymorhynchus) argeta* Dall ; alt. 43.0 mm. ; p. 283.  
FIG. 9. *Scaphander interruptus* Dall ; alt. 33.0 mm. ; p. 239.

The figures for this plate were drawn by the late Dr. J. C. McConnell.

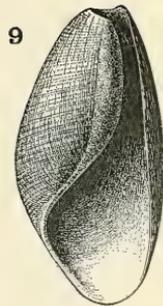
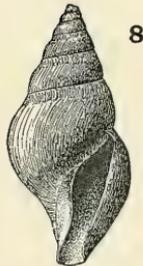
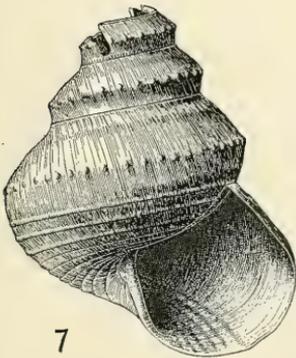
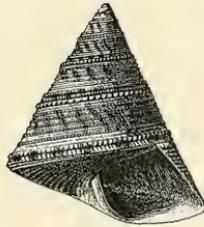
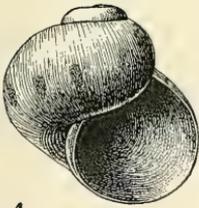
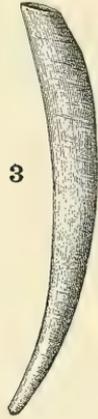
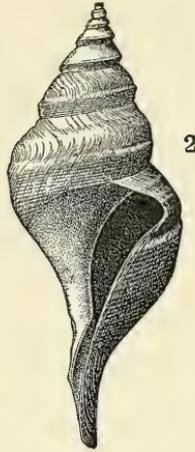
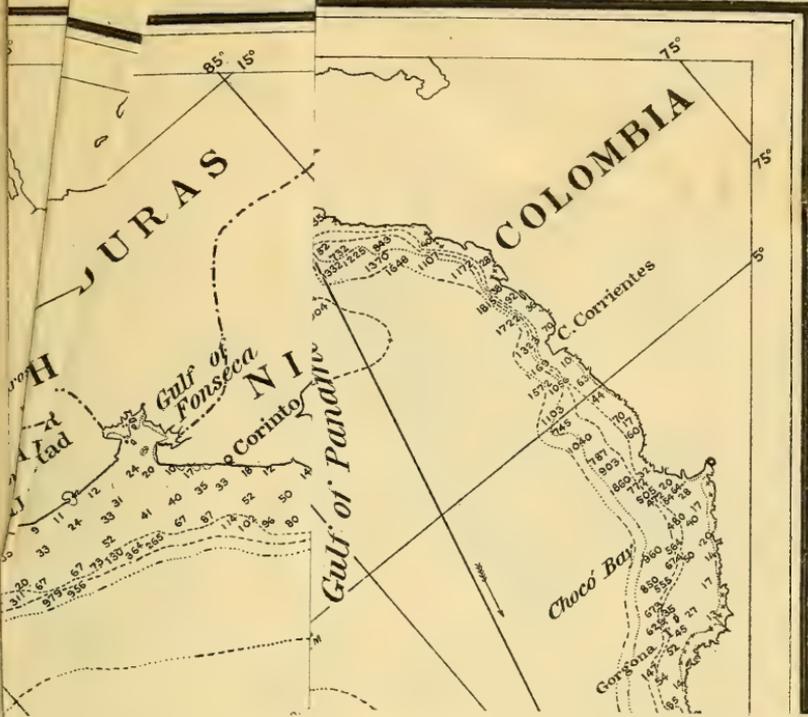






PLATE 20.

Hydrographic sketch of the Pacific, from the Gulf of California to Northern Ecuador, with the track of the "Albatross," February 22 to April 23, 1891.





# EXPLORATIONS OF THE U.S. FISH COMMISSION STEAMER ALBATROSS

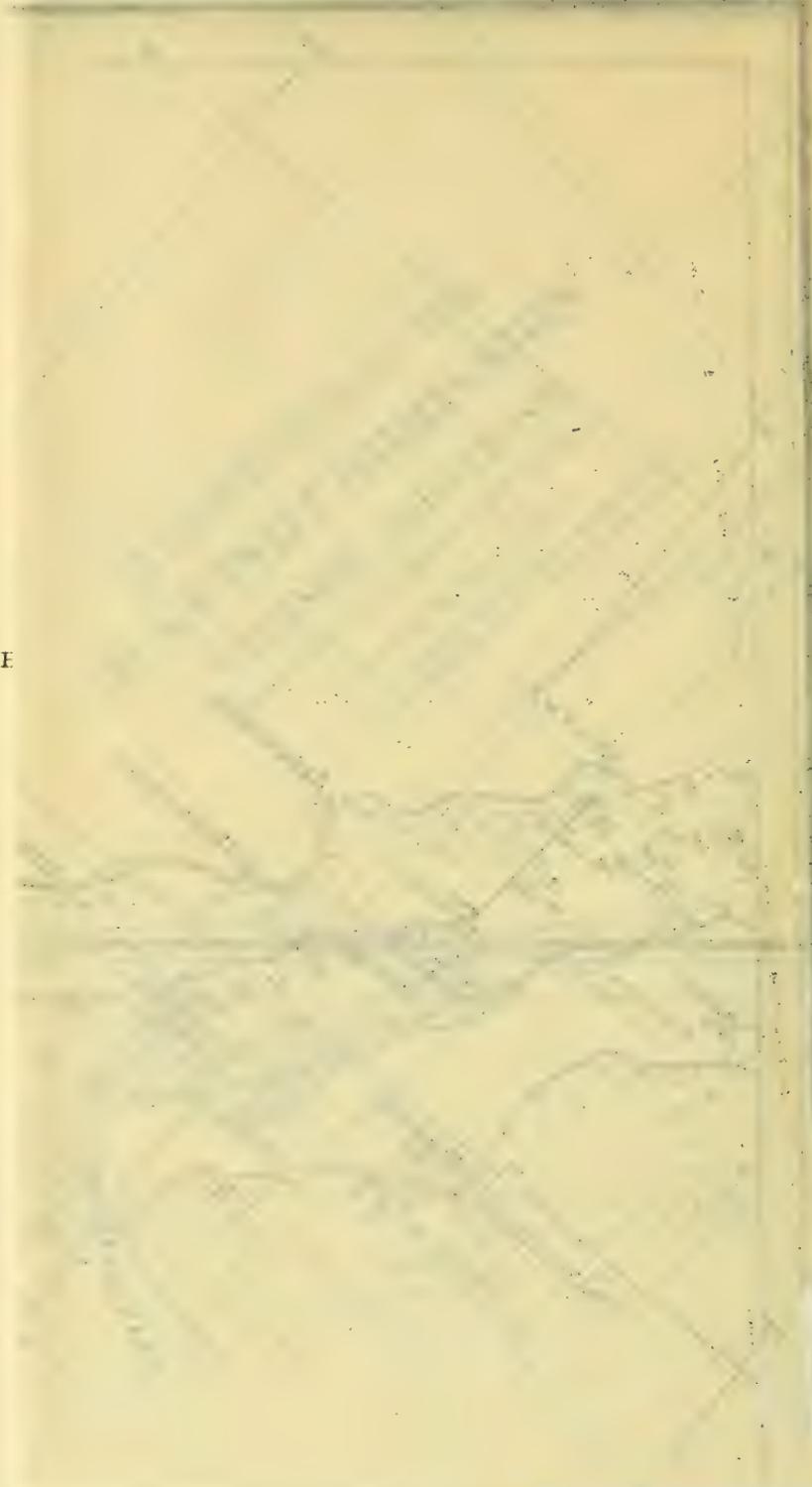
Under Command of Lt. Z. Tanner, U.S.N. Comdg.  
February to April 1891

Completed from the Survey of the Fish Commission by the U.S.C.G. Steamer "Albatross" 1891  
Charts used published by the U.S.C.G. Hydrographic Office

Soundings represented on this chart by the U.S.C.G. Steamer "Albatross" 1891  
100 fathoms (over) shown in blue  
500  
1000  
1500  
2000  
2500

P. Shows depth of galathea, at least 500 yds. and 1000 yds.  
S. Shows depth of sand, at least 100 yds. and 200 yds.  
G. Shows depth of green mud, at least 100 yds. and 200 yds.  
M. Shows depth of mud, at least 100 yds. and 200 yds.  
C. Shows depth of coral, at least 100 yds. and 200 yds.  
R. Shows depth of rock, at least 100 yds. and 200 yds.  
D. Shows depth of deep water, at least 100 yds. and 200 yds.





E

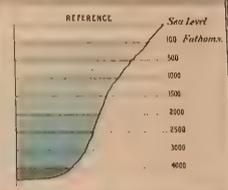


PLATE 21.

Bathymetrical chart of the Eastern Tropical Pacific, with the track of the "Albatross" in 1891 in the Panamic district, in 1899-1900 in the Central Tropical Pacific, and in 1904-1905 in the Eastern Pacific.







Track of Albatross in 1829  
 Track of Albatross in 1839  
 Track of Albatross in 1904-1905

Symbols denote surface temperature

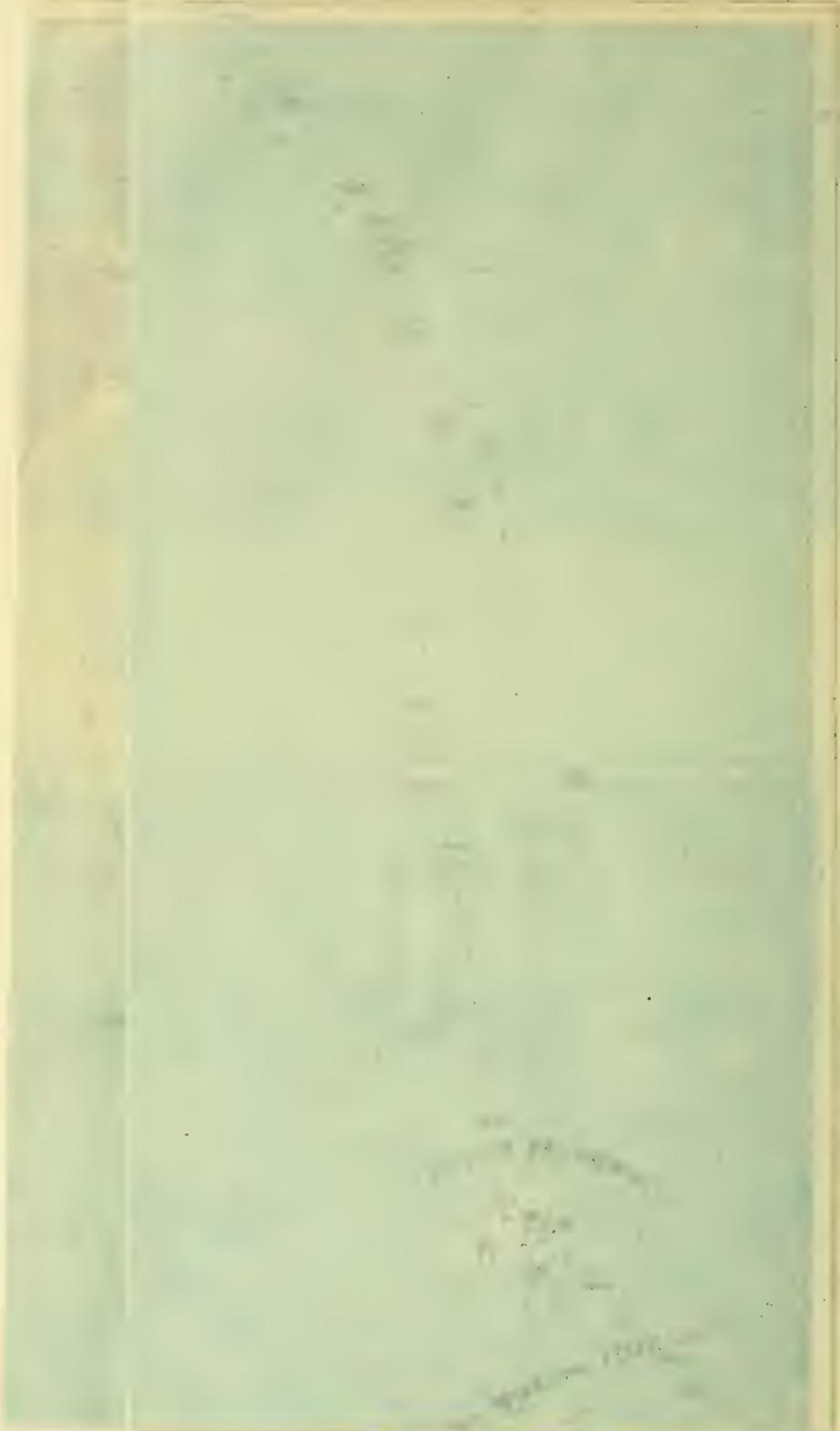
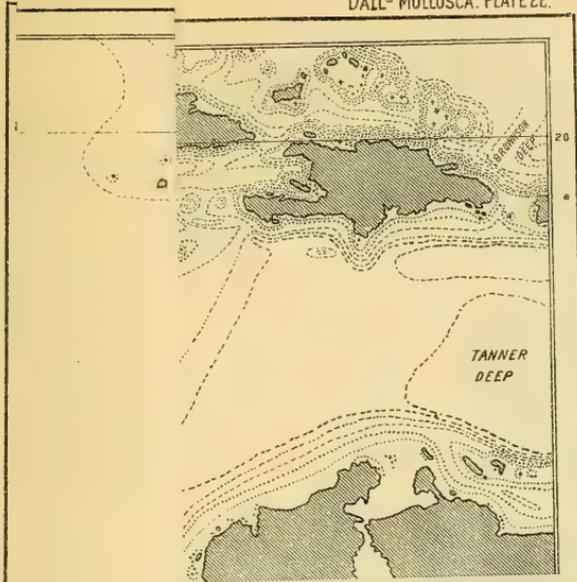




PLATE 22.

Showing position of the stations occupied by the "Albatross" during her cruise in the Eastern Pacific in 1904-1905.













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VOL. XXVII. No. 4.

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OF MEXICO, AND IN THE GULF OF CALIFORNIA, IN CHARGE OF  
ALEXANDER AGASSIZ, CARRIED ON BY THE U. S. FISH COMMIS-  
SION STEAMER "ALBATROSS," DURING 1891, LIEUT. COMMANDER  
Z. L. TANNER, U. S. N., COMMANDING.

XVIII.

DIE COMATULIDEN.

VON C. HARTLAUB.

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WITH FOUR PLATES.

CAMBRIDGE, MASS., U. S. A. :  
PRINTED FOR THE MUSEUM.  
AUGUST, 1895.



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XVIII.  
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WITH FOUR PLATES.

CAMBRIDGE, MASS., U. S. A. :  
PRINTED FOR THE MUSEUM.  
AUGUST, 1895.



No. 4. — *Reports on the Dredging Operations off the West Coast of Central America to the Galapagos, to the West Coast of Mexico, and in the Gulf of California, in charge of ALEXANDER AGASSIZ, carried on by the U. S. Fish Commission Steamer "Albatross," during 1891, Lieut.-Commander Z. L. TANNER, U. S. N., Commanding.*

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### XVIII.

#### *Die Comatuliden.* Von C. HARTLAUB.

Die Ergebnisse der Albatross Expedition sind, wie bereits von *Agassiz*<sup>1</sup> mitgetheilt wurde, auf dem Gebiete der Crinoiden auffallend spärlicher Natur gewesen. Während der Dampfer von andern Echinodermen, wie vor Allem Echiniden, Asteriden und Holothuriern reiches Material erbeutete, besteht der ganze Fang an Crinoiden aus nur 7 *Antedon*-Arten und dem interessanten *Calamocrinus Diomedæ*, welchen *Agassiz* schon beschrieben hat.<sup>2</sup> Unter den 84 Dredge-Stationen der Reise sind nur 10 zu nennen, die überhaupt Crinoiden lieferten. Von diesen fallen 6 auf die erste Fahrt, von Panama nach Cocos Island, 3 auf die zweite (3 Stationen bei den Galapagos) und eine auf die dritte Fahrt (Sta. 3424 Las Tres Marias). Ansehnliche Mengen von Exemplaren ergaben nur Sta. 3385, Golf von Panama (*Antedon tanneri* n. sp.), Sta. 3424, Las Tres Marias, und Sta. 3357, nicht weit von Cap Mariato Point, wo u. a. eine Anzahl Antedons aus der *Basicurva*-Gruppe (*Antedon agassizii* n. sp.) und der erwähnte *Calamocrinus* erlangt wurden.

Verglichen mit den Crinoiden Schätzen der *Blake*-Expedition auf der atlantischen Seite Central-Americas war dies negative Resultat auf der pacifischen gewiss sehr überraschend; allein so klein die Zahl der mitgebrachten Arten auch ist, die Albatross-Expedition

<sup>1</sup> *Agassiz Al.*, General Sketch of the Expedition of the "Albatross" from February to May, 1891, in: Bull. Mus. Comp. Zoöl. Harvard College. Vol. XXIII. No. 1.

<sup>2</sup> *Agassiz Al.*, *Calamocrinus diomedæ* in: Mem. Mus. Comp. Zoöl. Harv. Coll. Vol. XVII. No. 2.

hat doch unsre Kenntniss von der geographischen Verbreitung des Genus *Antedon* sehr bemerkenswerth bereichert. Es hat sich nämlich herausgestellt, dass eine Artengruppe dieser Gattung, die man nach den bisher bekannten Vertretern als vorwiegend arctisch und nahezu antarktisch ansah, dies keineswegs ist. Die Eschrichti Gruppe, als deren südlichster Verbreitungspunct auf der nördl. Halbkugel der 43. Grad nördl. Br. angesehen wurde (*Antedon eschrichti* bei *Halifax*) und welche auf der südlichen Hemisphäre die Magelhan Strasse und die Heard Islands als Fundorte hat, ist nicht minder in den Tropen zu Hause. An Individuenzahl nimmt sie in der Albatross-Sammlung sogar bei Weitem die erste Stelle ein, leider auch bezüglich der Schwierigkeit, welche mir die systematische Beurtheilung der beiden Formen gemacht hat, von denen ich nachstehend mit allem bei Crinoidenarten nöthigen Vorbehalte eine als neu beschrieben werde. Der Systematiker für Comatuliden ist ja insofern schlimm daran, als er für die mühsame Begründung neuer Arten selten durch das glückliche Gefühl voller Sicherheit belohnt wird.

## I. ARTEN MIT AMBULACRALER TÄFELUNG.

### BASICURVA GRUPPE CARP. Chall. Rep. XXVI. p. 99.

10-armige *Antedon* Arten, deren *Radialia* und untere *Armglieder* abgeplattete Seiten haben, und deren *Pinnula-Ambulacra* meistens getäfelt sind; die zwei äusseren *Radialia* sind gelenkig verbunden.

Uebersicht und Verbreitung ihrer Arten: —

Gesamtzahl der Arten, 21.

Geringste Tiefe: 49 Faden, Arapura See. — (*Antedon denticulata* Carp.)

Grösste Tiefe: — 1600 Faden, Südsee. — (*Antedon bispinosa* Carp.)

In Tiefen unter und bis zu 500 Faden, 13 Arten.

49 Faden, Arapura See.	}	<i>Antedon denticulata</i> Carp.
88-262 " Carribbean Sea. Str. of Florida.		" <i>duplex</i> Carp. M. S.
	}	" <i>flexilis</i> Carp.
		" <i>longicirra</i> Carp.
140 " Ki Islands.		" <i>parvipinna</i> Carp.
		" <i>pusilla</i> Carp.

270 Faden,	Str. of Florida.	<i>Antedon brevipinna</i> Pourt.
345 "	off Japan.	" <i>latipinna</i> Carp.
375 "	Pacific, off Pangloa Isl.	" <i>tuberosa</i> Carp.
420-550 "	S. Atl. off Tristan da Cunha, Ascension.	" <i>multispina</i> Carp.
500 "	Meangis Isl.	" <i>aculeata</i> Carp.
		" <i>gracilis</i> Carp.
		" <i>valida</i> Carp.

*In Tiefen von über 500-1000 Faden, 9 Arten.*

420-550 Faden,	S. Atl. Tristan da Cunha, Ascension	<i>Antedon multispina</i> Carp.
630 "	Kermadecs.	" <i>incerta</i> Carp.
		" <i>echinata</i> Carp.
		" <i>basicurva</i> Carp.
630-1350 "	" und Fiji.	" <i>breviradia</i> Carp.
610-630 "	"	" <i>incisa</i> Carp.
740 "	off Portugal.	" <i>lusitanica</i> Carp.
782 "	off Mariato Point.	" <i>agassizii</i> , Hartl.
950 "	Port Jackson.	" <i>spinicirra</i> Carp.

*In Tiefen von über 1000 Faden, 3 Arten.*

1350 Faden,	Fiji.	<i>Antedon acutiradia</i> Carp.
-1350 "	"	" <i>breviradia</i> Carp.
1600 "	Südsee.	" <i>bispinosa</i> Carp.

***Antedon agassizii* n. sp.**

Taf. I. Fig. 4, 7, 8; Taf. II. Fig. 16, 18, 19; Taf. III. Fig. 23; Taf. IV. Fig. 26.

Centrodorsale von mässiger Grösse, kuppelförmig, am dorsalen Ende cirrusfrei und mit kleinen Dornen bedeckt; 15-22 dünne, namentlich in der äusseren Hälfte stark comprimirte Cirren von etwa 40 mm. Länge; dieselben stehen in 2 und stellenweise 3 Horizontalreihen und bilden bisweilen auch Verticalreihen. Grösste Anzahl der Cirrusglieder etwas über 60; davon die beiden ersten kurz, das dritte länger, das 4. mal so lang als das dritte, das 6. am längsten und an langen Cirren  $2\frac{1}{2}$  mm. messend; von ihm ab nimmt die Länge der Cirrusglieder rasch ab bis circa zum 20. Gliede, auf welches eine Reihe kurzer, allmählig kleiner werdenden Glieder folgen; im Verlaufe dieser letzteren ist die dorsale Kante des Cirrus deutlich gezackt. Manche Cirren haben an den letzten 30 Gliedern einen ausgesprochenen Dorn. Dorn des vorletzten Gliedes mitunter schwach.

*Erste Radialia* eben sichtbar; die zweiten kurz, seitlich vollkommen frei, und für das rhombische Axillare, mit welchem sie einen schwachen Buckel bilden, nicht eingeschnitten. *Axillare* rhombisch, distalwärts stark verbreitert und hier zuweilen mit vertikal abgeplatteter Seite den Nachbaraxillarien angelagert. Zweites Radiale und Axillare sind mit kurzen stumpfen Dornen besetzt. Manchmal sind einzelne 2-gliedrige Distichalserien vorhanden.

10–12 *rundliche schlanke Arme* von beträchtlicher Länge und ganz rauher Oberfläche. Die Armglieder bis zur zweiten Syzygie tragen auf ihrem proximalen und distalen Rande kleine aufrechtstehende stumpfe Dornen nach Art derer auf den Radialien.

*Erste Brachialia* ziemlich kurz, in der hinteren Hälfte ambulacralwärts verbreitert und hier mit vertical abgeplatteter Seitenfläche dem ersten Brachiale des Nachbarradius angelagert. Diese Seitenfläche bildet die Fortsetzung der des Axillare und somit eine Gesamtfläche mit dieser. — Auf der Innenseite berühren sich die ersten Brachialia in ihrer proximalen Hälfte.

*Zweite Brachialia* etwas länger als die ersten und distalwärts verbreitert. Sie sowohl als die 3. Brachialia stehen in enger Berührung mit dem 2. und 3. Brachiale des Nachbararms; diese Berührungsstelle ist, da sie ganz ambulacralwärts liegt, schwer zu bemerken. Sie ist von der gleichen Contactfläche des ersten Brachiale durch eine Lücke getrennt. — Die auf das 3. folgenden 7 Glieder sind etwas breiter als lang und in der Mitte eingeschnürt. Vom etwa 9. an nimmt die Länge der Armglieder zu, und ihre Form beginnt mehr dreieckig zu werden, und so bleibt sie ungefähr vom 20. bis zum 30. Gliede. Vom etwa 23. Gliede an ( $2\frac{1}{2}$  mm.) nimmt die Länge wieder allmähig ab. Auf die dreieckige Gliedform folgt eine mehr trapezoide, und in der zweiten Armhälfte erschienen die Glieder dütenartig in einander gesteckt (Taf. II. Fig. 16). Die distalen Ränder sämtlicher Armglieder sind stark aufgeworfen und in der zweiten Armhälfte fein dornig. Hier gehen von ihnen Längsriefen aus, welche über die distale Gliedhälfte hinziehen.

Die Dicke der Arme nimmt ganz allmähig ab; die Armlänge beträgt bis 170 mm.; die Zahl der Armglieder bis zu 130.

Erste Syzygie im 3. Brachiale; zweite vom 13.–15., dann in Abständen von 2–3 Gliedern.

Die *Pinnula des zweiten Brachiale* (Taf. II. Fig. 18) ist ziemlich steif, 9–11 mm. lang und zählt 16–18 kurze, glatte Glieder, von denen die ersten 4 — vor Allem aber die 2 ersten — breiter als lang

sind. Es ist diese Pinnula an ihrer Basis seitlich abgeflacht und breit und nach etwa dem 6. Gliede spitzt sie sich schnell und fein zu. Ihre äusseren Glieder haben feine, bedornete Distalränder; die Glieder der proximalen Hälfte aber glatte; jedoch sind bei ihnen die ambulacraren Kanten gezackt. Das 2.-5. Glied hat eine Art Kiel; die Verbindung der mehr basalen Glieder unter sich ist eine lockere und dies in erhöhtem Grade an der folgenden Pinnula, deren Basalglieder dementsprechend eine etwas andre Form haben; doch sind auch diese etwas abgeflacht. Es hat das aber schon bei den unteren Gliedern der 3. Pinnula, die rundlicher ist, ein Ende.

Die *Pinnula des 4. Brachiale* ist kürzer und hat etwas weniger Glieder, auch ist sie weniger steif und bedeutend feiner gebaut; sie hat wie die folgenden Pinnulæ vorspringende, feine bedornete distale Ränder.

Die dann kommenden Pinnulæ werden bei etwas abnehmender Länge (geringstes Maass 6 mm.) noch zierlicher und ihre Glieder werden länglicher. Vom 14. Brachiale nimmt die Länge der Pinnulæ wieder zu bis zu einem Maximum von 23 mm., und 22-23 Gliedern. Diese letzteren werden bedeutend länger als breit mit Ausnahme der 2 ersten und besonders des Basalgliedes, welches kurz und breit bleibt und eine trapezoide Form hat.

Die *Pinnula des 3. Brachiale* ist etwa 2 mm. kürzer als die des zweiten und entschieden schwächer.

Ambulacralfäche der Arme und Genitalpinnulæ deutlich getäfelt. Die Pinnulæ haben Seitenplatten (Taf. 2, Fig. 19).

*Sacculi* klein und wenig auffallend; mit den Seitenplatten alternierend.

*Scheibe* stark eingeschnitten; vollständig getäfelt. 9 mm. Dm.

*Färbung* in Spiritus gleichmässig grünlich gelb, zum grössten Theil durch den stark ebenso gefärbten Alcohol ausgezogen.

*Klaffung* bis 35 cm.

*Fundorte* Station No. 3357, nicht weit von Cap Mariato Point (Bucht von Panama), in 782 Faden, "Modern Greensand"; Bodentemperatur 38,5 F. — Station No. 3408, Galapagos, 684 Faden, Globigerinen Schlamm; Bodentemperatur 39,5 F. — Station No. 3409, Galapagos, 327 Faden, Schwarzer Sand; Bodentemperatur 42,3 F.

Bemerkungen: —

Station No. 3408 lieferte ein kleines 11-armiges Exemplar. Es ist dadurch ausgezeichnet, dass seine erste Pinnula weniger glatte Gliederänder hat, als es die Regel ist. Sie sind fein bedornt, was bei

den übrigen Exemplaren nur an den äussersten Gliedern der betr. Pinnula der Fall ist.

Station 3408 ergab zwei noch kleinere Exemplare (Armlänge  $4\frac{1}{2}$  cm.) und 2 ganz winzige, bei denen das erste Radiale vollkommen sichtbar ist und stumpfe, kurze, aufrechtstehende Dornen besitzt.

Bemerkenswerth für die neue Species ist neben dem Dimorphismus in der Anzahl der Arme, die *Beschränkung der wandartigen interradialen Contactflächen auf das Axillare und erste Brachiale*, und der Umstand, dass dieselben sogar vollkommen fehlen können. Die 2. Radialia sind seitlich ganz frei; sie berühren sich nur an den Ausenkanten ihres verbreiterten proximalen Endes. Zwischen dieser Berührungsstelle und dem Contact der Axillaria befindet sich ein offener Zwischenraum, ein Loch. Aehnlich scheint sich *Antedon multispina* Carp. zu verhalten, doch ist der Autor geneigt bei ihr dies Vorkommen als Jugendcharakter zu deuten. [“The 2 outer radials, especially the second, which are very short can hardly be described as wall-sided,” Chall. Rep. XXVI. p. 117.]

Zu beachten ist sodann die Klafterung von *Antedon agassizii*, welche mit 35 cm. die fast aller andern Arten der Gruppe weit übertrifft. Am nächsten kommt ihr *Antedon valida* Carp. mit “25 cm. spread.” Uebertroffen wird ihre Grösse durch *Antedon flexilis* (Basicurva und Spinifera Gr.) mit “55 cm. spread” und *Antedon robusta* (Spinifera Gr.) “spread nearly 50 cm.”

Entschiedene Aehnlichkeit verbindet die Art durch die Bedornung ihrer Radialia and unteren Brachialia mit *Antedon bispinosa*, bei welcher die Kelchglieder und die untersten Brachialia der Abbildung nach zu urtheilen (Chall. Rep. XXVI. Pl. 20) nicht nur an den Rändern sondern auf ihrer ganzen Oberfläche mit kleinen stumpfen Dornen besetzt sind. Bei *Antedon agassizii* geht indessen dieser Schmuck weiter den Arm hinauf als bei jener Art und die kleinen ganz aufrechtstehenden Dornen sind auf den proximalen und distalen Rand eines jeden Gliedes beschränkt, in der Weise, dass jede Gliedverbindung durch 2 Querreihen von Dornen gekennzeichnet ist.

Bezüglich das Calyx verweise ich auf Tafel 1, Fig. 4, 7, 8. — Die Cirrusgruben sind ziemlich gross und besitzen einen ansehnlichen Gelenkkopf. Die ventrale Fläche des Centrodorsale ist annähernd pentagonal und die 5 Ecken ragen etwas vor. Die dorsale Fläche des radialen Pentagons zeigt Spuren eines Basalsterns. Im Trichter erkennt man, etwas tiefer als der dorsale Rand gelegen, die sogenannte Rosette. Die Gelenkflächen der Radialia (Fig. 8) lassen

eine Anzahl Gruben erkennen, von denen die zunächst ventralgelegenen Muskelgruben sind. Sie haben annähernd dieselbe Grösse, wie die durch eine schräge Leiste von ihnen getrennten Ligamentgruben und besitzen eine glatte Oberfläche.

Die ambulacrale Täfelung der Pinnula (Taf. 2, Fig. 19, Taf. 3, Fig. 23) besteht aus Seitenplatten und Deckschuppen. Die Deckschuppen sind ganzrandige, feinmaschige, annähernd ovale Blättchen; sie ruhen auf den Seitenplatten und sind wahrscheinlich beweglich, da ihre Stellung eine sehr wechselnde ist. Bald liegen sie dachziegelartig flach übereinander, bald sind sie mehr aufgerichtet; betrachtet man sie in dieser Lage von unten, so sieht man, dass sie eine alternierend schräge Stellung zur Längsaxe der Pinnula haben. Ihre genaue Befestigungsart zu bestimmen ist mir einstweilen nicht gelungen. Die Elemente sind äusserst klein, sehr zerbrechlich und schwer zu isoliren. Sie werden durch Weichtheile festgehalten, die selbst nach mehrere Minuten langen Kochen in Kalilauge nicht zerstört werden. Allzu langes Kochen in Kalilauge vertragen, die sehr dünnen zerbrechlichen Plättchen andererseits auch nicht. Bezüglich der Seitenplatten sei bemerkt, dass sie im Zickzack stehen. Sie bilden so auf jeder Seite der Ambulacralrinne eine Art spanischer Wand. In den Nischen mehr oder minder verborgen, liegen die Sacculi. Die vorspringenden Ecken werden meist von 2 aneinander stossende Platten gebildet (Fig. 19 und 23 se, se'); an anderen Stellen, so namentlich am Ende einer Pinnula, macht es aber den Eindruck, als ob sie von der Abknickung oder Biegung ein und derselben Platten herrührten. — Die Seitenplatten sind weitmaschiger als die Deckplatten, oft von annähernd viereckiger Gestalt und ausgezackten Rändern. An einigen Stellen sieht man (Taf. 2, Fig. 19), dass durch diese regelmässig wiederkehrenden Auszackungen 2 Lücken in der Berührung der Kanten entstehen. Die oberen dieser Lücken (Fig. 19 s.) werden durch die Sacculi ausgefüllt, durch die unteren (Fig. 19 t.) treten die Tentakel nach aussen.

Die beschriebene Species *Antedon agassizii* n. sp. ist, wie wir gesehen haben, dimorphisch, d. h. sie kommt nicht nur in 10-armigen Exemplaren vor sondern auch nicht selten in solchen, die 11 oder 12, ja vielleicht nochmehr Arme besitzen und diese Exemplare würden, da sie 2 Distichalia haben, zu einer ganz andern Serie der Carpenterschen Eintheilung gehören, nämlich in die *Spinifera Gruppe*. Da *Antedon agassizii* darin nicht vereinzelt dasteht, sondern innerhalb derselben Gruppen *Antedon flexilis*, *duplex*, *lusitanica* sich ganz gleich

verhalten, ebenso *Antedon multispina*, nur mit dem Unterschiede, dass sie auf Grund ihrer 3 Distichalia zum Theil in einer noch andern Serie figurirt, so wirft sich hier naturgemäss die Frage auf, ob eine Eintheilung, die derartige Doppelpacirungen nothwendig machte, natürlich und practisch war. Unserer Auffassung nach hat *Carpenter* in der Zusammenfassung der 10-armigen Antedons zu einer Serie einen entschiedenen Fehler gemacht. Er hat Arten ohne alle sonstige Gemeinschaft miteinander darin vereinigt wie z. B. die äusserst verschiedenen Arten der *Basicurva* und *Tenella* Gruppe, während er andre die durch den Besitz einer ambulacralen Bewaffnung, durch ihre horizontale und bathymetrische Verbreitung im Gegensatz zu den übrigen Species stehen, weit voneinander trennte. Auch unter den Arten mit unbedeckten Ambulacren finden sich solche die bald 10-armig, bald mehrarmig erscheinen; auch sie bestätigen, dass der Character der 10-Armigkeit kein zuverlässiger ist und deshalb nicht hätte Veranlassung geben dürfen übrigens soweit verschiedene Species in einer Serie systematisch zu verbinden. Jeden, der sich mit Comatuliden beschäftigt hat, muss der übereinstimmende Character im Habitus der *Basicurva*, *Spinifera* und *Granulifera* Gruppe frappirt haben, dazu kommt, dass sie viele Tiefseeformen aus dem pacifischen Ocean und dem Caraibischen Meere enthalten, während die grosse Mehrzahl der übrigen flacheren Gewässern angehören und indischen Ursprungs sind. (So vor Allem die zahlreichen Arten der *Savignyi* und *Palmata* Gruppe.<sup>1)</sup> Unsere Ansicht geht also dahin jene 3 Gruppen und die *Elegans* Gruppe, bei welcher die äusseren beiden Radialia im Gegensatz zu allen andern Antedon Arten durch Syzygie verbunden sind, bei welchen aber die Scheibe und die Ambulacralia innerhalb der äussersten Axillaria getäfelt sind, zu einer grossen Serie zu vereinigen und sie einer zweiten Serie gegenüber zu stellen, welche die Gruppen mit ungetäfelten Ambulacren umfasst. Es stellt sich das übersichtlich folgendermaassen dar.

I. Arten mit getäfelten Ambulacren: Serie I.

a) Die 2 äusseren Radialia durch Gelenk verbunden.

10 Arme	} Basicurva Gruppe.	
2 Distichalia		{ Acœla “
3 Distichalia		{ Spinifera “
		{ Granulifera “

<sup>1)</sup> *Hartlaub, A.*, Beitrag zur Kenntniss der Comatulidenfauna des Indischen Archipels in: *Nova Acta Leopold. Car. Akad.* Bd. LVIII. Nr. 1. 1891. 40.

- b) Die 2 äusseren Radialia  
 durch Syzygie verbunden Elegans Gruppe.

II. Arten mit ungetäfelten Ambulacren: Serie II.

10 Arme	}	Eschrichti Gruppe.	
		Milberti	“
		Tenella	“
2 Distichalia		Palmata	“
3 Distichalia		Savignyi	“

II. ARTEN OHNE AMBULACRALE TÄFELUNG.

**ESCHRICHTI GRUPPE** CARP. CHALL. REP. XXVI. p. 136.

“10 Arme. Die ersten zwei oder drei Pinnula Paare lang und geisselförmig, mit zahlreichen kurzen und breiten Gliedern.”

*Uebersicht und Verbreitung der Arten: —*

Zahl der bekannten Arten: 9.

Bathymetrische Verbreitung, 20–782 Faden.

In Tiefen unter und bis 200 Faden:

20–632 Faden, Le Have Bank.	<i>Antedon</i>	<i>Eschrichti</i> Müll.
25–410 “ Smith Sound.	“	<i>quadrata</i> Carp.
30 “ Magellan Str.	“	<i>magellanica</i> Carp.
75 “ Südsee.	“	<i>antarctica</i> Carp.
132 “ Kara See.	“	<i>barentsi</i> Carp.
150 “ Südsee.	“	<i>australis</i> Carp.

In Tiefen über 200 Faden:

20–632 Faden, Porcupine Sta. 57.	<i>Antedon</i>	<i>eschrichti</i> Carp.
25–410 “ Davis Str.	“	<i>quadrata</i> Carp.
286 “ Bucht v. Panama.	“	<i>tanneri</i> Hartl.
676–782 “ bei Mariato Point.	“	<i>rhomboidea</i> Carp.

Die höchste bis jetzt für die Gruppe nachgewiesene *Bodentemperatur* war 35,2 F. (= 1,67 Celsius) [*A. australis* zw. Heard Island und Kerguelen]. Auf Station 286 des Albatross aber — dem Fundort der neuen Art *A. tanneri* betrug die Bodentemperatur 45,9 F. (= 7,70 Celsius).

**Antedon rhomboidea** CARP.<sup>1)</sup>

Taf. I. Fig. 1, 2, 3, 6, 10, 11; Taf. II. Fig. 12, 14, 15, 17; Taf. III. Fig. 24.

Centrodorsale flach kuppelförmig, mit einer cirrusfreien Aushöhlung im Scheitel; circa 60 Cirren in 4–5 Reihen. Cirren gleichmässig dünn, mit etwa 40 Gliedern, die vom 4. bis etwa 10. langgestreckt sind und bis gegen das 20. Glied noch länger wie breit bleiben. Die Cirren sind mit Ausnahme der 7 oder 8 untersten Glieder stark comprimirt. Von der dorsalen oder ventralen Kante betrachtet, erscheinen daher auch die äusseren Glieder noch länglich. Das dorsale Profil der distalen Hälfte des Cirrus erscheint gezackt weil auf dieser Seite die Enden der Glieder vorspringen und selbst die Form kleiner Dornen annehmen. Die Länge der Cirren erreicht zuweilen 6 cm.

*Erste Radiale* kurz; zweite sehr kurz, seitlich nicht in Berührung unter einander, auf ihrer Verbindung mit dem Axillare eine starke knopfartige Erhebung, die an jüngeren Exemplaren aber kaum angedeutet ist. Axillare ziemlich gross, dreieckig; seine proximale Seite ist bedeutend breiter als die daran stossende distale Kante des 2. Brachiale.

10 *Arme*, die in ihrer proximalen Hälfte ziemlich dick und glatt sind und überall rundliche Glieder haben. Erste Brachialia kurz, auf der Innenseite mit einander nicht in Berührung; auf ihrer Verbindung mit dem zweiten ein starker Knopf; ähnliche knopfartige Erhebungen von schwächerer Entwicklung bemerkt man alternirend seitlich gelegen bis zum 10. oder 11. Gliede. Zweites Brachiale annähernd dreieckig. 3. Brachiale quadratisch (Syzygie); folgende Glieder bis zum 8. (2. Syzygie) von fast derselben Länge aber mehr trapezförmig. Auf das 8. folgen 2 oder 3 kürzere, scheibenförmige Glieder und auf diese ausgesprochen dreieckige. In der äusseren Armhälfte, wo die Glieder feindornige, verdickte überragende Distalränder bekommen, wird die Gliedform wieder mehr trapezoid.

*Erste Syzygie* im 3. Brachiale, zweite im 8., dritte Syzygie im 13. oder 14. Gliede, seltner schon im 12. oder erst im 15. Dann in Zwischenräumen von 2–3 Gliedern.

*Erste Pinnula* (Br. 2) lang und dünn geisselförmig, mit etwa 50 ausschliesslich kurzen Gliedern; 18 mm. lang; zweite etwas länger und von fast gleicher Form; ihre Glieder sind etwas dicker und

1) Chall. Rep. XXVI. p. 148. Pl. XII. Fig. 1 & 2; Pl. XXIV. Fig. 1–3.

meist länglich. Dritte Pinnula kürzer, mit viel weniger, aber bedeutend verlängerten Gliedern; vierte am kürzesten. Die Pinnulæ bleiben am ganzen Arm dünn und ihre Glieder, mit Ausnahme der 2 basalen, stark verlängert. Länge einer Pinnula am circa 59. Armgliede 25 mm.

*Sacculi*, spärlich.

*Färbung*, hellbräunlich.

*Scheibe*, etwa 12 mm.

*Klafterung*, wenigstens 31 cm. (Exemplar St. 3357), 28–29 cm. Ex. St. 3424.

*Fundorte*, St. 3357, in der Nähe von Mariato Point, 782 Faden Tiefe, Moderner Grünsand, Bodentemperatur 38,5 F.; und St. 3424, 676 Faden, bei Las Tres Marias, grüner Sand, Globigerinen, Bodentemperatur 38,04 F.

Die obige Beschreibung ist, mit Ausnahme der untersten Pinnulæ, welche zu verstümmelt waren, und mit Ausnahme der Cirren, die leider ganz fehlten, auf das Exemplar von St. 3357 zu beziehen (Taf. 2, Fig. 15). Die Beschreibung der Cirren und Pinnulæ aber wurde nach den Exemplaren von Las Tres Marias entworfen.

Ich habe die obige Schilderung der Art, die ich schrieb im Glauben, dass die vorliegenden Exemplare einer neuen Species angehörten, hier gegeben, weil sie von *Carpenters* Beschreibung und namentlich von seiner Abbildung, Chall. Rep. XXVI. Pl. 12, in vielen Punkten abweicht. Auf *Carpenters* Abbildung ist das Centrodorsale ventral durch eine scharfe grade Linie begrenzt; von den ersten Radialien sind nur die Ecken sichtbar, die zweiten Radialia scheinen sich seitlich zu berühren; sie sowohl wie die ersten Brachialia sind in Uebereinstimmung mit der Beschreibung l. c. p. 148 "deeply incised." Alles das verhielt sich an meinen Exemplaren anders und veranlasste mich zunächst zu einer spezifischen Abtrennung. Nachdem ich aber vor Kurzem vom Hamburger Museum ein von *Dr. Rehberg* in der Magellhan Strasse (Smyth's Channel) gesammeltes Exemplar von *Antedon rhomboidea* selbst untersucht habe, bin ich ganz anderer Meinung geworden. Ich glaube, dass die vermeintlichen Unterschiede nur auf Ungenauigkeiten der von *Carpenter* gegebenen Figur beruhen. Das Hamburger Exemplar von *A. rhomboidea* stimmt in jeder Hinsicht mit denen vom Albatross gesammelten. Die Art kommt also sowohl in der Magellhan Strasse als an der pacifischen Seite Central Americas vor. "A similar extensive geographical range from north to south has been observed

in the distribution of some of the Mollusks Echini and Starfishes, which extend all the way from the southern extremity of South America to the Panamic region. The course of the northerly current setting along the west coast of South America must of course act as a distributor of the marine fauna of that region" (A. Agassiz, Bull. Mus. Comp. Zool., XXIII. No. 1, p. 75).

Die Exemplare von Las Tres Marias unterscheiden sich nicht unbeträchtlich von dem Exemplar der St. 3357. Hierfür ist vielleicht maassgebend, dass sie aus sehr verschiedenen Tiefen stammen. Die Las Tres Marias Exemplare haben vor Allem einen viel schlankeren gracileren Habitus und erinnern in ihrer Erscheinung mit ihren dicht zusammengelegten, meist gestreckten Armen an eine *Antedon phalangium*, wie sie *Carpenter* (l. c. Taf. XXVIII) abgebildet hat. Die Knöpfe der Armbasis und der Radialien sind nur schwach entwickelt und die alternirend seitlich gelegenen in der unteren Armgegend fehlen ganz. Die Armglieder, namentlich die syzygialen, sind gestreckter.

Die Abbildungen Taf. 1, Fig. 1-3, 6, 10 und 11 geben ein Bild vom Calyx und seinen einzelnen Theilen. Fig. 1 zeigt das radiale Pentagon von der Dorsalseite. Weder von einem Basalstern noch von einer Rosette sind irgend welche Spuren zu bemerken. Die dorsale Oeffnung des Trichters ist weit (Fig. 1), und der Hohlraum im Centrodorsale (Fig. 2 h) dementsprechend. Die Gelenkflächen der Radialia (Taf. 1, Fig. 3 und 10) zeigen im Gegensatz zu *Antedon eschrichti* (Chall. Rep. XXVI. Pl. 1, Fig. 8a) eine gleichmässige Neigung gegen die verticale Hauptaxe; ihr ventraler Rand ist in der Mitte ziemlich stark eingeschnitten; von diesem Einschnitt verläuft eine Verticalleiste gegen das Loch des Centralcanals zu. Die Muskelgruben sind grösser als die Ligamentgruben und von ihnen durch eine ziemlich horizontal gerichtete Querleiste geschieden, die mit 2 mehr oder minder deutlich ausgeprägten Wurzeln entspringt, deren eine von der Verticalleiste, die andre an der Seite des Centralcanals ihren Ursprung nimmt. Auf der Fläche der Muskelgruben bemerkt man schwache, gebogene Querfurchen. Fig. 6 zeigt die ventrale Oeffnung des Trichters und die kleinen in denselben vorspringenden Zacken, die etwas unterhalb des Randes liegen und ventrale Enden von Längsleisten sind, die sich auf der Trichterfläche der Radialia befinden (Taf. 1, Fig. 11). — Diese Verhältnisse wurden an einem älteren und einem viel jüngeren Exemplare von Las Tres Marias untersucht und übereinstimmend gefunden.

*Carpenter* bildet im Chall. Rep. die besprochenen Theile für *Antedon eschrichti* und *antarctica* ab. Von diesen zeigt *Antedon eschrichti* die meiste Uebereinstimmung mit unsrer Art. Wir finden auch bei ihm auf der ventralen Kante der Radialia den medianen Einschnitt, und scheint es, dass derselbe innerhalb der Gruppe allgemeiner vorkommt, da er noch viel stärker entwickelt ist an der neuen Species, die uns sogleich beschäftigen wird. *Antedon eschrichti* besitzt ferner Querfurchen in den Muskelgruben, aber was ihn wesentlich unterscheidet, ist der Besitz einer Rosette, von der ich bei *Antedon rhomboidea* nichts bemerkte.

An vielen Exemplaren sassen cystenbildende Myzostomen.

### *Antedon tanneri* n. sp.

Taf. I. Fig. 9; Taf. II. Fig. 13; Taf. III. Fig. 20, 22.

*Centrodorsale* flach gewölbt, mit einer cirrusfreien Grube im Scheitel. Etwa 60 dichtstehende, gleichmässig dünne, comprimirt Cirren, die eine Länge von 33 mm. erreichen. Die Cirren haben grössten Theils längliche Glieder; die letzten davon sind kürzer und haben manchmal einen endständigen kleinen Dorn auf der dorsalen Seite.

*Erste Radialia* sichtbar, kurz. Zweite kurz und sich distalwärts verschmälernd, nicht in Berührung untereinander. Axillare rhombisch, am Ansatz der Arme beträchtlich verbreitert.

10 Arme, die sehr schlank und dünn sind und von Anfang an eine ganz unebene Oberfläche besitzen. Erste Brachialia von einander getrennt, kurz; zweite von unregelmässiger Form und von etwa doppelter Länge; drittes Glied (Syzygie) noch länger. Die folgenden bis zum 7. sind annähernd quadratisch und haben stark eingebogene Flächen. Das 8. Glied hat die Länge des dritten. Das erste und zweite Brachiale haben bisweilen einen kleinen seitlichen Dorn, der bei letzterem dicht vor dem Ansatz seiner Pinnula liegt. Auf das Glied der zweiten Syzygie folgen noch etwa 3 quadratische Glieder, dann wird die Form mehr trapezoid (aber nirgends dreieckig!). Die Glieder verbreitern sich alle etwas distalwärts, und ihre, in der zweiten Armhälfte etwas dornigen, Ränder überragen stark die Basis der nachfolgenden Glieder, was eine grosse Rauigkeit der Armoberfläche zur Folge hat. Die Arme sind an ihrer Basis rundlich und weiterhin mehr comprimirt; sie verdünnen sich bis etwa zum 15.-20. Gliede rasch und nachher ganz allmählig.

*Erste Syzygie* im 3. Brachiale, zweite im 8., dritte im 14., die folgenden in Zwischenräumen von 2–3 Gliedern.

*Pinnula* des zweiten Brachiale 14–16 mm. lang mit 35–44 kurzen Gliedern, geisselförmig und in eine sehr feine Spitze auslaufend. Am Ende der *Pinnula* ist eine Art Kamm entwickelt (Taf. 2, Fig. 13). *Pinnula* des 4. Brachialia manchmal etwas länger sonst ebenso. Dritte *Pinnula* bedeutend kürzer als die zweite und aus einer viel geringeren Zahl länglicher Glieder zusammengesetzt; ohne Kamm am Ende. Vierte *Pinnula* ebenso lang, dann nimmt die Länge ganz allmähig ab. Die 14. *Pinnula* ist etwa 10 mm. lang, doch sind die der äusseren Armhälfte wieder einige mm. länger. Alle diese *Pinnulæ* sind sehr dünn und haben, mit Ausnahme der zwei basalen, stark verlängerte Glieder.

*Scheibe* etwa 7 mm. Dm., mit zerstreuten Kalkkörperchen. — Mund central.

*Sacculi* zahlreich an den Ambulacren der *Pinnulæ*, Arme und Scheibe.

*Klafterung* durchschnittlich 20 mm.

*Färbung*, in Alcohol, hell gelblich; *Pinnulæ* bräunlich.

*Fundort*, St. 3385, Eingang der Bucht von Panama, 286 Faden, grüner Mud; Bodentemperatur 45,9 F. Zahlreiche Exemplare.

In einiger Hinsicht gleicht diese, neue Art vollkommen der vorigen, so besonders in der Form ihres Centrodorsale und ihrer Cirren, doch lässt ihr ganz anderer Habitus, die grosse Rauigkeit ihrer Armoberflächen und die Verschiedenheit der radialen Gelenkfläche, die ich an 2 Exemplaren untersuchte, wohl keinen Zweifel an ihrer Berechtigung zu. Bezüglich der Gelenkflächen vergleiche man die Figuren 9 und 10 auf Tafel 1. Wir finden bei unsrer Art an Stelle einer verticalen Längsleiste, eine breite flache intermuskuläre Mulde. Solch eine Bildung ist charakteristisch für die Gattung *Actinometra*, bei *Antedon* aber sehr selten (*Antedon disciformis* Palmata Gruppe). Sie gewinnt für unsre Art an Interesse, wenn man bedenkt, dass auch die unteren *Pinnulæ* durch den Besitz eines Kammes ein *Actinometra* ähnliches Verhalten zeigen. Von den radialen Gelenkflächen wäre weiterhin der ungemein tiefe Einschnitt ihres ventralen Randes zu erwähnen. Zu beiden Seiten dieses Einschnittes liegen die Muskelgruben auf leicht nach aussen gekrümmten Fortsätzen, die in ihrer Form langen Ohren gleichen. Sie haben leicht angedeutete, gebogene Querleisten. Von den Liga-

mentgruben sind sie durch sehr schwache Leisten getrennt, die ihren Ursprung seitlich vom Centralcanal nehmen, anfänglich vertical verlaufen und dann in einem ziemlich scharfen Winkel schräg nach oben abbiegen.

Das starke Ueberragen der Armglieder (overlapping of the arm-joints), was unsrer neuen Art ein so eigenes Gepräge verleiht, theilt sie in der Eschrichti Gruppe mit *Antedon antarctica* Carp.

An Zierlichkeit des Wachstums wird sie wohl von Keiner der verwandten Formen erreicht.

An sehr vielen Exemplaren fand ich cystenbildende Myzostomen.

### TENELLA GRUPPE CARP. CHALL. REP. XXVI. p. 156.

“10 Arme. Die Glieder der untersten Pinnulæ, welche oft lang und schlank sind, sind länger wie breit und dies oft in hohem Grade.”

Die von *Carpenter* in der *Tenella* Gruppe zusammengefassten Arten, einige zwanzig an der Zahl, haben ausserordentlich weite Grenzen sowohl in ihrer horizontalen als in ihrer bathymetrischen Verbreitung. Es sind unter ihnen zwei (*Antedon hirsuta* und *exigua*) vom 46. Grade südlicher Breite und eine (*Antedon proluxa*) vom etwa 70. Grade nördlicher Breite. Nur sehr wenige *Antedon* Arten überschreiten überhaupt diese Breiten. Andererseits ist die Hauptmenge der bekannten Species atlantisch, fünf aber gehören dem westl. Pacific an und eine Art (*Antedon nana*) dem indischen Archipel (Amboina). Die Arten, welche ich hier zu beschreiben habe, sind die ersten aus dem östlichen Theile des Stillen Oceans. Bathymetrisch gehören zur *Tenella* Gruppe sowohl littorale Species wie z. B. *Antedon nana* Hartl. und die europäische *Antedon rosacea*, als auch *Antedon abyssicola* aus 2900 Faden, der grössten Tiefe, aus der überhaupt Comatuliden gefischt wurden. Die neue Art *Antedon parvula* zeigt viel Aehnlichkeit mit der ebenfalls pacifischen *Antedon alternata* (south of Japan, northeast of New Zealand, Kermadecs, north of Papua) während *Antedon bigradata* n. sp. näher mit der oben erwähnten *Antedon proluxa* von Faeroe Channel und Smith Sound, Kara See, verwandt ist. Wie die übrigen pacifischen Arten, so wurden auch die vom Albatross gefischten in grossen Tiefen gefangen nämlich *Antedon parvula* in 978 Faden und *Antedon bigradata* in 385 und in 555 Faden. Ausser diesen beiden Species erhielt der

Albatross noch stark verstümmelte Exemplare von zwei andern Arten, von denen das eine, wahrscheinlich *Antedon abyssicola*, bei St. 3381 aus der bedeutenden Tiefe von 1772 Faden gefischt wurde.

***Antedon parvula* n. sp.**

Taf. III. Fig. 21.

*Centrodorsale* annähernd conisch mit schwacher Wölbung nach aussen. 20–30 Cirren, von 5–6 mm. Länge, deren Gliederzahl etwa 20 beträgt. Das 3., 4. und 5. Glied sind stark verlängert. Die folgenden werden schnell kürzer; die langen Glieder sind in der Mitte eingeschnürt. Die distalen Ränder sämtlicher Glieder springen vor, und die dorsale Contur des Cirrus ist stark gezackt. Das Ende des Cirrus ist etwas comprimirt.

*Erstes Radiale* etwas kürzer als das zweite und mit leicht eingebogenem distalem Rande; seitlich frei. Zweite kurz, nicht eingeschnitten, ebenfalls seitlich frei. Axillare rhombisch.

10 *Arme*. Erste Brachialia kurz, scheibenförmig, untereinander nicht in Berührung. Zweite fast doppelt so lang, von etwas wechselnder Form (bald mehr dreieckig, bald mehr viereckig). Drittes Brachiale (Syzygie) noch länger; jedes seiner syzygialen Glieder reichlich so lang wie das erste Brachiale. Es folgen vier fast quadratische Glieder und darauf das 8. (Syzygie), das wieder länger ist; dann ausschliesslich trapezoide Glieder, die bald die definitive, nicht unbedeutende Länge erreichen. (Das Armende ist an keinem Arm erhalten.)

*Syzygien* im 3., 8., 12. und darauf in Unterbrechungen von einem Gliede.

*Pinnula* des 2. Brachiale sehr dünn; die Glieder sind in der Mitte und gegen das Ende der Pinnula zu ziemlich stark verlängert, und haben vorspringende, fein gezähnte distale Ränder. (Keine war vollständig, eine aber bis zu 15 Gliedern erhalten). Die folgende Pinnula (Br. 6) 6 mm. lang mit circa 15 Gliedern, die der Mehrzahl noch stark verlängert sind. Pinnula des 6. Brachiale kürzer und aus etwa 10 stark verlängerten Gliedern bestehend. Die Pinnula des 8. Brachiale scheint die kürzeste zu sein. Die Glieder sämtlicher folgenden Pinnulæ sind stark verlängert.

*Scheibe* nicht sichtbar (auf etwa 3 mm. Dm. zu schützen).

*Färbung* weisslich.

*Klasterung* auf 60 mm. zu schützen.

*Sacculi* nicht deutlich zu erkennen.

*Fundort*, St. 3363, 978 Faden, Cocos Islands, weisser Globigerinen Schlamm; Bodentemperatur 37,5 F. Ein Exemplar.

Das winzige Exemplar, welches obiger Beschreibung zu Grunde liegt, trenne ich trotz übrigens grosser Aehnlichkeit mit *Antedon alternata* Carp. vorläufig von dieser specifisch ab, weil sich seine Cirren sehr wesentlich von denen jener unterscheiden (Taf. III, Fig. 21, und Chall. Rep. Pl. 22, Fig. 8 & 9). Ich kann aber nicht läugnen, dass mir trotzdem diese neue Art einiges Bedenken macht. Gewisse Uebereinstimmungen, so vor Allem solche in der Form des Centrodorsale, in der Form der Radialia, in der abwechselnden, ein Glied überspringenden Lage der Syzygieen, sind auffallend genug.

### *Antedon bigradata* n. sp.

Taf. I. Fig. 5.

*Centrodorsale* ziemlich lang conisch, mit abgestumpfter Spitze und etwas gewölbten Seiten. Die Cirrusgruben sind tief (Cirren selbst sind nicht erhalten), etwa 80 an der Zahl und stehen in 5 Feldern, die durch schmale interradiale Zwischenstreifen getrennt sind. Innerhalb der Felder stehen die Cirrusgruben in 4 verticalen Reihen, jede Reihe mit 4 Gruben. Die einzelnen Gruben berühren sich nicht untereinander.

Zwischen Centrodorsale und jedem ersten Radiale befindet sich eine spaltartige Vertiefung. Erste Radialia sichtbar und zwar nicht bloss an den Ecken des Calyx (wie die *A. hystrix*). Zweite Radiale kurz; es steht senkrecht zur Hauptaxe und im rechten Winkel zum Axillare; ebenso steht das erste Brachiale zum zweiten Brachiale. Kelch und Armbasis erscheinen durch diese Stellungsweise auffallend getreppt. Das radiale Axillare ist viereckig, sein proximaler Winkel spitz und lang ausgezogen; die beiden Seitenwinkel nach vorn gerückt.

*Erste Brachiale* kurz und dorsal kürzer als ventral. Zweite Brachiale dreieckig, drittes ziemlich kurz, dann 4 ebenfalls ziemlich kurze trapezoide Glieder, die auf ihrer pinnulatragenden Seite etwa halb so kurz sind als auf der andern.

Die *Pinnula* des zweiten Brachiale hat etwa 13 Glieder, von denen schon das erste bedeutend länger als dick ist, das zweite aber schon mindestens 2 mm. lang ist. Die *Pinnula* des 3. Brachiale ist klein und hat ebenfalls ein längliches Basalglied. *Pinnula* des 4. Brachiale

kürzer wie die des 2. mit 9 Gliedern, von denen das Basale ebenfalls länglich ist. An der Pinnula des 6. Brachiale, die aus etwa 9 Gliedern besteht, sind die zwei basalen Glieder kaum noch länger wie breit und auch die folgenden Glieder etwas kürzer.

*Scheibe* des Exemplars von St. 3404 hat 12 mm. Dm.

*Färbung*, hell röthlich braun mit weissen Flecken auf den Verbindungen der Pinnula Glieder.

*Fundorte*, St. 3358, 555 Faden, in der Nähe von Cap Mariato Point, "Modern Greensand," Bodentemperatur 40,2 F.; St. 3404, 385 Faden, zwischen Chatham und Hood Island, felsiger Grund, Bodentemperatur 43,2 F.

Die neue Art ist nahe verwandt mit *Antedon proluxa* Sladen, und mit dieser ist, wie mir *Carpenter* brieflich mittheilte, *Antedon hystrix* identisch. Da mir die *Sladensche* Beschreibung von *A. proluxa* nicht zugänglich ist, beschränke ich mich darauf auf die Unterschiede hinzuweisen, welche die neue Art im Vergleich mit *Carpenters* Beschreibung von *A. hystrix* darbietet. Besonders ist da hervorzuheben, dass die Cirren von *A. bigradata* in 5 Feldern stehen und innerhalb dieser wieder in Verticalreihen; sodann ist die spaltartige Vertiefung zwischen jedem ersten Radiale und dem Centrodorsale bemerkenswerth. Mehr Gewicht aber ist wohl noch auf die Verschiedenheit zu legen, welche die Pinnula des 2. Brachiale im Vergleich mit der von *A. hystrix* zeigt. Während sie nämlich bei letzterer 15 mm. lang ist und einige 30 Glieder hat "the first six of which are short and nearly square," hat sie bei unserer neuen Art 13 Glieder, von denen schon das erste bedeutend länger als dick ist.

### **Antedon spec.**

**Taf. IV. Fig. 25.**

*Fundort*, St. 3381, 1772 fath., Golf von Panama, in der Nähe von Malpelo Island, "Green Mud," Bodentemperatur 37,2 F. Ein Exemplar.

Am vorliegenden Exemplar fehlen die Cirren, und die Arme sind vom 3. Brachiale ab abgebrochen. Von den untersten Pinnulæ sind nur stellenweise einige Glieder erhalten.

Es handelt sich wahrscheinlich um *Antedon abyssicola* oder eine dieser sehr nahe verwandten Art.

Das Centrodorsale ist conisch und trägt etwa 25 Cirrusgruben, die relativ gross sind und dicht aneinander stehen. (*Antedon abyssicola*

hat nach Carpenter 15 Cirren). Die ersten Radialia sind wie bei *A. abyssicola* vollkommen sichtbar. Die Ecken schieben sich ein wenig zwischen die zweiten Radialia ein, sodass diese nicht seitlich in Berührung stehen. Dasselbe Verhalten zeigt *A. abyssicola* gelegentlich in ausgeprägtem Maasse.

An dem Exemplar sitzt als Schmarotzer festgeheftet ein *Stylifer* verwandte Schneckenart (nach Prof. v. Martens wahrscheinlich eine *Mucronalia*).

### Artedon spec.

Taf. IV. Fig. 27.

*Fundort*, St. 3354, 322 fath., in der Nähe der Küste bei Mariato Point, "Green Mud," Bodentemperatur 46,0 F. Ein Exemplar.

Eine Bestimmung ist nicht ausführbar, weil die Cirren und untersten Pinnulæ fehlen und die Arme sämtlich nahe ihrer Basis abgebrochen sind. Die conische Form des Centrodorsale, die bedeutende Zahl der Cirrusgruben sowie die Form der Radialia und untersten Armglieder lassen auf eine *Artedon proluxa* nahestehende Art wenn nicht gar auf diese selbst schliessen.

### Uebersicht der vom Albatross gesammelten Arten.

Gesammtzahl der Species, 7.

Sämmtliche Species gehören dem Genus *Artedon* an und vertheilen sich, wie folgt, auf drei Gruppen: —

#### I. BASICURVA GRUPPE CARP.

##### *Artedon agassizii* n. sp.

Fundorte:

- |  |            |
|--|------------|
| St. 3357, 782 Faden, "modern greensand," nicht weit von Mariato Point. |            |
| " 3408, 684 " " Globig. Ooze. }  | Galapagos. |
| " 3409, 327 " " "black sand." }  |            |

#### II. ESCHRICHTI GRUPPE CARP.

##### *Artedon rhomboidea* CARP.

Fundorte:

- |  |  |
|--|--|
| St. 3357, 782 Faden, "modern greensand," nicht weit von Mariato Point. |  |
| " 3424, 676 " "gray sand," Las Tres Marias Inseln.                     |  |

##### *Artedon tanneri* n. sp.

Fundort:

- |  |  |
|--|--|
| St. 3385, 286 Faden, "green mud," Golf von Panama. |  |
|--|--|

## III. TENELLA GRUPPE CARP.

**Antedon spec.**

Fundort:

St. 3354, 322 Faden, "green mud," bei Mariato Point.

**Antedon bigradata n. sp.**

Fundorte:

St. 3358, 555 Faden, "modern greensand," nicht weit von Mariato Point.

" 3404, 385 " "rocks," Galapagos.

**Antedon parvula n. sp.**

Fundort:

St. 3363, 978 Faden, "white Glob. Ooze," Cocos Inseln.

**Antedon spec. (abyssicola Carp.?).**

Fundort:

St. 3381, 1772 Faden, "green mud," nicht weit von Malpelo Island.

Besonderes Interesse verdienen des Fundortes wegen die zur *Eschrichti Gruppe* gehörenden Arten.

## ERKLÄRUNG DER ABBILDUNGEN.

## TAFEL I.

Fig. 1.	<i>Antedon rhomboidea</i>	Carp.	Exemplar von Las Tres Marias. Dorsale Ansicht des radialen Pentagons; vergrößert $\times 5$ .
Fig. 2.	“	“	Ventrale Ansicht des Centrodorsale vom selben Exemplar; vergr. $\times 5$ .
Fig. 3.	“	“	Calyx von der Seite, vom selben Exemplar; vergr. $\times 5$ .
Fig. 4.	“	<i>agassizii</i> n. sp.	Ventrale Ansicht des Centrodorsale; vergr. $\times 7$ .
Fig. 5.	“	<i>bigradata</i> n. sp.	vergr. $\times 3$ .
Fig. 6.	“	<i>rhomboidea</i> n. sp.	Ventrale Ansicht des Calyx; vergr. $\times 5$ .
Fig. 7.	“	<i>agassizii</i> n. sp.	Dorsale Ansicht des radialen Pentagons vom selben Exemplar wie Fig. 4; vergr. $\times 7$ . <i>r.</i> Rosette; <i>b.</i> ein Strahl des Basalsterns.
Fig. 8.	“	“	Seitenansicht des Calyx; vergr. $\times 6$ . <i>m.</i> Muskelgrube; <i>l.</i> Ligamentgrube.
Fig. 9.	“	<i>tanneri</i> n. sp.	Gelenkfläche des ersten Radiale; vergr. $\times 15$ .
Fig. 10.	“	<i>rhomboidea</i>	Gelenkfläche des ersten Radiale; vergr. $\times 11$ .
Fig. 11.	“	“	Ansicht eines Radiale vom Trichter aus; vergr. $\times 6$ .

## TAFEL II.

- Fig. 12. *Antedon rhomboidea* n. sp. Pinnula des zweiten Brachiale; vergr.  $\times 4$ .  
 Fig. 13. " *tanneri* n. sp. Ende der Pinnula des zweiten Brachiale;  
 stark vergr.  
 Fig. 14. " *rhomboidea* n. sp. Theil eines jungen Exemplars von Las  
 Tres Marias; vergr.  $\times 4$ .  
 Fig. 15. " " Theil eines Exemplars von St. 3357; vergr.  
 $\times 2\frac{1}{2}$ .  
 Fig. 16. " *agassizii* n. sp. Stück aus der äusseren Armhälfte; vergr.  
 Fig. 17. " *rhomboidea* n. sp. Cirrus eines Exemplars von Las Tres  
 Marias; vergr.  $\times 2$ .  
 Fig. 18. " *agassizii* n. sp. Proximale Armregion; vergr.  
 Fig. 19. " " Glied einer Pinnula von der Seite; sehr  
 stark vergr. *se, se'* Seitenplatten; *s.*  
 Platz des Sacculus; *t.* Lücke für den  
 Tentakeldurchtritt; *d.* Deckplatten.

## TAFEL III.

- Fig. 20. *Antedon tanneri* n. sp. vergr.  $\times 1\frac{1}{2}$ .  
 Fig. 21. " *parvula* n. sp. Cirrus; vergr.  $\times 11$ .  
 Fig. 22. " *tanneri* n. sp. Stück aus der mittleren Armgegend;  
 vergr.  $\times 4$ .  
 Fig. 23. " *agassizii* n. sp. Glied einer Pinnula; stark vergr.  
 Fig. 24. " *rhomboidea*. Exemplar von Las Tres Marias; vergr.  
 $\times 1\frac{1}{2}$ .

## TAFEL IV.

- Fig. 25. *Antedon spec. abyssicola*  
 Carp.? mit einer daran sitzenden  
*Mucronalia?* vergr.  $\times 4\frac{1}{2}$ .  
 Fig. 26. *Antedon agassizii* n. sp. vergr.  $\times 2$ . *Peters del.*  
 Fig. 27. " *spec.* (Tenella Gruppe). vergr.  $4\frac{1}{2}$ .





*Im Anhang* an die Beschreibung der Albatross Crinoiden möchte ich noch einen ebenfalls dem Mus. of Comp. Zoölogy gehörenden Antedon von *Gaspard Str.* beschreiben, den ich für neu erachte.

**Antedon subtilis** n. spec. (Palmata Gruppe).

*Centrodorsale* flach scheibenförmig, mit etwa 20 glatten Cirren am Rande, die meist zweireihig stehen. Cirren etwa 12 mm. lang, ziemlich dünn und in der äusseren Hälfte comprimirt. Circa 20 Cirrusglieder, die vom 5. an etwas länglich sind; die äusseren Glieder haben einen ganz schwachen Dorn, das vorletzte einen stärkeren.

Radien vom ersten Radiale an ganz frei seitlich. Erste Radialia seitlich etwas sichtbar. Zweite Radialia kurz, etwas kürzer wie die Seiten des fünfeckigen Radiale axillare. Distichale und palmare Stämme zweigliedrig. Erste Distichale und Palmare etwa so lang wie die Seiten des 2. u. 3. Radiale zusammengenommen. Keine Postpalmaria. Die Glieder der Radialia, Stämme und Arme vollkommen glatt. Nirgends Buckel auf den Verbindungen der Axillaria oder sonstige Protuberanzen.

20 *Arme*. (Ein Radius mit fünf Armen, einer mit drei, die übrigen mit vier). Die Arme sind ziemlich dünn, vollkommen glatt, etwa 5 cm. lang und mit sehr feinen Pinnulæ besetzt; die Armglieder sind kurz und zwar bis zum 8. mehr oder minder scheibenförmig, vom 9. an aber ausgesprochen dreieckig; so bleiben sie bis etwa zum 20. Gliede, von da ab wird die Form mehr trapezoid, und später quadratisch. Das erste Brachiale steht in theilweisem Contact mit dem Nachbargliede.

*Erste Syzygie* im 3. Brachiale, zweite im 14. Brachiale, die dritte nach einen Zwischenraum von 5-6 Gliedern, die folgenden in Zwischenräumen von 6-7.

*Pinnula* des 2. Brachiale etwa 7 mm. lang mit circa 13 glatten Gliedern, die mit Ausnahme der 2 basalen länglich sind. Pinnula des 4. Brachiale beträchtlich stärker und 10 mm. lang, geisselförmig. Glieder wie bei der vorigen länglich mit Ausnahme der zwei ersten. Die darauf folgenden 3 Pinnulæ derselben Armseite ganz winzig, etwa 2 mm. lang. Dann nimmt die Länge allmähig etwas zu, doch

SMITHSONIAN INSTITUTION  
UNITED STATES NATIONAL MUSEUM

MEMORANDUM

14 March 1911

Dear Dr Dall,

In looking over "An account of the shallow water Asteroidea" of the Indian Ocean by Professor R. Köchler, I find parasitic gastropods figured in situ as follows: -

plate VIII, fig. 7

X, fig. 4

XIII, fig. 5

XIV, figs. 4, 5, 6

XV, fig. 9.

I have just received a letter from L. Joubin of the Paris Museum in which he says he would like very much to exchange some terrestrial and fresh water molluscs from Africa against similar species from America. Can we do anything in this line.

Sincerely,  
Arthur W. Clark



bleiben die Pinnulæ des Mittelarms klein und dünn. Die Pinnulæ des Armendes sind von haarartiger Feinheit, aber etwas länger (5 mm.), die Glieder stets länglich.

*Sacculi* dichtstehend.

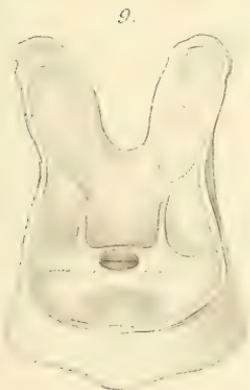
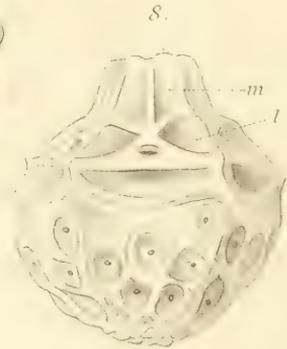
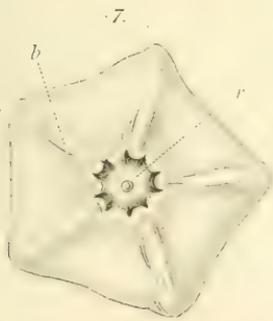
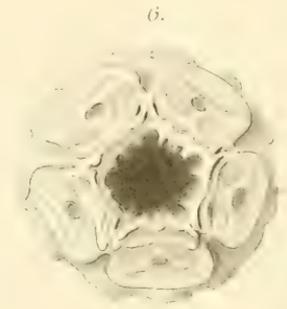
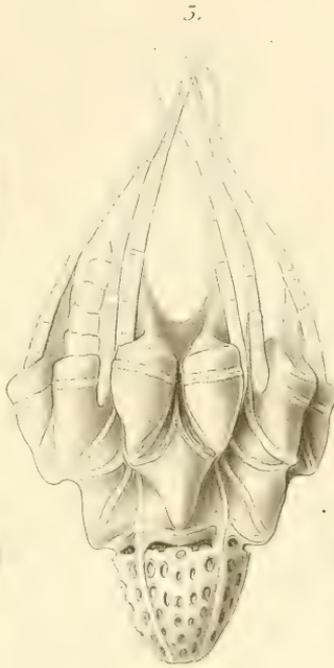
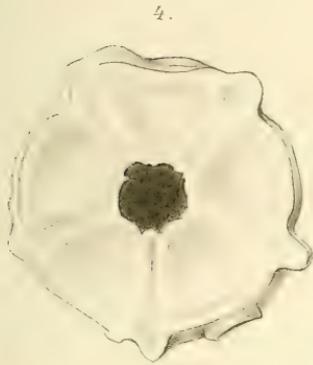
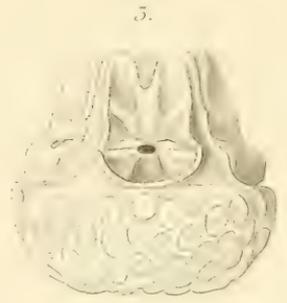
*Klafterung* etwa  $10\frac{1}{2}$  cm.

*Scheibe* tief eingeschnitten.

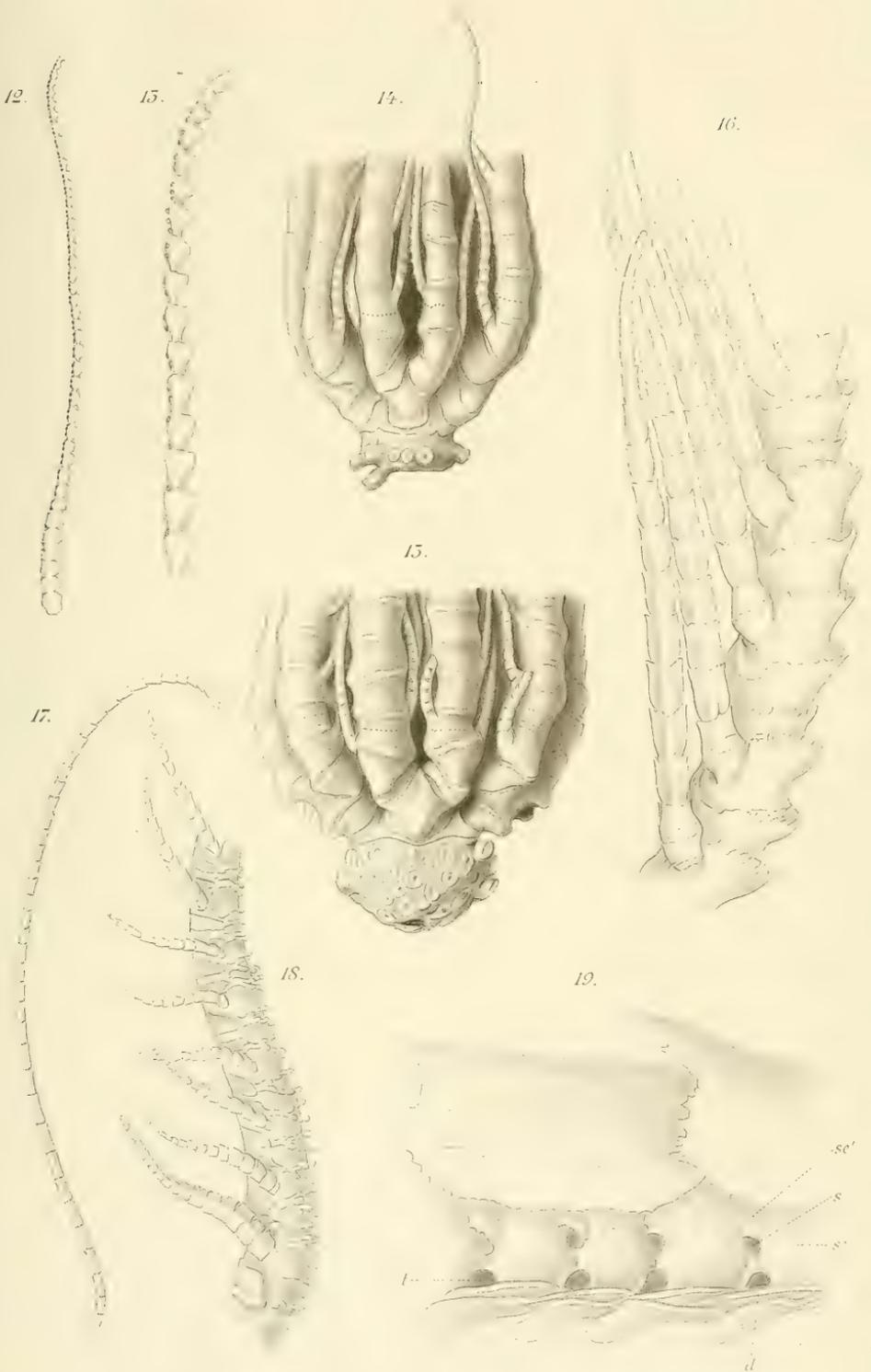
*Färbung* gleichmässig weiss.

*Fundort*, Gaspar Str. Ein Exemplar.

Die Art ist nahe verwandt der von mir beschriebenen Art *Ant. Klunzingeri* von Koseir aus dem Rothen Meer, unterscheidet sich aber von dieser durch die Kleinheit der Pinnulæ des 6. Brachiale. Dieselbe ist bei *A. Klunzingeri* so lang wie die des ersten Brachiale. Möglicher Weise wird sich nach Untersuchung grösseren Materials herausstellen, dass die beiden Arten identisch sind.

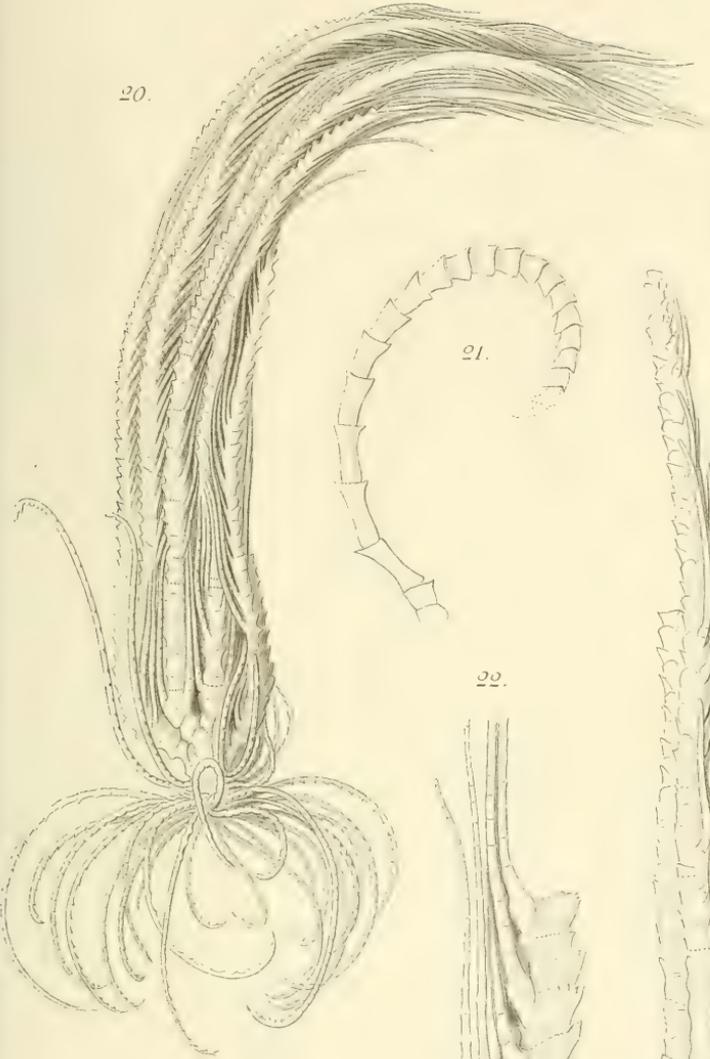




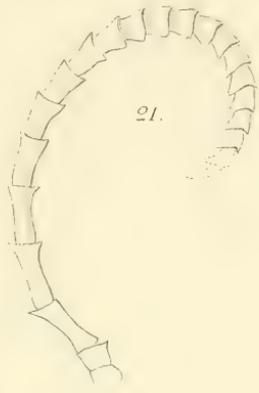




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21.



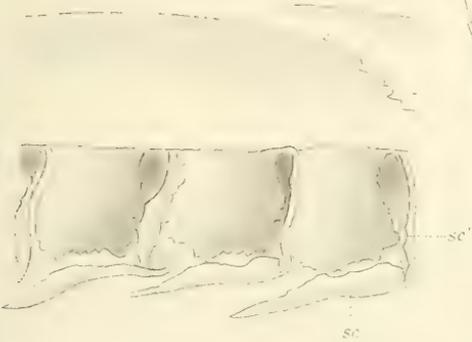
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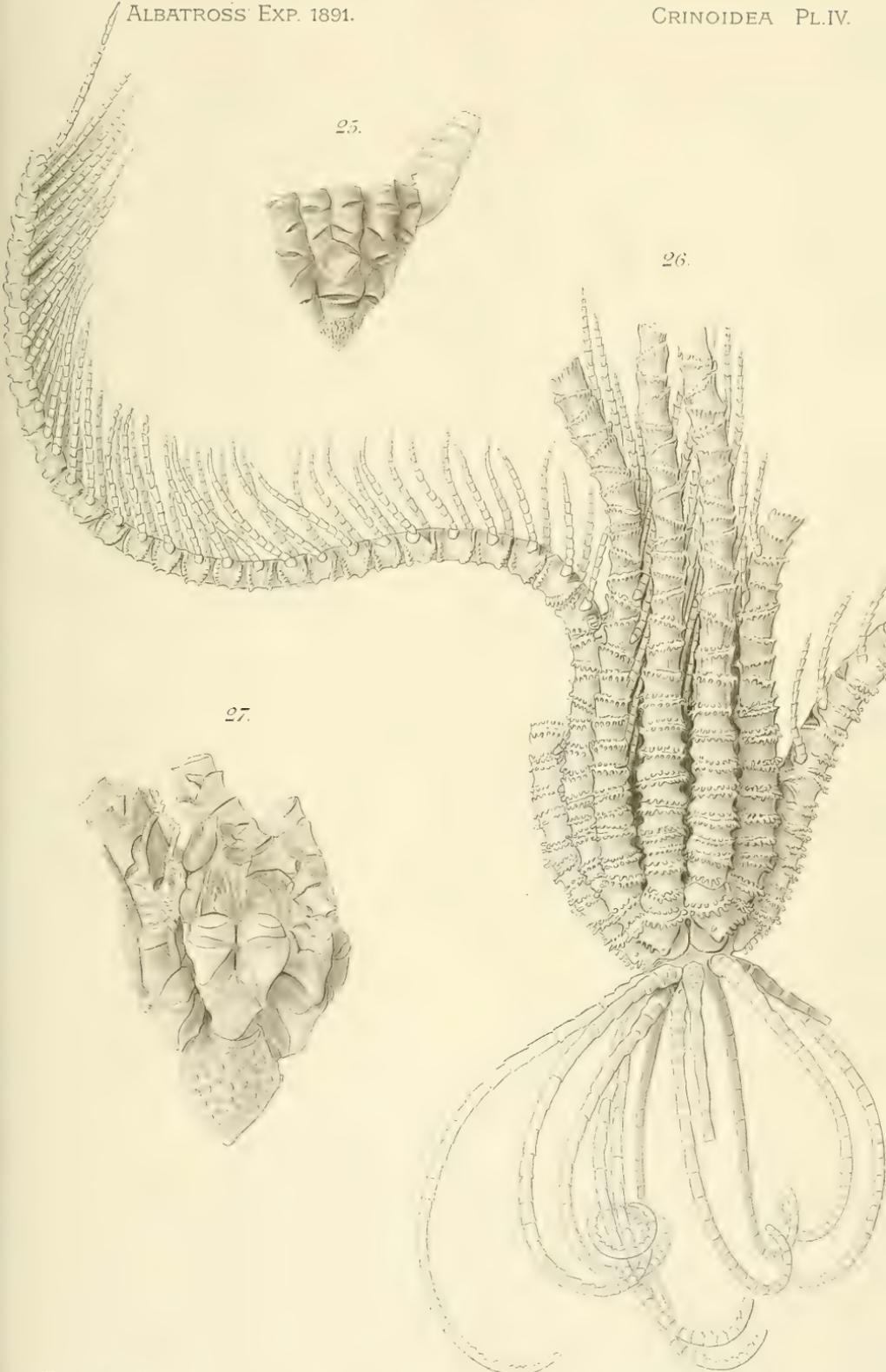




25.

26.

27.





REPORT ON A COLLECTION OF SHELLS FROM  
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MARINE MOLLUSCA OF THE PERUVIAN  
ZOOLOGICAL PROVINCE

BY

WILLIAM HEALEY DALL

Curator, Division of Mollusks, U. S. National Museum

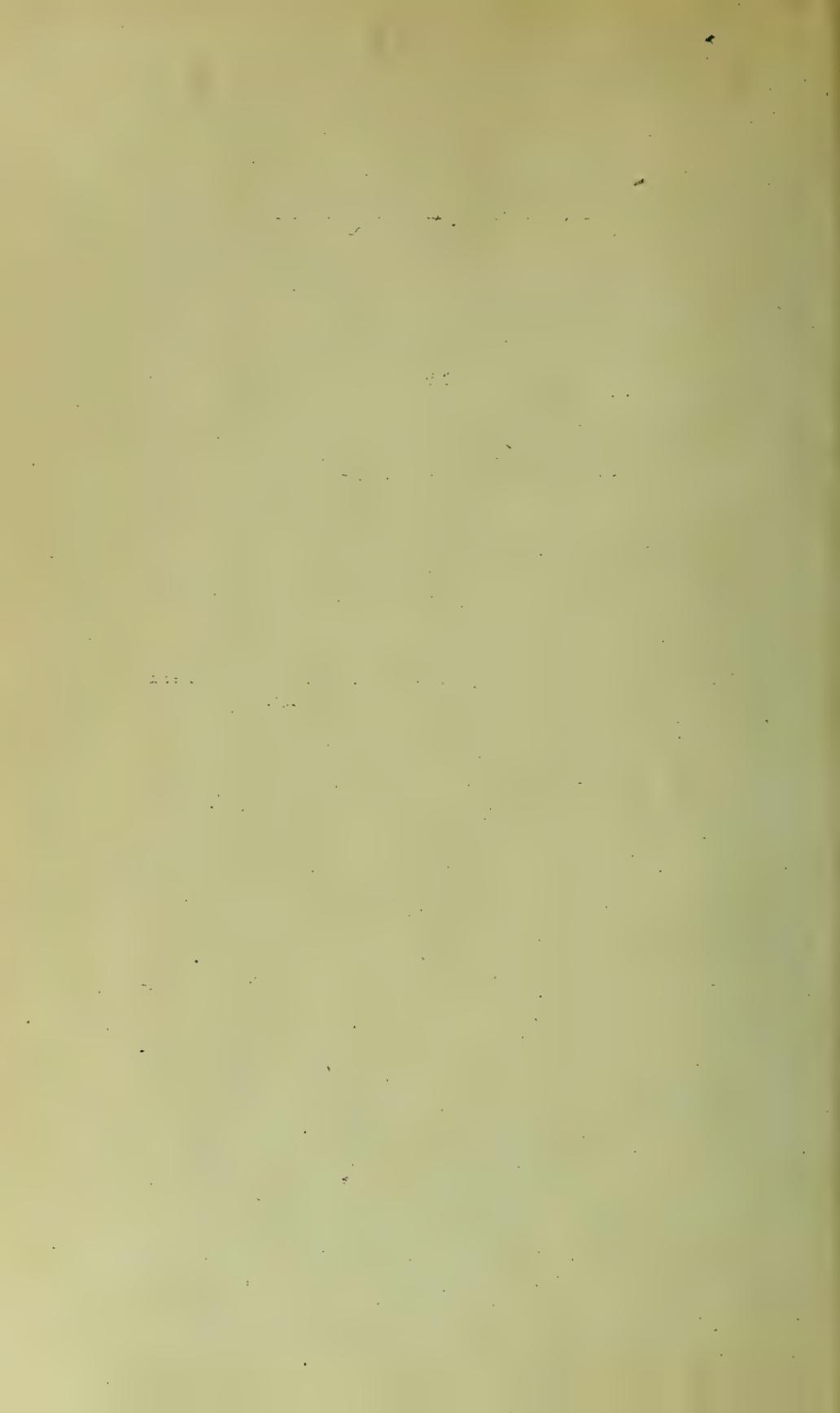
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No. 1704.—From the Proceedings of the United States National Museum,  
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REPORT ON A COLLECTION OF SHELLS FROM PERU, WITH  
A SUMMARY OF THE LITTORAL MARINE MOLLUSCA OF  
THE PERUVIAN ZOOLOGICAL PROVINCE.

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INTRODUCTION.

Under the auspices of the Ministerio de Fomento of Peru, Mr. R. E. Coker was engaged in making studies and collections of animals of the Peruvian coast with the intention of contributing to the knowledge of the aquatic resources of the country. In the course of this work numerous economic notes were made in relation to the animals obtained.

On the portion of the collection consisting of Mollusca, the authorities of Peru, through the intervention of Mr. Coker, have requested the writer to prepare a report.

It was found on looking into the matter that no systematic list of the shore mollusks of the Peruvian province had been published for more than half a century. It was thought that the value of this report to the naturalists of Peru and elsewhere would be considerably enhanced, after discussing the collection in question, if to it was added a list of the species reported as occurring on the shores of the Peruvian zoological province. The present report therefore contains both, together with illustrations of the chief economic mollusks of the Peruvian coast and islands contained in the collection.

It should be said that specimens of this collection have been returned with identifications, to the Peruvian authorities, and another series retained in the U. S. National Museum for reference. The notes in small type were prepared by Mr. Coker, who also collected the local names by which the more conspicuous species are known to the fishermen and local salesmen. It will be observed that these "common" names are no more precise or descriptive than those of our own fishermen, the same name being often applied to extremely distinct animals.

## ANNOTATED LIST OF THE MOLLUSCA COLLECTED.

## ANOMIA PERUVIANA Orbigny.

Plate 28, fig. 4.

*Anomia peruviana* ORBIGNY, Voy. Amer. MÉR., vol. 5, 1846, p. 673.—PHILIPPI, Abb. und Beschr. Neue Conch., vol. 3, 1850, p. 211, pl. 1, fig. 2.

*Anomia lampe* GRAY, Proc. Zool. Soc. of London for 1849, p. 117.—REEVE, Conch. Icon., vol. 11, *Anomia*, 1859, pl. 4, fig. 16.

Concha perla. Not "Concha de la Perla Viuda," which is applied to *Pteria*, the pearl oyster. Common, sessile on oysters, etc., near Capon and Matapalo.

*Distribution*.—From San Pedro, California, to Paita, Peru.

Shell very thin, pearly; white or coppery brown on the upper valve, bluish green internally and on the central part of the lower valve; sessile on other shells or smooth objects adhering by a prominent byssus which passes through a large hole in the lower valve. The scars of the muscles in an area on the inside of the upper valve form a nearly even straight row radiating from the direction of the hinge. The species can be distinguished from the other local species, *Anomia adamas* Gray, by the fact that the latter has the two distal scars on the area side by side and about equidistant from the hinge.

These shells have no economic relation unless it is that, when present in large numbers, they are injurious to the oysters upon which they perch, by consuming food the latter might otherwise get, or by overloading the oysters with their weight.

The *A. adamas* Gray, has been collected in Sechura Bay, at Mataballa, but seems to be less common than *A. peruviana*.

## OSTREA MEGODON Hanley.

*Ostrea megodon* HANLEY, Proc. Zool. Soc. of London for 1845, p. 106.—SOWERBY, in the Conchologia Iconica, vol. 18, *Ostrea*, 1871, pl. 12, fig. 24.

Taken in dredge, Bay of Sechura, about halfway between Bayovar and Mataballa.

*Distribution*.—From Scammon Lagoon, Lower California, and the Gulf of California, south to Peru. Fossil in the Antilles.

This species is very thin, narrow, and ribbon like; the margin fluted by four or five broad rounded waves, the color pale brownish when fresh, bleaching to white when beach worn. It has no economic value.

## OSTREA CHILENSIS Philippi.

Plate 26, fig. 1.

*Ostrea chilensis* PHILIPPI, Martini-Chemnitz Conch. Cab., 2d ed., *Ostrea*, 1845, p. 74, pl. 13, figs. 7-8.

Ostra of the fishermen. From the roots of mangroves, near the mouth of the Tumbes River.

*Distribution*.—From the island of Chiloë northward to the coast of Ecuador.

Shell ovate trigonal, irregular, moderately heavy; externally grayish white, internally white, sometimes faintly tinged with green;

the muscular scars white; the lower valve deep, rugose-scaly, the upper valve nearly flat.

This species is reported by Hupé to have as good a flavor as the edible oyster of Europe, yet the natives of South America will eat it only when cooked. It seems from an economic standpoint to be the most important species of the genus in the region where it occurs. It is easily distinguished from the following species in any of its mutations by the white or pale green margin of the valves.

OSTREA COLUMBIENSIS Hanley.

Plate 26, fig. 2.

*Ostrea columbiensis* HANLEY, Proc. Zool. Soc. of London, for 1845, p. 107.—SOWERBY, in the Conchologia Iconica, *Ostrea*, 1871, pl. 7, fig. 10a-b.

From the roots of the mangroves near the mouth of the Rio Tumbes; on the beach near the Estero Bendito; and bought in Callao, where they had been brought from the Tumbes region. *Ostra* of the fishermen.

*Distribution*.—From the Gulf of California south to Coquimbo, Chile.

Shell smaller than that of the preceding species, streaked with purple externally, the margins of the valves and the muscular scars purple or tinged with purple; ligamentary area broad, the beak of the lower valve strongly laterally recurved; form irregularly rounded trigonal, externally more or less lamellose and somewhat obscurely radiately ridged.

This species, distinguished by its purple scars and margins, is gathered for sale in the markets, but never attains the size of *O. chilensis*.

PECTEN PURPURATUS Lamarck.

Plate 26, figs. 5, 6.

*Pecten purpuratus* LAMARCK, Anim. s. Vert., vol. 6, pt. 1, 1819, p. 166.—SOWERBY, Thesaurus Conch., vol. 1, 1843, p. 53, pl. 15, fig. 113; pl. 16, figs. 123-125.

Concha abanico or conchitas. Taken near San Lorenzo Island, in Callao Bay, in about 15 feet of water, and in Sechura Bay, half-way between Bayovar and Matacaballa.

*Distribution*.—From Coquimbo, Chile, northward to Ecuador.

Shell orbicular, moderately convex, subequivalve, rather thin, with about 26 flat-topped ribs, laterally fringed, and separated by channeled interspaces; colors white, rose color, and different shades of purple distributed in an irregular manner; the interior zoned with blackish purple.

The large adductor muscle of this species is a delicious morsel when delicately cooked. The Chilean name for the species is *Ostion*.

## PTERIA PERUVIANA Reeve.

Plate 28, fig. 1.

*Avicula peruviana* REEVE, Conchologia Iconica, vol. 10, *Avicula*, 1857, pl. 14, fig. 53.

Concha perla viuda, purchased in Paita.

*Distribution.*—Gulf of California to Peru.

Shell large, inequivalve, very inequilateral, thin, purple or reddish with radiating yellowish rays externally, internally pearly with a dull margin, hinge line produced into auricles or "wings," the posterior usually longer and more broad, the anterior smaller and separated from the body of the valve by a conspicuous sinus in the flat valve, surface smooth or slightly laminated, the body of the shell plump, the extremities compressed. Byssiferous and potentially migratory.

This is the species originally abundant on this coast which supplied the pearl fisheries of Paita and Sechura bays, and at present the pearl industry of the Gulf of California. For the most part these fisheries have been destroyed by overfishing, and the mollusks no longer occur in sufficient profusion to afford a commerce of real importance.

## THE PEARL FISHERY IN PERU IN MODERN TIMES.

It seems that on the finding of pearls two companies were formed, one of which held a concession from the Government to take pearls from Tallara on the north to the Rio Piura on the south, while the latter fished from this river south to the Punta Aguja. The southern company employed divers in Panama, and made a promising start. Something like 200 pearls were taken at the outset, yielding about \$2,000 and repaying expenses. After this practically nothing was obtained. They then began exploring with dredges, the two companies finally working in conjunction in this investigation. They worked in water of from 2 to 12 fathoms and up to a distance of 7 miles from the shore, but failed to locate any bank of pearl oysters. It is believed, however, that there is somewhere in the bay a considerable bank of these shellfish, since when the wind blows stiffly from the north the beach is often strewn with the concha perlas. The conchas so found contain few pearls, and these of little value. The rastras which were used for exploring the bay were much like those used in Callao for concha abanicos, but with sharper teeth. No attempts have been made since 1901. The most valuable pearl was black and small, and worth \$400. For most of the above information I am indebted to Sr. Manuel Perez, who was the representative of the company which held the southern concession.

Getting such directions as were practicable regarding the location where the conchas were formerly encountered, I made several efforts with rastras to find them, but without success in this direction. Other forms of especial interest were taken, however. Later, at Paita, having obtained a dredge formerly used for the concha perlas, and a guide who had worked with one of the companies, we made other attempts a little south of Paita, but again with no success beyond the finding of a few dead shells. It is evident from this and from the repeated failures of the pearl companies that the locating of these banks would be accomplished only by long and thorough survey.

## MYTILUS CHORUS Molina.

Plate 25, fig. 1.

*Mytilus chorus* MOLINA, Hist. de Chile, 1782, p. 202, ed. 1787, p. 177; Conchologia Iconica, *Mytilus*, pl. 2, fig. 4.

Choro. From Windy Bay, in the southeast part of Independencia Bay.

*Distribution*.—From Coquimbo, Chile, northward to Peru. Known in Chile as Almeja, or Choro de Concepcion, after Conception Bay, where it abounds.

Shell large, ovate oblong, bluish with a thick black periostracum, smooth or concentrically subrugose; anterior end pointed, recurved; distal end rounded, produced; a single denticle at the hinge; the interior white with a bluish margin; byssus strong.

This is the largest of the mussels on the coast, and is regarded as the best of the edible shellfish. It is collected for the market where plentiful and transported to the principal towns as a standard article of sea food.

## MYTILUS MAGELLANICUS Lamarck.

Plate 25, fig. 4.

*Mytilus magellanicus* LAMARCK, Anim. s. Vert., vol. 6, pt. 1, 1819, p. 119; Encyclop. Méth., pl. 217, fig. 2.

Choro. Ancon and Callao Bays.

*Distribution*.—From Magellan Straits northward to Chile and Peru; the northern specimens smaller and less rugose than the more southern variety.

Shell of moderate size, straight, ovate-elongate, ventricose, anteriorly attenuated, subpyriform, blackish brown, varying to chestnut, with a thick periostracum; inside with a bluish nacre somewhat distributed in zones; the exterior feebly concentrically sculptured, the anterior half of the shell with more or less distinct radiating grooves and ridges.

Distinct from the young of *M. chorus* by the anterior radial sculpture.

## MYTILUS ATER Molina.

*Mytilus ater* MOLINA, Hist. de Chile, 1782, p. 203.

*Mytilus orbignyianus* HUPÉ, in Gay, Hist. de Chile, vol. 8, 1854, p. 211, pl. 5, fig. 5.

Choro. From rocks along the shore on the northeast side of San Lorenzo Island, Callao Bay. Also taken from the bottom of a small vessel after a voyage from Callao to the island Lobos de Afuera.

*Distribution*.—From Talcahuano, Chile, northward to Ecuador and the Galapagos Islands.

This species differs from the preceding in being quite smooth, without radiating sculpture, and when full grown does not exceed 3 inches in length. It takes the place of *Mytilus edulis* in the northern

hemisphere, and is chiefly found near tide limits on rocky shores. The specimens collected by Mr. Coker were very young, but seem to be referable to this species.

**MYTILUS GRANULATUS** Hanley.

*Mytilus granulatus* HANLEY, Proc. Zool. Soc. of London, for 1844, p. 17.—GAY, Hist. de Chile, vol. 8, 1854, p. 312, pl. 5, fig. 7.

Abundant on the rocky shores of the island Lobos de Afuera.

*Distribution.*—From Chiloë Island north to the Peruvian coast and islands.

Shell small, trigonal, inflated, thick, yellowish-brown, radiately conspicuously and closely costate, the costæ divaricating and bifurcating; anterior end high, obtuse; posterior end dilated, obliquely truncated; interior whitish, with a crenulate margin; the costæ are more or less distinctly granulate, and the form of the shell variable.

This species has no economic importance.

**MODIOLUS GUYANENSIS** Lamarck.

Platē 27, fig. 2.

*Modiola guyanensis* LAMARCK, An. s. Vert., vol. 6, 1819, p. 112.—REEVE, Conch. Iconica, vol. 10, *Modiola*, 1857, pl. 4, fig. 17.

Mejillones. From the flats at Capon and at the mouth of the Tumbes River, embedded in soft mud. They are usually quite buried or covered with mud, but their presence can be recognized by slits in the mud, such as would be made by thrusting in a broad knife blade. They occur in the mud floor of mangrove swamps and are commonly used for food.

*Distribution.*—Peru to the Gulf of California on the west, Guiana on the north, and south to Rio on the east coast of South America.

This is one of the few species which occur on both the eastern, northern, and western shores of South America. It was described by Lamarck from Guiana; there is a specimen from Rio Janeiro, obtained by Anthony, in the National Collection, and we now have it from Guayaquil and Peru.

Shell oblong, wedge shaped, externally green behind and above; the green area concentrically minutely wrinkled and separated from the rufous brown anterior part by a narrow lighter ray; ventral edge nearly straight, the interior pearly white, purple behind; the anterior end attenuated and the beaks adjacent.

This is one of the most attractive species of the genus when in good condition.

**MODIOLUS ARCIFORMIS**, new species.

Plate 28, fig. 2.

Huaquilla on the Ecuador border; apparently from a shellheap.

Two fragments of a slender arcuate *Modiolus* were gathered with the other dead shells from the shore at this locality and appear to belong to an undescribed species.

Shell slender, arcuate, of a pale brownish-white color (more or less bleached?) with some purple undertones dorsally; moderately tumid, with nearly terminal, very inconspicuous adjacent beaks; dorsal margin arcuate, very slightly subangulate at the end of the hinge line; posterior end rounded; anterior attenuated and rounded; base flattish and excavated or subconcave; bounded above by an obscure ridge; interior very pearly, of a lurid brown color, especially near the hinder edge, paler in the anterior region; shell margins simple; anterior adductor scar triangular, small, and deep; posterior scar larger, less impressed and near the posterior end of the shell. The type (Cat. No. 207756, U.S.N.M.) measured: Length of shell, 65; height at middle, 21; diameter at middle, 18 mm.

The nearest species to this is Carpenter's *Modiolus mutabilis*, which, however, is not arcuate to any conspicuous extent and has a different basal profile. It is also in all probability when adult a much larger shell.

#### MODIOLUS PURPURATUS Lamarck.

*Modiola purpurata* LAMARCK, Anim. s. Vert., vol. 6, pt. 1, 1819, p. 113.

*Modiola ovalis* CLESSIN, Martini Chemnitz, Conch. Cab., 2d ed., 1889, *Mytilacæa*, p. 125, pl. 33, figs. 4, 5.

Choro. Callao Bay, island of San Lorenzo, on rocks; also at Estero Zarumilla on the Ecuador border, near Capon.

*Distribution*.—From Punta Arenas, Chile, north to Ecuador, on the rocky shores of the whole Peruvian province.

Shell small, oval, coarsely radiately grooved, black or blackish purple with a thick periostracum, solid, angular anteriorly; interior purple, the margin crenate, not denticulate near the hinge; the concentric incremental lines sometimes crenulate the radial ridges.

This small shell has no economic value, but is abundant on the rocky beaches. The beaks are often badly eroded.

#### LITHOPHAGA (MYOFORCEPS) ARISTATA Dillwyn.

*Mytilus aristatus* DILLWYN, Descr. Cat. Rec. Shells, vol. 1, 1817, p. 303.—WOOD, Ind. Test., 1828, pl. 12, fig. 8.

Taken in dredge about halfway between Bayovar and Mataballa, Sechura Bay.

*Distribution*.—Red Sea, West Africa, West Indies, the west coast of America from the Gulf of California south to Chile, boring in coral, lime rock, and nullipores.

Shell small, slender, thin, nearly cylindrical, rounded and blunt in front, pointed behind; the surface is covered with a thin brown periostracum beneath which the shell is white; it deposits the calcareous matter from its boring on the exterior of the posterior end of the shell, forming a smooth coating which is extended on each valve beyond the end of the valve into a point; these points pass by each other like the blades of a pair of scissors.

This shell is of no economic importance, but is interesting on account of its boring habit and the singular form of the incrustation from which its subgeneric name was derived. The allied *L. attenuata* Deshayes, which also occurs on this coast, is distinguished by having the prolongations of its incrustation proximally flat and opposite like a duck's bill, instead of alternate.

ARCA (ANADARA) GRANDIS Broderip and Sowerby.

Plate 25, figs. 9, 10.

*Arca grandis* BRODERIP and SOWERBY, Zool. Journ., vol. 4, 1829, p. 365.—REEVE, Conch. Iconica, *Arca*, 1844, pl. 1, fig. 4.

Pata de Burro. From the oyster banks of Matapalo, near Capon, and at Huaquilla, on the northern border of Peru. A large coarse form eaten by fishermen.

*Distribution*.—From Magdalena Bay, Lower California, south to Peru. Common in the mud about mangrove roots.

Shell large, heavy, white, covered with a strong smooth dark olivaceous periostracum; obliquely subquadrangular, with strong radiating rounded ribs crenulated only near the anterior end of the shell.

The name applied by the Tumbes fishermen to this heavy coarse bivalve is the same which in the south they give to the univalve *Concholepas*.

ARCA (SCAPHARCA) TUBERCULOSA Sowerby.

Plate 27, fig. 4.

*Arca tuberculosa* SOWERBY, Proc. Zool. Soc. of London for 1833, p. 19.—REEVE, Conch. Iconica, *Arca*, 1844, pl. 3, fig. 18.

Concha prieta. Mouth of the river Tumbes, and near Capon, from the muddy floor of mangrove swamps. Among the first phenomena to catch one's attention on entering the mangrove swamps is a sound, heard repeatedly on every side, as of nuts falling into the water or the soft mud. Tracing the sound with some care, it is found to come from the watery hollows in the mud occupied by the concha prieta, and is presumably made by the sudden closing of its valves under water by the mollusk. This species, though inferior to some other shellfish of the region, is the one most commonly eaten.

*Distribution*.—From Cedros Island, west coast of Lower California, in mangrove swamps and muddy places, south to Peru.

Shell oval, turgid, oblique, the hinge line subauriculate, with numerous radiating ribs, armed, especially in front, with scattered tubercles; surface covered with a dense, pilose periostracum in life, the shell beneath white and porcellanous; ligamental area narrow, umbones adjacent.

This very common shell somewhat resembles *A. secticostata* Reeve, of the Florida coast.

## ARCA (SCAPHARCA) LABIATA Sowerby.

*Arca labiata* SOWERBY, Proc. Zool. Soc. of London for 1833, p. 21.—REEVE, Conch. Iconica, *Arca*, 1844, pl. 1, fig. 7.

From the flats at Capon.

*Distribution*.—From San Diego, California, south to Peru.

Shell very small, but having the aspect of *Arca grandis* in miniature. Without close inspection it would be taken for the young of that species. It has no economic importance.

## GLYCYMERIS INÆQUALIS Sowerby.

*Pectunculus inæqualis* SOWERBY, Proc. Zool. Soc. of London for 1832, p. 196 (not of Zool. of Beechey's Voy., 1839, pl. 32, fig. 3).—REEVE, Conch. Icon., *Pectunculus*, pl. 4, fig. 16.

Dredged in 5 fathoms, Sechura Bay, west of Mataballa.

*Distribution*.—Gulf of California to Sechura Bay, Peru.

Shell subcordate, solid, heavy, with obtuse radial ridges; lilac gray or white with four or five broad rusty or blackish transverse bands, irregularly disposed; interspaces of the ribs striated; ligament short and a very small part of it behind the umbones.

This species is rare and too small to have any economic value.

## GLYCYMERIS OVATA Broderip.

*Pectunculus ovatus* BRODERIP, Proc. Zool. Soc. of London for 1832, p. 126.—REEVE, Conch. Icon., *Pectunculus*, 1843, pl. 1, fig. 2.

Dredged in Callao Bay, near San Lorenzo Island.

*Distribution*.—Coquimbo, Chile, northward to the Lobos Islands, Peru, in 17 fathoms.

Shell obovate, convex, smooth, white, with fine transverse lines; the umbones pale chestnut, the interior white with a crenate margin. Periostracum thin, velvety, olive brown.

This species has no economic value and is rather uncommon.

## ALIGENA COKERI, new species.

Plate 28, figs. 5, 6.

Attached to worm tubes thrown upon the beach of the lagoon at Capon, Peru. The worms live in the beach. The tubes resembled those of *Chaetopterus*.

Shell small, white, thin, very fragile, tumid, more or less medially constricted; beaks full, high, closely adjacent, slightly anteriorly twisted and somewhat in advance of the middle of the shell; valves rounded quadrate, with a wide shallow furrow or constriction extending from the vicinity of the beaks to the middle of the base; ends rounded, base mesially excavated; sculpture consisting of concentric incremental lines and sparser, little-elevated, concentric threads;

the surface seems very liable to injury with resulting irregularities and depressions not normal to the shell; ligament strong, internal, its surface with a slight limy coat not consolidated into a lithodesma; hinge line edentulous, with a small callosity immediately in front of the ligament; pallial line entire, faint; interior of the valves white and smooth.

The type (Cat. No. 207759, U.S.N.M.) measures: Length, 7.5; height, 6.5; diameter, 6.5 mm.

Species of this genus exist on the east coast of the United States, and in the southern Tertiaries from the Eocene up; but this is the first time it has been recognized from the Pacific coast of the Americas. The present species is very similar to the *A. æquata* Conrad, of the Virginia Miocene. It is named for Mr. R. E. Coker.

DIPLODONTA (FELANIELLA) ARTEMIDIS, new species.

Plate 28, fig. 8.

On the "inside" or lagoon beach at Capon, in the sand.

Shell small, rather compressed, suborbicular, slightly inequivalve, the posterior side shorter; white with a polished yellowish periostracum and concentric sculpture, recalling in miniature that of *Dosinia dunkeri*; beaks small, pointed, slightly prosocœlous, adjacent; anterior end evenly rounded; posterior end slightly subtruncate, straighter, a little produced near the base, which is evenly arcuate; ligament strong, somewhat sunken; hingeplate excavated; teeth two in each valve, the anterior in the left and the posterior in the right valve larger and bifid; pallial line entire, margin simple, muscular scars small. Length, 12.0; height, 11.5; diameter, 6.0 mm.

This form has a rather unusual sculpture and polish for a *Diplodonta*, the yellowish periostracum is slightly zoned with pale gray. It has, like other shells of its size, no economic relations.

*Type-specimen*.—Cat. No. 207758, U.S.N.M.

CHAMA PELLUCIDA Broderip.

*Chama pellucida* BRODERIP, Trans. Zool. Soc. of London, vol. 1, 1835, p. 302, pl. 38, fig. 3.

On the shore rocks at the island of Lobos de Afuera, and at Mataballa, Sechura Bay, Peru.

*Distribution*.—From California south to Chile and Juan Fernandez Island.

Shell coarse, irregular, variable in form, adherent by the whole of one valve to rocks or other objects; rounded, the valves more or less subspiral; white with occasional reddish streaks on a subtranslucent ground; white within, with a crenulated margin; the exterior rude or rough, often much eroded, sometimes lamellose under favorable conditions of growth, reaching 2 inches in diameter, but having no economic value.

## CARDIUM PROCERUM Sowerby.

*Cardium procerum* SOWERBY, Proc. Zool. Soc. of London for 1833, p. 83; Conch. Ill., vol. 1, 1840, pl. 50, fig. 23.

A fragment was collected at the island Lobos de Afuera.

*Distribution.*—Cedros Island, Lower California, south to Paita, Peru.

Only a fragment was collected, and it is probably rare on the Peruvian coast.

## DOSINIA DUNKERI Philippi.

*Cytherea dunkeri* PHILIPPI, Abb. und Besch. neue Conch., vol. 1, 1844, p. 4, pl. 2, fig. 9.—SOWERBY, Thes. Conch., *Artemis*, pl. 140, fig. 5.

From a tidal lagoon at La Boca Grande, Tumbes.

*Distribution.*—Head of the Gulf of California and southward to Tumbes, Peru, and the Galapagos Islands.

Shell suborbicular, rather tumid, strong, and glossy, of a yellowish-white color, with moderately distant concentric sulci, the interspaces almost lamellar at the extremities of the shell; a few radiating very feeble striæ near the ends of the shell; lunule sunken, cordate; beaks not prominent; the greatest length is on a vertical line from the beaks.

The soft parts are small for the size of the shell and, though eaten by the natives of the Gulf of California, the shell is not sufficiently common to have an economic value.

## TIVELA PLANULATA Broderip and Sowerby.

Plate 28, fig. 9.

*Cytherea planulata* BRODERIP and SOWERBY, Zool. Journ., vol. 5, 1829, p. 48.—SOWERBY, Thes. Conch. *Cytherea*, 1851, pl. 127, fig. 13.

Matacaballa, Sechura Bay.

*Distribution.*—Gulf of California and southward to Coquimbo, Chile.

## MACROCALLISTA (PARADIONE) PANNOSA Sowerby.

*Cytherea pannosa* SOWERBY, Proc. Zool. Soc. of London for 1835, p. 47; Thes. Conch., 1851, pl. 133, figs. 140–142; pl. 163, figs. 202–203.

Dredged in Sechura Bay, west of Matacaballa, in about 5 fathoms.

*Distribution.*—Cape St. Lucas, Lower California, southward to Valparaiso, Chile.

Shell small, polished, compressed, obovate, solid, smooth, yellowish, variously painted with brown lines, spots, or streaks; beaks rather prominent; the interior of the shell white, the margins entire.

This little shell in some localities is quite common; in the Gulf of California the dead valves occur in heaps on the beaches, but it is too small to have any economic value, averaging only about an inch in length. It is attractive on account of its pretty and varied colors.

## CHIONE ASPERRIMA Sowerby.

*Venus asperrima* SOWERBY, Proc. Zool. Soc. of London for 1835, p. 42; Thes. Conch. *Venus*, 1853, pl. 155, figs. 57-58.

From the shell heaps at Huaquilla and Matapalo. Common in some localities, especially shelly beaches. "Concha tabaco" of the fishermen, who do not like it, saying it has the flavor of tobacco.

Found associated with the *Anomalocardia*.

*Distribution*.—Gulf of California southward to the Lobos Islands, Peru.

Shell rounded triangular, moderately tumid, whitish or grayish, with fine, rough, reticulate sculpture; in favorable localities with brown or livid varied painting on a lighter ground; lunule ovate, depressed, whitish.

This shell is recognizable by its rasp-like surface and long anterior cardinal tooth.

## CHIONE COMPTA Broderip.

*Venus compta* BRODERIP, Proc. Zool. Soc. of London, for 1835, p. 43.—SOWERBY, Thes. Conch. *Venus*, 1853, pl. 154, figs. 32-34.

Beach of Sechura Bay, near Matabacalla.

*Distribution*.—Gulf of California and southward to the Galapagos Islands and Sechura Bay, Peru.

Shell closely resembling *Chione cancellata* of the Atlantic coast, but flatter, more spread at the sides where the radiating threads are divergent, and the concentric sculpture is more laminar and less reflected; the latter is apt to be crowded, ventrally, in senile examples. The shell is white, rounded trigonal, solid, and heavy, with radiating rounded threads and concentric more or less distant lamellæ. The internal margins are crenulate, and the shell rarely exceeds 30 mm. in length. It is too small and not sufficiently abundant to have an economic value.

## ANOMALOCARDIA SUBRUGOSA Sowerby.

Plate 26, fig. 3.

*Venus subrugosa* SOWERBY, Genera of Shells, 1834, fig. 2.

Conchas de los bajos. Near Capon, at the oyster beds of Matapalo, there is along the border of the mangrove swamp a shelly bank about 25 meters wide. From this thousands of these shells may be taken in a short time. They are esteemed as food by the fishermen. They were also taken at Lancha de Fierro, at the mouth of the Tumbes River, and in the tidal lagoon La Boca Grande, at Tumbes; and the dead shells occur in the shell heaps at Huaquilla, on the Ecuador border.

*Distribution*.—From the Gulf of California to Valparaiso, Chile.

Shell ovate, subcordate, very tumid, thick and solid, the ventral edge much arcuated; color pale, with three or four dark rays; a few large, coarse, smooth, rounded and concentric ribs which become obsolete on the anterior slope and toward the ventral edge; lunule cordate, limited by an impressed line; inner margins crenated; length about 35 mm.

## CYRENA ISOCARDIOIDES Deshayes.

Plate 26, fig. 4.

*Cyrena isocardioides* DESHAYES, Proc. Zool. Soc. of London for 1854, p. 22.—  
PRIME, Smiths. Misc. Coll. No. 145, 1865, p. 25.

Llurona. Tumbes region, from the Estero Bendito. West Colombia, Deshayes.

These shells were found in some numbers barely covered by the muddy sand and rather high above low-water mark. The animal contains such a quantity of salt water as to be very unpalatable, even if the flesh be repeatedly punctured while roasting.

Shell much inflated, rounded trigonal, cordate, thin; anterior end evenly rounded; posterior side obliquely declining, subtruncate at the extremity; surface smooth except for incremental lines; periostracum thin, velvety, of an olivaceous brown; beaks large, swollen, incurved; shell white with faint violet streaks; hinge plate very narrow, teeth small, nearly equidistant from the cardinals; valves white inside, with sometimes a little violet near the margins, which are entire. Pallial line entire, without the sinus found in other American *Cyrenas*.

## DONAX ASPERA Hanley.

Plate 28, fig. 7.

*Donax asper* HANLEY, Proc. Zool. Soc. of London for 1845, p. 14.—SOWERBY, Thes. Conch., vol. 3, 1862, p. 307, pl. 1, fig. 24.

Almejas. Found at the sand beach of Santa Lucia, mouth of the Tumbes River. A small but esteemed comestible, abundant on many beaches.

*Distribution*.—Central America and southward to Tumbes, Peru.

Shell triangular, wedge shaped, small, solid, white or purple; radiately striate in front; on the short posterior side granulated near the angle of the truncation; behind the angle striated; posterior ventral margin denticulate; posterior area convex below, concave above; beaks elevated, the anterior dorsal slope steep.

The color, as in most donaces, is very variable. On the Lower Californian coast shells of this genus, even smaller than *D. aspera*, are washed, thrown, shells and all, into hot water, boiled until the juice is extracted and then strained out, leaving a clear broth of which the flavor is highly praised.

## IPHIGENIA ALTIOR Sowerby.

Plate 25, fig. 8.

*Capsa altior* SOWERBY, Proc. Zool. Soc. of London for 1832, p. 96.—ROEMER, Mon. *Donax*, 1869, p. 114, pl. 21, figs. 1-4.

Playeras. From the flats at Capon, 4 to 6 inches deep in the sand, and from a tidal lagoon at La Boca Grande, Tumbes.

*Distribution*.—Gulf of California and southward to Tumbes, Peru.

Shell subtriangular, oblong, arcuate, pale green or rosy under an olive periostracum, internally violet; posterior dorsal margin sloping,

rounded at the end; in front subtruncate; ventral edge rounded behind, in front somewhat flexuous; umbones blackish; the internal margins not crenate.

There is no record as to the edibility of this species.

TELLINA (ANGULUS) EBURNEA Hanley.

Plate 28, fig. 3.

*Tellina eburnea* HANLEY, Proc. Zool. Soc. of London for 1844, p. 61; Mon. *Tellina* in Thes. Conch., 1846, p. 241, pl. 58, fig. 91.

From the flats at Capon.

*Distribution*.—Gulf of California and southward to Paita, Peru.

Shell small, oblong, compressed, opaque white, glossy, inequilateral, with strong concentric sulci which usually are more feeble in one of the valves; and which become closer and the interspaces sublamellose on passing the flattened area at the upper edge of the more convex valve; posterior end shorter, subcuneiform, anterior edge straight, then rounded down to the base; ligament short and prominent; fold almost obsolete; inside pure white.

An inconspicuous species, not known to have any economic value.

TAGELUS (MESOPLEURA) DOMBEYI Lamarck.

Plate 27, fig. 3.

*Solen dombeyi* LAMARCK, Anim. s. Vert., vol. 5, 1818, p. 454; Encycl. Méth., pl. 224, fig. 1.

Navaja. Taken in sand, under 3 or 4 feet of water, at Chilca Bay, Peru. Used as food, but apparently does not occur abundantly.

*Distribution*.—From the island of Chiloë northward to Tumbes, Peru.

Shell elongate, parallel-sided, the ends rounded; covered with a dull olivaceous periostracum, white or purplish with an obsolete white ray; beaks subcentral, the ends of the shell gaping slightly; the base with its margin in the middle somewhat concave. Hinge with two inconspicuous cardinal teeth.

SEMELE SOLIDA Gray.

Plate 28, fig. 10.

*Amphidesma solidum* GRAY, Spicilegia Zoologica, 1828, pl. 6, fig. 6.—HUPÉ, in Gay, Hist. de Chile, vol. 8, 1854, p. 359, pl. 7, fig. 1.

Concha blanca. Bay of Chilca, 30 miles south of Callao.

*Distribution*.—Chonos Archipelago and northward to Callao, Peru.

Shell thick, solid, suborbicular, compressed, with concentric grooves and delicate radiating striæ; somewhat wrinkled distally; a touch of purple on the hinge margin; ligament internal; lunule minute, lanceolate; cardinal teeth very slender. Not of economic importance.

## MESODESMA DONACIUM Lamarck.

Plate 27, fig. 1.

*Maetra donacia* LAMARCK, Anim. s. Vert., vol. 5, 1818, p. 479.—CHENU, Man. de Conchyl., vol. 2, 1862, p. 79, fig. 341.

Almejas. Ancon. Used for food and bait. Seen not infrequently but irregularly in the market. Also obtained at Mollendo and Sechura Bay.

*Distribution*.—Whole Peruvian province, from Valparaiso north to Sechura Bay.

Shell white, solid, covered with a straw-colored periostracum; smooth or concentrically obscurely striated; wedge shaped, very inequilateral; shorter end subtruncate, longer end compressed, rounded, much produced.

This is the type of the genus *Mesodesma*.

## SAXICAVA SOLIDA Sowerby.

*Saxicava solida* SOWERBY, Proc. Zool. Soc. of London for 1834, p. 88; Thes. Conch., vol. 4, 1884, p. 133, pl. 471, fig. 12.

Taken from the rocks at north end of the water front at Callao, and from nullipores dredged in 5 fathoms, in Sechura Bay, west of Mataballa.

*Distribution*.—From Guayaquil to the Straits of Magellan, boring in soft material.

Shell small, irregular, mostly subcylindrical, distally blunt or subtruncate, chalky, covered with a straw-colored periostracum.

## MARTESIA CURTA Sowerby.

*Pholas curta* SOWERBY, Proc. Zool. Soc. of London for 1834, p. 71; Thes. Conch., vol. 1, 1849, p. 494, pl. 104, figs. 33, 34; pl. 108, fig. 105.

Boring in driftwood on the mud flats of La Pampa, mouth of the Tumbes River, Peru.

*Distribution*.—Almost world-wide in the tropics; boring in floating timber; West Indies, Panama, Ecuador, and Peru.

Shell oval, pointed behind, rounded in front; valves divided by a transversely grooved band; the anterior area obliquely divided in the adult, the dorsal portion with radiating wrinkles and transverse striæ, the ventral thinner and inflated, only filling the anterior wide gape when the shell is mature; posterior part of the valves concentrically striated; an accessory piece over the beaks on the back of the shell, pointed distally and contracted in the middle; posterior gape covered with a horny cuticle.

These small borers, except as helping to disintegrate sunken driftwood or wrecks, seem to have no economic importance.

## XYLOTRYA DRYAS, new species.

Plate 25, figs. 2, 3, 5, 6, 7.

From the stem of a living mangrove at Estero del Palo Santo, Tumbes, Peru.

As a rule, animals belonging to this family excavate their burrows in dead wood, not living trees, though the African mangrove of Senegal is bored in the living state by a true *Teredo*, which received the name of *T. senegalensis* from Blainville. The present species so far as noted is the first to be reported from living trees in America, and the first of the genus *Xylotrya* known to have this habit.

The external surface of the valves, beginning in front, is divided into five areas, of which the first might perhaps be regarded as internal rather than external, though when the muscles are removed it faces outward. It is in reality a myophoric surface, free from periostracum and in life supports very powerful muscles, which hold the two valves together; the surface of this area is rather irregular, the dorsal extremes of the area in the two valves project in blunt points; this area is separated from what is generally called the anterior area of the valves by a deep sulcus, the posterior slope of which terminates in a rounded bounding ridge; the anterior area proper is concentrically sculptured by regular, low, sharp, equally spaced, fine lamellæ with slightly wider interspaces; these are crossed by extremely sharp, fine, close, microscopic, radial striæ; the vertical width of this area is a little more than the width of the premedian area; the sculpture changes abruptly at the junction of the two areas and the angle at the junction of their ventral margins, as of the sculpture, is about  $97^{\circ}$ . The premedian area is similarly sculptured, but the lamellæ are rather smaller and more close set than in the anterior area, while the radial striæ are coarser and deeper, showing distinctly on the tops of the lamellæ. The postmedian area is feebly concentrically striated, covered with a thin glossy periostracum and more or less brown stained by the mangrove sap; it is separated from the posterior lobe by an angle; the posterior lobe or area is similar in surface and forms somewhat less than a semicircle, low and evenly rounded. The two valves are held together by strong muscles, chiefly attached to three myophoric areas. The first of these, anterior and looking outward and forward, has been described; the second forms an irregular concavely excavated rough surface extending from the anterior sulcus to the angle between the postmedian and posterior lobes of the shell. This surface includes much of the dorsal edges of the original valves, and when the muscles are removed the appearance is as if the valves have been badly eroded, but the condition is the same in the youngest valves I have been able to examine, and if, as seems evident, a considerable portion of the umbonal surface is missing, it has unquestionably been removed by absorption, and not by external erosion. The styloid processes are broad and long, extending nearly to the

nodules on the inside of the ventral points of the valves. They spring from a thick reinforcement of the hinge line, simulating a hinge plate, and they have nothing to do with the muscular system, but, as in the Pholads, are buried within the mass of the body and are probably of use in supporting the internal organs against the violent shocks resulting from its boring operations. From the posterior end of the "hinge plate" to a point on the margin of the valves corresponding to the angle between the postmedian and posterior areas, extends in the adult a broad septum in each valve, continuous on its inner edge with the margin of the valves and on the opposite edge free, with a recess behind it equal in depth to about half the whole width of the septum. The surfaces of these two plates form the third myophoric area above referred to and carry a relatively immense mass of muscular fibers uniting and holding closed the two valves and counteracting the action of the muscles massed on the exterior myophores. In other words, these muscles correspond to adductors of ordinary bivalves as regards their function, while the external muscles operate like a ligament. The nodules on the inside of the distal or ventral ends of the valves are of a rather unusual shape, subcylindrical and blunt at the opposed ends, rapidly cuneate at the proximal ends. The type, an adult shell, (Cat. No. 207695 U.S.N.M.), measures dorsoventrally 20, in length 19, and transverse diameter 19 mm. The soft parts, in alcohol, of this specimen were about 8 inches (20 cm.) in length. The pallets, set rather far back from the siphonal ends, measured about 45 mm. in length, of which 25 mm. is smooth cylindrical stalk, the remainder being vane, of which the mass is set on the stalk inequilaterally, the segments being closely crowded with a serrate profile, and pretty well covered by a thin brownish periostracum which passes over the segments on the back without interruption for the interspaces. The width of the vane is about 5 mm. near the base, gradually narrowing to a point at the tip.

It is somewhat odd that, in comparing the shell of this species with that of other Teredinidæ, the most similar shell found was not that of any *Xylotrya*, but a shell belonging to another genus, the *Teredo norvegica* of Spengler. From this the valves of *X. dryas* differ in having the posterior area axially longer, the postmedian shorter, the premedian wider, and the anterior about the same proportion. The styloid processes are longer; between the root of the process and the anterior end of the thickening I have for convenience called a "hinge plate," there is a small but prominent denticle which I have not found in any other species.

It is not improbable that this species may be confined to the mangroves and not attack dry wood; if so this would account for the form not being reported before.

## BULLARIA PUNCTULATA A. Adams.

*Bulla punctulata* A. ADAMS, Thes. Conch., vol. 2, 1850, p. 604, pl. 123, fig. 77.  
Lobos de Afuera Island. One dead specimen.

*Distribution.*—From Cape St. Lucas, Lower California, and the Gulf of California, southward to Pacasmayo, Peru, and the Galapagos Islands.

Shell oval, involute, solid, with a marbling and punctate painting of reddish brown; surface smooth, length about 25 mm.

## SIPHONARIA (LIRIOLA) LESSONI Blainville.

*Siphonaria lessoni* BLAINVILLE, Dict. Sci. Nat., vol. 32, 1824, p. 267, pl. 44, fig. 2.  
From rocks at north of water front, Callao. One specimen.

*Distribution.*—Straits of Magellan northward to Callao, Peru.

Shell patelliform, erect, the apex rather sharp, recurved; surface feebly radially striate; of a brownish-olive color. Margin entire. Interior brown, polished, the muscular scar interrupted for the passage of the siphon.

This is a very common species, of no economic value, frequently found among true marine limpets on rocks between tide marks. It has been frequently confounded with the *S. tristensis* of Sowerby from Tristan d'Acunha Island in the Atlantic Ocean.

## BULIMULUS HENNAHI Gray.

*Bulimulus hennahi* GRAY, Spicilegia Zool., vol. 1, 1828, p. 5, pl. 5, fig. 5.

Snails from the hills of San Gallan Island, near Pisco, Peru; 1,200- to 1,368 feet above the sea. The lower parts of the island are arid, but the higher parts derive sufficient moisture from the clouds to support a good deal of vegetation and these snails.

*Distribution.*—Arica, Tacna, and San Gallan Island, Peru.

Shell oval, subacuminate, solid, rather rude, with irregular feeble axial rugosities; color pinkish white, with pink apex, and about seven whorls, the last about equal to the spire, moderately rounded. Aperture ovate, purplish inside, pillar straight; peristome simple, acute; a small umbilical perforation behind the expanded posterior part of the pillar. Length about 27 mm.

These snails have no economic value.

## BULIMULUS COKERIANUS, new species.

Plate 23, fig. 3.

Snails from the peaks of Vieja Island, Independencia Bay, at about 1,200 feet elevation.

Shell small, thin, conical, with about eight whorls separated by a distinct but not channeled suture; nucleus smooth, brownish, with

an apical dimple and about a whorl and a half; spire above the last whorl about one-third of the total length or even less; color lilac-gray, with retractive axial streaks, more or less irregular, of purplish brown; aperture ovate, with a sharp simple peristome, a wash of enamel on the body, and a straight, thin, hardly reflected pillar; interior with the coloration shining through the shell and a faint grayish enamel; umbilicus small, deep; sculpture of incremental lines and feeble irregular rugosities. The type (Cat. No. 207700, U.S.N.M.) measures: Height of shell 27; of last whorl 19; of aperture 13.5; maximum diameter of last whorl 15 mm.

This species is most nearly approached by *B. apodematus* Orbigny, but differs constantly in its depressed spire with deep sutures, the very slight masking of the umbilicus by the expansion of the pillar, the aperture slightly more angular at the base, and the deeper and more intense coloration. It is named for the collector of the specimens.

#### CONUS XIMENES Gray.

*Conus ximenes* GRAY, Zoöl. Beechey's Voy. p. 119, (pl. 33, fig. 2, 1839, as *C. interruptus* BRODERIP and SOWERBY, Zoöl. Journ., vol. 4, p. 379, 1829; not *C. interruptus* MAWE, Conch., 1828).

Dredged in Sechura Bay, halfway between Bayovar and Matacaballa. One dead specimen.

This is the original *interruptus* of Broderip and Sowerby, as figured in Beechey's voyage. The normal *C. Ximenes*, as described, has additional brown flammules, this variety only the spiral rows of brown dots on a greenish-white ground. The spire has a very shallow channel behind the suture, but is not spirally striated like *C. purpurascens*, or granulated anteriorly as in that species. The shell is covered with a velvety periostracum, while that of *C. purpurascens* is smooth and almost polished.

#### OLIVA PERUVIANA Lamarck.

Plate 23, fig. 4.

*Oliva peruviana* LAMARCK, Ann. du Muséum, vol. 16, 1810, p. 317; Encycl. Méth. pl. 364, fig. 3.

Dredged, living, in Sechura Bay, between Bayovar and Mataballa.

*Distribution.*—From Valparaiso, Chile, northward to Guayaquil and the Galapagos Islands.

Shell ovate, solid, polished, whitish with irregular brown stripes, sometimes angular, sometimes axially directed. The epipodia behind, from the preserved specimens, seem to form a sort of pocket, which in life should fit over the spire of the shell.

## OLIVELLA COLUMELLARIS Sowerby.

*Oliva columellaris* SOWERBY, Tankerville Cat., App. 1825, p. xxxiv.—REEVE, Conch. Icon. *Oliva*, 1850, fig. 62.

Beach of Sechura Bay, near Mataballa.

*Distribution*.—Central American coast, Panama and southward to Paita and Sechura Bay.

Shell small, polished, spire acute, short, last whorl expanded in front, feebly axially striated; pale grayish or lead color, with a heavy whitish body callus, and usually a yellowish spiral band at the middle of the whorl and behind the suture. There is a single strong plait on the anterior edge of the pillar; interior of the aperture purple, showing one paler band. The animal, unlike that of *Oliva*, possesses a small horny operculum. These shells in prehistoric times were used as beads.

## OLIVELLA SEMISTRIATA Gray.

*Oliva semistriata* GRAY, Zool. Beechey's Voy., 1839, p. 130, pl. 36, fig. 10.

Dredged in Sechura Bay, in about 5 fathoms, west of Mataballa.

*Distribution*.—Gulf of California and southward to Sechura Bay.

This species is very similar to the last, but has a proportionately longer spire and is less compressed in front. Neither of the species has any present economic value.

## MARGINELLA CURTA Sowerby.

*Marginella curta* SOWERBY, Proc. Zool. Soc. of London for 1832, p. 105; Thes. Conch., vol. 1, p. 397, pl. 76, figs. 88, 89.

Dredged in Sechura Bay, between Bayovar and Mataballa; found also at the Chincha Islands and Lobos de Afuera Island.

*Distribution*.—From Panama southward to Iquique, Chile.

Shell small, polished, of a purplish brown, the spire very short, the aperture narrow, nearly as long as the spire, the pillar with four well-marked plaits; the surface without sculpture except faint incremental lines.

This species has no present economic value, but the prehistoric tribes ground off the apex of the spire, strung the shells on a cord, and used them for beads.

## MITRA ORIENTALIS Gray.

*Mitra orientalis* GRAY, in Griffith's Cuvier, 1834, pl. 40, fig. 5.

Taken on rocks of beach at Ancon; one dilapidated specimen.

*Distribution*.—Valparaiso, north to Ancon.

Shell elongate, turrated, covered with a thick black periostracum which in drying peels off, coarsely feebly spirally striated; the last whorl longer than the spire; aperture about half as long as the shell,

interior livid purple brown or whitish; pillar with three prominent plaits; no operculum. Species of no economic importance.

This species is one of a group of black *Mitras* characteristic of the west coast of the two Americas from California to Valparaiso. These shells have been generally confounded together on account of their general similarity, and the fact that specimens obtained are usually in poor condition, the periostracum at least being almost invariably defective.

SOLENOSTEIRA FUSIFORMIS Blainville.

Plate 22, fig. 3.

*Purpura fusiformis* BLAINVILLE, Nouv. Ann. du Muséum, Paris, vol. 1, 1832, p. 31, pl. 11, fig. 7.

Dredged in Sechura Bay, west of Mataballa, in about 5 fathoms. Also found at the Chincha Islands on the shores.

*Distribution*.—From Panama southward to the Chincha Islands.

Shell ovate, turrated, ventricose, white, covered with a thick lamellose dark olive periostracum; whorls convex, carinated, tuberculous above; the tubercles elevated and compressed; aperture ovate, white; columella smooth; base narrowly umbilicated; canal short, flaring. Operculum elongate with an apical nucleus.

This shell has much similarity to the *Thais kiosquiformis*, with which it has very generally been associated. It can be distinguished by the absence of the lamellose sutural band of the *Thais* and the entirely distinct operculum.

COLUMBELLA PAYTENSIS Lesson.

*Columbella paytensis* LESSON, Voy. Coquille, vol. 2, 1830, pt. 1, p. 402.—SOWERBY, Thes. Conch., *Columbella*, p. 116, pl. 36, figs. 36-37.

Dredged in Sechura Bay west of Mataballa, in about 5 fathoms. Also obtained at Lobos de Afuera Island.

*Distribution*.—Central American coast southward to Sechura Bay, and at the Galapagos Islands.

Shell small, stout, with a short spire and narrow aperture; whorls broadly channeled below the sutures; chestnut brown, more or less dotted with white; outer lip internally denticulated, a few tubercles on the pillar; aperture within whitish or purple; length about 25 mm.

ANACHIS RUGOSA Sowerby.

*Columbella rugosa* SOWERBY, Proc. Zool. Soc. of London, for 1832, p. 115.—KIENER, Icon., *Columbella*, 1839, p. 46, pl. 16, fig. 4, 1839 (as *C. bicolor* Kiener).

On oysters, at Matapalo, near Capon.

*Distribution*.—Gulf of California southward to Paita, Peru.

Shell small, ovate, tuberculate, plicate or rudely ribbed axially, the ribs only developed on the upper half of the body whorl; whole

surface with revolving striæ; spire acute, shorter than the body whorl; color white, gray, or olivaceous, with chocolate clouding especially on the back of the body whorl, which is sometimes nearly all chocolate colored; length 18 mm.

These small shells have no economic value in themselves; but they drill the very young oysters when about 10 mm. in diameter, pierce the thin shell, and suck the juices of the animal. If very numerous they might be a serious detriment to the maintenance of growing oysters.

ASTYRIS UNICOLOR Sowerby.

*Columbella unicolor* SOWERBY, Proc. Zool. Soc. of London for 1832, p. 119.—

REEVE, Conch. Icon., *Columbella*, pl. 19, fig. 105.

Dredged in Callao harbor, in 2½ fathoms, near San Lorenzo Island.

*Distribution*.—From Chiloë Island northward through Chile, Peru, and the Galapagos Islands.

Shell very small, ovate, smooth with revolving striæ near the canal; color chocolate or chestnut brown, with or without a lighter band revolving on the periphery; aperture brownish within; outer lip and pillar with a few obscure denticles in the adult; length about 12 mm.

This small shell, remarkable for its wide geographic range, has no economic relations.

ALECTRION (HIMA) DENTIFERUS Powys.

*Nassa dentifera* POWYS, Proc. Zool. Soc. of London for 1835, p. 95.—ORBIGNY,

Voy. Am. Mér., vol. 5, 1841, p. 432; pl. 61, figs. 22-23.

Dredged in about 9 fathoms, muddy bottom, in Ancon Bay.

*Distribution*.—Coasts of Chile and Peru, from Valparaiso northward to Panama.

Shell small, turritid, rather thin, obscurely reticulately sculptured, chocolate brown, inside and out, with occasionally a paler peripheral spiral band; outer lip sharp, thin, in the adult having an obscure varix behind it; the sculpture variable in strength; length 20 mm.

This small and unattractive species has no economic importance.

CONCHOLEPAS CONCHOLEPAS Bruguière.

Plate 22, fig. 1.

*Buccinum concholepas* BRUGUIÈRE, Encycl. Méth., 1789, p. 252.—DILLWYN, Rec. Sh., vol. 2, 1817, p. 611.

*Concholepas peruvianus* LAMARCK, An. s. Vert., vol. 7, 1822, p. 252.—TRYON, Man. Conch., vol. 2, 1880, p. 199, pl. 162, figs. 314-316.

Pata de burro, of the southern region. Common on some of the rocks some yards from shore and at or below low-water line.

*Distribution*.—Chincha Islands. Mollendo, and south to the Magellanic region. Also northward, according to E. von Martens, to the west coast of Mexico.

Shell large, rude, with spiral imbricated sculpture, the spire so reduced that the last whorl appears like a large rounded limpet; the color brownish. Inside white, polished, the margin more or less crenulated, and produced toward the anterior edge into two or more projecting denticulations. There is an operculum, but too small to close the aperture, into which the animal can barely withdraw. The shell may reach a length of 80 mm. or even more. It lives seated on rocks like a limpet, though closely related to the genus *Thais*.

Mr. Coker in his notes mentions that this species is sometimes eaten, but not esteemed.

THAIS CHOCOLATA DUCLOS.

Plate 22, fig. 2.

*Purpura chocolata* DUCLOS, Ann. Sci. Nat., vol. 26, 1832, p. 108, pl. 2, fig. 7.

Caracoles. Callao Bay, shore to 2½ fathoms, and on the shore of San Lorenzo Island. This form is commonly sold in the markets, after being removed from the shell.

*Distribution*.—From Valparaiso, Chile, northward to Paita, Peru.

Shell large, solid, with a short spire and very large body whorl often carinated and more or less tuberculate at the shoulder of the whorl; exterior chocolate color, the aperture within bluish or yellowish, the pillar orange colored; the shell when weathered, as many specimens are, becomes of a grayish color and is frequently more or less eroded. Operculum large with a lateral nucleus; the length of the shell sometimes reaching 3½ inches.

The word "caracoles" seems to be applied by the fishermen to any species of *Thais* or *Solenosteira*, and the general remarks as to edibility, etc., are probably referable to all the Peruvian species of these groups.

THAIS CRASSA Blainville.

*Purpura crassa* BLAINVILLE, Nouv. Ann. du Muséum, vol. 1, March, 1832, p. 241, pl. 12, fig. 4.

*Purpura melones* DUCLOS, Ann. Sci. Nat., vol. 26, May, 1832, p. 105, pl. 1, fig. 2.

*Purpura melo* REEVE, Conch. Icon., *Purpura*, 1846, pl. 4, fig. 17.

Callao, taken in fish-net near San Lorenzo Island.

*Distribution*.—Panama south to Callao and the Galapagos Islands.

Shell resembling that of the last species, but destitute of tubercles and only half as large; chestnut variegated with white, especially anteriorly; the pillar tinged with pink, the inner edge of the outer lip frequently marginated with black.

THAIS CALLAOËNSIS Gray.

*Purpura callaoënsis* GRAY, Spicilegia Zool., vol. 1, 1828, p. 4, pl. 6, fig. 11.—

REEVE, Conch. Icon., *Purpura*, 1846, fig. 79.

Lobos de Afuera Island, among stones at low water.

*Distribution*.—Panama and southward to Callao, Peru, and the Galapagos Islands.

Shell small, white or pale brownish inside and out, of the same general form as the last species; smooth, or faintly striated; length about 25 mm.

This is not the *P. callaoënsis* of Blainville, 1832. It is too small a shell to have much economic importance and does not seem to be abundant. Tryon referred it wrongly to the genus *Coralliophila*, probably from figures or worn specimens; but it is quite destitute of the peculiar sculpture of *Coralliophila*.

THAIS DELESSERTIANA Orbigny.

*Purpura delessertiana* ORBIGNY, Voy. Am. Mér., vol. 5, 1841, pp. ix, 439, pl. 77, fig. 7.

Caracolitos. Callao Bay, on the shores of San Lorenzo Island; on the Callao water front; and common on the shore rocks at the Chincha Islands.

*Distribution*.—Cedros Island, west coast of Lower California, and southward to the Chincha Islands.

Shell of the same general shape as *T. chocolata* Duclos, but smaller, thinner, with a smoother and more polished surface, the shoulder of the whorls more sloping and less prominently tuberculose, or without tubercles; general color brownish, usually with one or two paler, narrow, spiral bands on the last whorl; length about 50 mm.

This is *Purpura callaoënsis* Blainville, 1832, not of Gray, 1828.

THAIS KIOSQUIFORMIS Duclos.

Plate 22, fig. 4.

*Purpura kiosquiformis* DUCLOS, Ann. d'Hist. Nat., May, 1832, pl. 1, fig. 5.—KIENER, Icon., *Purpura*, p. 59, pl. 15, fig. 40.

Caracoles. Mouth of the Tumbes River. Also from the oysters of Matapalo, growing on the mangrove shoots. Near Capon, from the Estero Zarumilla, opposite Estero Cascajal.

These oyster drills are of importance economically as being a serious enemy to the young oysters. Also as of use in making a purple dye which is considered permanent. It is said that this forms a small industry in Ecuador. The purpuriferous gland is extracted and mixed with lemon juice to prepare the dye. The flesh of the animal is also preserved for food.

It is said to be customary to take thread from the region of Sechura and Piura to Guayaquil, to be dyed and returned, when it is used in fancy alforjas and other hand-woven articles. The dyed thread is called "hilo de caracoles" by the natives.

I saw a neat alforja hand-woven chiefly from hand-spun thread. It was in four colors: Natural white cotton and natural brown cotton, the purple hilo de caracoles, and an imported thread.

These drills were commonly found (Jan. 23) in pairs, breeding. Their destructive work on the young oysters is erroneously attributed by the local fishermen to an isopod, which is found boring into the mangrove roots.

*Distribution*.—From Magdalena Bay, Lower California, south to Tumbes, Peru.

Shell turritid, whorls more or less tabulate above the shoulder, in front of which there are one or two strong, more or less tuberculose

or angulate keels; the whole shell spirally threaded, with an axially lamellose band appressed at the suture; shell white with an olivaceous periostracum, the threads sometimes brownish, and the interior of the aperture sometimes spirally brown threaded; pillar without plaits, the operculum with a lateral nucleus. Length about 36 mm.

Specimens prepared for market by breaking off the greater part of the last whorl were also sent in by Mr. Coker. This species has been widely confused with *Cymia* (or *Cuma*) and *Solenosteira*. From the first it may be known by the absence of the strong plait or keel in the middle of the pillar, and from the second by its laterally nucleated operculum and the lamellose sutural band.

Several other species of *Thais* have been used since prehistoric times by the natives of Central America as a source of purple dye. The most commonly used species there is *Thais* (*Patellipurpura*) *patula* Linnæus. Many years ago the writer, at San Juan del Sur, Nicaragua, stained a handkerchief with the unmixed purple from one of these shells. Perhaps because lemon juice or other mordant was lacking the color faded considerably during three years that the handkerchief was kept, and the color was not at any time brilliant, resembling the water color known as "neutral tint." Señora Zelia Nuttall, of Mexico City, well known for her profound ethnological researches, has recently read a paper before the American Association for the Advancement of Science on the prehistoric use of these Molluscan purples in Mexico and Central America.

#### BURSA VENTRICOSA Broderip.

*Ranella ventricosa* BRODERIP, Proc. Zool. Soc. of London for 1832, p. 178.—  
SOWERBY, Conch. Ill., *Ranella*, 1839, pl. 92, fig. 116.

*Ranella tenuis* POTIEZ and MICHAUD, Galerie de Douai, Moll., vol. 1, 1837,  
p. 426, pl. 34, figs. 1, 2.

Dredged in Callao Bay, in about 2½ fathoms, near the northeast side of San Lorenzo Island. Also sold in Callao market, among other gastropods, under the name of Caracoles.

*Distribution*.—Nicaraguan coast and south to Callao, Peru.

Shell thin, whitish, obscurely rugosely sculptured or smooth, with lateral varices, a large aperture, with thickened and varicose outer lip, with a wide and deep canal near the junction of the lip and the body whorl.

#### CYMATIUM VESTITUM Hinds.

*Triton vestitus* HINDS, Zool. Sulphur's Voy., Moll., p. 11, pl. 4, fig. 1, 1844.  
Chincha Islands, among the rocks.

*Distribution*.—West coast of Central America and southward to the Chincha Islands, Peru.

Shell rather large, thin, with a moderately elevated spire and strong spiral ribs; surface covered with a dense lamellose periostracum

more or less produced in thread-like filaments; aperture large, lirate on the body callus and denticulate on the varicose outer lip, the denticles more or less painted with black streaks and associated in separate pairs.

This species is rare and without economic importance.

CYPRÆA ANNETTÆ Dall.

*Cypræa annettæ* DALL, Nautilus, April, 1909, p. 125.

*Cypræa sowerbyi* KIENER, Icon., *Cypræa*, 1845, p. 38, pl. 7, fig. 3. Not *C. sowerbyi* of GRAY, 1832; or ANTON, 1839.

Beach of Sechura Bay, near Matacaballa, one badly worn specimen.

*Distribution*.—Gulf of California and southward to Paita and Sechura Bay, Peru.

This species has no economic relations.

CERITHIUM STERCUSMUSCARUM Valenciennes.

*Cerithium stercusmuscarum* VALENCIENNES, Humboldt Voy., vol. 2, 1833, p. 278.—

SOWERBY, Thes. Conch., 1855 (as *C. ocellatum*), p. 865, pl. 179, figs. 59, 73.

From the shell bank at Matapalo near Capon. Occurs in great abundance on shelly ground, but is of no economic importance.

*Distribution*.—From Cedros Island, Lower California, and the Gulf of California, southward to Panama, Tumbes, and the Galapagos Islands.

TURRITELLA GONIOSTOMA Valenciennes.

*Turritella goniostoma* VALENCIENNES, Humboldt Voy., vol. 2, 1833, p. 275.—

RÉEVE, Conch. Icon., *Turritella*, 1849, fig. 10, a-b.

Island of Lobos de Tierra, one young shell.

*Distribution*.—Gulf of California and southward to Paita, Peru, and the Lobos Islands.

Shell slender, elongated, with many flat-sided, spirally threaded, purple and brownish whorls. Aperture subcircular. Length of a full-grown specimen about 75 mm.

This shell, though common, has no economic importance.

LITTORINA PERUVIANA Lamarck.

Plate 23, fig. 7.

*Phasianella peruviana* LAMARCK, Anim. s. Vert., vol. 7, 1822, p. 53.—WOOD, Index Test. suppl., 1828, pl. 6, fig. 33 (as *Turbo zebra*).

From rocks on the shores of Callao Bay and San Lorenzo Island. Also on the Chincha Islands in similar places, and along shore at Mollendo. Here some of these snails were taken far above the water line.

*Distribution*.—From Panama and the Galapagos Islands south to Valparaiso.

Shell small, conical, turbinata, with a corneous operculum of few whorls; the color black with large oblique blotches or streaks of

pure white; aperture simple, semilunate without denticulation, and the base without umbilicus.

These pretty little black and white snails are phytophagous, and too small to be of use for food, yet they form one of the most widely and commonly distributed and characteristic species of the Peruvian province.

LITTORINA VARIA Sowerby.

*Littorina varia* SOWERBY, Genera of Shells, fascic. 37, 1832, fig. 3.—PHILIPPI, Abb. und Beschr., vol. 2, *Littorina*, pl. 1, figs. 2, 3.

Near Capon, oyster beds of Matapalo; found crawling high on the branches of the mangroves, where they are extremely common in the mangrove swamps.

*Distribution*.—Gulf of California and southward to Peru.

Shell larger and proportionately thinner than the preceding species, spirally threaded, of a pale purple, grayish, or brownish color more or less articulated, streaked, or dotted with darker shades.

This species is large enough to be eaten like the English “periwinkle,” but no data to the effect that it is actually so used have come to hand.

CRUCIBULUM IMBRICATUM Sowerby.

*Calyptrea imbricata* SOWERBY, Gen. Shells, fascic. 23, 1824, *Calyptrea*, fig. 5. Dredged in about 5 fathoms, west of Mataballa, in Sechura Bay, Peru.

*Distribution*.—Gulf of California, and southward to the Galapagos Islands and Valparaiso, Chile.

Shell conical, irregularly marginate, according to the object upon which it is seated, of a brownish color, with emphatic radial appressed imbrications and deep interstices; the interior purplish brown or yellow, with a thin internal cup-like process attached on one side to the dome of the shell. It sometimes reaches a diameter of 70 mm.

A singular and characteristic limpet, of no economic importance.

CRUCIBULUM SPINOSUM Sowerby.

*Calyptrea spinosa* SOWERBY, Gen. Shells, fascic. 23, 1824, *Calyptrea*, figs. 4, 7. From the flats at Capon, and near Mataballa, Sechura Bay, Peru.

*Distribution*.—California, and southward to Valparaiso, Chile, and the Galapagos Islands.

Shell resembling the preceding species in a general way, but less heavy, lighter in color, and with the upper surface faintly concentrically striated, and with more or less developed subtubular spines varying in different specimens from mere low tubercles to long elevated spines. It reaches only about 30 mm. in diameter, as a rule, and is of no economic importance.

## CREPIDULA DILATATA Lamarck.

*Crepidula dilatata* LAMARCK, Anim. s. Vert., vol. 6, 1822, pt. 2, p. 25.—BRODERIP, Trans. Zool. Soc. London, vol. 1, 1834, p. 203, pl. 28, fig. 11.

On oysters and other objects in about 5 fathoms, near Mataballa, Sechura Bay; also on the beaches. Also from rocks at the north end of Callao water front, and on the north shore of San Lorenzo Island; called by the fishermen "piques." Found breeding in February.

*Distribution.*—From the Straits of Magellan northward to Mazatlan, Mexico, and at the Galapagos Islands.

Shell slipper shaped, rounded, brownish with a white septum internally; upper surface convex, varying from nearly smooth to lamellose, the general form irregular, conforming to the individual situs. Length about 30 mm.

## CREPIDULA CREPIDULA Linnæus.

*Patella crepidula* LINNÆUS, Mus. Lud. Ulricæ, 1764, p. 689.—FAVANNE, Conch., pl. 4, fig. D.

*Crepidula unguiformis* LAMARCK, Anim. s. Vert., vol. 6, 1822, pt. 2, p. 25.—GUALTERI, Test., pl. 69, fig. H.

In dead shells on the flats at Capon.

*Distribution.*—The whole Peruvian province, in dead shells, and northward to the Gulf of California.

Shell oval, flattened or dorsally concave, white, corresponding to the curve of the shell in which it is found; of irregular outline, conforming to its situs; length about 35 mm. It has no economic value.

## CREPIDULA ONYX Sowerby.

Plate 23, figs. 2, 5.

*Crepidula onyx* SOWERBY, Gen. Shells, fascic. 23, 1824, *Crepidula*, fig. 2.

In various parts of Sechura Bay, adhering to oyster shells and other objects; and dredged off Mataballa in about 5 fathoms.

*Distribution.*—From San Pedro, California, southward to Chile.

Shell slipper shaped, oval, with a smooth convex upper surface, a short, hardly prominent apex, and the internal septum white, with a nearly straight margin, and covering nearly half of the cavity of the shell; the exterior is more or less painted with brown spots, streaks or markings on a lighter ground; the interior usually dark brown, the septum white. It reaches a length of 45 mm.

The flesh of the analogous *C. fornicata* Lamarck, of the Atlantic coast of North America is regarded as a dainty in the raw state by epicures, but there is no information as to the economic use of the present species. The other species of the genus found in Peru are too small to be of much importance.

## TROCHITA TROCHIFORMIS Gmelin.

Plate 23, fig. 1.

*Patella trochiformis* GMELIN, Syst. Nat., vol. 8, 1791, p. 3693.*Calyptrea dilatata* SOWERBY, Gen. Shells, fascic. 23, 1824, fig. 9.

Picachos. From the beach at Pisco.

*Distribution.*—From Panama southward to Chile.

Shell conical, flattened on the slopes, with a spiral suture giving the effect of a spire; the surface radiately ribbed with rounded riblets, the color yellowish; below rounded with a more or less spiral septum of a white color; the dome of the shell brownish or whitish, the margin suborbicular when not disturbed by its situs. The elevation of the shell is very variable, and the diameter will average about 30 mm.

This is a very characteristic species of the Peruvian province, but of no particular economic significance.

## SINUM CONCAVUM Lamarck.

*Sigaretus concavus* LAMARCK, Anim. s. Vert., vol. 6, 1822, pt. 2, p. 208.—SOWERBY, Gen. Shells, fascic. 19, 1823, *Sigaretus*, fig. 1.

From muddy sand on the inside beach at Capon (one young specimen). Caracol tapadera of the fishermen.

*Distribution.*—Between the equator and lat. 25° 30' S., and at the Galapagos Islands.

Shell flattened, paucispiral, the last whorl much the largest; spirally closely sulcate, with a wide aperture and gyrate pillar; color livid flesh color to pale brownish.

The shell in the adult is nearly covered by the fleshy parts. The animal plows its way under the sand, drills holes in the shells it encounters and sucks the juices of its prey. It is economically injurious through its destruction, especially in their younger stages, of edible bivalves.

## TURBO MAGNIFICUS Jonas.

*Turbo magnificus* JONAS, Zeitschr. für Malak., vol. 1, 1844, p. 167.—PHILIPPI, Abb. u. Beschr. neue Conch., vol. 2, 1847, p. 25, pl. 6, fig. 1.

Dead shells and an operculum on the beach at Lobos de Afuera Island.

*Distribution.*—From Manta, Ecuador, south to Callao, Peru, and the Lobos Islands.

Shell turbinata, ovate conic, turgid, imperforate, spotted or marbled with violet and white on an olivaceous or dark-greenish ground; whorls rounded, delicately axially striated; obscurely angulated above, on the spire; suture distinct, not channeled; aperture large, circular, internally pearly with an opaque margin; columella simple, callous above; operculum nearly smooth externally. A rare shell, probably without economic importance.

## TURBO (PRISOGASTER) NIGER Wood.

*Turbo niger* WOOD, Index Test., suppl., 1828, pl. 6, No. 1.—SOWERBY, Gen. Shells, fascic. 37, 1832, *Turbo*, fig. 7.—GRAY, in Beechey's Voy., Zool., 1839, p. 143, pl. 36, fig. 1.

From rocks at west end of Callao water front; from tidal pool on shingle beach at La Punta, Callao; dredged in 2½ fathoms on the northeast side of San Lorenzo Island; and common on the rocks along shore at the Chincha Islands.

*Distribution*.—From the Straits of Magellan northward to Pacasmayo, Peru.

Shell small, turbate, smooth or spirally striated (especially in southern specimens), black, with a white aperture and smooth nearly hemispherical white shelly operculum; base imperforate, interior of aperture pearly; diameter about 20 mm.

## TEGULA ATRA Lesson.

Plate 24, fig. 4.

*Trochus ater* LESSON, Voy. Coq., 1830, p. 344, pl. 16, fig. 2.

With the last species.

*Distribution*.—From the Straits of Magellan northward to Pacasmayo, Peru.

Shell imperforate, conical, more or less depressed; heavy, solid, lusterless black; with about six moderately convex, nearly smooth whorls; suture impressed; last whorl obtusely rounded at the periphery, base flattish, concave in the center, eroded and light purple in front of the aperture; outer lip with a black margin, pearly within; a white callus, bearing a spiral rib and somewhat excavated, in the umbilical region; an obscure tubercle at the end of the pillar. Operculum horny, multispiral; diameter of shell about 40 mm.

This is the largest of the black trochoid species for which the coast is noted.

## TEGULA PATAGONICA Orbigny.

*Trochus patagonicus* ORBIGNY, Voy. Am. Mér., vol. 5, 1840, p. 408, pl. 55, figs.

1-4.—PHILIPPI, Conch. Cabinet, 2d ed., *Trochus*, p. 225, pl. 34, fig. 12.

Taken on the shore rocks at Lobos de Afuera Island.

*Distribution*.—San Blas, Patagonia, northward to the Lobos Islands, Peru.

Shell orbiculate conic, thick, umbilicate, axially granulose-sulcate, uniform brownish or purplish, spire obtuse; whorls five, subcarinate; sutures excavated, aperture rounded, columella bidentate; diameter about 14 mm.

## TEGULA TRIDENTATA Potiez and Michaud.

*Trochus tridentatus* POTIEZ and MICHAUD, Gal. de Douai, vol. 1, 1838, p. 321, pl. 29, figs. 16-17.—KIENER, Icon., *Trochus*, pl. 57, fig. 2.

Dredged in Sechura Bay, in 5 fathoms, also taken on the rocks in various places about the harbor of Callao.

*Distribution*.—From Talcahuano, Chile, northward to Sechura Bay, Peru.

Shell conoidal, heavy, solid, elevated, minutely perforate, black or purplish; whorls five or six, slightly convex, smooth; last whorl rounded at the periphery; base flattish, deeply eroded in front of the aperture; outer lip thick, lirate within, aperture small, oblique; umbilicus circular, minute; the pillar small, oblique, distinctly tridentate at the anterior end; diameter about 16 mm.

FISSURELLA CRASSA Lamarck.

Plate 24, figs. 5, 6.

*Fissurella crassa* LAMARCK, Anim. s. Vert., vol. 6, 1822, pt. 2, p. 11.—SOWERBY, Conch. Ill., 1834, fig. 11 (not fig. 2, nor *F. crassa* SOWERBY, Gen. Shells, 1828).

Lapa. Sometimes called "pata de burro," though this name is more generally applied to another form. Taken on rocky shores of the Pescadores Islands near Ancon; also at the Chincha Islands in similar places abundantly; also at Mollendo. Used for food and bait.

*Distribution*.—Coast of Chile and Peru, and the Galapagos Islands, and southward to the Straits of Magellan.

Shell oblong, depressed, with a subcentral foramen, sculptured only with faint concentric and radiate undulations, especially in front; color brownish; inside within the muscular scar pinkish, outside of it yellowish white with a narrow brown margin. Length about 85 mm.

FISSURELLA COSTATA Lesson.

*Fissurella costata* LESSON, Voy. Coq., vol. 2, 1830, p. 410.

*Fissurella chilensis* SOWERBY, Conch. Ill., 1836, *Fissurella*, fig. 36.

Lapa. Taken at Mollendo, July 23. These are probably utilized like the preceding species.

*Distribution*.—From the island of Chiloë northward to Mollendo, Peru.

Shell rounded oval, depressed, with the apex a little in front of the center; with radiating riblets. Perforation small, contracted in the middle by two small projections from each side; color grayish, rayed with brownish olive. Length about 40 mm.

FISSURELLA NIGRA Lesson.

*Fissurella nigra* LESSON, Voy. Coq., vol. 2, 1830, p. 412.—REEVE, Conch. Icon., *Fissurella*, 1850, fig. 11.

Lapa. One young specimen from the rocks at the north end of the Callao water front.

*Distribution*.—Straits of Magellan and northward to Peru and the Galapagos Islands.

Shell large, oval, conical, the summit in front of the middle; color black or purplish black, not rayed; surface, except for faint radial striation, smooth; foramen oblong, in young specimens tridentate; inside the shell is white with a black margin. Length up to 100 mm.

## FISSURELLA PERUVIANA Lamarck.

*Fissurella peruviana* LAMARCK, Anim. s. Vert., vol. 7, 1822, pt. 2, p. 15 (not of DELESSERT, Rec., pl. 24, fig. 7).—REEVE, Conch. Icon., 1849, *Fissurella*, fig. 26.

Lapa. Dredged in Callao Harbor on the northeast side of San Lorenzo Island, in 2½ fathoms.

*Distribution*.—The whole Peruvian province.

Shell rounded oval, elevated, conical, the foramen small, a little in advance of the middle; radiately finely striated; inside white, the margin alternately red and gray; outside red toward the summit, becoming more purple and darker toward the base; the margin is smooth, with a dark border inside, the exterior rayed with dark purple. Length about 30 mm.

This is the *F. occidentis* of Gould.

## MEGATEBENNUS COKERI, new species.

Plate 24, figs. 3, 7.

Lobos de Afuera Island, on beach.

Shell ovate, narrower in front, solid, heavy, steep sided, anterior slope shorter, sharply radially sulcate, the interspaces flattish, feebly rounded, not uniform in width; lines of growth looped toward the apex over the interspaces; color greenish white toward the base, reddish purple toward the apex, with sparse rays of the latter color; foramen large, keyhole shaped, with a greenish margin; length of foramen at the outer margin nearly one-third of the total length of the shell; interior greenish white, with a polished, greenish, radiately striate margin to the foramen; margin of the base smooth, entire, extended for a narrow space over the exterior edge. The type (Cat. No. 207744, U.S.N.M.) measures: Length of shell 27.5; of outer edge of foramen 9.0; of inner edge of same 6.0; of foraminal inside margin 11.0; maximum width of shell at the posterior edge of the above margin 16.5; at the anterior edge of the above margin 14.0; height of the shell 10.0 mm.

This species unquestionably belongs to Pilsbry's section *Amblychilepas*, which was supposed to be wholly old world in its distribution. It much resembles *M. scutellum* (Gmelin) Pilsbry, but is darker toward the summit and lighter toward the base, while in the Cape of Good Hope species the reverse coloration obtains.

Named for Mr. R. E. Coker.

## ACMÆA VIRIDULA Lamarck.

Plate 24, figs. 1, 2.

*Patella viridula* LAMARCK, Anim. s. Vert., vol. 7, 1822, p. 539.—DELESSERT, Rec. Coq., pl. 23, fig. 2.

*Acmaea pretrei* ORBIGNY, Voy. Am. Mér., vol. 5, 1841, p. 481, pl. 78, figs. 15-16.

Patela. From rocky shore on the northeast side of San Lorenzo Island, Callao Bay; similar stations on Lobos de Afuera Island; the Pescadores Islands; Sechura

Bay, and Mollendo. These shells, like other limpets, are also called "señoritas," or ladies (probably from a fancied resemblance to one of the flounced petticoats favored by Spanish señoras), and are used for food and bait.

*Distribution.*—Whole Peruvian province from Valparaiso to Paita.

Shell conical, with entire apex, solid, strong; rounded ovate, variable in height, the apex slightly in front of the middle of the shell; sculpture of low, rather wide radial ribs and obscure concentric and radial feeble striation; color whitish, with reticulated green markings, the interspaces of the ribs with larger greenish blotches; old shells may appear wholly gray outside and white inside, with a greenish inner border to the shell; young ones have a brownish or greenish blotch in the center.

These shells sometimes exceed 2 inches in length.

ACMÆA ORBIGNYI Dall, new name.

*Acmæa scutum* ORBIGNY, Voy. Am. Mér., vol. 5, 1841, p. 479, pl. 64, figs. 8, 9.

Not of ESCHSCHOLTZ, Zool. Atlas, vol. 5, 1833, p. 19, pl. 23, figs. 1, 2, 3.

*Lottia punctata* GRAY, 1835, according to ORBIGNY; not *P. punctata* LAMARCK (*Acmæa*), 1822.

Patela. On rocky shores of the northeast part of San Lorenzo Island, Callao Bay. Confused by the fishermen with the other species.

*Distribution.*—Whole Peruvian province from Chonos archipelago to Callao, Peru, and the Galapagos Islands. All these limpets seem to be called Patelas or Señoritas by the fishermen.

Shell rounded oval, conical, the apex a little anterior and directed forward; surface finely radiately striate; the striæ sometimes obsolete; color blackish, more or less flecked or dotted with white, with a broad dark margin and dark-brown central tract which, in old shells, may be obscured by a white shelly deposit. Length about 35 mm.

SCURRIA PARASITICA Orbigny.

*Patella parasitica* ORBIGNY, Voy. Am. Mér., vol. 5, 1841, p. 481, pl. 81, figs. 1, 2, 3. Not of REEVE, 1855.

Among other limpets collected at Mollendo. Of no economic importance.

*Distribution.*—From Valparaiso, Chile, north to Mollendo, Peru.

Shell rounded, conical, dome shaped, solid, the apex at the anterior third, with the anterior slope straight, the posterior arched; surface finely radially striated; whitish or gray, with radiating blackish rays of varying width; inside white, brown in the central area, border yellowish white, mottled by the external rays. Length about 20 mm.

CHITON CUMINGSII Frembly.

*Chiton cumingsii* FREMBLY, Zool. Journ., vol. 3, 1827, p. 198, suppl. pl. 16, fig. 3.—SOWERBY, Conch. Ill., 1841, *Chiton*, fig. 32.

*Amaurochiton cumingsii* THIELE, Gebiss d. Schneck., vol. 2, 1893, p. 362.

Barquillo. From rocks on the north side of the Callao water front and from tidal pool at La Punta, Callao; also from rocks on the shore at the Chincha Islands. Of no economic importance.

*Distribution.*—From Chiloë Island north to Tumbes, Peru.

Shell ovate oblong, with eight overlapping valves within a narrow border covered with flat pavement-like scales; whitish or olive, very closely and regularly striped with brown or lavender-colored concentric lines, which converge forward on the middle of the valves. Interior pale blue. Length about 50 mm., when full grown.

This is one of the most elegant and characteristic of the numerous chitons for which this province is noted.

CHITON GRANOSUS Frembly.

*Chiton granosus* FREMBLY, Zool. Journ., vol. 3, 1829, p. 200, suppl. pl. 17, fig.

1.—REEVE, Conch. Icon., 1848, *Chiton*, pl. 5, fig. 27.

Barquillo. Collected at Mollendo.

*Distribution*.—From Magellan Straits north to Tumbes, Peru.

Shell black, having a white stripe on each side of the central line, between the stripes clouded with whitish; surface sculptured with radiating lines of bead-like pustules; inside whitish, more or less clouded with olive gray. Length about 40 mm.

This species like the other chitons is of no economic importance.

CHÆTOPLEURA HENNAHI Gray.

*Chiton hennahi* GRAY, Spicilegia Zool., 1828, p. 6, fig. 11.—SOWERBY, Conch.

Ill., 1841, *Chiton*, figs. 1, 33.

Barquillo. Callao, 5 to 7 fathoms, and from rocks at the north end of Callao water front.

*Distribution*.—Callao, Peru.

Shell brownish, smooth, sometimes marked with red or greenish white; girdle or border leathery, with short hairs easily rubbed off; inside white, brown under the beaks of the valves. Length about 40 mm.

ACANTHOPLEURA (COREPHIUM) ECHINATA Barnes.

Plate 23, fig. 6.

*Chiton echinatus* BARNES, Am. Journ. Sci., vol. 7, 1823, p. 71, pl. 3, figs. 4, 4a.

*Chiton spiniferus* FREMBLY, Zool. Journ., vol. 3, 1827.—SOWERBY, Conch. Ill., 1833, *Chiton*, fig. 47.

Barquillo. From rocks along shore on the northeast side of San Lorenzo Island, Callao Bay.

*Distribution*.—From Valparaiso, Chile, northward to Paita, Peru, and the Galapagos Islands.

Shell elongate, solid, carinated along the dorsal ridge, the sides of the central areas engraved with fine flexuous grooves; color dark brown; lateral areas with several radiating lines of pustules; girdle broad, leathery, with strong projecting spines. Length 100 mm. or less, according to age.

This and the following species are particularly characteristic of this zoological province.

The name "barquillo," used for these animals by the fishermen, is probably derived from the resemblance, when the animal is placed on its back, to a little boat.

## ENOPLOCHITON NIGER Barnes.

Plate 23, fig. 8.

*Chiton niger* BARNES, Am. Journ. Sci., vol. 7, 1823, p. 71, pl. 3, fig. 3.*Chiton coquimbensis* FREMBLY, Zool. Journ., vol. 3, 1829, p. 197, suppl. pl. 16, fig. 2.

Barquillo. Collected at Mollendo.

*Distribution.*—Valparaiso, Chile, and northward to Mollendo, Peru.

Shell oblong, with rather elongate, strongly beaked, polished valves of a dark brown inside and out, which are usually badly eroded; girdle broad, fleshy, bearing numerous elongated, more or less widely separated narrow scales, the interspaces having a velvety surface. Length about 75 mm.

This species is said to live on the rocks between tides, exposed to the full force of the surf. The peculiar separated scales on the girdle will always enable it to be identified.

## POLYPUS FONTAINEANUS Orbigny.

Plate 20, fig. 1.

*Octopus fontaineanus* ORBIGNY, Voy. Am. Mér., vol. 5, 1835, p. 28, pl. 2, fig. 5.

Pulpo. Taken on the shore rocks, Lobos de Afuera Island, in March; and taken in a trammel net at the Chincha Islands. Common and used as food.

*Distribution.*—Coasts of Chile and Peru.

Animal with eight arms, of a rich purple color, but the tint variable, the surface obscurely granulose. Extreme length of specimens examined about 25 centimeters.

The details of its appearance will be very clearly recognized from the figure above referred to. It has no internal shell or endostyle.

## LOLIGO GAHI Orbigny.

Plate 21, figs. 1, 2.

*Loligo gahi* ORBIGNY, Voy. Am. Mér., vol. 5, 1835, Moll., p. 60, pl. 3, figs. 1, 2.

This species was not collected by Mr. Coker, who is, however, familiar with it, and since it forms one of the economic species of Peru, I have copied Orbigny's figure to make the report more complete. Mr. Coker notes in regard to the names for the cuttlefish (*Octopus*, *Polypus*) that it is called *pulpo*, or *jibia*. A large pulpo is called *chancharro*.

The squid (*Loligo*) is called *calamar*, a word doubtless derived from the Latin *calamarius*, a pen bearer, in allusion to the internal endostyle of the ten-armed cephalopods. To the larger specimens, those 2 feet or more in length, the name *pota* is given. Calamar, pulpo, and jibia are proper Spanish names, pota and chancharro probably of local origin.

*Distribution.*—In the Patagonian and Peruvian zoological provinces and the West Indian region.

The animal is normally of a pinkish white dotted with dark red, especially on the dorsal region. It has ten arms and an internal "pen" or endostyle, which is plume-shaped with symmetrical vanes, as represented in figure 2. This endostyle is of a cartilaginous material and not shelly, as in some other genera, such as *Sepia*, etc. The details of form are well represented by the figure.

Beside the mollusks enumerated in the above report, Mr. Coker collected the following species belonging to the Brachiopoda.

DISCINISCA LAMELLOSA Broderip.

*Orbicula lamellosa* Broderip, Proc. Zool. Soc. of London for 1833, p. 124; Trans. Zool. Soc. London, vol. 1, 1834, p. 142, pl. 23, fig. 2.

On *Mytilus* (Choro) at Ancon Bay. Of no economic importance.

*Distribution.*—From the Island of Chiloë northward to the Gulf of Panama, adhering like limpets to mussels, the timbers of old wrecks, and even to the bottoms of vessels which remain at anchor for some months. They occur from low-water mark to a depth of 9 or 10 fathoms.

The shell is horny, rounded, and nearly flat, with a more or less profusely lamellose surface; the upper valve is slightly convex, the apex a little eccentric, the lower valve is flat, radially striate, very thin, and pierced by a narrow foramen through which a fleshy pedicel extends by which the animal adheres to solid objects. The color is yellowish brown, and the diameter of these shells when normally developed rarely much exceeds 25 mm.

LIST OF THE PRINCIPAL WORKS RELATING TO THE MOLLUSCAN FAUNA OF THE PERUVIAN ZOOLOGICAL PROVINCE.

The following works are those most necessary for a study of this fauna, though many others have been consulted for incidental references. The abbreviations used in the faunal list to designate some of the more frequently cited works follows the title in parentheses.

- BAYERN, THERESE, Princessin von. Im Jahre 1898, auf einer Reise in Süd-amerika gesammelte Mollusken. Nachr. Deutsche Malak. Ges., 1900, pp. 49-58, pl. 1.
- BERGH, RUDOLPH. Die Opisthobranchier der Sammlung Plate. Zool. Jahrb. suppl. This is supplemental Bd. 4, pt. 1, 1898, pp. 481-582, 8°, pl. 6. (Fauna Chilensis).
- BERTIN, VICTOR. Revision des Tellinidés du Muséum d'histoire naturelle. Nouvelles Archives du Muséum, ser. 2, vol. 1, 1878, pp. 203-361, pls. 8-9.
- Revision des Donacidées du Muséum d'histoire naturelle. Nouvelles Archives du Muséum, ser. 2, vol. 4, 1879, pp. 57-121, pls. 3, 4.
- Revision des Garidées du Muséum d'histoire naturelle. Nouvelles Archives du Muséum, ser. 2, vol. 3, 1880, pp. 57-129, pls. 4, 5.
- BOAS, J. E. V. Spolia Atlantica, 1886, 248 pp. 4°, 8 pls. (see pp. 160-161).
- BRODERIP, W. J. Descriptions of some new species of Calyptræidæ. Trans. Zool. Soc. London, vol. 1, 1834, pp. 195-206, pls. 27-29.

- DALL, WILLIAM HEALEY. Preliminary Report on the Collection of Mollusks and Brachiopoda obtained (by the U. S. S. *Albatross*) in 1887-88. Proc. U. S. Nat. Mus., vol. 12, 1889, No. 773, pp. 219-362.
- Synopsis of the Family Veneridæ and of the North American recent species. Proc. U. S. Nat. Mus., vol. 26, 1902, No. 1312, pp. 335-412, pls. 13-16.
- Synopsis of the Carditacea and of the American species. Proc. Acad. Nat. Sci. Phila., for 1902, pp. 696-716, Jan. 1903.
- The Mollusca and Brachiopoda (of the *Albatross* in the Eastern Pacific during 1891, 1904, and 1905). Bull. Mus. Comp. Zoöl., vol. 43, 1908, pp. 205-531, pls. 1-22.
- DAUTZENBERG, PHILIPPE. Liste des Mollusques du Chili. Actes de la Société Scientifique du Chili, vol. 6, 1896, pp. lxiv-lxvii, 1896.
- FISCHER, PAUL. Manuel de Conchyliologie, 1880-1887. Paris, F. Savy. 8°, pp. xxiv, 1569; pls. 1-23 (Man. Con.) (see pp. 169-171).
- GRAY, JOHN EDWARD, and SOWERBY, GEORGE BRETTINGHAM. Zoölogy of Captain Beechey's Voyage, 1839, pp. xii, 155, 4°, pls. 33-44. (Beech. Voy.)
- The Mollusca were treated by Gray, pages 103-142, and continued by Sowerby, pages 143-155.
- GOULD, AUGUSTUS ADDISON. United States Exploring Expedition, 1838-1842, by Charles Wilkes, U. S. N., vol. 12, Mollusca and Shells, 4°, pp. xv, 510, 1852; atlas folio, 1856. (Wilkes Exp.)
- The figures in the Atlas are numbered continuously without reference to the plates. The collections, field notes, and many of the descriptions were prepared by Joseph Pitty Couthouy, naturalist of the expedition. Many of the preliminary diagnoses were published in the Proceedings of the Boston Society of Natural History, 1846-47, and afterwards collected with other reprints, in 1862, by Doctor Gould, in a small volume entitled "Otia Conchologica," (Boston, 1862, Gould and Lincoln, 8°, 256 pp.)
- HIDALGO, JOAQUIN GONZALEZ. Moluscos del Viaje al Pacifico verificado de 1862 a 1865, por una comision de naturalistas enviada por el Gobierno Español., vol. 3, Univalvos marinas, Madrid, 1879. 4°, pp. 1-44 (all issued).
- Descripcion de los moluscos recogidos por la Comision cientifica enviada por el Gobierno Español a la America Meridional, Madrid, 1893, 4°, pt. 3, pp. 332-432 (1893), 433-608, 1898.
- HOYLE, WILLIAM E. A Catalogue of the Recent Cephalopoda. Edinburgh, Proc. Roy. Phys. Soc., vol. 9, 1886, 8°, pp. (1-63) 205-267.
- A Catalogue of the Recent Cephalopoda, Supplement 1887-1896. Idem., 1897, pp. (1-13) 363-375.
- Report on the Cephalopoda (of the Expedition to the tropical Pacific, of the U. S. S. *Albatross* 1899-1900). Bull. Mus. Comp. Zoöl., vol. 43, 1904, Cambridge, Mass., 8°, pp. 1-93, pls. 1-12.
- HUPÉ, LOUIS HIPPOLYTE. Fauna Chilena. Moluscos. (In) Historia fisica y politica de Chile, por Claudio Gay; Zoologia, vol. 8, Paris, 1854. 8°, pp. 1-500; Atlas II, fol. pls. 1-14, 1854. (Hist. Chile.)
- LESSON, RENÉ PRIMEVÉRE. Voyage autour du monde, sur la Corvette la Coquille, pendant les années 1822-1825. Zoölogie, vol. 2, 4°, pt. 1, 1830; pt. 2, 1831-32. (Voy. Coq.)
- Usually catalogued under the name of Duperrey, commander of the vessel.
- MABILLE, JULES. Étude monographique du genre Concholepas. Annales de Malac., vbl. 2, 1886, pp. 261-282, pl. 3-5.
- MARTENS, EDUARD VON. Ueber einige Conchylien aus Chile. Malak. Blätt., vol. 16, 1869, pp. 215-222.
- MOLINA, GIOVANNI IGNACIO. Saggio sulla storia naturale del Chili. Bologna, 1782, 8°, 7 pls., 1 chart.

- ORBIGNY, ALCIDE D'. Voyage dans l'Amérique Méridionale, vol. 5, Mollusques. Paris, Bertrand, 1835-1846. 4°, pp. 1-48, 1835; 49-184, 1836; 185-376, 1837; 377-408, 1840; 409-488, 1841; 489-758, 1846; and atlas, 4°, pp. 4, pls. 1-84, 1846. (Voy. Am. Mér.)
- PFEFFER, GEORG. Die Cephalopoden des Hamburger Naturhist. Museum. Abh. Ver. Hamb., vol. 8, 1885, pp. 1-30, pl. 1-3.
- PHILIPPI, RUDOLPHUS AMANDUS. Abbildungen und Beschreibungen neuer oder wenig gekanntes Conchylien. Cassel, 4°, vol. 1, 1842-1845; vol. 2, 1847; vol. 3, 1847-1851. (Abb.)
- Breves descriptiones Molluscorum quorundam terrestrium et marinorum Chilensium. Abhand. d. Naturf. Ges. zu Halle, vol. 4, pts. 2 und 3, 1858; Sitzungb. d. Jahr. 1857, pp. 21-24.
- Beschreibung einige neuer Conchylien aus Chile. Zeitschr. f. d. ges. naturw. Halle, vol. 12, 1858, pp. 123-125.
- Reise durch die Wüste Atacama auf befehl der Chilenischen regierung in sommer 1853-54. Halle, Eduard Anton, 1860. 4°, pp. 192+62, pl. 27, 1 karte. (Atac.)
- PLATE, LUDWIG H. Die Anatomie und Phylogenie der Chitonen. Zool. Jahrb., suppl. Bd. 4, pt. 1, 1898, pp. 1-243; pt. 2, 1899, pp. 15-216.
- POIRIER, JULES. Revision des Murex du Muséum. Nouvelles Archives du Muséum d'histoire naturelle. Sér. 2, vol. 5, 1881, pp. 13-128, pl. 4-6. (Rev. Murex.)
- REEVE, LOVELL AUGUSTUS. Conchologia Iconica or Illustrations of the shells of Molluscos animals. 20 vols., 4°, 1843-1878.
- These monographs contain a large number of figures of West South American species from the collection of Hugh Cuming, now in the British Museum. The work is cited by monographs, each of which is supposed to be complete in itself, the numbers assigned to figures running continuously from the beginning to the end of each monograph without reference to the separate plates. After the death of Mr. Reeve, in 1865, the remaining volumes were edited by Mr. G. B. Sowerby.
- SOWERBY, GEORGE BRETtingham. Genera of recent and fossil shells. 8°, 42 parts, 264 colored plates, not numbered or paginated. 1820-1834. (Gen. Sh.)
- The figures are cited by genera. For dates of the several fasciculi consult Sherborn in Ann. Mag. Nat. Hist., ser. 6, vol. 13, April, 1894; and Sykes, Proc. Mal. Soc., vol. 7, 1906, pp. 193-194.
- The Conchological Illustrations. London, 1832-1841. 8°, 2 vols. (C. Ill.)
- Contains monographic lists of 19 genera and figures many of the species first collected by Hugh Cuming.
- Thesaurus Conchyliorum, or figures and descriptions of shells. 5 vols., 4°, 1842-1884. (Thes. Con.)
- STEARNS, ROBERT EDWARDS CARTER. List of shells collected on the west coast of South America, principally between latitudes 7° 30' S. and 8° 49' N., by Dr. W. H. Jones, surgeon, U. S. Navy. Proc. U. S. Nat. Mus., vol. 14, No. 854, pp. 307-335, Washington, 1891.
- STEMPELL, WALTER. Beiträge zu Kenntniss der Nuculiden. Zool. Jahrbuch, suppl. Bd. 4, pt. 1, 1898, pp. 339-430.
- Die Muscheln der Sammlung Plate. Zool. Jahrb., suppl. Bd. 4, heft 2, pt. 1, 1899, pp. 217-250, pl. 12. (Fauna Chilensis.)
- TAPPARONE-CANEFRI, CESARE. Zoologia del viaggio intorno al globo della R. Fre-gata Magenta, durante gli anni 1865-1868, Malacologia. Mem. della R. Accademia d. Scienze di Torino, ser. 2a, vol. 28, 1866, pp. 109-265, 4°, pls. 1-4.
- TROSCHEL, F. H. Verzeichniss der durch Herrn Dr. v. Tschudi in Peru, gesammel-ten Conchylien. Arch. für Naturg., vol. 18, pt. 1, 1852, pp. 151-208, pls. 5-7 (Arch. Nat.)

TRYON, GEORGE WASHINGTON (and PILSBRY, HENRY AUGUSTUS). Manual of Conchology, structural and systematic. 17 vols., 8°, 1879-1898. (Man. Con.)

After the death of Mr. Tryon, in 1888, this work was continued by Doctor Pilsbry. The above title refers to the series containing the Marine Gastropods only. In particular monographs the authors were assisted by W. B. Marshall, Benjamin Sharp, and S. Raymond Roberts.

WISSEL, KURT VON. Beiträge zur Anatomie der Gattung *Oncidiella*. Zool. Jahrbuch, suppl. Bd. 4, pt. 1, 1898, pp. 583-640.

ZOOLOGICAL SOCIETY OF LONDON. Proceedings, 1832-1854.<sup>1</sup> 8°.

Includes descriptions of species collected on the west coast of South America by Hugh Cuming, and diagnosed by Broderip, Sowerby, Powys, Swainson, and others. These descriptions as a rule have no titles assigned to them. (Proc. Zool. Soc.)

#### THE PERUVIAN PROVINCE.

The littoral marine molluscan faunas of the west coast of the two Americas, excluding the Arctic and Antarctic faunas properly so called, were recognized more than half a century ago in their main outlines by Woodward.<sup>a</sup>

They comprise, beginning at the north:

1. The *Oregonian Province*, extending from the limit of floating ice in Bering Sea south to Point Conception, California;
2. The *Californian Province*, ranging from Point Conception south to Lower California;
3. The *Panamic Province*, from Lower California, including the Gulf of California, south to the Bay of Guayaquil, Ecuador;
4. The *Peruvian Province*, extending from Guayaquil south to the vicinity of the island of Chiloë in southern Chile; and
5. The *Magellanic Province*, from Chiloë to the Fuegian Archipelago, and for a short but undetermined distance north on the Argentine coast, on the Atlantic side.

These provinces will eventually be recognized as containing minor divisions, with which, on this occasion, we are not concerned.

The distribution recognized in the term "Province" appears to be directly dependent on the temperature of the surface stratum of the sea which, in its turn, is distributed by ocean currents. In the case of the Peruvian Province a branch of the eastward-flowing south Pacific current diverges from the main stream and impinges upon the coast of South America in the vicinity of Chiloë Island. Thence it follows the coast northward, until by the northwesterly trend of the Peruvian shores it is diverted, in the vicinity of Point Aguja and Cape Blanco, to the westward, where it continues in the direction of the Galapagos group of islands. This current, known as the "Peruvian" or "Humboldt" current, throughout its entire extent maintains a temperature varying with the season of from 65° to 70° F. The temperature of the surface off Aguja Point, Peru, in November was 65° F. The temperature of the water in the Magellanic

<sup>a</sup> Manual of the Mollusca, 1856, pp. 373-377.

Province in midsummer varies from 50° F. in the straits themselves to 55° on the Chilean coast in the vicinity of Valdivia.

The surface temperatures of the Peruvian current, as related to those of the Magellanic water, are therefore warmer; and, as compared with the Panamic waters, measurably colder.

Precisely such a relation to the coast of North America is held by the southerly branch of the North Pacific current, which reaches the coast near Sitka with a summer temperature of 65° to 68°. This has diminished in the latitude of San Francisco Bay to 54° F., but the current continues until, in the vicinity of Point Conception, California, it is diverted off shore in a manner entirely analogous to the fate of the Peruvian current at Point Aguja.

The water of the Panamic Province is less disturbed by currents, receives the full heat of the tropical sun, and, as shown by Dr. Alexander Agassiz, emerges from the Gulf of Panama, follows the coast toward Cape San Lorenzo, and is there diverted offshore toward the Galapagos Islands. Trees from the mainland with leaves still adhering to them are occasionally cast upon the shores of the Galapagos, as observed by Dr. Agassiz, showing clearly that the current is not only present, but has no inconsiderable motion. The temperature of this water near the coast of Ecuador and only a few miles from the limit of the Peruvian current, in November, varied from 70° to 83° F., and, in March and April from 78° to 85° F. Among the Galapagos Islands the range in April was 81° to 83° F.

It will be noticed therefore that the currents fully account for the peculiarities of the Galapagos mollusk fauna, which exhibits large contributions from the Panamic and Peruvian faunas with only a very unimportant tincture of the Indo-Pacific in its make up.

A series of surface temperatures measured in November at right angles to the Peruvian current off Point Aguja, by the United States Bureau of Fisheries steamer *Albatross*, began with a temperature of 65° F. close in shore, rose quickly to 69° and later to 70° in the middle of the current, and declined again to 69° F. on its western edge.

The first exploration of the molluscan fauna of the Peruvian Province which was systematically carried on was that of Hugh Cuming. He was resident for some years at Valparaiso, later dredged and collected vigorously at various points of the Bay of Guayaquil. Tradition has handed down the account that a severe earthquake (referred to by Darwin in the Voyage of the *Beagle*) laid bare a long stretch of coast where the shore mollusks, elevated above their natural situs, were accessible to the collector by the thousand. Mr. Cuming collected largely, and on his return to England these collections gave an opportunity to the systematic naturalists to describe many new Peruvian and Chilean shells. This lasted for a good many years. Broderip, Sowerby, Swainson, Gaskoin, Powys, Deshayes, and Reeve worked on

these collections during the first half of the nineteenth century, and, according to Woodward,<sup>a</sup> Mr. Cuming's collection embraced 222 species from the coast of Peru south of Paita, and 172 species from the coast then politically included in Chile. Of these probably half were common to the northern and southern portions of the province. A little later the explorations of Humboldt and Bonpland added a few species; the majority of their collection it would seem were not worked up.

M. Alcide D'Orbigny's South American investigations seem to have been, so far as this province is concerned, largely restricted to the Chilean portion of it. He collected 160 species, one-half of which were common to Chile and Peru, while only one species was common to Callao and Paita. The inference naturally drawn from this last fact by Woodward and others was that the northern border of the province lay between those two ports. But this conclusion was due to imperfect knowledge, and is completely refuted by later information. At present more than 200 species are known to be common to Paita and Callao.

Orbigny's report with its atlas of fine illustrations is a classic source for information, relating, however, to South America as a whole, rather than to the Peruvian Province.<sup>b</sup>

Collections made by Gay and others, worked up in his monographic *Historia de Chile*, by Hupé, form the third large and well-illustrated contribution to the malacology of the province, chiefly restricted of course to the southern, or Chilean, portion.

The last important contributor to a knowledge of this fauna, in these earlier days, was the German naturalist Philippi, who added numerous species and useful illustrations in the *Zeitschrift für Malakozoologie*, his *Abbildungen*, and his *Atacama Reise*.

Of course many minor contributors to the work, such as Lesson, Jonas, etc., might be mentioned, but I propose in this hasty sketch to touch only on the most important. The list of Tschudi's collection, ostensibly from Peru, as described by Troschel, unfortunately contains numerous exotic Indo-Pacific and Panamic species, so that its authority is seriously impaired.

More recently the researches of Ludwig Plate, the Princess of Bavaria, and others mentioned in the bibliography have added essentially to our knowledge.

In considering the distribution of species along the coast of the province it should not be forgotten that the collections have not been made in an equal manner on different parts of the coast. The

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<sup>a</sup> Manual, p. 376.

<sup>b</sup> In my references to this work, for simplicity and convenience, I have omitted the article, since there seems to be no particular reason why we should reserve for D'Orbigny what custom has denied to De la Marck and De la Cépède.

ports of Guayaquil, Paita, Callao, and Valparaiso have naturally been much more thoroughly explored than others. The careful collecting which would obtain the smaller species is not recorded to have been done anywhere at all.

Dredging also is practicable with difficulty, except in the sheltered harbors, which occur so rarely on this coast, or by the aid of a large steamer, which could be had only under government auspices on account of the great expense involved.

The small lots of material derived from the mud which came up on the anchor of the U. S. Bureau of Fisheries steamer *Albatross* at one or two points, show that proper exploration will certainly reveal the presence of many small species, new or extra limital, which are at present unknown.

In the preparation of this list I have endeavored to give a reference to the original description and to the best available figure or figures. In determining what species should be included I have depended somewhat upon the known characteristics, as regards distribution, of the groups to which the species belong. For instance, if I found a species reported from Guayaquil and belonging to a widely distributed group, such as the *Pholadidæ*, though not actually reported from a Peruvian locality, I have not hesitated to include it, knowing that in all probability it will be found on more thorough search in Peruvian territory. There can be little doubt that a large number of the more mobile of the Panamic species reaching the Bay of Guayaquil will be found to have extended their range more or less within the northern border of the Peruvian Province, just as a certain number of the characteristic Magellanic species have traveled beyond their strict limits and mingle with the southern members of the Peruvian fauna. Species properly belonging to the Panamic Province and not reported as far south as Guayaquil or the Galapagos Islands have been omitted from the list.

It will be observed that the list contains only a few minute species. Doubtless many of these exist, and will be found when carefully sought for, but, as previously indicated, the majority of collectors seem to have confined their attention to the more conspicuous species.

I have included a certain number of pelagic forms, Cephalopods, Pteropods, and Nudibranchs, which are not strictly littoral, but are found occasionally thrown on the beaches or are captured within a short distance of the shore. And since collectors are certain to obtain them in their search for mollusks, I have added at the end of the list of Mollusca a list of the littoral Brachiopoda, some of which are so common on these shores.

In any first census of this kind some species will be included which later investigation will exclude. I have rejected a number of Tschudi's

species as obviously exotic, but a small number remain which are doubtful and which are indicated by the name (Tschudi) as needing confirmation. I have also omitted a few names which seemed to be almost certainly due to misidentification or to a confusion between such localities as Arica and Africa. "Lumping" closely related species, such as some of the Siphonarias, has led certain authors to include purely Atlantic forms with their Pacific analogues under one name. So far as time and the access to specimens permitted, I have tried to disentangle such cases and use only the name belonging to the Pacific form. In making her dredgings the U. S. Bureau of Fisheries steamer *Albatross* seems to have avoided shallow water; and in the case of *Dentalium*, which has a wide range in depth, I have included a few species actually dredged beyond the 100-fathom line, but which will in all probability be found within it when sought for. No other deep-water species, however, have been admitted. An account of them will be found in my *Albatross* report of 1908. In scanning the list those unfamiliar with the repetition of names so prevalent in Spanish geographical nomenclature will need to remember that there is a Tumbes in Chile as well as in Peru, and be on the lookout for analogous cases. Species of Auriculidæ which are exclusively littoral although pulmonate have been included, also the salt-water Cyrenas, my aim being to include all species which are to be found along the shores of the province, on the beaches, and in the adjacent waters of the sea. Whatever deductions from the list may be necessary hereafter, I am convinced that they will be more than made up for by future additions from the ranks of the minute species.

It is probable, though not by any means certain, that when we eliminate the overflow from the Panamic and Magellanic provinces the remaining fauna on this long stretch of coast may be susceptible of division into subfaunas, but it is too early to speculate about this possible feature of the distribution.

I have indicated in the preceding remarks the nature of the reservations which must be made in discussing the statistics of our present census of the Peruvian fauna, and subject to those reservations we may now proceed to consider the figures.

The total number of species appears to be 869, of which 64 are pelagic and may be omitted from consideration in the matter of distribution, leaving 805. Taking the present political limits of the two countries as a starting point, we find 71 species reported from Peru exclusively, and 103 restricted to Chile. But as political and biological boundaries rarely have anything in common, these data are not especially significant. We have 174 species restricted to Peru or Chile, and 141 common to Peru and Chile, making 315 species proper to the province itself. In addition to these we have

253 species common to the Panamic Province and to Peru, and 239 species of the Panamic Province which are known to reach the northern border of the Peruvian Province at or near Cape Blanco, many of which will doubtless be found to have a more extended southerly range. In addition to these there are 25 species whose range extends from Upper California south to Peru or even to Valparaiso.

At the southern extreme of the Peruvian Province it receives 41 recruits from the Magellanic Province, few of which range north of Valparaiso. Of the whole 805 species enumerated, which are not pelagic, only 24 are known from the West Indies or Atlantic Ocean, most of which are Pholads, borers, or limpets, forms peculiarly liable to transportation long distances on ships or floating timber. The only species which can be regarded as also Indo-Pacific are even fewer in number and to be included in the same category.

Eliminating all the pelagic species and all the Panamic species not shown to be now actually domiciled within the limits of the Peruvian Province, we have a population for the province of 566 species of littoral marine mollusks.

In Bulletin 84 of the U. S. Geological Survey, pages 25-28, 1892, I have shown that the average population for a warm-temperate area (where the temperature ranges from 60° to 70° F.) is about 500 species of shell-bearing mollusks. Adding the species of Nudi-branches, naked Tectibranchs, and littoral cephalopods enumerated in our list, it would seem that the average is pretty well maintained in the case of the Peruvian Province.

Dismissing the minuter species from consideration as insufficiently known, the more striking characteristics of the Peruvian fauna may be summed up as follows:

1. There is an unusual proportion of the species which are black or blackish or of a lurid tint. This feature of the fauna has attracted attention from all who have studied it and has been discussed by von Martens. It is particularly marked among the phytophagous groups.

2. The fauna is notable for its Fissurellidæ and Acmaeidæ, its Trochids of the genus *Tegula*, its numerous and peculiar chitons, its numerous Cancellarias, the development of Calyptræidæ, of species of Arcidæ, and of the genus *Thais*, *Chione*, *Semele*, *Petricola*, *Mulinia*, all represented by numerous species.

3. The deficiencies in the fauna are as marked as the redundancies. There are notably few Pectens or Lucinas, and the Tellinidæ are poorly represented. *Acteon*, the smaller Tectibranchs, *Conus*, the Turritidæ especially, the Marginellidæ, *Fusinus* and its allies, *Epitonium* (*Scala*) and the Pyramidellidæ are all very poorly represented. *Calliostoma* and *Margarita*, *Haliotis* and *Pleurotomaria* are absent or barely represented.

The notion that the mournful colors of so many of the species might be correlated with the huge beds of kelp characteristic of these shores seems to be negatived by the fact that in California similar kelp beds afford a shelter to some of the most brightly colored Trochidæ, etc., and that, as I am informed by Mr. Coker, red and green seaweeds are abundant on the rocks below low-water mark, on a large part of the coast of Peru, and presumably also of Chile. This and a number of other problems await the investigations of the future.

Lastly, a survey of the characteristic groups of which the fauna is largely made up leads to the conclusion that the fauna is chiefly of southern origin. In spite of the fact that many species are common to the Panamic fauna and a relatively small number to the Magellanic fauna, the more conspicuous types, like the blackish species of *Tegula*, have a Magellanic rather than a tropical character. This particular group has extended its range to Alaska on the north and Japan on the northwest, but its metropolis is in southern Chile. The type represented by the various species of *Thais* and *Acanthina* has traveled the same road, and so has the *Protothaca* group of Veneridæ.

If we may accept as the original metropolis of a special type of mollusks that region where it is developed in the greatest number and variety of species, and perhaps also with the most extreme limits of size and ornamentation, we shall have for example *Buccinum* and *Chrysodomus* focused in the boreal Pacific region, certain types of *Thais* and *Acanthina* in the region of southern Chile.

Cook has called attention to the relation between *Thais lapillus* and the Oregonian *T. lamellosa*, and other species in the Tropics of the Panamic and Antillean region; but, viewed from an Eastern Pacific standpoint, the relatively few Atlantic forms may easily have originated in the Pacific, where their existing representatives show a much more luxuriant development.

There is only one *Thais* of the *Nucella* type in the North Atlantic, but the North Pacific has five or six. It is very remarkable that in the Peruvian Province we have not a single distinctively old world type of mollusk. Those which seem to be such are really cosmopolitan types, more familiar to us from old world localities, perhaps, but not necessarily of old world origin.

APPROXIMATE LATITUDES OF PLACES MENTIONED IN THIS  
CATALOGUE.

	°	'
San Diego, California.....	33	12 N.
Cerros (Cedros) Island, Lower California.....	28	00 N.
Mazatlan, Gulf of California.....	23	20 N.
Acapulco, Mexico.....	16	00 N.
Gulf of Nicoya, Central America.....	9	40 N.
Panama.....	8	29 N.
Chiriqui, Central America.....	8	00 N.
Montijo Bay, Central America.....	7	40 N.
Bahia (Panguapi) Ecuador.....	3	00 N.
Atacames, Ecuador.....	0	50 N.
Bahia de Caragues (Caracas).....	0	35 S.
Chatham Island, Galapagos Islands.....	1	00 S.
Manta, Ecuador.....	1	00 S.
Monte Cristi, Ecuador.....	1	00 S.
Jipijapa (Xipixapi), Ecuador.....	1	15 S.
Isla la Plata, Ecuador.....	1	20 S.
Salango, Ecuador.....	1	30 S.
Bahia Santa Elena, Ecuador.....	2	10 S.
Guayaquil, Ecuador.....	2	11 S.
Puna Island, Bay of Guayaquil, Ecuador.....	3	00 S.
Capon, Huaquilla, and Matapalo.....	3	10 S.
Tumbes (Tumbez), Peru.....	3	30 S.
Paita (Payta), Peru.....	5	00 S.
Lobos Islands (northern), Peru (Lobos de Tierra).....	5	20 S.
Lobos Islands (southern), Peru (Lobos de Afuera).....	6	27 S.
Sechura Bay, Peru (and Mataballa).....	5	40 S.
Lambayeque, Peru.....	6	30 S.
Pacasmayo, Peru.....	7	25 S.
Salaverri, Peru.....	8	10 S.
Guañape Islands, Peru.....	8	30 S.
Isla Blanca, Chimbote Bay, Peru.....	9	08 S.
Casma, Peru.....	9	30 S.
Ancon, Peru (and Pescadores Islands).....	11	47 S.
Callao, Peru (with La Punta, S. Lorenzo Island, etc.).....	12	00 S.
Chilca, Peru.....	12	30 S.
Asia Islands, Peru.....	12	50 S.
Pisco (Chincha and Ballestas Islands, San Gallan Island).....	13	45 S.
Paracas Bay, Peru.....	13	50 S.
Bay of Independencia, Peru (and Windy Bay).....	14	15 S.
Ica, Peru.....	14	30 S.
Islay, Peru.....	17	00 S.
Mollendo, Peru.....	17	00 S.
Arica, Chile.....	18	30 S.
Mejillones del Norte, Chile.....	19	50 S.
Iquique, Chile.....	20	15 S.
Cobija, Chile.....	22	30 S.
Antofagasta, Chile.....	22	40 S.
Mejillones (Mexillones) del Sur, Chile.....	23	00 S.
Isla Blanca (del Chimba) of Philippi, Chile.....	23	37 S.
Paposo, Chile.....	25	07 S.
Caldera, Chile.....	27	00 S.

Copiapo, Chile.....	27	10 S.
Coquimbo, Chile.....	30	00 S.
Quintero, Chile.....	32	45 S.
Valparaiso, Chile.....	33	00 S.
Juan Fernandez Island, Chile.....	33	40 S.
Talcahuano, Quiriquina, and Tumbes, Chile.....	36	40 S.
Lota and Concepcion, Chile.....	37	10 S.
Valdivia, Chile.....	39	50 S.
Puerto Montt, Chile.....	41	30 S.
Island of Chiloë, Chile.....	42	30 S.
Chonos Archipelago, Chile.....	45	00 S.
Magellan Straits, western entrance.....	52	35 S.

## LIST OF SPECIES COMPOSING THE FAUNA.

## SUBKINGDOM MOLLUSCA.

## Class CEPHALOPODA.

## Order DIBRANCHIATA.

## Suborder OCTOPODA.

## Family ARGONAUTIDÆ.

## Genus ARGONAUTA Linnæus.

## ARGONAUTA CORNUTA Conrad.

1854. Journ. Acad. Nat. Sci. Phila., ser. 2, vol. 2, p. 332, pl. 34, fig. 2. Gulf of Panama to Cape St. Lucas.

## ARGONAUTA NOURYI Lorois.

1852. Rev. et Mag. de Zool., ser. 2, vol. 4, p. 9, pl. 1, fig. 5. Marquesas Islands; coast from Peru to Mexico.

## ARGONAUTA PACIFICA Dall.

1869. Amer. Nat., vol. 3, p. 237. From the Galapagos Islands north to Monterey, California.

## ARGONAUTA NODOSA Solander.

1786. Portland Catalogue, p. 96, No. 2120.—SHAW, Nat. Misc. 1811, vol. 23, pl. 995. Off Chiloë Island.

## ARGONAUTA HIANS Solander.

1786. Portland Catalogue p. 44, No. 1055.—ADAMS AND REEVE, Voy. Samarang, Moll., 1850, p. 4, pl. 3, figs. 2 *a-c*. Indo-Pacific Ocean; Chilean coast.

## Family PHILONEXIDÆ.

## Genus TREMOCTOPUS Della Chiaje.

## TREMOCTOPUS MINIMUS Orbigny.

1835. Voy. Am. Mér., vol. 5, p. 23, pl. 1, figs. 4, 5. S. Lat 30°. off Coquimbo.

## Family ALLOPOSIDÆ.

## Genus BOLITÆNA Steenstrup.

**BOLITÆNA MICROTYLA** Steenstrup.

1859. Vid. med. Nat. Foren. Kjobenh. for 1858, p. 183.—HOYLE, Bull. Mus. Comp. Zool., vol. 43, p. 9, pl. 3, figs. 6-11; pl. 4, fig. 1. Galapagos Islands; also Atlantic Ocean.

## Family POLYPODIDÆ.

Genus POLYPUS Schneider, 1784. (*Octopus* Lamarck, 1799.)**POLYPUS GRANULATUS** Lamarck.

1799. Mém. Soc. Hist. Nat. Paris, vol. 1, p. 20.—ORBIGNY, Céph. Acét., 1838, p. 45, pls. 6, 23, fig. 2. Atlantic and Pacific Oceans; coast of Peru.

**POLYPUS FONTAINEANUS** Orbigny.

1835. Voy. Am. Mér., vol. 5, p. 28, pl. 2, fig. 5. Coast of Chile and Peru.

**POLYPUS OCCIDENTALIS** Hoyle.

1886. Challenger Ceph., p. 77.—ORBIGNY, Moll. Cuba, p. 14, pl. 1, 1845. Atlantic and Pacific Oceans; Galapagos Islands.

**POLYPUS CHIERCHIÆ** Jatta.

1889. Boll. soc. nat. Napoli, vol. 3, p. 65. Peru.

**POLYPUS OCULIFER** Hoyle.

1904. Bull. Mus. Comp. Zool., vol. 43, p. 14, pl. 4, figs. 3-4. Galapagos Islands.

**POLYPUS PUSILLUS** Gould.

1852. U. S. Expl. Exped. (Wilkes) Moll., p. 478, fig. 591. Cocos Island north to Acapulco, Mexico.

**POLYPUS JANUARI** Hoyle.

1886. Challenger Ceph., p. 97, pl. 7, figs. 1-4. Cocos Island.

**POLYPUS SAPHENIA** Gray.

1849. Brit. Mus. Cat. Ceph., p. 11. Peru.

**POLYPUS MIMUS** Gould.

1852. U. S. Expl. Exped. (Wilkes) Moll., p. 473, fig. 587. Peruvian region.

Genus MOSCHITES Schneider, 1784. (*Eledone* Leach, 1817.)**MOSCHITES ROTUNDA** Hoyle.

1886. Challenger Ceph., p. 104, pl. 8, figs. 4-6. Gulf of Panama.

**MOSCHITES VERRUCOSA** Verrill.

1881. Bull. Mus. Comp. Zool., vol. 8, p. 105, pls. 5, 6. Gulf of Panama.

## Genus ELEDONELLA Verrill.

**ELEDONELLA DIAPHANA** Hoyle.

1885. Ann. Mag. Nat. Hist., ser. 5, vol. 15, p. 232; Challenger Ceph., p. 107, pl. 9, figs. 3-6, 1886. Galapagos Islands.

## Genus JAPETELLA Hoyle.

## JAPETELLA PRISMATICA Hoyle.

1885. Ann. Mag. Nat. Hist., ser. 5, vol. 15, p. 231; Challenger Ceph., p. 109, pl. 9, figs. 1-2, 1886.

## Suborder DECAPODA.

## Superfamily MYOPSIDA.

## Family LOLIGINIDÆ.

## Genus LOLIGO Lamarck.

## LOLIGO GAHI Orbigny.

1835. Voy. Am. Mér., vol. 5, Moll., p. 60, pl. 3, figs. 1-2. Valparaiso; Patagonian, Peruvian, and West Indian regions.

## Superfamily CEGOPSIDA.

## Family OMMATOSTREPHIDÆ.

## Genus OMMASTREPHEs Orbigny.

## OMMASTREPHEs GIGAS Orbigny.

1835. Voy. Am. Mér., vol. 5, Moll., p. 50, pl. 4. Peruvian region; Valparaiso to Arica.

## Genus SYMPLECTOTEUTHIS Pfeffer.

## SYMPLECTOTEUTHIS OUALANIENSIS Lesson.

1829. Voy. Coquille, Moll., vol. 2, p. 240, pl. 1, fig. 1. Indo-Pacific region; Cocos Island; Gulf of Panama.

## Genus STEENSTRUPIOLA Pfeffer.

## STEENSTRUPIOLA CHILENSIS Pfeffer.

1884. Ceph. Hamburg Mus., p. 16, fig. 20. Peruvian region.

## Genus CUCIOTEUTHIS Steenstrup.

## CUCIOTEUTHIS UNGUICULATUS Molina.

1782. Saggio Stor. Nat. Chile, p. 199.—OWEN, Trans. Zool. Soc. Lond., vol. 11, pt. 5, p. 150, pls. 30-32. Chile.

## Family BATHYTEUTHIDÆ.

## Genus BATHYTEUTHIS Hoyle.

## BATHYTEUTHIS ABYSSICOLA Hoyle.

1885. Challenger, Sci. Results, p. 272, fig. 108. Chall. Ceph. p. 168. Eastern Pacific.

## Family MASTIGOTEUTHIDÆ.

## Genus MASTIGOTEUTHIS Verrill.

## MASTIGOTEUTHIS DENTATA Hoyle.

1904. Bull. Mus. Comp. Zool., vol. 43, p. 34, pl. 6, figs. 8-11. Galapagos Islands. Gulf of Panama.

## Family ONYCHOTEUTHIDÆ.

## Genus ONYCHOTEUTHIS Lichtenstein.

## ONYCHOTEUTHIS BRACHYPTERA Pfeffer.

1884. Ceph. Hamburg Mus., p. 20, fig. 26. Peruvian region.

Genus TELEOTEUTHIS Verrill. (*Onychia* Lesueur.)

## TELEOTEUTHIS PLATYPTERA Orbigny.

1835. Voy. Am. Mér., vol. 5, Moll., p. 41, pl. 3, figs. 8-11.  
Indo-Pacific region. Chilean coast, off Valdivia.

## TELEOTEUTHIS PERATOPTERA Orbigny.

1835. Voy. Am. Mér., vol. 5, Moll., p. 39, pl. 3, figs. 5-7.  
Indo-Pacific region. Juan Fernandez Island. Chilean coast.

## Family ENOPLOTEUTHIDÆ.

## Genus ABRALIOPSIS Joubin.

## APRALIOPSIS HOYLEI Pfeffer.

1884. Ceph. Hamburg Mus., p. 17, fig. 22. Gulf of Panama to  
Acapulco, Mexico.

## Genus PTERYGIOTEUTHIS H. Fischer.

## PTERYGIOTEUTHIS GIARDI Fischer.

1896. Journ. de Conchyl., vol. 48, pp. 205-211, pl. 9. Gulf of  
Panama. Galapagos Islands north to Guaymas, Mexico.  
Also North Atlantic.

## Family HISTIOTEUTHIDÆ.

## Genus CALLITEUTHIS Verrill.

## CALLITEUTHIS REVERSA Verrill.

1880. Am. Journ. Sci., vol. 20, p. 393; Trans. Conn. Acad. Sci.,  
vol. 5, p. 295, pl. 46, figs. 1, 1b., 1880. North Atlantic.  
Gulf of Panama.

## Family CRANCHIIDÆ.

## Genus TAONIUS Steenstrup.

## TAONIUS SCHNEEHAGANI Pfeffer.

1884. Ceph. Hamburg Mus., p. 23, fig. 31. Peruvian region.

## Class GASTROPODA.

## Subclass ANISOPLEURA.

## Superorder OPISTHOBANCHIATA.

## Order PTEROPODA.

## Suborder GYMNOSOMATA.

## Family PNEUMODERMATIDÆ.

## Genus PNEUMODERMON Cuvier.

## PNEUMODERMON BOASI Pelseneer.

1888. Challenger Pterop., p. 30, pl. 2, fig. 3. Off Caldera, Chile, S. lat. 27°.

## Genus DEXIOBRANCHÆA Boas.

## DEXIOBRANCHÆA POLYCOTYLA Boas.

1886. Spolia Atlantica, vol. 4, p. 161. Challenger Pterop., p. 17, pl. 1, figs. 4, 5, 1888. Off Chile, S. lat. 27° to 37° 30'.

## DEXIOBRANCHÆA SIMPLEX Boas.

1886. Spolia Atlantica, vol. 4, p. 160. Challenger Pterop., p. 16, pl. 1, fig. 3, 1888. Off Caldera, Chile, in S. lat. 27°.

## Suborder THECOSOMATA.

## Family CAVOLINIIDÆ.

## Genus CAVOLINA Abildgaard.

## CAVOLINA GIBBOSA Rang.

1836. *Hyalæa gibbosa* RANG, in Orbigny, Voy. Am. Mér., p. 95, pl. 5, figs. 16–25. Southeast Pacific, Atlantic, and Indian seas.

## CAVOLINA INFLEXA Lesueur.

1813. *Hyalæa inflexa* LESUEUR, Nouv. Bull. Soc. Philom., vol. 3, p. 285, pl. 5, fig. 3. Eastern Pacific from N. lat. 13° to S. lat. 42°. Also Atlantic.

## CAVOLINA LONGIROSTRIS Lesueur.

1822. *Hyalæa longirostris* LESUEUR, Dict. Sci. Nat., vol. 22, p. 81.—ORBIGNY, Voy. Am. Mér., p. 101, pl. 6, figs. 11 to 15, 1836. S. lat. 12° to N. lat. 23°. Also Atlantic.

## CAVOLINA TELEMUS Linnæus, var. OCCIDENTALIS Dall.

1758. *Monoculus telemus* LINNÆUS, Syst. Nat., 10th ed., p. 1059. *Hyalæa tridentata* (FORSKAL) BOAS, Spolia Atlantica, p. 115, pl. 1, figs. 8, 9; pl. 2, fig. 19; pl. 4, fig. 66; pl. 6, fig. 100, 1886. Off the west coast of South America and the Galapagos Islands. Also North Pacific.

## CAVOLINA UNCINATA Rang.

1836. *Hyalæa uncinata* RANG in Orb. Voy. Am. Mér., p. 93, pl. 5, figs. 11-13. Cape St. Lucas, Lower California, south to Ecuador and the Galapagos Islands. Also Atlantic.

## Genus CLIO Linnæus.

## CLIO ANTARCTICA Dall.

1908. Smithsonian Misc. Coll., vol. 50, p. 501. *Hyalæa australis* ORBIGNY Voy. Am. Mér., p. 117, pl. 8, figs. 9-11, 1836; not of Peron, 1816. Southeastern Pacific, also near Cape of Good Hope.

## CLIO PYRAMIDATA Linnæus.

1767. Syst. Nat., 12th ed., p. 1094. *Cleodora lanceolata* SOULEYET, Zool. Bonite, vol. 2, p. 179, pl. 6, figs. 17-25, 1852. Southeastern Pacific, in S. lat. 27° 11'. Also Atlantic.

## CLIO SULCATA Pfeffer.

1879. *Cleodora sulcata* PFEFFER, Monatsb. k. Preuss. Akad. Wiss., p. 240, figs. 11, 12. Off Manta, Ecuador, and southward to the Antarctic.

## CLIO (HYALOCYLIX) STRIATA Rang.

1828. *Creseis striata* RANG, Ann. Sci. Nat., ser. 1, vol. 13, p. 315, pl. 16, fig. 7. Off coast of Chile. Also Atlantic.

## Genus CRESEIS (Rang) Sowerby.

## CRESEIS SUBULA Quoy and Gaimard.

1827. Ann. Sci. Nat., ser. 1, vol. 10, p. 233, pl. 8D, figs. 1, 2, 3 (as *Cleodora*). Eastern Pacific. Also Atlantic, etc.

## Genus STYLIOLA (Lesueur) Gray.

## STYLIOLA ACICULA Rang.

1828. *Creseis acicula* RANG, Ann. Sci. Nat., ser. 1, vol. 13, p. 318, pl. 17, fig. 6. Eastern Pacific. Also Atlantic.

## STYLIOLA CONICA Eschscholtz.

1829. *Creseis conica* ESCHSCHOLTZ, Zool. Atlas, p. 17, pl. 15, fig. 3. Eastern Pacific. Also Atlantic.

## STYLIOLA VIRGULA Rang.

1828. *Creseis virgula* RANG, Ann. Sci. Nat., ser. 1, vol. 13, p. 316, fig. 2. Southeastern Pacific, off Juan Fernandez Island. Also Atlantic.

## STYLIOLA (BOASIA) CHIERCHIE Boas.

1886. *Cleodora chierchiæ* BOAS, Spolia Atlantica, p. 62, pl. 3, fig. 39ter. Tropical eastern Pacific. Also Atlantic.

## Genus CUVIERINA Boas.

## CUVIERINA COLUMELLA Rang.

1828. *Cuvieria columella* RANG, Ann. Sci. Nat., ser. 1, vol. 13, p. 323, pl. 45, figs. 1-8. Eastern Pacific from N. lat. 23° to S. lat. 42°. Also Atlantic.

## Family LIMACINIDÆ.

## Genus LIMACINA Lamarck.

## LIMACINA BULIMOIDES Orbigny.

1836. *Atlanta bulimoides* ORBIGNY, Voy. Am. MÉR., p. 179, pl. 12, figs. 36–38. Temperate and tropical eastern Pacific. Also Atlantic.

## LIMACINA LESUEURI Orbigny.

1836. *Atlanta lesueuri* ORBIGNY, Voy. Am. MÉR., p. 177, pl. 20, figs. 12–15. Eastern Pacific to S. lat. 42°. Also Atlantic.

## LIMACINA TROCHIFORMIS Orbigny.

1836. *Atlanta trochiformis* ORBIGNY, Voy. Am. MÉR., p. 177, pl. 12, figs. 29–31. Eastern Pacific to S. lat. 30°. Also Atlantic.

## Genus EMBOLUS Jeffreys.

## EMBOLUS INFLATUS Orbigny.

1836. *Atlanta inflata* ORBIGNY, Voy. Am. MÉR., p. 174, pl. 12, figs. 16–19. Eastern Pacific from N. lat. 42° to S. lat. 40°. Also Atlantic.

## Genus PERACLE Forbes.

## PERACLE RETICULATA Orbigny.

1836. *Atlanta reticulata* ORBIGNY, Voy. Am. MÉR., p. 178, pl. 12, figs. 32–35, 39. Eastern Pacific in S. lat. 20°. Also Atlantic and Mediterranean.

## Order TECTIBRANCHIATA.

## (CEPHALASPIDEA.)

## Family ACTEONIDÆ.

## Genus ACTEON Montfort.

## ACTEON VENUSTUS Orbigny.

1840. *Tornatella venusta* ORBIGNY, Voy. Am. MÉR., p. 399, pl. 56, figs. 4, 5, 6. Païta, Peru.

## Family BULLARIIDÆ.

## Genus BULLARIA Rafinesque.

## BULLARIA ASPERSA A. Adams.

1850. *Bulla aspersa* ADAMS, Thes. Con., vol. 2, p. 578, pl. 123, fig. 78. Panama to Païta, Peru.

## BULLARIA GOULDIANA Pilsbry.

1898. *Bulla gouldiana* PILSBRY, Man. Con., vol. 15, p. 340, pl. 36, figs. 22–24. San Pedro, Cal., southward to the Gulf of California, Mazatlan, and Guayaquil.

## BULLARIA PUNCTULATA A. Adams.

1850. *Bulla punctulata* ADAMS, Thes. Con., p. 604, pl. 123, fig. 77. Gulf of California to the Lobos Islands, Peru.

## Family AKERATIDÆ.

## Genus HAMINEA Leach.

## HAMINEA PERUVIANA Orbigny.

1837. *Bulla peruviana* ORBIGNY, Voy. Am. MÉR., p. 211, pl. 19, figs. 4, 5 (*B. hydatis* on plate). Callao, Peru.

## (ANASPIDEA.)

## Family AGLAJIDÆ.

## Genus AGLAJA Renier.

## AGLAJA MACULATA Orbigny.

1837. *Posterobranchea maculata* ORBIGNY, Voy. Am. MÉR., p. 203, pl. 17, figs. 6-9. Valparaiso and Juan Fernandez Island.

## Family APLYSIIDÆ.

## Genus TETHYS Linnæus.

## TETHYS CHIERCHIANA Mazzarelli and Zuccard.

1889. *Aplysia chierchiana* MAZZARELLI and ZUCCARD, Bol. Soc. Nat. Napoli, vol. 3, p. 52. San Lorenzo Island. Callao, Peru.

## TETHYS INCA Orbigny.

1837. *Aplysia inca* ORBIGNY, Voy. Am. MÉR., p. 207, pl. 14, fig. 13. Callao, Peru.

## TETHYS LESSONI Rang.

1828. *Aplysia lessoni* RANG, Mon. Aplysia, p. 60, pl. 14. Paita, Peru.

## TETHYS NIGRA Orbigny.

1837. *Aplysia nigra* ORBIGNY, Voy. Am. MÉR., p. 209, pl. 18, figs. 1-2. Callao, Peru.

## TETHYS RANGIANA Orbigny.

1837. *Aplysia rangiana* ORBIGNY, Voy. Am. MÉR., p. 210, pl. 17, figs. 11-13. Paita, Peru.

## Genus APLYSIOPSIS Bergh.

## APLYSIOPSIS JUANINA Bergh.

1898. BERGH, in Plate, Fauna Chilensis, vol. 1, p. 483, pl. 28, figs. 1-25, pl. 29, fig. 1. Juan Fernandez Island.

## Genus DOLABELLA Lamareck.

## DOLABELLA GUAYAQUILENSIS Petit.

1868. SOWERBY, Con. Icon., vol. 16, pl. 2, figs. 6 a-b. Guayaquil.

## (NOTASPIDEA.)

## Family PLEUROBRANCHIDÆ.

## Genus PLEUROBRANCHUS Cuvier.

## PLEUROBRANCHUS PLATEI Bergh.

1898. Fauna Chilensis, vol. 1, p. 494. Calbuco, Chile.

## PLEUROBRANCHUS PATAGONICUS Orbigny.

1837. Voy. Am. Mér., p. 204, pl. 17, figs. 4, 5. Talcahuano, Chile. Also south of the Rio Negro on the Atlantic coast of Patagonia.

## Genus PLEUROBRANCHÆA Leue.

## PLEUROBRANCHÆA MACULATA Quoy and Gaimard.

1832. Voy. Astrolabe, Zool., vol. 5, pt. 2, p. 301, pl. 22, figs. 11-14. Plate, Fauna Chilensis, vol. 1, p. 492, pl. 29, figs. 2-9, 1898. Juan Fernandez Island.

## Order NUDIBRANCHIATA.

## (CLADOHEPATICA.)

## Family AEOLIDIIDÆ.

## Genus AEOLIDIA Cuvier.

## AEOLIDIA LOTTINI Lesson.

1830. *Aeolis lottini* LESSON, Voy. Coq., p. 290, pl. 14, figs. 6 g-n. Southern Chile.

## AEOLIDIA PAPILLOSA (Linnæus) Bergh.

1898. Plate, Fauna Chilensis, vol. 1, p. 540. Chile.

## AEOLIDIA SEROTINA (Linnæus) Bergh.

1898. Plate, Fauna Chilensis, vol. 1, p. 541, pl. 31, figs. 26-31. Talcahuano and Tumbes, Chile.

## Genus CRATENA Bergh.

## CRATENA CAVANCA Bergh.

1898. Plate, Fauna Chilensis, vol. 1, p. 545, pl. 31, figs. 32-34. Cavanca, Chile.

## CRATENA PUSILLA Bergh.

1898. Plate, Fauna Chilensis, vol. 1, p. 547, pl. 31, figs. 35-37. Juan Fernandez Island.

## Genus PHIDIANA Gray.

## PHIDIANA EXIGUA Bergh.

1898. Plate, Fauna Chilensis, vol. 1, p. 559, pl. 32, figs. 16-18. Coquimbo, Chile.

## PHIDIANA INCA Orbigny.

1837. *Aeolis inca* ORBIGNY, Voy. Am. Mér., p. 195, pl. 13, figs. 1-7. Callao to Talcahuano, Chile.

## PHIDIANA NATANS Orbigny.

1837. *Aeolis natans* ORBIGNY, Voy. Am. MÉR., p. 195, pl. 13, figs. 8-10. Off Peru, S. lat. 13°.

Genus FIONA Hancock and Embleton.

## FIONA PINNATA Eschscholtz.

1831. *Aeolidia pinnata* ESCHSCHOLTZ, Zool. Atlas, pt. 4, p. 14, pl. 19, fig. 1. Eastern Pacific; off Sitka, Alaska, and southward. Pelagic.

## FIONA MARINA Forskål, var. PACIFICA Bergh.

1898. Plate, Fauna Chilensis, vol. 1, p. 560. Juan Fernandez Island and Talcahuano, Chile.

Genus GLAUCILLA Bergh.

## GLAUCILLA DISTICHOICA Orbigny.

1837. *Glaucus distichoicus* ORBIGNY, Voy. Am. MÉR., p. 196, pl. 14, figs. 1-3. Off Peru, S. lat. 20°.

## Family PHYLLIRHOIDÆ.

Genus PHYLLIRHOË Peron and Lesueur.

## PHYLLIRHOË ROSEA Orbigny.

1836. *Phyllirhoë roseum* ORBIGNY, Voy. Am. MÉR., p. 183, pl. 20, figs. 16-17. Eastern Pacific S. lat. 36°.

## Family PLEUROPHYLLIDIIDÆ.

Genus PLEUROPHYLLIDIA Meckel.

## PLEUROPHYLLIDIA CUVIERI Orbigny.

1837. *Diphyllidia cuvieri* ORBIGNY, Voy. Am. MÉR., p. 199, pl. 17, figs. 1-3. Paita, Peru, to Valparaiso, Chile, in 7-8 fathoms.

## Family TRITONIIDÆ.

Genus TRITONIA Cuvier.

## TRITONIA (CANDIELLA) AUSTRALIS Bergh.

1898. Plate, Fauna Chilensis, vol. 1, p. 536, pl. 31, figs. 17-25. Calbuco, Chile. Juan Fernandez Island.

(HOLOHEPATICA.)

## Family DORIDIDÆ.

(CRYPTOBRANCHIATA.)

Genus ARCHIDORIS Bergh.

## ARCHIDORIS? FONTAINEI Orbigny.

1837. *Doris fontainei* ORBIGNY, Voy. Am. MÉR., p. 189, pl. 15, figs. 1-3. Valparaiso, Tumbes, Chile.

## ARCHIDORIS? INCERTA Bergh.

1898. Plate, Fauna Chilensis, vol. 1, p. 504, pl. 29, figs. 21-25.  
Tumbes, Chile.

## Genus ANISODORIS Bergh.

## ANISODORIS MARMORATA Bergh.

1898. Plate, Fauna Chilensis, vol. 1, p. 515, pl. 30, figs. 5-7.  
Coquimbo, Chile.

## ANISODORIS PUNCTUOLATA Orbigny.

1837. *Doris punctuolata* ORBIGNY, Voy. Am. Mér., p. 187, pl. 16, figs. 4-6.—BERGH, Fauna Chilensis, vol. 1, p. 509, pl. 29, figs. 31-34; pl. 30, figs. 1-2, 1898. Callao, Peru, south to Talcahuano, Chile.

## ANISODORIS TESSELLATA Bergh.

1898. Plate, Fauna Chilensis, vol. 1, p. 518, pl. 30, figs. 8-11.  
Molle Bay, Chile, 8 fathoms.

## ANISODORIS VARIOLATA Orbigny.

1837. *Doris variolata* ORBIGNY, Voy. Am. Mér., p. 186, pl. 16, figs. 1-3.—BERGH, Fauna Chilensis, vol. 1, p. 512, pl. 30, figs. 3-4, 1898. Valparaiso and Tumbes, Chile.

## Genus TRIPPA Bergh.

## TRIPPA? HISPIDA Orbigny.

1837. *Doris hispida* ORBIGNY, Vol. Am. Mér., p. 188, pl. 15, figs. 4-6. Calbuco, Valparaiso, and Tumbes, Chile.

## Genus TYRINNA Bergh.

## TYRINNA NOBILIS Bergh.

1898. Plate, Fauna Chilensis, vol. 1, p. 524, pl. 30, figs. 21-29; pl. 32, figs. 21-24. Calbuco, Chile.

## Genus PLATYDORIS Bergh.

## PLATYDORIS PUNCTATELLA Bergh.

1898. Plate, Fauna Chilensis, vol. 1, p. 521, pl. 30, figs. 12-20.  
Isla de Pajargo, Chile.

## Genus CHROMODORIS Alden and Hancock.

## CHROMODORIS JUVENCA Bergh.

1898. Plate, Fauna Chilensis, vol. 1, p. 531, pl. 31, figs. 4-11.  
Isla de Pajargo, Chile, and Juan Fernandez Island.

## (POROSTOMATA.)

## Family DORIOPSISIDÆ.

## Genus DORIOPSIS Pease.

## DORIOPSIS PERUVIANA Orbigny.

1837. *Doris peruviana* ORBIGNY, Voy. Am. Mér., p. 188, pl. 15, figs. 7-9. Galapagos Islands and Callao, Peru, and south to Valparaiso, Chile.

## (PHANEROBRANCHIATA.)

## Family POLYCERATIDÆ.

## Genus EUPLOCAMUS Philippi.

## EUPLOCAMUS MACULATUS Bergh.

1898. Plate, Fauna Chilensis, vol. 1, p. 534, pl. 31, figs. 12-16.  
Juan Fernandez Island.

## Order PULMONATA.

## Suborder BASOMMATOPHORA.

## Superfamily AKTEOPHILA.

## Family AURICULIDÆ.

## Genus AURICULA Lamareck.

## AURICULA STAGNALIS Orbigny.

1835. ORBIGNY in Guerin, Mag. de Zoöl., p. 23; Voy. Am. MÉR.,  
p. 325, pl. 42, figs. 7-8, 1837. Panama to Guayaquil.

## Genus MELAMPUS Montfort.

## MELAMPUS ACROMELAS Troschel.

1852. *Conovulus acromelas* TROSCHER, Arch. f. Nat., vol. 18,  
pt. 1, p. 197, pl. 6, fig. 2. Peru (Tschudi).

## MELAMPUS LUTEUS Quoy and Gaimard.

1832. Voy. Astrolabe, Zool., vol. 2, p. 163, pl. 13, figs. 25-27.  
Tumaco Island, Guayaquil. Peru (Tschudi).

## MELAMPUS PIRIFORMIS Petit.

1842. *Auricula piriformis* PETIT, Proc. Zool. Soc., p. 202.—  
KÜSTER, Conch. Cab., *Auricula*, p. 37, pl. 5, figs. 12-14, 1844.  
Tumaco Island, Guayaquil.

## MELAMPUS (SIONA) FRUMENTUM Petit.

1842. *Conovulus frumentum* PETIT, Rev. Zoöl., p. 32. Callao,  
Peru.

## MELAMPUS (SIONA) AVENA Petit.

1842. *Conovulus avena* PETIT, Rev. Zoöl., p. 106.—KÜSTER,  
Conch. Cab., *Auricula*, p. 48, pl. 7, figs. 17-19, 1844. Val-  
paraiso, Chile.

## MELAMPUS (DETRACIA) GLOBULUS Ferussac.

1835. ORBIGNY, Mag. de Zoöl., p. 23, no. 4.—PFEIFFER, Nov.  
Conch., vol. 1, p. 23, pl. 6, figs. 23-25. Tumaco Island,  
Guayaquil.

## Genus TRALIA Gray.

## TRALIA (ALEXIA) REFLEXILABRIS Orbigny.

1840. *Auricula reflexilabris* ORBIGNY, Voy. Am. MÉR., p. 326, pl.  
42, figs. 1-3. Callao, salt marshes.

## Genus MARINULA King.

## MARINULA ACUTA Orbigny.

1835. *Auricula acuta* ORBIGNY, in Guerin, Mag. de Zool., 1835, p. 23, no. 2; Voy. Am. MÉR., p. 326, pl. 42, figs. 4-6, 1837. Panama to Guayaquil.

## MARINULA MARINELLA Küster.

1844. *Auricula marinella* KÜSTER, Conch. Cab., *Auricula*, p. 24, pl. 3, figs. 4, 5. Callao, Peru, south to the island of Chiloë.

## MARINULA PEPITA King.

1831. Zool. Journ., vol. 5, p. 344.—H. and A. ADAMS, Gen. Rec. Moll., vol. 2, p. 247, pl. 83, fig. 2a, 1856. Guayaquil, south to the island of Chiloë.

## Superfamily PETROPHILA.

## Family SIPHONARIIDÆ.

## Genus SIPHONARIA Sowerby.

## SIPHONARIA COSTATA Sowerby.

1835. Proc. Zool. Soc., p. 6.—REEVE, Con. Icon., vol. 9, pl. 4, fig. 19, 1856. Guacomayo, Central America, south to Valparaiso, Chile.

## SIPHONARIA GIGAS Sowerby.

1825. Tankerville Cat., App., p. VI.—REEVE, Con. Icon., pl. 1, fig. 3, 1856. Acapulco, Mexico, to Peru. Cocos and Galapagos Islands.

## SIPHONARIA LÆVIUSCULA Sowerby.

1835. Proc. Zool. Soc., p. 7.—REEVE, Con. Icon., vol. 9, pl. 1, fig. 5, 1856. Valparaiso, southward to the Magellan Straits.

## SIPHONARIA LESSONI Blainville.

1824. Dict. Sci. Nat., vol. 32, p. 267, pl. 44, fig. 2. Nicaragua, and south to the Magellan Straits.

## SIPHONARIA LINEOLATA Sowerby.

1835. Proc. Zool. Soc., p. 6.—REEVE, Con. Icon., vol. 9, pl. 3, fig. 11, 1856. Guayaquil, south to the Chilean coast.

## SIPHONARIA MAURA Sowerby.

1835. Proc. Zool. Soc., p. 7.—REEVE, Con. Icon., vol. 9, pl. 7, fig. 36, 1856. Magdalena Bay, Lower California, south to Guayaquil. Chile (Dautzenberg).

## SIPHONARIA TENUIS Philippi.

1860. Atacama Reise, p. 181, Zool., pl. 7, figs. 5a-c. Paita, Peru, to Valparaiso, Chile.

## Genus WILLIAMIA Monterosato.

## WILLIAMIA GALAPAGANA Dall.

1909. *Nacella subspiralis* WIMMER, Sitzb. k. Akad. Wiss. Wien., vol. 80, p. 41, 1879, not of CARPENTER, 1866. Galapagos Islands, Panama Bay, etc., on floating seaweed.

## Family GADINIIDÆ.

## Genus GADINIA Gray.

## GADINIA PERUVIANA Sowerby.

1835. *Mouretia peruviana* SOWERBY, Proc. Zool. Soc., p. 6;  
Zool. Beechey's Voy., Moll., p. 147, pl. 39, fig. 6, 1839.  
Gulf of California, south to Talcahuano, Chile.

## Suborder STYLOMMATOPHORA.

## Superfamily DITREMATA.

## Family ONCHIDIIDÆ.

## Genus ONCHIDIUM Buchanan.

## ONCHIDIUM CHILENSE Hupé.

1854. Gay, Hist. Chile, p. 120. San Carlos de Chiloë.

## ONCHIDIUM JUANFERNANDEZIANA Wissell.

1898. Zool. Jahrb., suppl. vol. 4, pp. 583-640, pl. 1-3. Juan  
Fernandez Island.

## ONCHIDIUM LANUGINOSUM Hupé.

1854. Gay, Hist. Chile, p. 121. San Carlos de Chiloë.

## Superorder CTENOBRANCHIATA.

## (STREPTONEURA.)

## Order ORTHODONTA.

## Superfamily TOXOGLOSSA.

## Family TEREBRIDÆ.

## Genus TEREBRA Bruguière.

## TEREBRA GUAYAQUILENSIS E. A. Smith.

1880. Proc. Zool. Soc., p. 481. Guayaquil.

## TEREBRA STRIGATA Sowerby.

1825. Tankerville Cat., App., p. xxv; Thes. Con., p. 151, pl. 41,  
fig. 10, 1847. Cape St. Lucas and Gulf of California south  
to Paita, Peru, and the Galapagos Islands.

## TEREBRA ASPERA Hinds.

1843. Proc. Zool. Soc., p. 154.—SOWERBY, Thes. Con., p. 174,  
pl. 43, fig. 44, 1847. Guayaquil and Paita, Peru.

## TEREBRA GEMMULATA Kiener.

1839. KIENER, Icon., *Terebra*, p. 15, pl. 5, figs. 11, 11a. Chile.

## TEREBRA LARVÆFORMIS Hinds.

1843. Proc. Zool. Soc., p. 155.—SOWERBY, Thes. Con., p. 176,  
pl. 43, figs. 46, 47, 1847. Guayaquil.

## TEREBRA PLICATA Gray.

1834. Proc. Zool. Soc., p. 61.—TRYON, Man., vol. 7, p. 24, pl. 7,  
fig. 20, 1885. Guayaquil.

## Family CONIDÆ.

## Genus CONUS Linnæus.

## CONUS BRUNNEUS Mawe.

1828. WOOD, Ind. Test., suppl. pl. 3, fig. 1.—SOWERBY, Con. Ill., *Conus*, pl. 57, fig. 88; var. fig. 63. Central America and southward to Manta, Ecuador, and the Galapagos Islands.

## CONUS FERGUSONI Sowerby.

1875. Proc. Zool. Soc., p. 145, pl. 15, fig. 1. Panama and southward. Galapagos Islands.

## CONUS LUCIDUS Mawe.

1828. WOOD, Index Test. suppl. pl. 3, fig. 4. Gulf of Panama; Paita, Peru; and Galapagos Islands.

## CONUS MONILIFER Sowerby.

1833. Proc. Zool. Soc., p. 54. Con. Ill., pl. 33, fig. 37, 1833. Magdalena Bay, Lower California, and south to Sechura Bay, Peru.

## CONUS PRINCEPS Linnæus.

1758. Syst. Nat., 10th ed., p. 713.—SOWERBY, Con. Ill., figs. 30a-30b, 1833. Panama, south to Paita, Peru.

## CONUS PURPURASCENS Broderip.

1833. Proc. Zool. Soc., p. 54.—SOWERBY, Con. Ill., fig. 13, 1833. Gulf of California and south to Paita, Peru.

## CONUS RECURVUS Broderip.

1833. Proc. Zool. Soc., p. 54.—SOWERBY, Con. Ill., fig. 36, 1833. Guaymas, Mexico, to Guayaquil.

## CONUS TORNATUS Broderip.

1833. Proc. Zool. Soc., p. 53.—SOWERBY, Con. Ill., fig. 25, 1833. Ecuador coast.

## CONUS XIMENES Gray.

1839. Zool. Beech. Voy. p. 119, pl. 33, fig. 2. Gulf of California to Sechura Bay, Peru.

## Family TURRITIDÆ.

## Genus SURCULA H. and A. Adams.

## SURCULA MACULOSA Sowerby.

1833. *Pleurotoma maculosa* SOWERBY, Proc. Zool. Soc., p. 135.—REEVE, Con. Icon., *Pleurotoma*, fig. 45. Gulf of California to Guayaquil.

## SURCULA MAURA Sowerby.

1833. *Pleurotoma maura* SOWERBY, Proc. Zool. Soc., p. 134.—REEVE, Con. Icon., *Pleurotoma*, fig. 47 (not *P. maura* Kiener). Guayaquil.

## SURCULA OLIVACEA Sowerby.

1833. *Pleurotoma olivacea* SOWERBY, Proc. Zool. Soc., p. 136.—REEVE, Con. Icon., *Pleurotoma*, fig. 27. Guayaquil, Salango, Ecuador.

## Genus DRILLIA Gray.

## DRILLIA ADUSTA Sowerby.

1833. *Pleurotoma adusta* SOWERBY, Proc. Zool. Soc., p. 137.  
*Monte Cristi*, Ecuador.

## DRILLIA ATERRIMA Sowerby.

1833. *Pleurotoma aterrima* SOWERBY, Proc. Zool. Soc., p. 137.—  
 REEVE, Con. Icon., *Pleurotoma*, fig. 100. *Monte Cristi*,  
 Ecuador.

## DRILLIA BOTTÆ Valenciennes.

1840. *Pleurotoma bottæ* (VALENCIENNES) KIENER, Icon., p. 33,  
 pl. 15, fig. 12. Gulf of California to Guayaquil.

## DRILLIA CLAVATA Sowerby.

1833. *Pleurotoma clavata* SOWERBY, Proc. Zool. Soc., p. 135.—  
 REEVE, Con. Icon., *Pleurotoma*, fig. 132. Ecuador coast. *Xipe*  
*Colomb*

## DRILLIA COLLARIS Sowerby.

1833. *Pleurotoma collaris* SOWERBY, Proc. Zool. Soc., p. 139.—  
 REEVE, Con. Icon., *Pleurotoma*, fig. 120. Ecuador coast. *Zaracuan*

## DRILLIA DISCORS Sowerby.

1833. *Pleurotoma discors* SOWERBY, Proc. Zool. Soc., p. 137.—  
 REEVE, Con. Icon., *Pleurotoma*, fig. 38. Ecuador coast. *Colomb*

## DRILLIA LUCTUOSA Hinds.

1843. *Pleurotoma luctuosa* HINDS, Proc. Zool. Soc., p. 40; Zool.  
 Sulph. Voy., p. 18, pl. 6, fig. 4 (as *Clavatula*). Magdalena  
 Bay, Lower California, and south to Guayaquil.

## DRILLIA NIGERRIMA Sowerby.

1833. *Pleurotoma nigerrima* SOWERBY, Proc. Zool. Soc., p.  
 137.—REEVE, Con. Icon., *Pleurotoma*, fig. 102. Gulf of  
 California to Ecuador. *Pleurotoma*

## DRILLIA ROSEA Sowerby.

1833. *Pleurotoma rosea* SOWERBY, Proc. Zool. Soc., p. 134.—  
 REEVE, Con. Icon., *Pleurotoma*, fig. 43. Nicaragua coast  
 and southward to Ecuador. *Delagoa*

## DRILLIA RUDIS Sowerby.

1833. *Pleurotoma rudis* SOWERBY, Proc. Zool. Soc., p. 134.—  
 REEVE, Con. Icon., *Pleurotoma*, fig. 53. Mazatlan, Mexico,  
 south to Ecuador and the Galapagos Islands. *Colomb*

## DRILLIA RUSTICA Sowerby.

1833. *Pleurotoma rustica* SOWERBY, Proc. Zool. Soc., p. 138.—  
 REEVE, Con. Icon., *Pleurotoma*, fig. 91. Mazatlan, Mexico,  
 and south to Ecuador.

## DRILLIA SOWERBYI Reeve.

1833. *Pleurotoma sowerbyi* REEVE, Con. Icon., errata, and fig.  
 49. Ecuador coast.

## DRILLIA ZONULATA Reeve.

1843. *Pleurotoma zonulata* REEVE, Syst. Con., vol. 2, pl. 234,  
 fig. 10; Con. Icon., *Pleurotoma*, fig. 39. Coast of Ecuador.

## Genus CLATHURELLA Carpenter.

## CLATHURELLA ASPERA Hinds.

1843. *Pleurotoma aspera* HINDS, Proc. Zool. Soc., p. 40; Zool. Sulph. Voy., p. 19, pl. 6, figs. 7, 8, 1844. Guayaquil.

## Genus MANGILIA (Leach) Risso.

## MANGILIA FORMICARIA Sowerby.

1833. *Pleurotoma formicaria* SOWERBY, Proc. Zool. Soc., p. 139.—REEVE, Con. Icon., *Pleurotoma*, fig. 247. Iquique.

## MANGILIA ORDINARIA E. A. Smith.

1882. Ann. Mag. Nat. Hist., p. 216.—TRYON, Man. Con., vol. 6, p. 250, pl. 34, fig. 97, 1884. Chile and Peru.

## MANGILIA RUFOCINCTA E. A. Smith.

1882. Ann. Mag. Nat. Hist., p. 215. Porto Cavallo.

## Family CANCELLARIIDÆ.

## Genus CANCELLARIA Lamarek.

## CANCELLARIA ALBIDA Hinds.

1843. Proc. Zool. Soc., p. 47.—SOWERBY, Thes. Con., vol. 2, p. 442, pl. 94, fig. 43, 1848. Coast of Nicaragua and south to Guayaquil.

## CANCELLARIA BREVIS Sowerby.

1832. Proc. Zool. Soc., p. 52; Thes. Con., pl. 93, fig. 21, 1848. Mazatlan, Mexico, and south to Guayaquil.

## CANCELLARIA BUCCINOIDES Sowerby.

1832. Proc. Zool. Soc., p. 54; Con. Ill., vol. 2, fig. 11, 1832. Coast of Nicaragua and southward to Mejillones, Chile.

## CANCELLARIA BULLATA Sowerby.

1832. Proc. Zool. Soc., p. 53; Con. Ill., fig. 35, 1832. Gulf of Panama and southward to Iquique.

## CANCELLARIA CASSIDIFORMIS Sowerby.

1832. Proc. Zool. Soc., p. 53; Con. Ill., fig. 22, 1832. Gulf of California to Paita, Peru.

## CANCELLARIA CHRYSOSTOMA Sowerby.

1832. Proc. Zool. Soc., p. 54; Thes. Con., p. 451, pl. 94, fig. 39. Gulf of Panama to Paita, Peru.

## CANCELLARIA CLAVATULA Sowerby.

1832. Proc. Zool. Soc., p. 52; Con. Ill., fig. 12, 1832. Panama to Paita, Peru.

## CANCELLARIA CORRUGATA Hinds.

1843. Proc. Zool. Soc., p. 48.—SOWERBY, Thes. Con., vol. 2, p. 448, pl. 96, figs. 92-93, 1848. Guayaquil.

## CANCELLARIA EXOPLEURA Dall.

1908. Albatross Rep., p. 294. Panama Bay to Paita, Peru.

Proc.N.M.vol.37—09—14

*Cancellaria curvingiana* Petit. Ecuador.  
Mancora, Peru. Hinds.

**CANCELLARIA MITRIFORMIS** Sowerby.

1832. Proc. Zool. Soc. p. 51; Con. Ill., fig. 15, 1832. Panama to Pacasmayo, Peru.

**CANCELLARIA OBESA** Sowerby.

1832. Proc. Zool. Soc., p. 52; Thes. Con., vol. 2, p. 441, pl. 95, fig. 37, 1848. Gulf of California to Guayaquil.

**CANCELLARIA PARVA** Philippi.

1860. Atacama Reise, p. 187, pl. 7, fig. 18. Paposo, Chile.

**CANCELLARIA TESSELATA** Sowerby.

1832. Proc. Zool. Soc., p. 51; Thes. Con., vol. 2, pl. 93, fig. 32, 1848. Gulf of California to Guayaquil.

**CANCELLARIA TUBERCULOSA** Sowerby.

1832. Proc. Zool. Soc., p. 51; Con. Ill., fig. 36, 1833. Callao. Peru, south to Mejillones, Chile.

**CANCELLARIA UNIPLICATA** Sowerby.

1848. Thes. Con., vol. 2, pl. 93, fig. 35. Panama to Valparaiso.

## Superfamily RHACHIGLOSSA.

### Family OLIVIDÆ.

#### Genus OLIVA Martyn.

**OLIVA ANGULATA** Lamarck.

1810. Ann. du Mus., vol. 16, p. 310; Encycl. Méth., pl. 363, fig. 6. Magdalena Bay, Lower California, southward to Peru.

**OLIVA KALEONTINA** Duclos.

1836. Mon. *Oliva*, pl. 8, figs. 7, 8.—SOWERBY, Thes. Con., p. 10, pl. 333, figs. 92, 93, 1871. Cape St. Lucas and southward to Paita, Peru, and the Galapagos Islands.

**OLIVA PERUVIANA** Lamarck.

1810. Ann. du Mus., vol. 16, p. 317.—REEVE, Con. Icon., fig. 14. Whole Peruvian province from Paita, Peru, to Lota, Chile, and the Galapagos Islands.

**OLIVA TESTACEA** Lamarck.

1810. Ann. du Mus., vol. 16, p. 324.—MARTENS, Arch. Nat., vol. 63, p. 165, pl. 15, figs. 13, 14, 1897; and var. *philippii*; Idem, pl. 16, figs. 7, 12, 1897. Mazatlan, Mexico, and southward to Cobija, Chile.

#### Genus OLIVELLA Swainson.

**OLIVELLA COLUMELLARIS** Sowerby.

1825. Tankerville Cat., App., p. xxxiv.—REEVE, Con. Icon., *Oliva*, fig. 62, 1850. Central American coast and southward to Sechura Bay, Peru.

**OLIVELLA SEMISTRIATA** Gray.

1839. Zool. Beech. Voy., p. 130, pl. 36, fig. 10. Gulf of California to Sechura Bay, Peru.

**OLIVELLA TERGINA** Duclos.

1835. Mon. *Oliva*, pl. 2, figs. 13–16.—REEVE, Con. Icon., *Oliva*, fig. 80, 1850. Acapulco, Mexico, and southward to Paita, Peru.

**OLIVELLA VOLUTELLA** Lamarck.

1810. *Oliva volutella* LAMARCK, Ann. du Mus., vol. 16, p. 322.—DUCLOS, Mon. *Oliva*, pl. 6, figs. 5, 6, 1835. Gulf of California to Paita, Peru.

**OLIVELLA ZONALIS** Lamarck.

1810. *Oliva zonalis* LAMARCK, Ann. du Mus., vol. 16, p. 327.—REEVE, Con. Icon., *Oliva*, fig. 56, 1850. Mazatlan, Mexico, to Guayaquil.

## Family MARGINELLIDÆ

## Genus MARGINELLA Lamarck.

**MARGINELLA CURTA** Sowerby.

1832. Proc. Zool. Soc., p. 105; Thes. Con., vol. 1, p. 397, pl. 76, figs. 88, 89. Gulf of California and southward to Iquique, Chile.

**MARGINELLA FRUMENTUM** Sowerby.

1832. Proc. Zool. Soc., p. 57.—REEVE, Con. Icon., *Marginella*, fig. 71, 1865. Cape St. Lucas and south to Guayaquil and the Galapagos Islands.

**MARGINELLA SAPOTILLA** Hinds.

1844. Proc. Zool. Soc., p. 74.—SOWERBY, Thes. Con., vol. 1, p. 383, pl. 77, figs. 150, 151. Gulf of Panama to Peru.

## Family VOLUTIDÆ.

## Genus ADELOMELON Dall.

**ADELOMELON MAGELLANICUS** Lamarck.

1811. *Voluta magellanica* LAMARCK, Ann. du Mus., vol. 17, p. 69; Encycl. Méth., pl. 385, figs. 1a, 1b, 1816. Chiloë Island and southward to Magellan Straits, and on the Argentine coast and the Falkland Islands.

**ADELOMELON ANCILLA** Solander.

1786. Portland Museum, p. 137, No. 3061.—LAMARCK, Encycl. Méth., pl. 385, fig. 3, 1816. Magellanic region and northward to Puerto Montt, and Chiloë Island, Chile.

## Family TURBINELLIDÆ.

## Genus VASUM Bolten.

**VASUM CÆSTUS** Broderip.

1833. *Turbinella cæstus* BRODERIP, Proc. Zool. Soc., p. 8.—REEVE, Con. Icon., *Turbinella*, pl. 6, fig. 34a. San Diego, California, south to Ecuador.

## Family MITRIDÆ.

## Genus MITRA Martyn.

## MITRA EFFUSA Swainson.

1835. Proc. Zool. Soc., p. 194.—REEVE, Con. Icon., *Mitra*, pl. 14, fig. 100, 1844. Gulf of Panama to the Galapagos Islands.

## MITRA LENS Mawe.

1828. WOOD, Ind. Test., suppl. pl. 3, fig. 25. Mazatlan, Mexico, south to Paita, Peru, and the Galapagos Islands.

## MITRA ORIENTALIS Gray.

1834. Griffith's Cuvier, pl. 40, fig. 5. Ancon, Peru, south to Iquique, Chile.

## MITRA SEMIGRANOSA Von Martens.

1897. Arch. Nat., vol. 63, p. 178, pl. 16, figs. 24, 25. Ecuador coast and south to Chile.

## MITRA SULCATA Swainson.

1825. Tankerville Cat., App., p. xxvi.—REEVE, Con. Icon., *Mitra*, pl. 22, fig. 176, 1844. West coast Central America and southward to Ecuador.

## MITRA TRISTIS Swainson.

1835. *Tiara tristis* SWAINSON, Proc. Zool. Soc., p. 194.—REEVE, Con. Icon., *Mitra*, pl. 15, fig. 114, 1844. Mazatlan, Mexico, to Guayaquil and the Galapagos Islands.

## Family FASCIOLARIIDÆ.

## Genus FASCIOLARIA Lamarck.

## FASCIOLARIA GRANOSA Broderip.

1832. Proc. Zool. Soc., p. 32.—REEVE, Con. Icon., *Fasciolaria*, fig. 6, 1847. West Mexico, Panama; Peru (Tschudi).

## FASCIOLARIA PRINCEPS Sowerby.

1825. Tankerville Cat., App., p. xvi.—KIENER, Icon., *Fasciolaria*, p. 6, pls. 12, 13. Gulf of California to Peru and the Galapagos Islands.

## Genus LATIRUS Montfort.

## LATIRUS CERATUS Gray.

1828. In WOOD, Ind. Test., suppl. pl. 5, fig. 15 (as *Murex*). Mazatlan, Mexico, to Manta, Ecuador, and the Galapagos Islands.

## LATIRUS CONCENTRICUS Reeve.

1847. Con. Icon., *Turbinella*, figs. 2, 44. Acapulco, to Panama and Guayaquil.

*Latirus (Seristernia) sowerbyi* Melvill Jour. Conch., Ser. 2, vol. 4, p. 191, fig. 1911, p. 176, fig. Proc. Mal. Soc. VII, 217, fig. Galapagos 261

## Family BUCCINIDÆ.

## Genus AUSTROFUSUS Kobelt.

## AUSTROFUSUS FONTAINEI Orbigny.

1841. *Fusus fontainei* ORBIGNY, Voy. Am. MÉR., p. 447, pl. 63, fig. 2. Callao, Peru, south to Valparaiso; Chile.

## Genus ATRACTODON Charlesworth.

## ATRACTODON PLUMBEUS Philippi.

1844. *Fusus plumbeus* PHILIPPI, Abb., vol. 1, p. 108, pl. 1, fig. 3. Southern Chile and the Magellanic region; Puerto Montt; Chiloë.

## Genus GALEODES Bolten.

## GALEODES PATULUS Broderip.

1829. *Pyrula patula* BRODERIP and SOWERBY, Zoöl. Journ., vol. 1, p. 377.—GRAY, Beech. Voy., Zoöl., p. 115, pl. 34, fig. 10; pl. 35, figs. 1, 3. Central American coast; Gulf of Panama and southward.

## Genus SOLENOSTEIRA Dall.

## SOLENOSTEIRA FUSIFORMIS Blainville.

1832. *Purpura fusiformis* BLAINVILLE, Nouv. Ann. du Mus., vol. 1, pl. 11, fig. 7.—REEVE, Con. Icon., *Buccinum*, pl. 7, fig. 50, 1846. Gulf of Panama and southward to the Chincha Islands, Peru.

*S. anomala* Reeve,

*Mancora, Peru, Olsson*

## Family COLUBRARIIDÆ.

## Genus COLUBRARIA Schumacher.

## COLUBRARIA SOWERBYI Reeve.

1844. *Triton sowerbyi* REEVE, Con. Icon., *Triton*, fig. 65. Galapagos Islands.

## Genus CANTHARUS Bolten.

## CANTHARUS BOLIVIANUS Eydoux and Souleyet.

1852. *Buccinum bolivianum* EYDOUX and SOULEYET, Voy. Bonite, Zoöl., vol. 2, p. 610, pl. 41, figs. 22, 24. Cobija, Chile.

## CANTHARUS DISTORTUS Gray.

1828. *Buccinum distortum* GRAY, in Wood, Ind. Test., suppl. pl. 4, fig. 7. Panama to Guayaquil.

## CANTHARUS ELEGANS Gray.

1833. *Triton (Pusio) elegans* GRAY, in Griffith's Cuvier, vol. 12, p. 600, pl. 25, fig. 2; not of ORBIGNY, 1852. Mazatlan, Mexico, to Paita, Peru.

## CANTHARUS GEMMATUS Reeve.

1846. *Buccinum gemmatum* REEVE, Con. Icon., fig. 49. Mazatlan, Mexico, to Guayaquil.

## CANTHARUS INCA Orbigny.

1841. *Murex inca* ORBIGNY, Voy. Am. Mér., p. 455, pl. 78, fig. 3. Peruvian coast, Pacasmayo to Callao.

## CANTHARUS JANELLI Kiener.

1835. *Purpura janelli* KIENER, Icon., *Purpura*, p. 122, pl. 38, fig. 89; not of VALENCIENNES, 1846. Païta, Peru, and the Chincha Islands.

## CANTHARUS RINGENS Reeve.

1846. *Buccinum ringens* REEVE, Con. Icon., fig. 45. Panama to Guayaquil.

## CANTHARUS SANGUINOLENTUS Duclos.

1833. *Purpura sanguinolenta* DUCLOS, Guérin, Mag. de Zoöl., vol. 5, p. 22, fig. 1. Mazatlan, and south to Guayaquil.

## CANTHARUS VIBEX Broderip.

1832. Proc. Zool. Soc., p. 175 (unfigured). Gulf of Panama to Guayaquil.

## Genus ENGINA Gray.

## ENGINA CONTRACTA Reeve.

1846. *Ricinula contracta* REEVE, Con. Icon., *Ricinula*, fig. 32. Gulf of Panama to Guayaquil.

## ENGINA CARBONARIA Reeve.

1846. *Ricinula carbonaria* REEVE, Con. Icon., fig. 22. Gulf of Panama to Manta, Ecuador, and the Galapagos Islands.

## Family ALECTRIONIDÆ.

## Genus ARCULARIA Link.

## ARCULARIA LUTEOSTOMA Broderip and Sowerby.

1829. *Nassa luteostoma* BRODERIP and SOWERBY, Zoöl. Journ., vol. 4, p. 376.—GRAY, Beech. Voy., p. 127, pl. 36, fig. 3, 1839. Mazatlan to Panama. Peru (Tschudi).

## ARCULARIA PAPOSANA Philippi.

1860. *Buccinum paposanum* Philippi, Atac. Reise, p. 188. Paposo, Chile.

## Genus ALECTRION Montfort.

## ALECTRION (HIMA) COMPLANATUS Powys.

1835. *Nassa complanata* POWYS, Proc. Zool. Soc., p. 36.—REEVE, Con. Icon., *Nassa*, figs. 105, 107, 111b. Gulf of Panama south to S. lat. 25°.

## ALECTRION (HIMA) DENTIFERUS Powys.

1835. *Nassa dentifera* POWYS, Proc. Zool. Soc., p. 95.—ORBIGNY, Voy. Am. Mér., p. 432, pl. 61, figs. 22, 23, 1841. Gulf of Panama south to Valparaiso, Chile.

## ALETRION (HIMA) ESCALÆ Philippi.

1860. *Buccinum escalæ* PHILIPPI, Atac. Reise, p. 188, pl. 7, fig. 19. Mejillones, Chile, S. lat. 23°.

ALETRION (HIMA) EXILIS Powys. + *faint handwritten note*

1835. *Nassa exilis* POWYS, Proc. Zool. Soc., p. 95.—REEVE, Con. Icon., *Nassa*, fig. 101a. Panama to Paita, Peru.

## ALETRION (HIMA) FESTIVUS Powys.

1835. *Nassa festiva* POWYS, Proc. Zool. Soc., p. 95.—REEVE, Con. Icon., *Nassa*, fig. 117. Panama to Guayaquil.

## ALETRION (HIMA) GAYII Kiener.

1835. *Buccinum gayii* KIENER, Icon., *Buccinum*, p. 71, pl. 21, fig. 79. Callao, Peru, southward to Magellan Straits.

## ALETRION INSCULPTUS Carpenter, var.?

Sechura Bay, Peru.

## ALETRION (HIMA) PANAMENSIS Philippi.

1851. *Buccinum panamense* PHILIPPI, Zeitschr. f. Mal., p. 61; not of ADAMS. Panama to Paita, Peru.

## ALETRION (HIMA) PLANICOSTATUS A. Adams.

1851. *Nassa planicostata* ADAMS, Proc. Zool. Soc., p. 108.—REEVE, Con. Icon., *Nassa*, fig. 96b. Paita.

## ALETRION (HIMA) SPARTA Marrat.

1897. *Nassa sparta* MARRAT, New forms of *Nassa*, p. 11, pl. 1, fig. 22. "West coast of South America."

## ALETRION (HIMA) VERSICOLOR C. B. Adams.

1852. *Nassa versicolor* ADAMS, Panama Shells, p. 66.—REEVE, Con. Icon., *Nassa*, fig. 110. Mazatlan, Mexico, to Paita, Peru. *cf. planicostata*

## ALETRION (TRITIA) TÆNIOLATUS Philippi.

1845. *Buccinum tæniolatum* PHILIPPI, Arch. f. Naturg., vol. 11, p. 69.—HUPÉ, Hist. Chile, vol. 8, p. 207, pl. 4, fig. 7, 1854. Magellan Straits and northward to Coquimbo, Chile.

## ALETRION (TRITIA) TSCHUDII Troschel.

1852. *Nassa tschudii* TROSCHEL, Arch. f. Naturg., p. 173, pl. 5, fig. 4. Peru.

## Genus NORTHIA Gray.

## NORTHIA NORTHIÆ Gray.

1833. *Nassa northiæ* GRAY, in Griffith's Cuvier, pl. 30, fig. 2.—KIENER, Icon., *Buccinum*, p. 23, pl. 9, fig. 28, 1834. Gulf of Panama and south to Guayaquil.

## Genus BUCCINANOPS Orbigny.

## BUCCINANOPS PAYTENSIS Valenciennes.

1834. *Buccinum paytensis* VALENCIENNES, Kiener, Icon., p. 17, pl. 6, fig. 16. Paita, Peru.

## Family COLUMBELLIDÆ.

## Genus COLUMBELLA Lamarck.

## COLUMBELLA FUSCATA Sowerby.

1832. Proc. Zool. Soc., p. 117; Thes. Con., *Columbella*, p. 114, pl. 36, figs. 21, 25, 1844. Gulf of California and southward to Paita, Peru, and the Galapagos Islands.

## COLUMBELLA HÆMASTOMA Sowerby.

1832. Proc. Zool. Soc., p. 116; Thes. Con., *Columbella*, p. 111, pl. 36, fig. 5, 1844. Gulf of California and southward to Ecuador and the Galapagos Islands.

## COLUMBELLA LABIOSA Sowerby.

1822. Gen. Sh., *Columbella*, fig. 2. Santa Elena, Guayaquil.

## COLUMBELLA MAJOR Sowerby.

1832. Proc. Zool. Soc., p. 119; Thes. Con., *Columbella*, p. 110, pl. 36, figs. 3, 4, 1844. Gulf of California, south to Paita, Peru.

## COLUMBELLA PAYTENSIS Lesson.

1830. Voy. Coq., vol. 2, pt. 1, p. 402.—SOWERBY, Thes. Con., *Columbella*, p. 116, pl. 36, figs. 36, 37, 1844. Pacific coast of Nicaragua and southward to Sechura Bay, Peru, and the Galapagos Islands.

## COLUMBELLA STROMBIFORMIS Lamarck.

1822. An. s. Vert., vol. 7, p. 293.—SOWERBY, Thes. Con., *Columbella*, p. 110, pl. 36, figs. 1, 2, 1844. Gulf of California to Paita, Peru, and the Galapagos Islands.

## COLUMBELLA UNCINATA Sowerby.

1832. Proc. Zool. Soc., p. 114.—SOWERBY, Thes. Con., *Columbella*, p. 112, pl. 36, figs. 13, 14, 1844. Guayaquil.

## Genus ANACHIS H. and A. Adams.

## ANACHIS FLUCTUATA Sowerby.

1832. Proc. Zool. Soc., p. 115.—KIENER, Icon., *Columbella*, p. 45, pl. 9, fig. 2. Gulf of Panama to Paita, Peru.

## ANACHIS GUATEMALENSIS Reeve.

1859. *Columbella guatemalensis* REEVE, Con. Icon., vol. 11, pl. 31, fig. 198. Gulf of California to Zorritos, Peru.

## ANACHIS PYGMÆA Sowerby.

1832. *Columbella pygmæa* SOWERBY, Proc. Zool. Soc., p. 119; Thes. Con., *Columbella*, p. 141, pl. 40, fig. 163, 1847. Gulf of California to Guayaquil.

## ANACHIS RUGOSA Sowerby.

1832. *Columbella rugosa* SOWERBY, Proc. Zool. Soc., p. 115; *C. bicolor* KIENER, Icon., *Columbella*, p. 46, pl. 16, fig. 4. Gulf of California to Paita, Peru.

## ANACHIS RUGULOSA Sowerby.

1844. *Columbella rugulosa* SOWERBY, Proc. Zool. Soc., p. 51; Thes. Con., *Columbella*, p. 133, pl. 39, fig. 131, 1844. Gulf of Panama to Paita, Peru, and the Galapagos Islands.

## ANACHIS VARICOSA Gaskoin.

1851. *Columbella costellata* SOWERBY, Proc. Zool. Soc., 1832, p. 118; not of SOWERBY 1829. *C. varicosa* GASKOIN, Proc. Zool. Soc., 1851, p. 5.—SOWERBY, Thes. Con., *Columbella*, fig. 147, 1844. Mazatlan, Mexico, south to Paita, Peru, and Arica, Chile.

## Genus ASTYRIS H. and A. Adams.

## ASTYRIS ELECTROIDES Reeve.

1858. *Columbella electroides* REEVE, Con. Icon., fig. 72. Guayaquil.

## ASTYRIS UNICOLOR Sowerby.

1832. *Columbella unicolor* SOWERBY, Proc. Zool. Soc., p. 119.—REEVE, Con. Icon., *Columbella*, fig. 105. From Chimbote Bay, Peru, south to the island of Chiloë, Chile; also at the Galapagos Islands.

## ASTYRIS UNIFASCIATA Sowerby.

1832. *Columbella unifasciata* SOWERBY, Proc. Zool. Soc., p. 114; Thes. Con., *Columbella*, p. 133, pl. 39, fig. 130, 1844. Valparaiso, Chile, north to Arica. Magellan? (*C. ebenum* Gould.).

## Genus NITIDELLA Swainson.

## NITIDELLA BUCCINOIDES Sowerby.

1832. *Columbella buccinoides* SOWERBY, Proc. Zool. Soc., p. 114 (not of LESSON, 1842).—SOWERBY, Thes. Con., fig. 128, 1844. Paita, Peru, south to Coquimbo, Chile.

## NITIDELLA OCELLATA Gmelin.

1791. *Voluta ocellata* GMELIN, S. Nat., vol. 8, p. 3455.—REEVE, Con. Icon., *Columbella*, fig. 62. Tropical Atlantic. West Indies. Pacific, from Cape St. Lucas south to the Galapagos Islands and Guayaquil.

## NITIDELLA OBLITA Reeve.

1859. *Columbella oblita* REEVE, Con. Icon., vol. 11, pl. 31, fig. 22. Peru.

## Genus STROMBINA Morch.

## STROMBINA DORSATA Sowerby.

1832. Proc. Zool. Soc., p. 120.—REEVE, Con. Icon., *Columbella* fig. 15a. 1858. Guayaquil.

## STROMBINA GIBBERULA Sowerby.

1832. *Columbella gibberula* SOWERBY, Proc. Zool. Soc., p. 115.—REEVE, Con. Icon., *Columbella*, fig. 61b. 1858. West coast of Central America and southward to Paita, Peru.

## STROMBINA LANCEOLATA Sowerby.

1832. *Columbella lanceolata* SOWERBY, Proc. Zool. Soc., p. 116; (not of LOCARD, 1886); Thes. Con., *Columbella*, p. 139, pl. 40, fig. 153-155, 1847. Paita, Peru, and the Galapagos Islands.

## STROMBINA RECURVA Sowerby.

1832. *Columbella recurva* SOWERBY, Proc. Zool. Soc., p. 115.—REEVE, Con. Icon., fig. 18a, 1858. Central America and south to Guayaquil.

## STROMBINA TURRITA Sowerby.

1832. *Columbella turrita* SOWERBY, Proc. Zool. Soc., p. 115; Thes. Con., p. 135, pl. 39, figs. 137, 138, 1847. Nicaragua, to coast of Ecuador.

## Family MURICIDÆ.

## Genus TROPHON Montfort.

## Subgenus XANTHOCHORUS Fischer.

## TROPHON CASSIDIFORMIS Blainville.

1832. *Purpura cassidiformis* BLAINVILLE, Nouv. Ann. du Mus., vol. 1, p. 214.—REEVE, Con. Icon., *Purpura*, fig. 24. Paita, Peru, south to Chiloë Island, Chile, and at the Galapagos Islands.

TROPHON HORRIDUS Broderip. ? *tritonalis*

1832. *Murex horridus* BRODERIP, Proc. Zool. Soc., p. 176.—SOWERBY, Con. Ill., *Murex*, fig. 29, 1834. Panama and south to Antofagasta, Chile.

## Subgenus TROPHON s. s.

## TROPHON LACINIATUS Martyn.

1784. *Buccinum laciniatum* MARTYN, Univ. Conch., vol. 2, pl. 42. Magellan Straits and northward to Puerto Montt, Chile.

## Genus MUREX Linnæus.

## MUREX ELENENSIS Dall, new name.

1909. *Murex plicatus* SOWERBY, Proc. Zool. Soc., 1840, p. 139; Con. Ill., *Murex*, fig. 6, 1834. Not *M. plicatus* GMELIN, 1791. Gulf of California and south to Santa Elena, Bay of Guayaquil.

## MUREX NIGRESCENS Sowerby.

1840. Proc. Zool. Soc., p. 138; Con. Ill., vol. 2, pl. 198, fig. 113, 1841. Jipijapa, Ecuador.

## Genus PHYLLONOTUS Swainson.

## PHYLLONOTUS BICOLOR Valenciennes.

1833. *Murex bicolor* VALENCIENNES, Zool. Humboldt Voy., vol. 2, p. 301.—REEVE, Con. Icon., *Murex*, pl. 11, fig. 44, 1845. Guaymas, Mexico, to Paita, Peru.

## PHYLLONOTUS BRASSICA Lamarck.

1822. *Murex brassica* LAMARCK, An. s. Vert., vol. 7, p. 167.—SOWERBY, Con. Ill., fig. 56, 1834. Mazatlan, Mexico, and south to Peru.

## PHYLLONOTUS EXIGUUS Broderip.

1832. *Murex exiguus* BRODERIP, Proc. Zool. Soc., p. 175.—SOWERBY, Con. Ill., fig. 17, 1834. Salango, Ecuador.

## PHYLLONOTUS HUMILIS Broderip.

1832. *Murex humilis* BRODERIP, Proc. Zool. Soc., p. 176.—SOWERBY, Con. Ill., figs. 46, 47, 1834. Gulf of Panama to Guayaquil.

## PHYLLONOTUS INCISUS Broderip.

1832. *Murex incisus* BRODERIP, Proc. Zool. Soc., p. 176 (not of CARPENTER).—SOWERBY, Con. Ill., fig. 13, 1834. Bay of Guayaquil.

## PHYLLONOTUS LAPPA Broderip.

1832. *Murex lappa* BRODERIP, Proc. Zool. Soc., p. 177.—SOWERBY, Con. Ill., fig. 15, 1834. Mazatlan, Mexico, south to Guayaquil.

## PHYLLONOTUS RADIX Lamarck.

1822. *Murex radix* LAMARCK., An. s. Vert., vol. 7, p. 168 (after GMELIN, 1791).—KIENER, Icon., *Murex*, p. 60, pl. 37, fig. 1; pl. 38, fig. 1. Acapulco, Mexico, southward to Panama and Paita, Peru.

## PHYLLONOTUS REGIUS Wood.

1828. *Murex regius* WOOD, Ind. Test., suppl. pl. 5, fig. 13. Acapulco, Mexico, to Peru and the Galapagos Islands.

## PHYLLONOTUS SQUAMOSUS Broderip.

1832. *Murex squamosus* BRODERIP, Proc. Zool. Soc., p. 176.—SOWERBY, Con. Ill. fig. 27, 1834. Paita, Peru.

## PHYLLONOTUS TORTUOSUS Sowerby.

1841. *Murex tortuosus* SOWERBY, Con. Ill., *Murex*, fig. 8; new name for *M. crispus* (BRODERIP not of LAMARCK). Pacasmayo, Peru.

## PHYLLONOTUS VARICOSUS Sowerby.

1834. Con. Ill., *Murex*, fig. 49.—*Murex varicosus* SOWERBY, Proc. Zool. Soc., p. 115, 1840; Acapulco, Mexico, and south to Ecuador.

## Genus TRITONALIA Fleming.

## TRITONALIA BUXEA Broderip.

1832. *Murex buxeus* BRODERIP, Proc. Zool. Soc., p. 194.—SOWERBY, Con. Ill., *Murex*, pl. 61, fig. 28, 1834. Pacasmayo, Peru, and south to Iquique, Chile.

## TRITONALIA CRASSILABRUM Gray.

1829. *Murex crassilabrum* GRAY, Spicil. Zool., vol. 1, p. 4.—SOWERBY, Con. Ill., *Murex*, fig. 14, 1834. Peruvian coast and southward to Valparaiso, Chile.

## TRITONALIA HAMATA Hinds.

1844. *Murex hamatus* HINDS, Zool. Sulph. Voy., p. 8, pl. 3, figs. 11, 12. Guayaquil, Ecuador, and south to Paita, Peru.

## Genus PURPURA Martyn.

## PURPURA FONTAINEI Tryon.

1880. *Murex fontainei* TRYON, Man., vol. 2, p. 126, pl. 35, figs. 384, 385. Paita, Peru.

## PURPURA PINNIGERA Broderip.

1832. *Murex pinniger* BRODERIP, Proc. Zool. Soc., p. 174.—*M. cristatus* GRAY, Con. Ill., fig. 50, 1834. Jipijapa, Ecuador.

## Genus TYPHIS Montfort.

## TYPHIS CORONATUS Broderip.

1832. Proc. Zool. Soc., p. 178.—SOWERBY, Con. Ill., pl. 200, figs. 3, 4, 1841. Salango, Ecuador.

## TYPHIS CUMINGII Broderip.

1832. Proc. Zool. Soc., p. 177.—SOWERBY, Con. Ill., pl. 200, figs. 1, 2, 1841. Bahia de Caraques, Ecuador.

## TYPHIS QUADRATUS Hinds.

1843. Proc. Zool. Soc., p. 18; Zool. Sulph. Voy., p. 10, pl. 3, figs. 3, 4, 1844. Gulf of Panama, and south to Guayaquil.

## Genus MURICIDEA Swainson.

## MURICIDEA VITTATA Broderip.

1832. *Murex vittatus* BRODERIP, Proc. Zool. Soc., p. 176; Con. Ill., *Murex*, fig. 19, 1834. Manta, Ecuador, and south to Paita, Peru.

## Genus EUPLEURA Adams.

## EUPLEURA MURICIFORMIS Broderip.

1832. *Ranella muriciformis* BRODERIP, Proc. Zool. Soc., p. 179.—REEVE, Con. Icon., *Ranella*, fig. 41. Bay of Montijo, West Columbia, and north to Gulf of California.

## EUPLEURA NITIDA Broderip.

1832. *Ranella nitida* BRODERIP, Proc. Zool. Soc., p. 179.—REEVE, Con. Icon., *Ranella*, fig. 45. Bahia de Caraques, Ecuador.

## Genus THAIS Bolten.

## THAIS BISERIALIS Blainville.

1832. *Purpura biserialis* BLAINVILLE, Mon. *Purpura*, p. 50, pl. 11, fig. 11. Cedros Island, west coast of Lower California, and southward to Callao, Peru.

## THAIS CALLAËNSIS Gray.

1828. *Purpura callaënsis* GRAY, Spicil. Zool., p. 4, pl. 6, fig. 11.—REEVE, Con. Icon., *Purpura*, fig. 79, 1846. Gulf of Panama, and southward to Callao, Peru.

## THAIS CHOCOLATA Duclos.

1832. *Purpura chocolata* DUCLOS, Ann. Sci. Nat., vol. 26, p. 108, pl. 2, fig. 7.—ORBIGNY, Voy. Am. MÉR., vol. 5, p. 436, pl. 61, figs. 1-3, 1841. Paita, Peru, south to Valparaiso, Chile.

## THAIS COLUMELLARIS Lamarck.

1822. *Purpura columellaris* LAMARCK, An. s. Vert., vol. 7, p. 236.—REEVE, Con. Icon., *Purpura*, pl. 2, fig. 9, 1846. Gulf of Panama to Peru and the Galapagos Islands.

## THAIS COSTATA Blainville.

1832. *Purpura costata* BLAINVILLE, Nouv. Ann. du Mus., vol. I, p. 231, pl. 11, fig. 8. Mazatlan, Mexico, to Paita, Peru.

## THAIS CRASSA Blainville.

1832. *Purpura crassa* BLAINVILLE, Nouv. Ann. du Mus., vol. 1, p. 241, pl. 12, fig. 4 (March).—*P. melones* DUCLOS, Ann. Sci. Nat., vol. 26, p. 105, pl. 1, fig. 2 (May), 1832. Gulf of Panama to Callao, Peru, and the Galapagos Islands.

## THAIS DELESSERTIANA Orbigny.

1841. Voy. Am. MÉR., p. 439, pl. 77, fig. 7. Cedros Island, Lower California, south to the Chincha Islands, Peru.

## THAIS KIOSQUIFORMIS Duclos.

1832. *Purpura kiosquiformis* DUCLOS, Ann. Sci. Nat., vol. 26, pl. 1, fig. 5.—KIENER, Icon., *Purpura*, p. 59, pl. 15, fig. 40. Magdalena Bay, Lower California, southward to Tumbes, Peru.

## THAIS PATULA Linnæus.

1758. *Buccinum patulum* LINNÆUS, Syst. Nat., 10th ed., p. 739; 12th ed., p. 1202, 1767.—REEVE, Con. Icon., *Purpura*, fig. 3. Gulf of California to Panama and the Galapagos. Peru (Tschudi). West Indies.

## THAIS PERUËNSIS Dall, new name.

1909. *Purpura peruviana* EYDOUX and SOULEYET, Voy. Bonite, Zoöl., vol. 2, p. 606, pl. 40, figs. 1-3, 1852. Not of BLAINVILLE, 1832. Paita and Pacasmayo, Peru.

## THAIS PLANOSPIRA Lamarck.

1822. *Purpura planospira* LAMARCK, An. s. Vert., vol. 7, p. 240.—REEVE, Con. Icon., *Purpura*, pl. 3, fig. 14, 1846. Lower California, and southward to Peru, and the Galapagos Islands.

## THAIS TRIANGULARIS Blainville.

1832. *Purpura triangularis* BLAINVILLE, Nouv. Ann. du Mus., vol. 1, p. 223, pl. 11, fig. 4. Mazatlan, Mexico, and south to Paita, Peru, and the Galapagos Islands.

## Genus CYMIA Morch.

## CYMIA TECTUM Wood.

1828. *Buccinum tectum* WOOD, Ind. Test., suppl. pl. 4, fig. 13.—  
SOWERBY, Gen. Sh., *Purpura (callosa)*, fig., 1834. Gulf of  
Panama to Manta, Ecuador.

## Genus CONCHOLEPAS Lamarck.

CONCHOLEPAS CONCHOLEPAS Bruguière. = *C. loco, Molina, 1782, as Murex*

1789. *Buccinum concholepas* BRUGUIÈRE, Encycl. Méth., p. 252.  
*Purpura peruviana* BLAINVILLE, Mon., *Purpura*, p. 55, 1832.—  
TRYON, Man. Con., vol. 2, p. 199, pl. 162, figs. 314–316,  
1880. West coast of Mexico (v. Martens); Callao, Peru, and  
southward to Magellan Straits.

## Genus ACANTHINA Fischer.

## ACANTHINA BREVIDENTATA Mawe.

1828. *Buccinum brevidentatum* MAWE, in Wood, Index Test.,  
suppl. pl. 4, fig. 10. Gulf of Panama to Paita, Peru.

## ACANTHINA CALCAR-LONGUM Martyn.

1784. *Buccinum calcar-longum* MARTYN, Univ. Conch., pl. 50.  
*B. unicomne* BRUGUIÈRE, Enc. Méth., p. 254, pl. 396, fig. 2,  
1789. Peruvian coast, south to the island of Chiloë, Chile.

## ACANTHINA MURICATA Broderip.

1832. *Purpura muricata* BRODERIP, Proc. Zool. Soc., p. 125.—  
REEVE, Con. Icon., *Monoceros*, pl. 2, fig. 7, 1846. Mazatlan,  
Mexico, to Guayaquil, Ecuador.

## ACANTHINA TUBERCULATA Gray.

1835. SOWERBY, Con. Ill., *Monoceros*, pl. 82, fig. 9. Mazatlan,  
Mexico, to Paita, Peru, and the Galapagos Islands.

## Genus CHORUS Gray.

## CHORUS GIGANTEUS Lesson.

1829. *Monoceros giganteus* LESSON, Voy. Coq., Moll., p. 405,  
pl. 11, fig. 4. Concepcion, Chile.

## Family CORALLIOPHILIDÆ.

## Genus CORALLIOPHILA H. and A. Adams.

## CORALLIOPHILA CARDUUS Broderip.

1832. *Murex carduus* BRODERIP, Proc. Zool. Soc., p. 175.—  
SOWERBY, Con. Ill., *Murex*, pl. 61, fig. 22, 1834. Pacas-  
mayo, Peru, from a coral reef 12 miles off shore.

## CORALLIOPHILA SCALARIFORMIS Lamarck.

1822. *Purpura scalariformis* LAMARCK, An. s. Vert., vol. 7,  
p. 241.—KIENER, Icon., *Purpura*, p. 74, pl. 19, fig. 55.  
Guayaquil.

## Suborder STREPTODONTA.

## Superfamily PTENOGLOSSA.

## Family SCALIDÆ.

## Genus EPITONIUM Bolten.

## EPITONIUM DUCALE Mörch.

1875. *Scalaria ducalis* MÖRCH, Mal. Blätt., vol. 22, p. 143.—  
SOWERBY, Thes. Con., *Scalaria*, p. 88, pl. 34, fig. 75, 1847;  
as *S. principalis* (not of PALLAS, 1774). Jipijapa, Ecuador.

## EPITONIUM ELENENSE Sowerby.

1844. *Scalaria elenensis* SOWERBY, Proc. Zool. Soc., p. 29; Thes.  
Con., *Scalaria*, p. 98, pl. 34, fig. 102, 1847. Santa Elena, Bay  
of Guayaquil, Ecuador.

## EPITONIUM OBTUSUM Sowerby.

1844. *Scalaria obtusa* SOWERBY, Proc. Zool. Soc., p. 29; Thes.  
Con., *Scalaria*, p. 98, pl. 33, fig. 54, 1847. Santa Elena, Bay  
of Guayaquil, Ecuador.

## EPITONIUM ORBIGNYI Nyst.

1873. *Scalaria orbignyi* NYST, Tabl., p. 48; *S. elegans* ORBIGNY,  
Voy. Am. Mér., p. 389, pl. 54, figs. 1, 2, 1840; not of RISSO,  
1826. Southern Chile.

## EPITONIUM POLITUM Sowerby.

1844. *Scalaria polita* SOWERBY, Proc. Zool. Soc., p. 30; Thes.  
Con., *Scalaria*, p. 100, pl. 34, fig. 99, 1847. Jipijapa, Ecuador.

## EPITONIUM STATUMINATUM Sowerby.

1844. *Scalaria statuminata* SOWERBY, Proc. Zool. Soc., p. 30;  
Thes. Con., *Scalaria*, p. 102, pl. 35, fig. 127, 1847. Bay of  
Guayaquil, southward to Paita, Peru.

## Family JANTHINIDÆ.

## Genus JANTHINA Bolten.

## JANTHINA EXIGUA Lamarck.

1822. An. s. Vert., vol. 6, pt. 2, p. 206.—TRYON, Man., vol. 9,  
p. 37, pl. 10, figs. 17–22, 1887. Chile; also Atlantic and Pacific  
oceans. Pelagic.

## JANTHINA JANTHINA Linneus.

1758. *Helix janthina* LINNÆUS, Syst. Nat., 10th ed., p. 772.—  
ORBIGNY, Voy. Am. Mér., p. 413, pl. 61, figs. 8–10, 1841.  
Pelagic. N. Lat. 42° to S. lat. 36° in the Pacific Ocean.

## JANTHINA PALLIDA Harvey.

1817. Thompson's Ann. Phil. Nat. Hist., vol 5, p. 96, pl. 2, fig.  
2. Pelagic in the tropical Pacific and Atlantic.

## Superfamily GYMNOGLOSSA.

## Family EULIMIDÆ.

## Genus EULIMA Risso.

## EULIMA HASTATA Sowerby.

1834. Proc. Zool. Soc., p. 7.—REEVE, Con. Icon., *Eulima*, fig. 9.—SOWERBY, Con. Ill., *Eulima*, fig. 10, 1841. Santa Elena, Bay of Guayaquil, Ecuador.

## EULIMA PUSILLA Sowerby.

1834. Proc. Zool. Soc., p. 7; Con. Ill., *Eulima*, fig. 6, 1841. Santa Elena, Bay of Guayaquil, Ecuador.

## EULIMA VARIANS Sowerby.

1834. Proc. Zool. Soc., p. 8.—REEVE, Con. Icon., *Leiostraca*, fig. 1.—SOWERBY, Con. Ill., *Eulima*, fig. 14, 1841. Jipijapa, Ecuador.

## Genus NISO Risso.

## NISO IMBRICATA Sowerby.

1834. *Eulima imbricata* SOWERBY, Proc. Zool. Soc., p. 1.—REEVE, Con. Icon., *Niso*, fig. 3. Santa Elena, Bay of Guayaquil, Ecuador.

## NISO SPLENDIDULA Sowerby.

1834. *Eulima splendidula* SOWERBY, Proc. Zool. Soc., p. 6.—REEVE, Con. Icon., *Niso*, fig. 7. Santa Elena, Bay of Guayaquil, Ecuador. Also western Atlantic and Gulf of Mexico.

## Genus ENTOCOLAX Voight.

## ENTOCOLAX SCHIEMENZII Voight.

1901. Zool. Anz., vol. 24, pp. 285-292, illustrated. Chile. (Ento-parasitic in *Chirodota pisanii*.)

## Family PYRAMIDELLIDÆ.

## Genus TURBONILLA Risso.

## TURBONILLA (PYRGISCUS) ANNETTÆ Dall and Bartsch.

1909. Mon. W. Am. Pyr., Bull. U. S. Nat. Mus., No. 68, p. 76, pl. 7, fig. 7.  
Off Manta, Ecuador.

## TURBONILLA (PYRGISCUS) CORA Orbigny.

1840. *Chemnitzia cora* ORBIGNY, Voy. Am. MÉR., p. 398, pl. 76, figs. 7-9. Paita, Peru.

## Genus ODOSTOMIA Fleming.

## ODOSTOMIA (MENESTHO) CHILENSIS Dall and Bartsch.

1909. Mon. W. Am. Pyr., Bull. U. S. Nat. Mus., No. 68, p. 189, pl. 21, fig. 6.  
Tomé, Chile, in 14 fathoms.

## Superfamily NUCLEOBRANCHIATA.

## Family ATLANTIDÆ.

## Genus ATLANTA Lesueur.

## ATLANTA PERONII Lesueur.

1836. Voy. Am. Mér., p. 171, pl. 12, figs. 1-15. Eastern Pacific. Pelagic. Also Atlantic.

## ATLANTA TURRICULATA Orbigny.

1836. Voy. Am. Mér., p. 173, pl. 20, figs. 5-11. Eastern Pacific, lat. 30° S. Pelagic.

## Genus OXYGYRUS Benson.

## OXYGYRUS RANGII Eydoux and Souleyet.

1841. Voy. Bonite, Atlas, pl. 18, figs. 18-24; text, Zool., vol. 2, p. 369, 1852. Southeastern Pacific. Pelagic.

## Family PTEROTRACHEIDÆ.

## Genus PTEROTRACHEA Forskål.

## PTEROTRACHEA PERONII Orbigny.

1836. *Firola (Anops) peronii* ORBIGNY, Voy. Am. Mér., p. 149, pl. 10, figs. 8-10. Eastern Pacific, lat. 20° S. Pelagic.

## Genus FIROLOIDA Lesueur.

## FIROLOIDA LESUEURI Orbigny.

1836. *Firola (Cerophora) lesueuri* ORBIGNY, Voy. Am. Mér., p. 151, pl. 10, figs. 11-12. Eastern Pacific, lat. 30° S. Pelagic.

## Genus CARINARIA Lamarek.

## CARINARIA PUNCTATA Orbigny.

1836. Voy. Am. Mér., p. 160, pl. 11, figs. 6-15. Off Juan Fernandez Island, S. lat. 33°. Pelagic.

## Superfamily TÆNIOGLOSSA.

## Family SEPTIDÆ.

## Genus DISTORTIO Bolten.

## DISTORTIO CONSTRICTUS Broderip.

1833. *Triton constrictus* BRODERIP, Proc. Zool. Soc., p. 5.—REEVE, Con. Icon., *Triton*, pl. 12, fig. 41, 1844. Acapulco, Mexico, south to the coast of Ecuador.

## Genus CYMATIUM Bolten.

## CYMATIUM GIBBOSUM Broderip.

1833. *Triton gibbosum* BRODERIP, Proc. Zool. Soc., p. 7.—REEVE, Con. Icon., *Triton*, pl. 11, fig. 38, 1844. Panama to Guayaquil.

## CYMATIUM LIGNARIUM Broderip.

1833. *Triton lignarius* BRODERIP, Proc. Zool. Soc., p. 5.—REEVE, Con. Icon., *Triton*, pl. 13, fig. 40, 1844. Gulf of Panama to Ecuador.

## CYMATIUM PILEARE Linnæus.

1758. *Murex pilearis*, LINNÆUS, Syst. Nat., 10th ed., p. 749; *Triton pilearis* LAMARCK; Küster, Con. Cab., 2d ed., *Triton*, p. 196, pl. 42, figs. 3, 4; pl. 56, fig. 4, 1878. Peru (Tschudi). Indo-Pacific and Atlantic, West Indies.

## CYMATIUM COSTATUM Born.

1778. *Murex costata* BORN, Ind. Mus. Vind., p. 295.—*Murex olearium* LINNÆUS, 1767, not 1758.—KOBELT, Icon. Europ. Meeresconch., vol. 2, pl. 38, figs. 1, 2; pl. 39, fig. 1, 1901. Paita, Peru; Galapagos Islands. Cosmopolitan.

## CYMATIUM VESTITUM Hinds.

1844. *Triton vestitus* HINDS, Zool. Sulph. Voy., p. 11, pl. 4, fig. 1. West Coast of Central America to the Chincha Islands, Peru.

## CYMATIUM CINGULATUM Lamarck.

1822. *Cassidaria cingulata* LAMARCK, An. s. Vert., vol. 7, p. 216.—REEVE, Con. Icon., vol. 2, *Triton*, fig. 35. Peru (Tschudi). Indo-Pacific region.

## CYMATIUM WIEGMANNI Anton.

1839. *Triton wiegmanni* ANTON, Verz., p. 77.—REEVE, Con. Icon., *Triton*, fig. 37. Mazatlan, Mexico, to Paita, Peru.

## Genus ARGOBUCCINUM Möreh.

## ARGOBUCCINUM RUDE Broderip.

1833. *Triton rudis* BRODERIP, Proc. Zool. Soc., p. 6.—REEVE, Con. Icon., *Triton*, fig. 53. Iquique to Valparaiso, Chile.

## ARGOBUCCINUM SCABRUM King.

1831. *Triton scaber* KING, Zool. Journ., vol. 5, p. 348.—*Polia scabra* GRAY, Zool. Beechey's Voy., p. 111, pl. 36, fig. 16, 1837. Coast of Ecuador, south to Valparaiso, Chile.

ARGOBUCCINUM VEXILLUM Sowerby. = *ranelliforme* King, 1831

1841. *Ranella vexillum* SOWERBY, Proc. Zool. Soc., p. 51; Con. Ill., *Ranella*, fig. 13, 1841. Southern Chile.

## Family RANELLIDÆ.

## Genus BURSA Bolten.

## BURSA CÆLATA Broderip.

1832. *Ranella cælata* BRODERIP, Proc. Zool. Soc., p. 179.—REEVE, Con. Icon., *Ranella*, fig. 4. Panama. Peru (Tschudi).

## BURSA VENTRICOSA Broderip.

1832. *Ranella ventricosa* BRODERIP, Proc. Zool. Soc., p. 178.—SOWERBY, Con. Ill., pl. 92, fig. 16, 1836. West coast of Nicaragua, south to Callao, Peru.

## Family CASSIDIDÆ.

## Genus CASSIDEA Bruguière.

## CASSIDEA (BEZOARDICA) ABBREVIATA Lamarck.

1822. *Cassis abbreviata* LAMARCK, An. s. Vert., vol. 7, p. 224.—  
REEVE, Con. Icon., *Cassis*, fig. 18, 1848. Central American  
coast and south to Guayaquil.

## Family DOLIIDÆ.

## Genus MALEA Valenciennes.

## MALEA RINGENS Swainson.

1822. *Dolium ringens* SWAINSON, Bligh Cat. app., p. 4.—REEVE,  
Con. Icon., *Dolium*, pl. 4, fig. 5, 1848. Acapulco, Mexico,  
and south to Paita, Peru, and the Galapagos Islands.

## Family AMPHIPERASIDÆ.

## Genus SIMNIA Risso.

## SIMNIA RUFÆ Sowerby.

1832. *Ovula rufa* SOWERBY, Proc. Zool. Soc., p. 173; Con. Ill.,  
fig. 58, 1836. Bahia de Caraquez, Ecuador.

## Genus CYPHOMA Bolten.

## CYPHOMA EMARGINATA Sowerby.

1830. *Ovula emarginata* SOWERBY, Species Con., pt. 1, p. 7,  
figs. 54, 55; Thes. Con., *Ovulum*, figs. 11, 12. Panama to  
Guayaquil.

## Family CYPRÆIDÆ.

## Genus CYPRÆA Linnæus.

## CYPRÆA ALBUGINOSA Gray.

1824. Zool. Journ., vol. 1, p. 510, pl. 7, fig. 2, p. 12, fig. 2.—  
SOWERBY, Con. Ill., *Cypræa*, p. 6, no. 45, 1832. Gulf of  
California to the Galapagos Islands.

## CYPRÆA ANNETTÆ Dall.

1909. Dall, Nautilus, vol. 22, no. 12, p. 125.—*C. sowerbyi*  
KIENER, 1845, Icon., *Cypræa*, p. 38, pl. 7, fig. 3; not of  
GRAY, 1832. Gulf of California and southward to Sechura  
Bay, Peru.

## CYPRÆA ARABICULA Lamarck.

1810. An. du Mus., vol. 16, p. 100, no. 54; An. s. Vert., vol. 7,  
p. 399.—SOWERBY, Thes. Con., *Cypræa*, p. 16, pl. 7, figs. 38,  
39, 1859. Gulf of California to Paita, Peru.

## CYPRÆA EXANTHEMA Linnæus.

1767. Syst. Nat., 12th ed., p. 1172.—SOWERBY, Thes. Con.,  
*Cypræa*, p. 5, pl. 22, fig. 181, 1859. Gulf of California to  
Paita, Peru, and the Galapagos Islands.

## CYPRÆA NIGROPUNCTATA Gray.

1828. Zoöl. Journ., vol. 4, p. 81.—SOWERBY, Con. Ill., *Cypræa*, fig. 22, 1832. Manta, Ecuador, south to Paita, Peru (Chile, Hidalgo), and the Galapagos Islands.

## CYPRÆA ROBERTSI Hidalgo.

1906. Mon. *Cypræa*, pp. 161, 220.—*C. punctulata*, GRAY, Zoöl. Journ., vol. 1, p. 387, 1824; not of GMELIN, Syst. Nat., p. 340 $\frac{1}{2}$ , 1791.—SOWERBY, Con. Ill., *Cypræa*, pl. 4, fig. 20, 1832. Gulf of California to Paita, Peru.

## Family TRIVIIDÆ.

## Genus TRIVIA Gray.

## TRIVIA ACUTIDENTATA Gaskoin.

1835. Proc. Zool. Soc., p. 201.—BUTTON, Nautilus, vol. 19, p. 132, 1906. (Unfigured.) Guayaquil and the Galapagos Islands.

## TRIVIA FUSCA Gray.

1832. In SOWERBY, Con. Ill., fig. 37. Mazatlan to Guayaquil and the Galapagos Islands.

## TRIVIA PACIFICA Gray.

1832. Proc. Zool. Soc., p. 185.—SOWERBY, Thes. Con. *Cypræa*, p. 45, pl. 34, figs. 441, 443, 1859. Gulf of California to Panama and the Galapagos Islands.

## TRIVIA PULLA Gaskoin.

1846. Proc. Zool. Soc., p. 24; 1848, p. 97.—SOWERBY, Thes. Con., *Cypræa*, p. 48, pl. 26, figs. 490, 491, 1859. Gulf of California to Guayaquil and the Galapagos Islands.

## TRIVIA RADIANS Lamarck.

1810. *Cypræa radians* LAMARCK, Ann. du Mus., vol. 16, p. 102.—SOWERBY, Con. Ill., pl. 119, fig. 146, 1837. Gulf of California to Peru and Chile and the Galapagos Islands.

## TRIVIA RUBESCENS Gray.

1832. Proc. Zool. Soc., p. 185.—SOWERBY, Con. Ill., *Cypræa*, fig. 31, 1832. Gulf of California to Panama and the Galapagos Islands.

## TRIVIA SANGUINEA Gray.

1832. In SOWERBY, Con. Ill., p. 13, fig. 32. Gulf of California to Guayaquil, Ecuador.

## TRIVIA SOLANDRI Gray.

1832. In SOWERBY, Con. Ill., p. 15, pl. 7, fig. 43. Santa Barbara Islands, California, and south to Panama and Peru.

## Genus ERATO Risso.

## ERATO (ERATOPSIS) SCABRIUSCULA Gray.

832. In SOWERBY, Con. Ill., *Cypræa*, fig. 45; Thes. Con., *Erato*, p. 81, pl. 210, figs. 14-16, 1859. Cape St. Lucas, Lower California, and southward to Peru.

## Family STROMBIDÆ.

## Genus STROMBUS Linnæus.

## STROMBUS GRACILIOR Gray.

1828. WOOD, Index Test., suppl. pl. 4, fig. 1. Gulf of California to Manta, Ecuador.

## STROMBUS GRANULATUS Gray.

1828. WOOD, Index Test., suppl. pl. 4, fig. 21.—SOWERBY, Thes. Con., *Strombus*, p. 33, pl. 9, fig. 100, 1847. Mazatlan, Mexico, and southeast to Guayaquil.

## STROMBUS PERUVIANUS Swainson.

1831. Zoöl. Ill., pl. 39.—SOWERBY, Thes. Con., vol. 1, p. 34, pl. 10, fig. 110, 1847. Manta, Ecuador, to Paita, Peru.

## Family CERITHIIDÆ.

## Genus CERITHIUM Brugière.

## CERITHIUM ADUSTUM Kiener.

1841. Icon., *Cerithium*, p. 37, pl. 13, fig. 2. Mazatlan to Panama and the Galapagos Islands.

## CERITHIUM INTERRUPTUM Menke.

1850. Zeitschr. f. Mal., p. 178.—SOWERBY, Thes. Con., vol. 2, p. 869, figs. 155, 156, 1855. Gulf of California to Manta, Ecuador, and the Galapagos Islands.

## CERITHIUM MACULOSUM Kiener.

1841. Icon., *Cerithium*, p. 36, pl. 13, fig. 3. Panama to Guayaquil and the Galapagos Islands.

## CERITHIUM OCELLATUM Brugière.

1792. Encycl. Méth., p. 499, no. 43.—TRYON, Man., vol. 9, p. 13, pl. 24, fig. 19, 1887. Mazatlan, Mexico, to Panama and the Galapagos Islands.

## CERITHIUM PACIFICUM Sowerby.

1833. SOWERBY, Gen. Shells, *Cerithium*, part xlii, fig. 9. Panama and south to Valparaiso, Chile.

## CERITHIUM STERCUSMUSCARUM Valenciennes.

1833. Humboldt Voy., Zool., vol. 2, p. 278. Cedros Island, Lower California, and southward to Tumbes, Peru, and the Galapagos Islands.

## Genus BITTIUM (Leach) Gray.

## BITTIUM PERUVIANUM Orbigny.

1841. *Cerithium peruvianum* ORBIGNY, Voy. Am. Mér., p. 443, pl. 77, figs. 9, 10. Arica, Chile.

## BITTIUM (STYLIDIUM) SULCIFERUM Troschel.

1852. *Rissoina sulcifera* TROSCHER, Arch. f. Naturg., vol. 18, pt. 1, p. 154, pl. 5, fig. 1. Peru (Tschudi).

## Genus CERITHIDEA Swainson.

## CERITHIDEA MONTAGNEI Orbigny.

1841. *Cerithium montagnei* ORBIGNY, Voy. Am. MÉR., p. 443, pl. 63, figs. 3, 4. Gulf of California, and south to Panama and Chile.

## Family CERITHIOPSIDÆ.

## Genus SEILA A. Adams.

## SEILA ASSIMILATA C. B. Adams.

1852. *Cerithiopsis assimilata* ADAMS, Panama Sh., pp. 150, 309.—SOWERBY, Thes. Con., vol. 2, p. 881, pl. 184, fig. 246, 1855. Catalina Island, California, south to the Gulf of California, Panama, and Sechura Bay, Peru.

## Family MODULIDÆ.

## Genus MODULUS Gray.

## MODULUS PERLATUS Dillwyn.

1817. Cat. Rec. Sh., vol. 2, p. 788.—EYDOUX and SOULEYET, Voy. Bonite, Zoöl., vol. 2, p. 598, pl. 37, figs. 25-31, 1852. Isla Puna, Guayaquil. Peru (Tschudi).

## Family PLANAXIDÆ.

## Genus PLANAXIS Lamarck.

## PLANAXIS PLANICOSTATUS Sowerby.

1825. Tankerville Cat., app., p. xiii; Con. Icon., *Planaxis*, fig. 26. Mazatlan, Mexico, south to Panama and the Galapagos Islands. Peru (Tschudi).

## Family VERMETIDÆ.

## Genus BIVONIA Gray.

## BIVONIA COMPACTA Carpenter.

1864. Rep. Brit. Assoc. for 1863, pp. 628, 654; Ann. Mag. Nat. Hist., 3rd ser., vol. 14, p. 427, Dec., 1864. (Unfigured.) Vancouver Island, British Columbia, and southward to Paita, Peru.

## Genus SERPULORBIS Sacco.

## SERPULORBIS SQUAMIGERUS Carpenter.

1856. Proc. Zool. Soc., p. 226.—TRYON, Man., vol. 8, p. 181, pl. 54, figs. 73, 74, 1886. San Diego, California, and southward to Paita, Peru.

## Family TURRITELLIDÆ.

## Genus TURRITELLA Lamarck.

## TURRITELLA CINGULATA Sowerby.

1825. Tankerville Cat., app., p. xiii.—REEVE, Con. Icon., *Turritella*, fig. 23, 1849. Manta, Ecuador, south to the island of Chiloë, Chile.

## TURRITELLA GONIOSTOMA Valenciennes.

1833. Humboldt Voy., Zoöl., vol. 2, p. 275.—REEVE, Con. Icon., *Turritella*, figs. 10a-b, 1849. Gulf of California, to the Lobo Islands, Peru.

## TURRITELLA RADULA Kiener.

1840. Icon., *Turritella*, p. 13, pl. 2, fig. 1. Bay of Guayaquil.

## TURRITELLA RUBESCENS Reeve.

1849. Con. Icon., *Turritella*, fig. 63. Gulf of Panama.

## Family LITTORINIDÆ.

## Genus LITTORINA Ferussac.

## LITTORINA ARAUCANA Orbigny.

1840. Voy. Am. Mér., p. 393, pl. 53, figs. 3, 4. Coast of Nicaragua, and south to Paita, Valparaiso, and the island of Chiloë.

## LITTORINA PERUVIANA Lamarck.

1822. *Phasianella peruviana* LAMARCK, An. s. Vert., vol. 7, p. 53.—GRAY, Beechey's Voy., p. 138, pl. 36, fig. 8, 1839. Coast of Nicaragua, and southward to Valdivia, Chile, and the Galapagos Islands.

## LITTORINA PULCHRA Sowerby.

1832. Gen. Sh., *Littorina*, figs. 2, 3.—REEVE, Con. Icon., *Littorina*, fig. 17. Panama to Guayaquil.

## LITTORINA THERSITES Reeve.

1857. Conch. Icon., *Littorina*, fig. 78. "Chile and Peru" (Reeve).

## LITTORINA UMBILICATA Orbigny.

1840. Voy. Am. Mér., p. 394, pl. 76, fig. 1-3. Coast of Ecuador and Peru, south to Cobija, Chile.

## LITTORINA VARIA Sowerby.

1832. Gen. Sh., *Littorina*, vol. 38, fig. 3.—PHILIPPI, Abb., vol. 2, *Littorina*, pl. 1, figs. 2-3. Gulf of California to Casma, Peru. (Chiloë?).

## LITTORINA ZICZAC Gmelin.

1791. *Trochus ziczac* GMELIN, Syst. Nat., vol. 8, p. 3587.—*Littorina glabrata* PHILIPPI, Abb., vol. 3, p. 62, pl. 7, fig. 5, 1848. Paita, Peru.

## Genus TECTARIUS Valenciennes.

## TECTARIUS GALAPAGIENSIS Stearns.

1892. *Nautilus*, vol. 6, no. 8, Dec., p. 87; Proc. U. S. Nat. Mus., vol. 16, p. 396, pl. 51, fig. 7, 1893. Manta, Ecuador, and the Galapagos Islands.

## Family SOLARIIDÆ.

## Genus ARCHITECTONICA Bolten.

## ARCHITECTONICA GRANULATA Lamarck.

1822. *Solarium granulatum* LAMARCK, An. s. Vert., vol. 7, p. 3. Encycl. Méth., pl. 446, fig. 5a-b.—KIENER, Icon., *Solarium*, p. 4, pl. 2, fig. 2. Lower California to Panama and Peru (Tschudi).

## ARCHITECTONICA KOCHII Dall, new name.

1909. *Solarium nanum* (KOCH ms.) PHILIPPI, Conch. Cab., 2d ed., Mon. *Solarium*, 1853, p. 27, pl. 4, fig. 5; not *Solarium nanum* Grateloup, 1838. Chile.

## Family RISSOIDÆ.

## Genus RISSOA Fréminville.

## RISSOA (ALVANIA) CARPENTERI Weinkauff.

1885. *Alvania carpenteri* WEINKAUFF, Conch. Cab., 2d ed., *Rissoa*, p. 192. *A. reticulata* CARPENTER, 1864, not of MONTAGU, 1804. Neah Bay, Washington, to the Galapagos Islands.

## Genus RISSOINA Orbigny.

## RISSOINA CANCELATA Philippi.

1847. Zeitschr. Mal., p. 127.—SCHWARTZ VON MOHR., Mon. *Rissoina*, p. 89, pl. 7, fig. 52, 1860. Coast of Ecuador and Peru. Also in the West Indies.

## RISSOINA COSTATA A. Adams.

1851. Proc. Zool. Soc., p. 266.—SCHWARTZ VON MOHR., Mon. *Rissoina*, p. 53, pl. 2, fig. 16, 1860. Cobija, Chile.

## RISSOINA INCA Orbigny.

1840. Voy. Am. Mér., p. 395, pl. 53, figs. 11-16. Peru, and the Galapagos Islands, and south to the island of Chiloë.

## Family CALYPTRÆIDÆ.

## Genus CHEILEA Modeer.

## CHEILEA EQUESTRIS Linnæus.

1758. Syst. Nat., 10th ed., p. 780; 12th ed., p. 1257, 1767.—*C. varia* BRODERIP, Trans. Zool. Soc. London, vol. 1, p. 197, pl. 27, fig. 3, 1834. Mazatlan, Mexico, to Arica, Chile, and the Galapagos Islands. Cosmopolitan.

## CHEILEA CORRUGATA Broderip.

1884. Trans. Zoöl. Soc. London, vol. 1, p. 197, pl. 27, fig. 2.—  
REEVE, Con. Icon., *Trochita*, fig. 9. Gulf of California,  
south to Callao, Peru, and the Galapagos Islands.

## Genus CALYPTRÆA Lamarck.

## CALYPTRÆA LICHEN Broderip.

1834. Trans. Zoöl. Soc. London, vol. 1, p. 201, pl. 28, fig. 4.  
Muerte Island, Guayaquil.

## CALYPTRÆA MAMILLARIS Broderip.

1834. Trans. Zoöl. Soc. London, vol. 1, p. 201, pl. 28, fig. 5.  
Muerte Island, Guayaquil.

## Genus TROCHITA Schumacher.

## TROCHITA INTERMEDIA Orbigny.

1841. *Calyptrea intermedia* ORBIGNY, Voy. Am. Mér., p. 463.,  
pl. 59, figs. 4-6. Islay, Peru, 20 fathoms.

## TROCHITA TROCHIFORMIS Gmelin.

1791. *Patella trochiformis* GMELIN, Syst. Nat., vol. 8, p. 3693.—  
SOWERBY, Gen. Sh., *Calyptrea*, fig. 9, 1824. Panama to  
Valparaiso, Chile.

## Genus CRUCIBULUM Schumacher.

## CRUCIBULUM IMBRICATUM Sowerby.

1824. *Calyptrea imbricata* SOWERBY, Gen. Sh., fig. 5.—BRODERIP,  
Trans. Zoöl. Soc. London, vol. 1, p. 198, pl. 27, fig. 7, 1834.  
Gulf of California, and southward to Callao, Peru, and the  
Galapagos Islands.

## CRUCIBULUM QUIRIQUINÆ Lesson.

1830. Voy. Coq., vol. 2, pt. 1, p. 397.—BRODERIP, Trans. Zoöl.  
Soc. London, vol. 1, pl. 27, fig. 9, 1834. Gulf of California,  
southward to the Straits of Magellan.

## CRUCIBULUM SPINOSUM Sowerby.

1824. *Calyptrea spinosa* SOWERBY, Gen. Sh., figs. 4, 7.—BRO-  
DERIP, Trans. Zoöl. Soc. London, vol. 1, pl. 28, fig. 8, 1834.  
California (at Monterey), south to northern Chile.

## Genus CREPIDULA Lamarck.

## CREPIDULA ACULEATA Gmelin.

1791. *Patella aculeata* GMELIN, Syst. Nat., vol. 8, p. 3693.—  
FAVANNE, Conch., vol. 1, p. 564, pl. 4, fig. F 2.—BRODERIP,  
Trans. Zoöl. Soc. London, vol. 1, pl. 29, fig. 1, 1834. Cali-  
fornia to Lobos Islands, Peru; West Indies, Africa, Japan.  
Cosmopolitan.

## CREPIDULA CREPIDULA Linnæus.

1764. *Patella crepidula* LINNÆUS, Mus. Lud. Ulricæ, p. 689.—  
FAVANNE, Conch., pl. 4, fig. lower D. Mazatlan, Mexico, to  
Callao, Peru. West Indies. Cosmopolitan.

## CREPIDULA DILATATA Sowerby.

1824. *C. dilatata* (LAMARCK Ms.) SOWERBY, Gen. Sh., *Crepidula*, fig. 5.—DELESSERT, Rec. de Coq. pl. 24, fig. 4a-c. California, Peru, and southward to Magellan straits.

CREPIDULA DORSATA Broderip. *lingulata* Gld., 1846.

not 1834. *Calyptrea dorsata* BRODERIP, Trans. Zoöl. Soc. London, vol. 1, p. 202, pl. 28, fig. 10. California, south to Valparaiso, Chile.

## CREPIDULA EXCAVATA Broderip.

1834. Trans. Zoöl. Soc. London, vol. 1, p. 225, pl. 29, fig. 7. Gulf of California and south to the Chilean coast.

## CREPIDULA INCURVA Broderip.

1834. Proc. Zoöl. Soc., p. 40; Trans. Zoöl. Soc. London, vol. 1, pl. 29, fig. 6. Mazatlan, Mexico, to Paita, Peru.

## CREPIDULA ONYX Sowerby.

1824. Gen. Shells, *Crepidula*, fig. 2. San Pedro, California, south to Arica, Chile.

## CREPIDULA SQUAMA Broderip.

1834. Proc. Zoöl. Soc., p. 40; Trans. Zoöl. Soc. London, vol. 1, p. 205, pl. 29, fig. 10, 1834. Straits of Fuea south to Patagonia. *Panama*

## Family CAPULIDÆ.

## Genus CAPULUS Montfort.

## CAPULUS UNGARICOIDES Orbigny.

1841. Voy. Am. MÉR., p. 457, pl. 78, fig. 4. Paita, Peru.

## Family HIPPONICIDÆ.

## Genus HIPPONIX DeFrance.

## HIPPONIX ANTIQUATA Linnæus.

1767. *Patella antiquata* LINNÆUS, Syst. Nat., 12th ed., p. 1259.—SOWERBY, Thes., vol. 1, p. 369, pl. 73, figs. 18-20, 1847. Santa Barbara, California, and south to Peru and the Galapagos Islands. Also West Indies.

## HIPPONIX BARBATA Sowerby.

1835. Proc. Zoöl. Soc., p. 5; Thes. Con., vol. 1, p. 369, pl. 73, figs. 26-27, 1847. Mazatlan, Mexico, and south to Guayaquil and the Galapagos Islands. Also Indo-Pacific.

## HIPPONIX GRAYANA Menke.

1853. Zeitschr. f. Mal., p. 115.—TRYON, Man., vol. 8, p. 135, pl. 40, figs. 4, 5, 1886. Mazatlan, Mexico, to Guayaquil and the Galapagos Islands.

## HIPPONIX SUBRUFa Lamarck.

1819. *Pileopsis subrufa* LAMARCK, An. s. Vert., vol. 6, pt. 2, p. 16.—SOWERBY, Thes. Con., vol. 1, p. 370, pl. 73, figs. 21-23, 1847. Panama and south to the Lobos Islands, Peru; Indo-Pacific. Also West Indies.

## Family NATICIDÆ.

## Genus NATICA Scopoli.

## NATICA BRODERIPIANA Recluz.

1847. Proc. Zool. Soc., p. 205.—REEVE, Con. Icon., *Natica*, fig. 66a. Mazatlan, Mexico, and southward to the Ecuador coast.

## NATICA ELENÆ Recluz.

1843. Proc. Zool. Soc., p. 205.—REEVE, Con. Icon., *Natica*, fig. 94a. Panama to Santa Elena, Ecuador.

## NATICA UNDATA Philippi.

1852. Arch. f. Naturg., vol. 1, p. 160.—KÜSTER, Con. Cab., 2d. ed., *Natica*, pl. 11, fig. 12, 1852. Peru (Tschudi).

## NATICA UNIFASCIATA Lamarck.

1822. An. s. Vert., vol. 6, pt. 2, p. 201.—REEVE, Con. Icon., *Natica*, fig. 49, 1855. Gulf of California, Panama and (*vide* Tschudi) Peru.

## Genus POLINICES Montfort.

## POLINICES ALVEATUS Troschel.

1852. *Natica alveata* TROSCHER, Arch. f. Naturg., p. 159, pl. 5, fig. 3. Peru (Tschudi).

## POLINICES CORA Orbigny.

1840. *Natica cora* ORBIGNY, Voy. Am. Mér., p. 401, pl. 76, figs. 10, 11. Callao, Peru, to Caldera, Chile.

## POLINICES DUBIUS Recluz.

1843. *Natica dubia* RECLUZ, Proc. Zool. Soc., p. 209.—REEVE, Con. Icon., *Natica*, fig. 41. Paita, Peru, to Mejillones del Sur, Chile.

## POLINICES OTIS Broderip.

1829. *Natica otis* BRODERIP, Zool. Journ., vol. 5, p. 372.—GRAY, Beechey's Voy., Zool., pl. 34, fig. 13; pl. 37, fig. 3, 1839, Gulf of California, and south to Paita, Peru, and the Galapagos Islands.

## POLINICES PHILIPPIANUS Nyst.

1845. *Natica philippiana* NYST, Bull. Acad. de Bruxelles, vol. 12, pt. 2, p. 153, n. n. for *N. acuta* PHILIPPI, Abb., vol. 2, pl. 2, fig. 3, 1847; not *N. acuta* DESHAYES, 1825. Galapagos Islands, Peru, and southern Chile.

## POLINICES RAVIDUS Eydoux and Souleyet.

1852. *Natica ravidata* EYDOUX and SOULEYET, Voy. Bonite, Zool., vol. 2, p. 582, pl. 35, figs. 12-15. Santa Elena, Ecuador, to Paita, Peru.

## POLINICES UBER Valenciennes.

1833. *Natica uber* VALENCIENNES, Humboldt Voy., vol. 2, p. 266.—ORBIGNY, Voy. Am. Mér., p. 401, pl. 55, figs. 12-14, 1840. Gulf of California, south to Callao, Peru, and the Galapagos Islands. *negritos, Peru, Olson.*

## POLINICES (EUSPIRA) AGUJANUS Dall.

1908. Bull. Mus. Comp. Zool., vol. 43, no. 6, p. 334, pl. 9, fig. 2 (young). Gulf of Panama to Sechura Bay, Peru.

## POLINICES (EUSPIRA) PISIFORMIS Recluz.

1843. *Natica pisiformis* RECLUZ, Proc. Zool. Soc., p. 213.—SOWERBY, Thes. Con., *Natica*, fig. 163. Valparaiso.

## POLINICES (NEVERITA) GLAUCA Humboldt.

1826. *Natica glauca* HUMBOLDT, Ms., in Lesson, Voy. Coq., Atlas, pl. 11, fig. 1; text, Zool., p. 369, 1830. Acapulco, Mexico, to Callao, Peru.

## POLINICES (NEVERITA) RECLUZIANA Deshayes.

1839. *Natica recluziana* DESHAYES, Rev. Zool. Soc. Cuv., p. 361.—GUERIN, Mag. de Zool., pl. 37, 1841. Catalina Island, California, south to Mexico (and Chile, Philippi).

## Genus SINUM Bolten.

## SINUM CONCAVUM Lamarck.

1822. *Sigaretus concavus* LAMARCK, An. s. Vert., vol. 6, pt. 2, p. 208.—SOWERBY, Gen. Sh., *Sigaretus*, fig. 1, 1823.—PHILIPPI, Abb., vol. 1, pl. 1, fig. 1, 1844. Capon, Peru, the Galapagos Islands, and south on the mainland to S. lat. 25° 30', at Taltal, Chile.

## Family MARSENIIDÆ.

## Genus MARSENIOPSIS Bergh.

## MARSENIOPSIS PACIFICA Bergh.

1886. Die Marseniaden, vol. 1, pp. 19–22, pl. 1, figs. 17–27. Magellan straits and northward to Calbuco, Chile.

## Superfamily DOCOGLOSSA.

## Family PATELLIDÆ.

## Genus PATELLA Linnæus.

## PATELLA MAGELLANICA Gmelin.

1791. Syst. Nat., vol. 8, p. 3703.—REEVE, Con. Icon., *Patella*, fig. 19, 1854. Magellanic Province, and northward to Puerto Montt, Chiloë Island, and the Dalcachue channel.

## PATELLA MEXICANA Broderip and Sowerby.

1829. Zool. Journ., vol. 4, p. 369.—PILSBRY, Man. Con., vol. 13, p. 108, pl. 31, figs. 59–62, 1891. Gulf of California, south to Paita, Peru.

## Genus NACELLA Schumacher.

## NACELLA CLYPEATER Lesson.

1830. *Patella clypeater* LESSON, Voy. Coq., vol. 2, p. 419.—PILSBRY, Man. Con., vol. 13, p. 122, pl. 50, figs. 40–43, 1891. Valparaiso, and northward (to Peru, Tschudi), southward to the Magellanic region.

## Genus HELCIONISCUS Dall.

## HELCIONISCUS NIGRISQUAMATUS Reeve.

1854. *Patella nigrisquamata* REEVE, Con. Icon., *Patella*, fig. 3.  
Concepcion, Chile.

## Family ACMÆIDÆ.

## Genus SCURRIA Gray.

## SCURRIA MESOLEUCA Menke.

1851. *Acmea mesoleuca* MENKE, Zeitschr. f. Mal., p. 38.—  
*Patella striata* REEVE, Con. Icon., *Patella*, fig. 99; not *P.*  
*striata* QUOY. Gulf of California, and south to Guayaquil  
and the Galapagos Islands.

## SCURRIA PARASITICA Orbigny.

1841. *Patella parasitica* ORBIGNY, Voy. Am. MÉR., p. 481, pl. 81,  
figs. 1-3; not of REEVE. Mollendo, Peru, and south to Val-  
paraiso, Chile.

## SCURRIA SCURRA Lesson.

1830. *Patella scurra* LESSON, Voy. Coq., p. 421.—ORBIGNY, Voy.  
Am. MÉR., p. 478, pl. 64, fig. 11, 1841. From Callao, Peru,  
south to S. lat. 41°, living on the stalks of *Macrocystis*.

## SCURRIA ZEBRINA Lesson.

1830. *Patella zebrina* LESSON, Voy. Coq., p. 417.—*Acmea zebrina*  
ORBIGNY, Voy. Am. MÉR., p. 480, pl. 65, figs. 1-3, 1841. Mol-  
lendo, Peru, and south to the Magellanic region.

## Genus ACMÆA Eschscholtz.

## ACMÆA ALBESCENS Phillippi.

1846. Zeitschr. f. Mal., p. 50. Abb., vol. 3, p. 118, pl. 2, fig. 7.  
1849. Central Chile.

## ACMÆA ARAUCANA Orbigny.

1841. Voy. Am. MÉR., p. 482, pl. 65, figs. 4-6; not of REEVE.  
Paita, Peru, and south to Valparaiso, Chile.

## ACMÆA CECILIANA Orbigny.

1841. *Patella cecilians* ORBIGNY, Voy. Am. MÉR., p. 482, pl. 81,  
figs. 4-6. Antofagasta to Valparaiso, Chile.

## ACMÆA COFFEA Reeve.

1855. *Patella coffea* REEVE, Con. Icon., *Patella*, fig. 139. Val-  
paraiso.

## ACMÆA ORBIGNYI Dall, new name.

1909. *Acmea scutum* ORBIGNY, Voy. Am. MÉR., p. 479, pl. 64,  
figs. 8, 9, 1841. Not of ESCHSCHOLTZ, Zoöl. Atlas, part 5,  
p. 19, pl. 23, figs. 1-3, 1833. Salaverri, Peru, and the Gala-  
pagos Islands, and south to the Magellanic region.

## ACMÆA VARIABILIS Sowerby.

1839. Zoöl. Beechey's Voy., p. 147, pl. 39, fig. 5 (only). Whole  
Peruvian Province, and the Galapagos Islands.

## ACMÆA VIRIDULA Lamarck.

1822. *Patella viridula* LAMARCK, An. s. Vert., vol. 7, p. 539.  
*Acmaea pretrei* ORBIGNY, Voy. Am. MÉR., p. 481, pl. 78, figs.  
 15, 16, 1841. Paita, Peru, the Lobos Islands, and south to  
 Valparaiso, Chile.

## Superfamily RHIPIDOGLOSSA.

## Family PHASIANELLIDÆ.

## Genus PHASIANELLA Lamarck.

## PHASIANELLA (TRICOLIA) PERFORATA Philippi.

1848. Zeitschr. f. Mal., p. 164.—PILSBRY, Man. Con., vol. 10,  
 p. 172, pl. 39a, fig. 12, 1888; not of CARPENTER. Paita, Peru.

## PHASIANELLA (EULITHIDIUM) MINIMA Philippi.

1860. Reise Atacama, p. 186, pl. 7, fig. 17; Paita, Peru, south to  
 Chimba Bay, Chile, in S. lat. 23° 37'.

## Family TURBINIDÆ.

## Genus LEPTOTHYRA (Carpenter MS.) Dall.

## LEPTOTHYRA CUNNINGHAMI Smith.

1881. *Collonia cunninghami* E. A. SMITH, Proc. Zool. Soc.,  
 p. 33, pl. 4, figs. 10, 10a. Chiloë, and southward.

## Genus TURBO Linnæus.

TURBO MAGNIFICUS Jonas. *1847*

1847. Zeitschr. f. Mal., p. 167.—PHILIPPI, Abb., vol. 2, p. 25,  
 pl. 6, fig. 1, 1847. Manta, Ecuador, and south to Callao,  
 Peru, and the Lobos Islands.

## TURBO (PRISOGASTER) NIGER Wood.

1828. WOOD, Index Test., suppl. pl. 6, no. 1.—SOWERBY, Beechey's  
 Voy., p. 143, pl. 36, fig. 1, 1839; Gen. Shells, *Turbo*, fig. 7,  
 1832. Pacasmayo, Peru, south to the Magellan straits.

## TURBO (PRISOGASTER) ELEVATUS Eydoux and Souleyet.

1852. Voy. Bonite, Zool., vol. 2, p. 594, pl. 37, figs. 15-19.  
 Caldera, Chile, south to Valparaiso.

## TURBO (SENECTUS) SQUAMIGER Reeve.

1842. Proc. Zool. Soc., p. 186.—REEVE, Con. Icon., *Turbo*, fig.  
 21. Gulf of California, south to Paita, Peru, and the Gala-  
 pagos Islands.

## TURBO (CALLOPOMA) FLUCTUOSUS Wood.

1828. Index Test., suppl. pl. 6, fig. 44. Gulf of California, and  
 Cedros Island, south to Paita, Peru.

## TURBO (CALLOPOMA) SAXOSUS Wood.

1828. Index Test., suppl. pl. 6, fig. 45. Mazatlan, Mexico, and  
 south to Paita, Peru, and the Galapagos Islands.

Genus *ASTRÆA* Bolten.*ASTRÆA* (*CYCLOCANTHA*) *BABELIS* Fischer.

1874. *Turbo babelis* FISCHER, in Kiener, Icon., *Trochus*, pl. 78, fig. 2.—PILSBRY, Man. Con., vol. 10, p. 238, pl. 52, figs. 21–22, 1888. Santa Elena and south to Guayaquil.

*ASTRÆA* (*UVANILLA*) *BUSCHII* Philippi.

1844. *Trochus buschii* PHILIPPI (not KIENER) in Küster, Con. Cab., 2d ed., *Trochus*, p. 213, pl. 32, fig. 1. Gulf of California, south to Paita, Peru.

## Family LIOTIIDÆ.

Genus *LIOTIA* Gray.*LIOTIA CANCELLATA* Gray.

1829. *Delphinula cancellata* GRAY, Spicil. Zoöl., p. 3.—PILSBRY, Man. Con., vol. 10, p. 109, pl. 36, fig. 2, 1888. Arica to Coquimbo, Chile.

## Family TROCHIDÆ.

Genus *TEGULA* Lesson.*TEGULA ATRA* Lesson.

1830. *Trochus ater* LESSON, Voy. Coq. Zool., p. 344, pl. 16, fig. 2.—PHILIPPI, Abb., vol. 1, p. 188, pl. 5, fig. 6, 1844. Pacasmayo, Peru, south to Magellan straits, and the Chincha Islands.

*TEGULA EURYOMPHALUS* Jonas.

1844. *Trochus euryomphalus* JONAS, Zeitschr. f. Mal., p. 113.—PHILIPPI, Abb., vol. 2, p. 27, pl. 6, fig. 4, 1847. Peru (Tschudi) south to Talcahuano, Chile.

*TEGULA FUSCESCENS* Philippi.

1844. *Trochus fuscescens* PHILIPPI, Abb., vol. 1, p. 92, pl. 3, fig. 8 (not of CARPENTER). Chile and Peru.

*TEGULA GAUDICHAUDI* Hupé.

1854. Hist. de Chile, vol. 8, p. 146, pl. 4, fig. 4. Valparaiso.

*TEGULA LUCTUOSA* Orbigny.

1841. *Trochus luctuosus* ORBIGNY, Voy. Am. Mér., p. 409, pl. 76, figs. 16–19. Ancon, Peru, and south to Valparaiso, Chile.

*TEGULA LUGUBRIS* Philippi.

1844. *Trochus lugubris* PHILIPPI, Abb., vol. 1, p. 91, pl. 3, fig. 7. Chile.

*TEGULA MELALEUCA* Jonas.

1844. *Trochus melaleucos* JONAS, Zeitschr. f. Mal., p. 169.—PHILIPPI, Abb., vol. 2, *Trochus*, p. 16, pl. 6, fig. 7, 1847. Peru.

*TEGULA MOESTA* Jonas.

1844. *Trochus moestus* JONAS, Zeitschr. f. Mal., p. 113.—HUPÉ, Hist. de Chile, Zoöl., pl. 4, fig. 6, 1854. Pacasmayo, Peru, south to Antofagasta, Chile.

## TEGULA PANAMENSIS Philippi.

1848. *Trochus (Phorcus) panamensis* PHILIPPI, Zeitschr. f. Mal., p. 127; Conch. Cab., 2d ed., *Trochus*, p. 311, pl. 44, fig. 15. Panama to Paita, Peru.

## TEGULA PATAGONICA Orbigny.

1840. *Trochus patagonicus* ORBIGNY, Voy. Am. MÉR., p. 408, pl. 55, fig. 1-4; Phil., Conch. Cab., 2d ed., *Trochus*, p. 225, pl. 34, fig. 12. Lobos de Afuera Island, Peru, south to San Blas, Patagonia (Chile).

## TEGULA QUADRICOSTATA Gray.

1828. WOOD, Index Test., suppl. pl. 5, fig. 16.—ORBIGNY, Voy. Am. MÉR., p. 408, 1840. Peru and south to Valparaiso, Chile.

## TEGULA RETICULATA Gray.

1828. *Trochus reticulatus* WOOD, Index Test., suppl. pl. 6, fig. 38. Panama, and south to Guayaquil, and the Galapagos Islands.

## TEGULA SMITHII Tapparone-Canevri.

1874. *Omphalius smithii* TAPPARONE-CANEFRI, Viag. Magenta, p. 166, pl. 1, figs. 13, *a-b*. Peru.

## TEGULA TRIDENTATA Potiez and Michaud.

1838. *Trochus tridentatus* POTIEZ AND MICHAUD, Gal. de Douai, vol. 1, p. 321, pl. 29, figs. 16, 17.—KIENER, Icon., *Trochus*, pl. 57, fig. 2. Sechura Bay, Peru, and southward to the Chonos archipelago, southern Chile.

*Tegula coronulatus* Pils. not C.B. Ads. = *mariana* Dal.  
Paita.

Genus MONODONTA Lamarek.

## MONODONTA (DILOMA) CRUSOEANA Pilsbry.

1889. Man. Conch., vol. 11, p. 98, pl. 35, figs. 19-21. Pacasmayo, Peru, south to Coquimbo, Chile, and Juan Fernandez Island.

## MONODONTA (DILOMA) NIGERRIMA Gmelin.

1791. *Trochus nigerrimus* GMELIN, Syst. Nat., vol. 8, p. 3597.—ORBIGNY, Voy. Am. MÉR., pl. 55, figs. 5-8, 1841.—PHILIPPI, Conch. Cab., 2d ed., *Trochus*, p. 149, pl. 24, fig. 14. Salaverry, Peru, south to the straits of Magellan.

Genus CALLIOSTOMA Swainson.

## CALLIOSTOMA FONKII Philippi.

1860. *Trochus fonkii* PHILIPPI, Atacama Reise, p. 185, pl. 7, fig. 22.—PILSBRY, Man. Conch., vol. 11, p. 371, pl. 57, fig. 48, 1889. Peru, and south to the island of Chiloë.

## Family VITRINELLIDÆ.

Genus CIRCULUS Jeffreys.

## CIRCULUS COSMIUS Bartsch.

1907. Proc. U. S. Nat. Mus., vol. 32, no. 1520, p. 173, fig. 8. Atacamas, Ecuador, 30 fathoms.

## Family NERITIDÆ.

## Genus NERITA (Linnæus) Lamarck.

## NERITA BERNHARDI Recluz.

1850. Journ. de Conchyl., vol. 1, p. 285 (name only).—REEVE,  
Con. Icon., *Nerita*, pl. 12, fig. 27, 1855. Panama to Peru.

## NERITA CEROSTOMA Troschel.

1852. Arch f. Naturg., vol. 18, pt. 1, p. 179, pl. 5, fig. 5. Peru.

## NERITA SCABRICOSTA Lamarck.

1822. An. s. Vert, vol. 6, pt. 2, p. 194.—TRYON, Man. Con., vol. 10,  
pl. 6, fig. 6, 1888. Lower California and south to Ecuador  
and the Galapagos Islands. Peru (Tschudi).

## Genus NERITINA Lamarck.

## NERITINA OWENII Mawe.

1828. WOOD, Index Test., suppl. pl. 8, fig. 16. Costa Rica,  
and south to Paita, Peru.

## NERITINA SOBRINA Recluz.

1849. In SOWERBY, Thes. Con., *Neritina*, p. 536, pl. 112, fig. 100.  
Chile.

## Superfamily ZYGOBRANCHIA.

## Family FISSURELLIDÆ.

## Genus FISSURELLA Bruguière

## FISSURELLA BRIDGESII Reeve.

1849. Conch. Iconica, *Fissurella*, fig. 15. Paposo to Valparaiso,  
Chile.

## FISSURELLA CLYPEUS Sowerby.

1834. Proc. Zool. Soc. p. 128; Con. Ill., *Fissurella*, fig. 77, 1835.  
Santa Elena, Guayaquil, Ecuador.

## FISSURELLA COSTATA Lesson.

1830. Voy. Coq., vol. 2, p. 410.—SOWERBY, Con. Ill., *Fissurella*,  
fig. 36, 1835 (as *F. chilensis*). Mollendo, Peru, to Valparaiso.

## FISSURELLA CRASSA Lamarck.

1822. An. s. Vert., vol. 6, pt. 2, p. 11.—SOWERBY, Con. Ill., *Fissu-*  
*rella*, fig. 11, 1834; not fig. 2, nor figure in SOWERBY, Genera  
Sh., 1823. Galapagos and Pescadores Islands, Peru, and  
southward to the Magellanic region.

## FISSURELLA FULVESCENS Sowerby.

1834. Proc. Zool. Soc., p. 127; Con. Ill., *Fissurella*, fig. 49, 1835.  
Valparaiso.

## FISSURELLA LATA Sowerby.

1834. Proc. Zool. Soc., p. 124; Con. Ill., *Fissurella*, fig. 5, 1834.  
Valparaiso, and south to the Magellanic region.

## FISSURELLA LATIMARGINATA Sowerby.

1834. Proc. Zool. Soc., p. 126; Con. Ill., *Fissurella*, fig. 69.  
Peru, and south to Valparaiso, Chile.

## FISSURELLA LIMBATA Sowerby.

1834. Proc. Zool. Soc., p. 123; Con. Ill., *Fissurella*, fig. 74, 1835.  
Antofagasta to Valparaiso, Chile.

## FISSURELLA MAXIMA Sowerby.

1834. Proc. Zool. Soc., p. 123; Con. Ill., *Fissurella*, fig. 18, 1834.  
Manta, Ecuador, to Valparaiso, Chile.

## FISSURELLA NIGRA Lesson.

1830. Voy. Coq., Zoöl., vol. 2, p. 412.—REEVE, Con. Icon.,  
*Fissurella*, fig. 11, 1850. Callao, Peru, south to Magellan  
straits.

## FISSURELLA OBOVALIS Lesson.

1830. Voy. Coq., Zoöl., vol. 2, p. 411. (Unfigured.) Concep-  
cion, Chile.

## FISSURELLA ORIENS Sowerby.

1834. Proc. Zool. Soc., p. 124; Con. Ill., *Fissurella*, fig. 25, 1834.  
Chiloë Island, Chile.

## FISSURELLA PERUVIANA Lamarck.

1822. An. s. Vert., vol. 7, pt. 2, p. 15 (not of Delessert, Rec.  
pl. 24, fig. 7).—REEVE, Con. Icon., *Fissurella*, fig. 26, 1849.  
Pacasmayo, Peru, south to Coquimbo, Chile.

## FISSURELLA PHILIPPIANA Reeve.

1849. Con. Icon., *Fissurella*, fig. 37; *errata*. Concepcion, Chile.

## FISSURELLA PICTA Gmelin.

1791. *Patella picta* GMELIN, Syst. Nat., vol. 8, p. 3729.—PILS-  
BRY, Man. Conch., vol. 12, p. 144, pl. 45, figs. 9-11, 1890.  
Manta, Ecuador, and south to the straits of Magellan.

## FISSURELLA PULCHRA Sowerby.

1834. Proc. Zool. Soc., p. 124; Con. Ill., *Fissurella*, fig. 24, 1834.  
Paposo, Chile, and south to Valparaiso.

## FISSURELLA PUNCTATISSIMA Pilsbry.

1890. Man. Conch., vol. 12, p. 150, pl. 58, figs. 21-23. Valparaiso.

## FISSURELLA RUGOSA Sowerby.

1835. Con. Ill., *Fissurella*, fig. 51. Mazatlan, Mexico, and south  
to Païta, Peru, and the Galapagos Islands.

## FISSURELLA STELLATA Reeve.

1850. Con. Icon., *Fissurella*, fig. 80. Valparaiso.

## FISSURELLA (CREMIDES) ASPERELLA Sowerby.

1834. Proc. Zool. Soc., p. 127; Con. Ill., *Fissurella*, fig. 71.  
Lobos Islands, Peru.

## FISSURELLA (CREMIDES) MACROTREMA Sowerby.

1834. Proc. Zool. Soc., p. 125; Con. Ill., *Fissurella*, fig. 41.  
Panama south to the Lobos Islands, Peru, and the Galapa-  
gos Islands.

**FISSURELLA (CREMIDES) OBSCURA** Sowerby.

1834. Proc. Zool. Soc., p. 125; Con. Ill., *Fissurella*, fig. 27.  
Gulf of Panama southward to Lambayeque, Peru, and the Galapagos Islands.

**FISSURELLA (CREMIDES) VIRESCENS** Sowerby.

1834. Proc. Zool. Soc., p. 125; Con. Ill., *Fissurella*, fig. 51.  
Mazatlan, Mexico, south to Paita, Peru, and the Galapagos Islands.

Genus **MEGATEBENNUS** Pilsbry.**MEGATEBENNUS COKERI** Dall.

1909. Proc. U. S. Nat. Mus., vol. 37, p. 178, pl. 5, figs. 3, 7.  
Lobos de Afuera Island, Peru.

Genus **FISSURIDEA** Swainson.**FISSURIDEA ALTA** C. B. Adams.

1852. *Fissurella alta* C. B. Adams, Panama Sh., pp. 236, 320.—  
SOWERBY, Thes. Con., *Fissurella*, p. 194, pl. 7, figs. 154-6,  
1866. Mazatlan, Mexico, to Paita, Peru, and the Galapagos Islands.

**FISSURIDEA ASPERIOR** Dall, new name.

1909. *Fissurella aspera* SOWERBY, Proc. Zool. Soc., 1834, p. 127;  
Con. Ill., *Fissurella*, fig. 46. Not of ESCHSCHOLTZ, Zoöl.  
Atlas, 1833. Pacasmayo, Peru.

**FISSURIDEA FONTAINEANA** Orbigny.

1841. *Fissurella fontaineana* ORBIGNY, Voy. Am. MÉR., p. 477,  
pl. 78, figs. 12, 13, Islay, Peru.

**FISSURIDEA INÆQUALIS** Sowerby.

1834. *Fissurella inæqualis* SOWERBY, Proc. Zool. Soc., p. 126;  
Con. Ill., *Fissurella*, fig. 45, 1835. Lower California to Pan-  
ama and the Galapagos Islands.

**FISSURIDEA SATURNALIS** Carpenter.

1864. *Glyphis saturnalis* CARPENTER, Ann. Mag. Nat. Hist., p.  
479. (Unfigured.) Cape St. Lucas, and south to the Gala-  
pagos Islands.

Genus **LUCAPINELLA** Pilsbry.**LUCAPINELLA ÆQUALIS** Sowerby.

1834. *Fissurella æqualis* SOWERBY, Proc. Zool. Soc., p. 127;  
Con. Ill., *Fissurella*, fig. 56, 1841. Santa Elena, Guayaquil,  
Ecuador.

**LUCAPINELLA CALLOMARGINATA** Carpenter.

1872. *Clypidella callomarginata* (CARPENTER Ms.) DALL, Am.  
Journ. Conch., vol. 7, p. 133, pl. 15, fig. 8.—PILSBRY, Man.  
Con., vol. 12, p. 196, pl. 44, figs. 3, 4, 5; pl. 61, figs. 1-5,  
1890. Lobitas, California, and southward to Paita, Peru,  
and Valparaiso, Chile.

## Genus PUNCTURELLA Lowe.

## PUNCTURELLA FALKLANDICA A. Adams.

1862. *Cemoria falklandica* ADAMS, Thes. Con., *Fissurellidæ*, p. 208, pl. 245, fig. 14. Falkland Islands, Patagonia, and southern Chile.

## Family STOMATELLIDÆ.

## Genus GENA Gray.

## GENA, species.

1900. "*Gena planulata* Lamarck" T. v. BAYERN, Nachrbl. Mal. Ges., vol. 32, p. 53. Antofagasta, Chile.

## Subclass ISOPLEURA.

## Order POLYPLACOPHORA.

## Superfamily MESOPLACOPHORA.

## Family ISCHNOCHITONIDÆ.

## Genus TONICELLA Carpenter.

## TONICELLA (MOPALIELLA) STIGMATA Dall, new name.

1909. *Chiton bipunctatus* SOWERBY, Proc. Zool. Soc., 1832, p. 104; Con. Ill., *Chiton*, fig. 27, 1833; not of G. FISCHER, Tabl. Syn. Zoög. p. 11, 1808. Lobos Islands, Peru.

## Genus CHÆTOPLEURA Shuttleworth.

## CHÆTOPLEURA BENEVENTEI Plate.

1899. Zool. Jahrb., Suppl. Bd. 4, p. 194, pl. 2, fig. 143, pl. 11, fig. 305-306. Tumbes; Iquique, Chile.

## CHÆTOPLEURA FERNANDENSIS Plate.

1899. Zool. Jahrb., Suppl. Bd. 4, p. 197, fig. Juan Fernandez Island.

## CHÆTOPLEURA HENNAHI Gray.

1828. *Chiton hennahi* GRAY, Spicil. Zool., p. 6, no. 11.—SOWERBY, Con. Ill., *Chiton*, figs. 1, 33, 1833. Callao, Peru, 5-7 fathoms.

## CHÆTOPLEURA LURIDA Sowerby.

1832. *Chiton luridus* SOWERBY, Proc. Zool. Soc., p. 26; Con. Ill., *Chiton*, fig. 20, 1833. Gulf of California, and southward to Islay, Peru.

## CHÆTOPLEURA PERUVIANA Lamarck.

1819. *Chiton peruvianus* LAMARCK, An. s. Vert., vol. 6, pt. 1, p. 321; Encycl. Méth., pl. 163, figs. 7, 8.—SOWERBY, Con. Ill., *Chiton*, fig. 44. Tumbes, Peru, to Valparaiso, Chile.

## Genus VARIOLEPIS Plate.

## VARIOLEPIS IQUIQUENSIS Plate.

1899. Fauna Chilensis, vol. 1, p. 200, fig.; pl. 11, figs. 307-311.  
Iquique, Chile.

## Genus ISCHNOCHITON Gray.

## ISCHNOCHITON CATENULATUS Sowerby.

1832. *Chiton catenulatus* SOWERBY, Proc. Zool. Soc., p. 104; Con. Ill., *Chiton*, fig. 145, 1840. Lobos Islands, Peru.

## ISCHNOCHITON FIMBRIATUS Sowerby.

1840. *Chiton fimbriatus* SOWERBY, Mag. Nat. Hist., p. 293; Con. Ill., *Chiton*, fig. 137. Peru.

## ISCHNOCHITON IMITATOR Smith.

1881. Proc. Zool. Soc., p. 35, pl. 4, fig. 13. Tumbes, Chile, to the Magellanic region and the Falkland Islands.

## ISCHNOCHITON INCA Orbigny.

1841. *Chiton inca* ORBIGNY, Voy. Am. MÉR., p. 486, pl. 65, figs. 20-24. Islay, Peru.

## ISCHNOCHITON KEILI Plate.

1899. Fauna Chilensis, vol. 2, p. 108, pl. 2, fig. 145; pl. 7, figs. 227-230. Juan Fernandez Island.

## ISCHNOCHITON (STENOPLAX) LIMACIFORMIS Sowerby.

1832. *Chiton limaciformis* SOWERBY, Proc. Zool. Soc., p. 26; Con. Ill., *Chiton*, fig. 38, 1833. Mazatlan, Mexico, to the Lobos Islands, Peru; also in the West Indies, and perhaps Japan.

## ISCHNOCHITON PUNCTULATISSIMUS Sowerby.

1832. *Chiton punctulatissimus* SOWERBY, Proc. Zool. Soc., p. 58; Con. Ill., *Chiton*, fig. 9, 1833. Tumbes, Peru, and southward to Mejillones del Sur, Chile.

## ISCHNOCHITON PUSILLUS Sowerby.

1832. *Chiton pusillus* SOWERBY, Proc. Zool. Soc., p. 57; Con. Ill., *Chiton*, fig. 31. Pacasmayo, Peru, in 17 fathoms, 9 miles off shore.

## ISCHNOCHITON BOOGI Haddon.

1886. Challenger Chitons, p. 16, 1886.—*Chiton roseus* SOWERBY, Proc. Zool. Soc., 1832, p. 58; not of BLAINVILLE, 1825; Con. Ill., *Chiton*, fig. 14, 1833. Ecuador and Peru. Also Atlantic.

## ISCHNOCHITON RUGULATUS Sowerby.

1832. *Chiton rugulatus* SOWERBY, Proc. Zool. Soc., p. 58; Con. Ill., *Chiton*, fig. 42, 1833. Gulf of Panama to the Lobos Islands, Peru.

## ISCHNOCHITON STRAMINEUS Sowerby.

1832. *Chiton stramineus* SOWERBY, Proc. Zool. Soc., p. 104; Con. Ill., *Chiton*, fig. 28. Chiloë Island, Chile.

## ISCHNOCHITON VARIANS Plate.

1899. Fauna Chilensis, p. 113, fig. Tumbes, Chile, to Chiloë Island and Juan Fernandez.

## Genus CALLISTOCHITON Carpenter.

## CALLISTOCHITON ELENENSIS Sowerby.

1832. *Chiton elenensis* SOWERBY, Proc. Zool. Soc., p. 27; Con. Ill., *Chiton*, fig. 69, 1840. Panama to Santa Elena, Ecuador.

## CALLISTOCHITON INFORTUNATUS Pilsbry.

1892. Man. Con., vol. 14, p. 266, pl. 59, figs. 37-42. Gulf of California to Ecuador.

## CALLISTOCHITON PULCHELLUS Gray.

1828. *Chiton pulchellus* GRAY, Spicil. Zool., vol. 1, pt. 1, p. 6, pl. 3, fig. 9 (not of ORBIGNY). Islay, Peru, to Arica, Chile.

## CALLISTOCHITON VIVIPARUS Plate.

1899. Fauna Chilensis, p. 154, pl. 9, figs. 267-281. Near Coquimbo, Chile.

## Family MOPALIIDÆ.

## Genus PLACIPHORELLA Carpenter.

## PLACIPHORELLA BLAINVILLEI Broderip.

1832. *Chiton blainvillei* BRODERIP, Proc. Zool. Soc., p. 27; Con. Ill., *Chiton*, fig. 6, 1833. Galapagos, Cocos, and Lobos islands.

## Genus PLAXIPHORA Gray.

PLAXIPHORA ~~SETIGER~~, var. FREMBLII Broderip.

1832. *Chiton fremblii* BRODERIP, Proc. Zool. Soc., p. 28; Con. Ill., *Chiton*, fig. 4, 1833. Valparaiso, Chile.

## PLAXIPHORA FERNANDEZI Thiele.

1909. Zoologica, vol. 22, p. 22, pl. 3, figs. 1-8. Juan Fernandez Island.

## Family ACANTHOCHITIDÆ.

## Genus ACANTHOCHITES Risso.

## ACANTHOCHITES HIRUDINIFORMIS Sowerby.

1832. *Chiton hirudiniformis* SOWERBY, Proc. Zool. Soc., p. 59; Con. Ill., *Chiton*, figs. 23, 142. Païta to Islay, Peru, and the Galapagos Islands.

## Superfamily TELEOPLACOPHORA.

## Family CHITONIDÆ.

## Genus CHITON Linnæus.

## CHITON BRODERIPI Potiez and Michaud.

1838. Galérie de Douai, vol. 1, p. 533 (unfigured, relations unknown). Chile.

**CHITON CUMINGSII** Frembly.

1827. Zool. Journ., vol. 3, p. 198, suppl. pl. 16, fig. 3.—SOWERBY, Con. Ill., *Chiton*, fig. 32, 1833.—*Amaurochiton* THIELE, Gebiss d. Schn., vol. 2, p. 362, 1893. Callao, Peru, to Chiloë Island, Chile.

**CHITON GLAUCOCINCTUS** Frembly.

1827. Zool. Journ., vol. 3, p. 201, suppl. pl. 17, fig. 2. Valparaiso, Chile.

**CHITON GRANOSUS** Frembly.

1827. Zool. Journ., vol. 3, p. 200, suppl. pl. 17, fig. 1.—REEVE, Con. Icon., *Chiton*, pl. 5, fig. 27.—*Chondroplax*, THIELE, Gebiss d. Schn., vol. 2, p. 364, 1893. Callao, Peru, to the Magellanic region.

**CHITON GRANULOSUS** Frembly.

1827. Zool. Journ., vol. 3, p. 201; suppl. pl. 17, fig. 3. Isla Blanca, Peru, to Concepcion, Chile.

**CHITON LATUS** Sowerby.

1825. (Jan.) Tankerville Cat., app. p. v; not of LOWE (April, 1825) or GULDING, 1829.—REEVE, Con. Icon., *Chiton*, pl. 1, fig. 3 (as *C. magnificus*). Valparaiso and Coquimbo, Chile.

**CHITON PUSIO** Sowerby.

1832. Proc. Zool. Soc., p. 105.—*C. murrayi* HADDON, Challenger Chitons, p. 21, pl. 1, fig. 7, pl. 3, fig. 7a-7e, 1886. Callao, Peru, to Valparaiso, Chile.

**CHITON STOKESII** Broderip.

1832. Proc. Zool. Soc., p. 25.—SOWERBY, Con. Ill., *Chiton*, fig. 24, 1833. Guaymas, Mexico, south to Arica, Chile.

**CHITON SUBFUSCUS** Sowerby.

1832. Proc. Zool. Soc., p. 26; Con. Ill., *Chiton*, figs. 3, 41, 1833 (as *C. striatus*, BARNES). Southern Chile; Puerto Montt; Chiloë Island.

Section **RADSIA** Gray.**CHITON BARNESII** Gray.

1828. Spicil. Zool., vol. 1, p. 3, pl. 6, fig. 22.—SOWERBY, Con. Ill., *Chiton*, fig. 2, 1833. Coquimbo, Chile.

**CHITON GOODALLI** Broderip.

1832. Proc. Zool. Soc., p. 25.—SOWERBY, Con. Ill., *Chiton*, figs. 34, 40, 1833. Galapagos Islands.

**CHITON SULCATUS** Wood.

1815. Gen. Conch., p. 16, pl. 3, fig. 1.—SOWERBY, Con. Ill., *Chiton*, fig. 12. Galapagos Islands.

Genus **TONICIA** Gray.**TONICIA ARGYROSTICTA** Philippi.

1845. *Chiton argyrosticta* PHILIPPI, Arch. f. Naturg., p. 49; Atacama Reise, p. 179, pl. 7, fig. 4, 1860. Isla Blanca, Peru, to Magellan Straits.

## TONICIA CALBUCENSIS Plate.

1897. Fauna Chilensis, p. 205, fig. Calbuco, Chile, S. lat. 41°.

## TONICIA CHILENSIS Frembly.

1827. *Chiton chilensis* FREMBLY, Zoöl. Journ., vol. 3, p. 204, suppl. pl. 17, fig. 8. Coquimbo, Tumbes, Valparaiso, Chile.

## TONICIA DISJUNCTA Frembly.

1827. *Chiton disjunctus* FREMBLY, Zoöl. Journ., vol. 3, p. 203, suppl. pl. 17, fig. 5. Tumbes and Valparaiso, Chile.

## TONICIA ELEGANS Frembly.

1827. *Chiton elegans* FREMBLY, Zoöl. Journ., vol. 3, p. 203, suppl. pl. 17, fig. 6.—SOWERBY, Con. Ill., *Chiton*, fig. 75, 1840. Callao, Peru, and south to Chiloë Island, Chile.

## TONICIA FONTAINEI Rochebrune.

1882. Bull. Soc. Philom., Paris, p. 193. (Unfigured.) Chile.

## TONICIA GAUDICHAUDI Rochebrune.

1883. Bull. Soc. Philom., Paris, p. 35. (Unfigured.) Chile.

## TONICIA GRANIFERA Sowerby.

1832. *Chiton graniferus* SOWERBY, Proc. Zool. Soc., p. 104.—REEVE, Con. Icon., *Chiton*, pl. 15, fig. 86. Concepcion, Chile, 9 fathoms.

## TONICIA GRAYI Sowerby.

1832. *Chiton grayi* SOWERBY, Proc. Zool. Soc., p. 57; Con. Ill., *Chiton*, figs. 8, 16. Callao Bay, Peru.

## TONICIA LINEOLATA Frembly.

1827. *Chiton lineolatus* FREMBLY, Zoöl. Journ., vol. 3, p. 204, suppl. pl. 17, fig. 7.—SOWERBY, Con. Ill., *Chiton*, fig. 154, 1840. Valparaiso and Talcahuano Bay, Chile.

## TONICIA RUBIDENS Pilsbry.

1892. Man. Con., vol. 14, p. 202, pl. 44, figs. 65–67. Callao, Peru, Chile (U. S. Expl. Exp.).

## TONICIA SWAINSONI Sowerby.

1832. *Chiton swainsoni* SOWERBY, Proc. Zool. Soc., p. 27; Con. Ill., *Chiton*, fig. 5, 1833. Callao, Peru, to Iquique, Chile.

## Genus ACANTHOPLEURA Guilding.

## ACANTHOPLEURA ECHINATA Barnes.

1823. *Chiton echinatus* BARNES, Am. Journ. Sci., vol. 7, p. 71, pl. 3, figs. 4, 4a.—SOWERBY, Con. Ill., *Chiton*, fig. 47 (as *C. spiniferus*). Paita, Peru, and south to Valparaiso, Chile, and the Galapagos Islands.

## Genus ENOPOCHITON Gray.

## ENOPOCHITON NIGER Barnes.

1823. *Chiton niger* BARNES, Am. Journ. Sci., vol. 7, p. 71, pl. 3, fig. 3. Mollendo, Peru, and south to Valparaiso.

## Class SCAPHOPODA.

## Order SOLENOCONCHA.

## Family DENTALIIDÆ.

## Genus DENTALIUM Linnæus.

## DENTALIUM ÆQUATORIUM Pilsbry and Sharp.

1897. Man. Con., vol. 17, p. 112, pl. 21, fig. 43. Off Manta, Ecuador.

## DENTALIUM INNUMERABILE Pilsbry and Sharp.

1897. Man. Con., vol. 17, p. 119, pl. 18, figs. 6-8. Magdalena Bay, Lower California, and southward to Panama and Guayaquil.

## DENTALIUM NUMEROSUM Dall.

1897. Man. Con., vol. 17, p. 25, pl. 10, figs. 70-73. Todos Santos Bay, Lower California, and southward to Panama and the Galapagos Islands.

## DENTALIUM QUADRANGULARE Sowerby.

1832. Proc. Zool. Soc., p. 29; Thes. Con., vol. 3, p. 103, pl. 224, fig. 31, 1860. West Coast of Nicaragua and south to Jipijapa, Ecuador.

## DENTALIUM TESSARAGONUM Sowerby.

1832. Proc. Zool. Soc., p. 29.—PILSBRY and SHARP, Man. Con., vol. 17, p. 34, pl. 4, fig. 1, 1897. Gulf of Panama and south to Jipijapa, Ecuador.

## Genus CADULUS Philippi.

## CADULUS ALBICOMATUS Dall.

1889. Proc. U. S. Nat. Mus., vol. 12, p. 259, pl. 9, fig. 8. Gulf of Panama to vicinity of Manta, Ecuador.

## CADULUS PERPUSILLUS Sowerby.

1832. *Dentalium perpusillum* SOWERBY, Proc. Zool. Soc., p. 29.—PILSBRY and SHARP, Man. Con., vol. 17, p. 191, pl. 36, figs. 23, 24, 1847. Off Lower California, N. lat. 23° 33', and south to Panama and Guayaquil.

## CADULUS PLATYSTOMA Pilsbry and Sharp.

1897. Man. Con., vol. 17, p. 180, pl. 35, figs. 17, 18. Off Manta, Ecuador.

## Class PELECYPODA.

## Order PRIONODESMACEA.

## (FOLIOBRANCHIATA.)

## Superfamily NUCULACEA.

## Family NUCULIDÆ.

## Genus NUCULA Lamarck.

## NUCULA COLOMBIANA Dall.

1908. Albatross Rep., p. 371. Panama to Patagonia.

## NUCULA DECLIVIS Hinds.

1843. Proc. Zool. Soc., p. 97; Zoöl. Voy. Sulph., p. 63, pl. 18,  
fig. 8, 1844. Panama to Magellan Straits.

## NUCULA EXIGUA Sowerby.

1832. Proc. Zool. Soc., p. 198; Con. Ill., *Nucula*, figs. 24, 24\*,  
1833. Acapulco, Mexico, south to Ecuador and to the  
Magellanic region.

## NUCULA GRAYI Orbigny.

1841. Voy. Am. Mér., p. 625.—SOWERBY, Con. Ill., *Nucula*,  
fig. 21. Valparaiso, Chile.

## NUCULA PAYTENSIS A. Adams.

1856. Proc. Zool. Soc., p. 51.—HANLEY, Thes. Con., *Nucula*, p.  
50, pl. 5, figs. 160-161, 1860. Paita, Peru.

## NUCULA PISUM Sowerby.

1832. Proc. Zool. Soc., p. 198; Con. Ill., *Nucula*, fig. 23, 1841.—  
ORBIGNY, Voy. Am. Mér., p. 624 (as *N. semiornata*), pl. 84,  
figs. 27-29, 1846. Valparaiso to San Blas, Chile.

## Family LEDIDÆ.

## Genus LEDA Schumacher.

## LEDA ACUTA Conrad.

1831. *Nucula acuta* CONRAD, Am. Mar. Con., p. 32, pl. 6, fig. 3  
(not of SOWERBY, 1839).—SOWERBY, Con. Ill., *Nucula*, fig.  
15 (as *N. cuneata*). California, the Gulf of Panama, and south  
to Valparaiso, Chile. Also Atlantic.

## LEDA CALLIMENE Dall.

1908. *Leda (Jupiteria) callimene* DALL, Albatross Rep., p. 342,  
pl. 17, figs. 3, 4. Gulf of Panama to Tomé, Chile.

## LEDA EBURNEA Sowerby.

1832. *Nucula eburnea* SOWERBY, Proc. Zool. Soc., p. 198; Con.  
Ill., *Nucula*, fig. 10, 1833. Gulf of Panama to the Bay of  
Caraques, Ecuador.

**LEDA ELENENSIS** Sowerby.

1832. *Nucula elenensis* SOWERBY, Proc. Zool. Soc., p. 198; Con. Ill., *Nucula*, fig. 14, 1833. Santa Elena, Ecuador.

**LEDA GIBBOSA** Sowerby.

1832. *Nucula gibbosa* SOWERBY, Proc. Zool. Soc., p. 198; Con. Ill., *Nucula*, fig. 9, 1833. Gulf of Panama to Paita, Peru.

**LEDA ORNATA** Orbigny.

1846. Voy. Am. Mér., p. 546, pl. 82, figs. 4-6. Paita, Peru.

Genus **YOLDIA** Mörch.**YOLDIA (ADRANA) SOWERBYANA** Orbigny.

1846. Voy. Am. Mér., p. 544.—SOWERBY, Con. Ill., *Nucula*, fig. 1 (as *lanceolata*), 1833.—HANLEY, Thes. Con., *Nuculidæ*, Leda No. 2, fig. 33, 1860. Jipijapa, Ecuador.

**YOLDIA (ADRANA) CRENIFERA** Sowerby.

1832. *Nucula crenifera* SOWERBY, Proc. Zool. Soc., p. 197; Con. Ill., *Nucula*, fig. 3. Jipijapa, Ecuador.

**YOLDIA (ADRANA) ELONGATA** Sowerby.

1832. *Nucula elongata* SOWERBY, Proc. Zool. Soc., p. 197; Con. Ill., *Nucula*, fig. 2, 1833. Coast of Ecuador.

*Yoldia (Adrana)**Boca de Pan, Peru.*Genus **MALLETIA** Desmoulins.**MALLETIA CHILENSIS** Desmoulins.

1832. Actes Soc. Linn. de Bordeaux, vol. 5, p. 85, pl. 1. Coquimbo, south to Talcahuano Bay, Chile.

Genus **TINDARIA** Bellardi.**TINDARIA SULCULATA** Couthouy.

1852. *Nucula sulculata* COUTHOUY, Wilkes Exp. Sh., p. 424, pl. 37, figs. 539 a-e. Talcahuano, Chile, south to the Magellanic region.

(FILIBRANCHIATA.)

Superfamily **ARCACEA**.Genus **ARCA** Linnæus.**ARCA ANGULATA** King.

1831. Zool. Journ., vol. 5, p. 336.—STEMPELL, Fauna Chilensis, vol. 2, p. 219, pl. 12, figs. 1-9, 1899. Juan Fernandez Island.

**ARCA MUTABILIS** Sowerby.

1833. Proc. Zool. Soc., p. 17.—REEVE, Con. Icon., *Arca*, pl. 13, fig. 35, 1844. Gulf of California to Guayaquil.

**ARCA PACIFICA** Sowerby.

1833. *Byssoarca pacifica* SOWERBY, Proc. Zool. Soc., p. 17.—REEVE, Con. Icon., *Arca*, pl. 11, fig. 75, 1844. Gulf of California to Paita, Peru.

## ARCA ALTERNATA Sowerby.

1833. *Byssoarca alternata* SOWERBY, Proc. Zool. Soc., p. 17.—REEVE, Con. Icon., *Arca*, pl. 13, fig. 88, 1844. Panama to Ecuador.

## ARCA GRADATA Broderip and Sowerby.

1829. Zool. Journ., vol. 4, p. 365.—REEVE, Con. Icon., *Arca*, pl. 14, fig. 92, 1844. Mazatlan, Mexico, to Iquique, Chile, and the Galapagos Islands.

## ARCA PUSILLA Sowerby.

1833. *Byssoarca pusilla* SOWERBY, Proc. Zool. Soc., p. 18.—REEVE, Con. Icon., *Arca*, pl. 16, fig. 112, 1844. Coast of Ecuador, and south to S. lat. 23° 37'.

## ARCA SOLIDA Sowerby.

1833. Proc. Zool. Soc., p. 18.—REEVE, Con. Icon., *Arca*, pl. 16, fig. 106, 1844. Gulf of California, to Paita, Peru, and the Galapagos Islands.

## ARCA (BARBATIA) BIANGULATA Sowerby.

1833. *Arca biangulata* SOWERBY, Proc. Zool. Soc., p. 21. Guayaquil.

## ARCA (BARBATIA) DECUSSATA Sowerby.

1833. *Byssoarca decussata* SOWERBY, Proc. Zool. Soc., p. 18.—REEVE, Con. Icon., *Arca*, pl. 12, fig. 81, 1844. Galapagos Islands.

## ARCA (BARBATIA) LITHODOMUS Sowerby.

1833. *Byssoarca lithodomus* SOWERBY, Proc. Zool. Soc., p. 16.—REEVE, Con. Icon., *Arca*, pl. 12, fig. 76, 1844. (*Barbatia* grown in a *Lithodomus* burrow?) Monte Cristi, Ecuador. Sta. 71

## ARCA (BARBATIA) LURIDA Sowerby.

1833. *Byssoarca lurida* SOWERBY, Proc. Zool. Soc., p. 19.—REEVE, Con. Icon., *Arca*, pl. 14, fig. 95, 1844. Santa Elena, Guayaquil.

## ARCA (BARBATIA) REEVIANA Orbigny.

1846. *Arca reeviana* ORBIGNY, Voy. Am. Mér., p. 635.—*Arca helblingi* REEVE, Con. Icon., *Arca*, pl. 14, fig. 90, 1844; not of BRUGUIÈRE, 1789. From Manta, Ecuador, south to Paita, Peru. *Mazatlan, Lowe.*

## ARCA (BARBATIA) VELATA Sowerby.

1833. *Byssoarca velata* SOWERBY, Proc. Zool. Soc., p. 18.—REEVE, Con. Icon., *Arca*, fig. 79, 1844. Indo-Pacific. Peru (Tschudi).

## ARCA (CUCULLARIA) PLATEI Stempel.

1899. *Arca (Barbatia) platei* STEMPELL, Fauna Chilensis, vol. 2, p. 220, pl. 12, figs. 10-12. Juan Fernandez Island.

## ARCA (SCAPHARCA) AVICULOIDES Reeve.

1844. *Arca aviculoides* REEVE, Con. Icon., *Arca*, pl. 10, fig. 63 (and pl. 6, fig. 35 as *A. auriculata* SOWERBY, not LAMARCK). Panama to Guayaquil.

## ARCA (SCAPHARCA) BREVIFRONS Sowerby.

1833. Proc. Zool. Soc., p. 22.—REEVE, Con. Icon.; *Arca*, pl. 1, fig. 6, 1844. Gulf of California to Tumbes, Peru.

## ARCA (SCAPHARCA) CEPOIDES Reeve.

1844. Con. Icon., *Arca*, pl. 10, fig. 66. San Miguel, Ecuador.

## ARCA (SCAPHARCA) EMARGINATA Sowerby.

1833. Proc. Zool. Soc., p. 20.—REEVE, Con. Icon., *Arca*, pl. 4, fig. 26, 1844. Gulf of California, and south to Atacames, Ecuador, and Guayaquil.

## ARCA (SCAPHARCA) FORMOSA Sowerby.

1833. Proc. Zool. Soc., p. 20.—HANLEY, Rec. Biv. Sh., p. 160, pl. 19, fig. 9, 1843. Lower California to Paita, Peru.

## ARCA (SCAPHARCA) LABIATA Sowerby.

1833. Proc. Zool. Soc., p. 21.—REEVE, Con. Icon., *Arca*, pl. 1, fig. 7, 1844. San Diego, California, to Tumbes, Peru.

## ARCA (SCAPHARCA) LABIOSA Sowerby.

1833. Proc. Zool. Soc., p. 21.—REEVE, Con. Icon., *Arca*, pl. 10, fig. 67, 1844. Tumbes, Peru.

## ARCA (SCAPHARCA) NUX Sowerby.

1833. Proc. Zool. Soc., p. 19.—REEVE, Con. Icon., *Arca*, pl. 1, fig. 1, 1844. Panama to Ecuador. Jipijapa, 12 fathoms.

## ARCA (SCAPHARCA) OBESA Sowerby.

1833. Proc. Zool. Soc., p. 21.—REEVE, Con. Icon., *Arca*, pl. 1, fig. 3, 1844. Ecuador coast.

## ARCA (SCAPHARCA) TUBERCULOSA Sowerby.

1833. Proc. Zool. Soc., p. 19.—PHILIPPI, Abb., vol. 1, p. 44, pl. 1, fig. 2, 1843. Ballenas lagoon, Lower California, to Tumbes, Peru.

## ARCA (CUNEARCA) ÆQUATORIALIS Orbigny.

1846. Voy. Am. Mér., p. 636.—*Arca ovata* REEVE (not GMELIN, 1791), Con. Icon., *Arca*, pl. 8, fig. 49, 1844. Santa Elena, Ecuador.

ARCA (CUNEARCA) CARDIFORMIS Sowerby. *not Basterot*

1833. Proc. Zool. Soc., p. 22.—REEVE, Con. Icon., *Arca*, pl. 3, fig. 17, 1844. Gulf of California to Paita, Peru.

## ARCA (ANADARA) GRANDIS Broderip and Sowerby.

1829. Zool. Journ., vol. 4, p. 365.—REEVE, Con. Icon., *Arca*, pl. 1, fig. 4, 1844. Magdalena Bay, Lower California, to Tumbes, Peru.

## ARCA (NOËTIA) REVERSA Sowerby.

1833. Proc. Zool. Soc., p. 20.—REEVE, Con. Icon., *Arca*, pl. 1, fig. 5, 1844. Gulf of California to Tumbes, Peru.

## Genus GLYCYMERIS Da Costa.

## GLYCYMERIS CHEMNITZII Dall, new name.

1909. *Pectunculus minor* ORBIGNY, Voy. Am. Mér., 1846, p. 628, not of I. LEA, 1833. Gulf of California, south to Monte Cristi, Ecuador.

## GLYCYMERIS INÆQUALIS Sowerby.

1832. *Pectunculus inæqualis* SOWERBY, Proc. Zool. Soc., p. 196 (not of SOWERBY, 1839).—REEVE, Con. Icon., *Pectunculus*, pl. 4, fig. 16, 1843. Mazatlan, Mexico, south to Sechura Bay, Peru.

## GLYCYMERIS MULTICOSTATA Sowerby.

1832. *Pectunculus multicostatus* SOWERBY, Proc. Zool. Soc., p. 195.—REEVE, Con. Icon., *Pectunculus*, pl. 5, fig. 24, 1843. Mazatlan, Mexico, to Guayaquil.

## GLYCYMERIS OVATA Broderip.

1832. *Pectunculus ovatus* BRODERIP, Proc. Zool. Soc., p. 126.—REEVE, Con. Icon., *Pectunculus*, pl. 1, fig. 2, 1843. Lobos Islands, Peru, to Coquimbo, Chile.

## GLYCYMERIS STRIGILATA Sowerby.

1832. *Pectunculus strigilatus* SOWERBY, Proc. Zool. Soc., p. 196.—REEVE, Con. Icon., *Pectunculus*, pl. 6, fig. 31, 1843. Santa Elena, Ecuador.

## GLYCYMERIS TESSELLATA Sowerby.

1832. *Pectunculus tessellatus* SOWERBY, Proc. Zool. Soc., p. 196.—REEVE, Con. Icon., *Pectunculus*, pl. 6, fig. 29, 1843. Cape St. Lucas, Lower California, to Monte Cristi, Ecuador.

## Superfamily PTERIACEA.

## Family PINNIDÆ.

## Genus PINNA Linnæus.

## PINNA LANCEOLATA Sowerby.

1835. Proc. Zool. Soc., p. 84.—REEVE, Con. Icon., *Pinna*, pl. 31, fig. 58, 1858. Gulf of California, and south to Guayaquil.

## PINNA MAURA Sowerby.

1835. Proc. Zool. Soc., p. 84.—REEVE, Con. Icon., *Pinna*, pl. 29, fig. 54, 1858. Gulf of California to Panama. Peru (Tschudi).

## Family MELINIDÆ.

## Genus MELINA Retzius.

## MELINA LEGUMEN Gmelin.

1791. *Ostrea legumen* GMELIN, Syst. Nat., vol. 8, p. 3399.—REEVE, Con. Icon., *Perna*, pl. 5, fig. 22, 1858. Galapagos Islands.

## MELINA QUADRANGULARIS Reeve.

1858. *Perna quadrangularis* REEVE, Con. Icon., *Perna*, pl. 2, fig. 6. Galapagos Islands.

## Family PTERIIDÆ.

## Genus PTERIA Scopoli.

## PTERIA PERUVIANA Reeve.

1857. *Avicula peruviana* REEVE, Con. Icon., *Avicula*, pl. 14, fig. 53. Gulf of California to Paita, Peru.

## Genus MARGARITIPHORA Megerle.

## MARGARITIPHORA CUMINGI Reeve.

1857. *Avicula cumingi* REEVE, Con. Icon., pl. 4, fig. 6. Paita, Peru, and the Galapagos Islands.

## Superfamily OSTRACEA.

## Family OSTREIDÆ.

## Genus OSTREA Linnæus.

## OSTREA ÆQUATORIALIS Orbigny.

1846. Voy. Am. Mér., p. 672. Bay of Guayaquil (on trees). Paita, Peru.

## OSTREA CALLICHROA Hanley.

1845. Proc. Zool. Soc., p. 107.—SOWERBY, Con. Icon., *Ostrea*, pl. 4, fig. 6, 1870. Chiloë Island, Chile.

## OSTREA CHILENSIS Philippi.

1845. Con. Cab., ed. 2, *Ostrea*, p. 74, pl. 13, figs. 7, 8. Coast of Ecuador, south to Chiloë Island, Chile.

## OSTREA COLUMBIENSIS Hanley.

1845. Proc. Zool. Soc., p. 107.—SOWERBY, Con. Icon., *Ostrea*, pl. 7, fig. 10a-b, 1871. Gulf of California, south to Coquimbo, Chile.

## OSTREA LONGIUSCULA Hupé.

1854. Hist. de Chile, Zoöl., Mol., p. 282, pl. 5, fig. 3. Coquimbo, Chile.

## OSTREA MEGODON Hanley.

1845. Proc. Zool. Soc., p. 106.—SOWERBY, Con. Icon., *Ostrea*, pl. 12, fig. 24, 1871. Scammon Lagoon, Lower California, to Sechura Bay, Peru. Fossil, Antilles.

## OSTREA VIOLENTA Hupé.

1854. Hist. de Chile, Zoöl., Mol., p. 282, pl. 5, fig. 2. Coquimbo, Chile.

## Superfamily PECTINACEA.

## Family PECTINIDÆ.

## Genus PECTEN Müller.

## PECTEN DENTATUS Sowerby.

1835. Proc. Zool. Soc., p. 109; Thes. Con., vol. 1, *Pecten*, p. 49, pl. 15, figs. 105, 106, 1843. Santa Elena, Ecuador, to Paita, Peru.

## PECTEN DIGITATUS Hinds.

1844. Zoöl. Sulph. Voy., Moll., p. 61, pl. 17, fig. 2. Bay of Guayaquil.

## PECTEN PATAGONICUS King.

1831. Zoöl. Journ., vol. 5, p. 337.—SOWERBY, Thes. Con., vol. 1, p. 54, pl. 13, fig. 60, 1842. Magellanic Region, north to Chiloë Island and Puerto Montt.

## PECTEN PURPURATUS Lamarck.

1819. An. s. Vert., vol. 6, pt. 1, p. 166.—SOWERBY, Thes. Con., vol. 1, p. 53, pl. 15, fig. 113; pl. 16, figs. 123-125, 1843. Panama and south to Coquimbo, Chile.

## PECTEN ROSACEUS Stempell.

= *patagonicus* King fide S. M. S.

1899. Fauna Chilensis, p. 228.—*P. australis* PHILIPPI, Arch. f. Naturg., vol. 11, p. 56, 1845; not of SOWERBY, 1842. Calbuco, Chiloë, and the Chonos Islands.

## PECTEN SUBNODOSUS Sowerby.

1835. Proc. Zool. Soc., p. 109, no. 1; Thes. Con., *Pecten*, p. 65, pl. 15, figs. 97, 112. Gulf of California to Guayaquil and the Galapagos Islands.

## PECTEN TUMBEZENSIS Orbigny.

1846. Voy. Am. MÉR., p. 663.—*P. aspersus* SOWERBY (not of LAMARCK), Thes. Con., *Pecten*, p. 51, pl. 19, figs. 198-9, 1843. Tumbes and Paita, Peru.

## PECTEN VENTRICOSUS Sowerby.

1842. Thes. Con., *Pecten*, p. 51, pl. 12, figs. 18, 19, 26. Gulf of Panama, south to Paita, Peru.

## Family SPONDYLIDÆ.

## Genus SPONDYLUS Linnæus.

## SPONDYLUS CRASSISQUAMA Lamarck.

1819. An. s. Vert., vol. 6, p. 191.—SOWERBY, Thes. Con., *Spondylus* (as *S. pictorum* CHEMNITZ), p. 422, pl. 85, fig. 17; pl. 86, fig. 28; pl. 88, fig. 45, 1847. Panama to Guayaquil.

## Genus PLICATULA Lamarck.

## PLICATULA DUBIA Hanley.

= *penicillata* Cpr. Mag. Oct.

1847. SOWERBY, Thes. Con., *Plicatula*, p. 437, pl. 91, fig. 19.—HANLEY, Rec. Biv. Sh., p. 289, 1856. Panama to Guayaquil.

## Family LIMIDÆ.

## Genus LIMA Cuvier.

## LIMA ANGULATA Sowerby.

1843. Proc. Zool. Soc., p. 23; Thes. Con., vol. 1, p. 86, pl. 22, figs. 39, 40, 1843. Gulf of Panama and southward to Juan Fernandez Island.

## LIMA GALAPAGENSIS Pilsbry and Vanatta.

1902. Proc. Wash. Acad. Sci., vol. 4, p. 556, pl. 35, fig. 4. Galapagos Islands.

## LIMA PACIFICA Orbigny.

1846. Voy. Am. Mér., p. 654.—*L. arcuata* SOWERBY (not GEINITZ, 1840), Thes. Con., vol. 1, p. 86, pl. 22, figs. 41–42, 1843. Panama to Guayaquil and the Galapagos Islands.

## Superfamily ANOMIACEA.

## Family ANOMIIDÆ.

## Genus ANOMIA Linnæus.

## ANOMIA ADAMAS Gray.

1849. Proc. Zool. Soc., p. 117.—REEVE, Con. Icon., *Anomia*, pl. 3, fig. 15, 1859. Gulf of California to Sechura Bay, Peru, and the Galapagos Islands.

## ANOMIA PACILUS Gray.

1849. Proc. Zool. Soc., p. 117.—REEVE, Con. Icon., *Anomia*, pl. 4, fig. 19, 1859. Tumbes, Peru.

## ANOMIA PERUVIANA Orbigny.

1846. Voy. Am. Mér., p. 673.—PHILIPPI, Abb., vol. 3, p. 211, pl. 1, fig. 2, 1850. San Pedro, California, south to Panama, and to Paita, Peru.

## Genus MONIA Gray.

## MONIA FOLIATA Broderip.

1834. *Placunanomia foliata* BRODERIP, Proc. Zool. Soc., p. 2.—REEVE, Con. Icon., *Placunanomia*, pl. 1, fig. 5, 1859. San Pedro, California, and south to Guayaquil.

## Superfamily MYTILACEA.

## Family MYTILIDÆ.

## Genus MYTILUS Linnæus.

## MYTILUS ADAMSIANUS Dunker.

1856. Proc. Zool. Soc., p. 360.—REEVE, Con. Icon., *Mytilus*, pl. 11, fig. 55. Gulf of Panama, to the Galapagos Islands.

## MYTILUS ATER Molina.

1782. Stor. Nat. Chile, p. 203.—*M. orbignyianus* HUPÉ, Hist. de Chile, Mol., p. 211, pl. 5, fig. 5, 1854. Manta, Ecuador, and south to Talcahuano, Chile, with the Galapagos Islands.

## MYTILUS CHILENSIS Hupé.

1854. Hist. de Chile, Mol., p. 309, pl. 5, fig. 4. Valparaiso, Chile, and southward to the Magellanic region.

## MYTILUS CHORUS Molina.

1782. Stor. Nat. Chile, p. 202.—REEVE, Con. Icon., *Mytilus*, fig. 4. Pacasmayo, Peru, south to Coquimbo, Chile.

**MYTILUS DACTYLIFORMIS** Hupé.

1854. Hist. de Chile, Mol., p. 310, pl. 5, fig. 6. Isla Blanca del Chimba, Chile, to Corral.

**MYTILUS GRANULATUS** Hanley.

1844. Proc. Zool. Soc., p. 17; Rec. Biv. Sh., p. 246, pl. 24, fig. 33, 1844.—HUPÉ, Hist. de Chile, Mol., p. 312, pl. 5, fig. 7, 1854. Lobos Islands, Peru, and south to the island of Chiloe.

**MYTILUS MAGELLANICUS** Lamarck.

1819. An. s. Vert., vol. 6, pt. 1, p. 119; Encycl. Méth. pl. 217, fig. 2. Callao, Peru, south to the Magellanic region.

**MYTILUS PATAGONICUS** Orbigny.

1889. In CLESSIN, Conch. Cab., 2d ed. *Mytilacea*, p. 82, pl. 18, figs. 5, 6. Chile and southward.

**MYTILUS PILOSUS** Reeve.

1858. (RECLUZ, ms. in) REEVE, Con. Icon., *Mytilus*, pl. 8, fig. 35. Iquique to Coquimbo, Chile, and Juan Fernandez Island.

**MYTILUS SPLENDENS** Dunker.

1856. Proc. Zool. Soc., p. 368. Peru.

**MYTILUS STEARNSII** Pilsbry and Raymond.

1898. Nautilus, vol. 12, no. 6, p. 70, pl. 4, figs. 1, 2, 3. San Diego, California, and southward. (Chile, Dautzenberg, Oahu, Conrad.)

Genus **MODIOLUS** Lamarck.**MODIOLUS ARCIFORMIS** Dall.

1909. Proc. U. S. Nat. Mus., vol. 37, p. 152, pl. 28, fig. 2, Huacilla, Ecuador. *also E. coast of Peru*

**MODIOLUS GUYANENSIS** Lamarck.

1819. *Modiola guyanensis* LAMARCK, An. s. Vert., vol. 6, pt. 1, p. 112.—REEVE, Con. Icon., *Modiola*, pl. 4, fig. 17, 1857. Lower California to Tumbes, Peru. Also Guiana, and Brazil at Rio Janeiro.

**MODIOLUS MUTABILIS** Carpenter.

1856. *Modiola (braziliensis* var. ?) *mutabilis* CARPENTER, Mazatlan Cat., p. 122. Mazatlan to Ecuador.

**MODIOLUS PURPURATUS** Lamarck.

1819. An. s. Vert., vol. 6, p. 113.—CLESSIN, Conch. Cab., 2d ed., p. 128, (*ovalis*) pl. 33, figs. 4, 5, 1889. Ecuador, south to Concepcion, Chile.

**MODIOLUS SPECIOSUS** Dunker.

1889. Conch. Cab., 2d ed., *Mytilacea*, p. 112, pl. 81, fig. 1. Panama, south to Paita, Peru.

Genus **ADULA** H. and A. Adams.**ADULA SOLENIFORMIS** Orbigny.

1846. *Mytilus soleniformis* ORBIGNY, Voy. Am. Mér., p. 649, pl. 85, fig. 17, 18. Paita, Peru.

## Genus LITHOPHAGA Bolten.

## LITHOPHAGA ARISTATA Dillwyn.

1817. *Mytilus aristatus* (SOLANDER Ms.) DILLWYN, Rec. Shells, I, p. 303.—WOOD, Index Test., pl. 12, fig. 8, 1825. Gulf of California south to the Chilean coast. Red Sea, Senegal, West Indies.

## LITHOPHAGA ATTENUATA Deshayes.

1836. *Modiola attenuata* DESHAYES, An. s. Vert., 2d ed., vol. 7, p. 28.—SOWERBY, Gen. Sh., *Lithodomus*, fig. 3, 1824.—PHILIPPI, Abb., vol. 2, p. 148, pl. 1, fig. 6, 1847. Coast of Peru (at Callao, in nullipore) and Chile.

## LITHOPHAGA INCA Orbigny.

1846. *Lithodomus inca* ORBIGNY, Voy. Am. MÉR., p. 651. Paita, Peru.

## LITHOPHAGA PERUVIANA Orbigny.

1846. *Lithodomus peruvianus* ORBIGNY, Voy. Am. MÉR., p. 651. Callao, Peru, and Arica, Chile.

## Order ANOMALODESMACEA.

## Superfamily ANATINACEA.

## Family PERIPLOMATIDÆ.

## Genus PERIPLOMA Schumacher.

## PERIPLOMA LENTICULARIS Sowerby.

1834. Proc. Zool. Soc., p. 87. Muerte Island, Ecuador.

## PERIPLOMA PLANIUSCULA Sowerby.

1834. Proc. Zool. Soc., p. 87.—HANLEY, Rec. Biv. Sh., pp. 21, 339; suppl. pl. 10, fig. 33, 1842. Santa Elena, Ecuador.

## Family PANDORIDÆ.

## Genus PANDORA Schumacher.

## PANDORA RADIATA Sowerby.

1830. Species Conch., figs. 23. 24; Proc. Zool. Soc., p. 94, 1835. Muerte Island, Ecuador.

## Genus CLIDIOPHORA Carpenter.

## CLIDIOPHORA ARCUATA Sowerby.

1830. *Pandora arcuata* SOWERBY, Species Conch., figs. 27, 28; Proc. Zool. Soc., p. 93, 1835. Santa Elena, Ecuador.

## Family LYONSIIDÆ.

## Genus ENTODESMA Philippi.

## ENTODESMA CUNEATA Gray.

1828. *Anatina cuneata* GRAY, Spicil. Zool., vol. 1, pl. 3, fig. 14. Coast of Ecuador, south to the Magellanic region.

## (SEPTIBRANCHIATA.)

## Superfamily POROMYACEA.

## Family CUSPIDARIIDÆ.

## Genus CUSPIDARIA Nardo.

## CUSPIDARIA COSTATA Sowerby.

1834. *Anatina costata* SOWERBY, Proc. Zool. Soc., p. 87. Coast of Costa Rica, and south to Santa Elena, Ecuador.

*Cuspidaria chilensis* Dall, 1889, Proc. U. S. N. Mus., xii, p. 282, pl. 13, Order TELEODESMACEA. off Chile, 1036 fms

## (NASSIBRANCHIATA.)

## Superfamily ASTARTACEA.

## Family CRASSATELLITIDÆ.

## Genus CRASSATELLITES Krüger.

## CRASSATELLITES GIBBOSUS Sowerby.

1832. *Crassatella gibbosa* SOWERBY, Proc. Zool. Soc., p. 56.—REEVE, Con. Icon., *Crassatella*, pl. 1, fig. 1, 1843. Gulf of California, south to Paita, Peru.

## Superfamily CYRENACEA.

## Family CYRENIDÆ.

## Genus CYRENA Lamareck.

## CYRENA ANOMALA Deshayes.

1854. Proc. Zool. Soc., p. 21.—PRIME, Mon. Corbic., p. 30, fig. 24, 1865.—REEVE, Con. Icon., *Cyrena*, pl. 19, fig. 109, 1876. Coasts of Ecuador and Peru.

## CYRENA CHILINA Prime.

1867. Ann. Lyc. N. Hist. N. York, vol. 8, p. 418. Chile.

## CYRENA CORDIFORMIS Recluz.

1853. Journ. de Conchyl., vol. 4, p. 251, pl. 7, fig. 9. Paita, Peru.

## CYRENA FONTAINEI Orbigny.

1844. Voy. Am. Mér., p. 569, pl. 83, figs. 14-15. Guayaquil, Ecuador.

## CYRENA FORTIS Prime.

1861. Journ. de Conchyl., vol. 9, p. 355; vol. 10, p. 387, pl. 14, fig. 2, 1862. Ecuador.

## CYRENA ISOCARDIOIDES Deshayes.

1854. Proc. Zool. Soc., p. 22.—PRIME, Mon. Corbic., p. 25, 1865; Proc. U. S. Nat. Mus., vol. 37, p. 159, pl. 26, fig. 4. Ecuador coast. Estero Bendito, Tumbes, Peru.

## CYRENA MERIDIONALIS Prime.

1865. Mon. Corbiculidæ, p. 19, fig. 14. Paita, Peru.

## CYRENA NOTABILIS Deshayes.

1854. Proc. Zool. Soc., p. 21.—SOWERBY, Con. Icon., *Cyrena*, pl. 18, fig. 107, 1876, Paita, Peru.

## Superfamily CARDITACEA.

## Family CARDITIDÆ.

## Genus CARDITA Bruguière.

## CARDITA GRAYI Dall.

1903. Proc. Acad. Nat. Sci. Phila. for 1902, p. 706.—REEVE, Con. Icon., *Cardita*, pl. 7, fig. 32, 1843.—*Cardita crassa* GRAY, Beechey's Voy., 1839, not of LAMARCK, 1819. Gulf of California to Guayaquil and the Galapagos Islands.

## CARDITA LATICOSTATA Sowerby.

1832. Proc. Zool. Soc., p. 195.—REEVE, Con. Icon., *Cardita*, pl. 7, fig. 36, 1843. Guaymas, Mexico, to Panama and Guayaquil, Ecuador.

## CARDITA (GLANS) NAVIFORMIS Reeve.

1843. *Cardita naviformis* REEVE, Con. Icon., *Cardita*, pl. 9, fig. 45. Arica to Valparaiso, Chile.

## Genus CARDITAMERA Conrad.

## CARDITAMERA RADIATA Sowerby.

1832. *Cardita radiata* SOWERBY, Proc. Zool. Soc., p. 195.—REEVE, Con. Icon., *Cardita*, pl. 1, figs. 5a-b, 1843. Costa Rican coast and southward to Guayaquil, Ecuador.

## Genus VENERICARDIA Lamarck.

## VENERICARDIA COMPRESSA Reeve.

1843. *Cardita compressa* REEVE, Con. Icon., *Cardita*, pl. 9, fig. 46. Valparaiso, Chile, and southward.

## VENERICARDIA CRASSICOSTATA Sowerby.

1825. *Cardita crassicostata* SOWERBY, Tankerville Cat., app. p. iv.—REEVE, Con. Icon., *Cardita*, pl. 5, figs. 25-26; pl. 8, fig. 38, 1843. Gulf of California, and southward to Ecuador and the Galapagos Ids.

## VENERICARDIA PÆTELIANA Clessin.

1888. *Cardita pæteliana* CLESSIN, Con. Cab., 2d ed., *Cardita*, p. 20, pl. 6, figs 7-8. Iquique, Chile.

## VENERICARDIA SPURCA Sowerby.

1832. Proc. Zool. Soc., p. 195.—REEVE, Con. Icon., *Cardita*, pl. 7, fig. 32, 1843. Callao, Peru, and southward to the Magellanic region.

## VENERICARDIA VELUTINA E. A. Smith.

1881. Proc. Zool. Soc., p. 42, pl. 5, fig. 8. Chiloë Island and southward to Punta Arenas.

## Family CONDYLOCARDIIDÆ.

## Genus CARDITELLA Smith.

## CARDITELLA PYGMÆA Philippi.

1860. *Cardium pygmæum* PHILIPPI, Atacama Reise, p. 176, Zoöl., pl. 7, figs. 3a-c. Isla Blanca, Chile, S. lat. 23° 30'.

## CARDITELLA SEMEN Reeve.

1843. *Cardita semen* REEVE, Con. Icon., *Cardita*, pl. 9, fig. 43, 1843. Cobija, Chile, south to Isla Blanca.

## CARDITELLA TEGULATA Reeve.

1843. *Cardita tegulata* REEVE, Con. Icon., *Cardita*, pl. 9, fig. 48. Callao, Peru, to Valparaiso, Chile.

## Genus CARDITOPSIS Smith.

## CARDITOPSIS FLABELLUM Reeve.

1843. *Cardita flabellum* REEVE, Con. Icon., *Cardita*, pl. 9, fig. 47. Callao, Peru, to Valparaiso, and southward to Magellan Straits.

## Superfamily CHAMACEA.

## Family CHAMIDÆ.

## Genus CHAMA Bruguière.

## CHAMA ECHINATA Broderip.

1835. Trans. Zoöl. Soc. London, vol. 1, p. 305, pl. 39, figs. 5-7. Panama and southward to Piña, Peru.

## CHAMA FRONDOSA Broderip.

1835. Trans. Zoöl. Soc. London, vol. 1, p. 302, pl. 38, figs. 1, 2. Gulf of Panama to Guayaquil and the Galapagos Islands.

## CHAMA PELLUCIDA Broderip.

1834. Proc. Zoöl. Soc., p. 50; Trans. Zoöl. Soc. London, vol. 1, p. 302, pl. 38, fig. 3, 1835. San Pedro, California, south to Valparaiso, Chile, and Juan Fernandez Island.

## Superfamily LUCINACEA.

## Family LUCINIDÆ.

## Genus PHACOIDES Blainville.

## PHACOIDES FENESTRATUS Hinds.

1844. *Lucina fenestrata* HINDS, Zoöl. Sulph. Voy., Moll., p. 66, pl. 19, fig. 2. Lower California to Panama and to Tumbes, Peru.

## PHACOIDES TELLINOIDES Reeve.

1850. *Lucina tellinoides* REEVE, Con. Icon., *Lucina*, pl. 9, fig. 56. Magdalena Bay, Lower California, to Guayaquil, Ecuador.

## Family DIPLODONTIDÆ.

## Genus DIPLODONTA Bronn.

## DIPLODONTA ARTEMIDIS Dall.

1909. Proc. U. S. Nat. Mus., vol. 37, p. 156, pl. 28, fig. 8. Capon, Peru.

## DIPLODONTA CÆLATA Reeve.

1850. *Lucina cælata* REEVE, Con. Icon., *Lucina*, pl. 6, fig. 27. Bay of Guayaquil.

## DIPLODONTA INCONSPICUA Philippi.

1842. Arch. f. Naturg., p. 74.—HUPÉ, Hist. de Chile, Zool., p. 357, pl. 8, fig. 4, 1854. Mejillones, Chile, south to Chiloë Island.

## DIPLODONTA PUNCTATA Say.

1822. *Amphidesma punctata* SAY, Journ. Acad. Nat. Sci. Phila., I, p. 308.—REEVE, Con. Icon., *Lucina*, pl. 8, fig. 43, 1850. Chiloë Island and Atlantic coast.

## DIPLODONTA SERICATA Reeve.

1850. *Lucina sericata* REEVE, Con. Icon., *Lucina*, pl. 9, fig. 25, 1850. Gulf of California to Guayaquil, Ecuador.

## Family THYASIRIDÆ.

## Genus THYASIRA Leach.

## THYASIRA TOMEANA Dall.

1901. Proc. U. S. Nat. Mus., vol. 23, p. 818, pl. 39, fig. 3. Tomé, Chile.

## Family LEPTONIDÆ.

## Genus ERYCINA (Lamarek) Recluz.

## ERYCINA? DUBIA Deshayes.

1855. Proc. Zool. Soc., p. 183. Guayaquil.

## Genus BORNIA Philippi.

## BORNIA? PAPYRACEA Deshayes.

1855. *Erycina papyracea* DESHAYES, Proc. Zool. Soc., p. 183. Santa Elena, Bay of Guayaquil.

## BORNIA PLATEI Stempel.

1899. *Lepton platei* STEMPELL, Fauna Chilensis, vol. 2, pt. 1, p. 233, figs. 20–21. Juan Fernandez Island.

## Genus KELLIA Turton.

## KELLIA BULLATA Philippi.

1845. Arch. f. Naturg., vol. 11, p. 51; Reise Atacama, p. 175, Zool., pl. 7, figs. 1a–c, 1860. Cobija, Chile, and south to Punta Arenas.

## KELLIA SUBORBICULARIS Montagu.

1804. *Mya suborbicularis* MONTAGU, Test. Brit., pp. 39, 564, pl. 2, fig. 6.—TURTON, Dithyra Brit., p. 56, pl. 11, figs. 5, 6, 1822. Straits of Fuca, British Columbia, south to Panama, Ecuador, and Peru. Also Antilles.

## KELLIA TUMBESIANA Stempel.

1899. *Diplodontina tumbesiaca* STEPELL, Fauna Chilensis, Bd. 2, pt. 1, p. 232, pl. 12, figs. 18, 19, 19a. Tumbes peninsula, near Talcahuano, Chile.

Genus ROCHEFORTIA Vélain.

## ROCHEFORTIA COQUIMBENSIS Hanley.

1856. *Montacuta coquimbensis* HANLEY, Proc. Zool. Soc., p. 340, Coquimbo, Chile.

Genus LASÆA Leach.

## LASÆA PETITIANA Recluz.

1843. *Poronia petitiana* RECLUZ, Rev. Sci. Soc. Cuv., p. 175.—*Kellia miliaris* PHILIPPI, Reise Atacama, p. 175, Zoöl., pl. 7, figs. 2a-c, 1860. Callao, Peru, south to Magellan Straits and Juan Fernandez.

Family KELLIELLIDÆ.

Genus ALIGENA H. C. Lea.

## ALIGENA COKERI Dall.

1909. Proc. U. S. Nat. Mus., vol. 37, p. 155, pl. 28, figs. 5, 6. Attached to wormcases by a byssus, at the "inside beach," Capon, Peru.

Superfamily CARDIACEA.

Family CARDIIDÆ.

Genus CARDIUM (Linnæus) Lamarck.

## CARDIUM (TRACHYCARDIUM) CONSORS Broderip and Sowerby.

1833. *Cardium consors* BRODERIP and SOWERBY, Proc. Zool. Soc., p. 85.—SOWERBY, Con. Ill., *Cardium*, p. 3, no. 40, pl. 47, fig. 8, 1833. Gulf of California to Guayaquil and the Galapagos Islands.

## CARDIUM (TRACHYCARDIUM) MACULOSUM Wood.

1815. Gen. Conch., p. 218, pl. 52, fig. 3; not of SOWERBY, 1833? Con. Ill., vol. 1, p. 4, pl. 182, fig. 63, 1840. Gulf of Panama to Guayaquil.

## CARDIUM (TRACHYCARDIUM) SENTICOSUM Sowerby.

1833. *Cardium senticosum* SOWERBY, Proc. Zool. Soc., p. 84; Con. Ill., *Cardium*, pl. 47, fig. 10, 1840. Gulf of California to Paita, Peru.

## CARDIUM (RINGICARDIUM) PROCERUM Sowerby.

1832. *Cardium procerum* SOWERBY, Proc. Zool. Soc., p. 83; Con. Ill., vol. 1, p. 5, pl. 50, fig. 23, 1834. Cedros Island, Lower California, south to the Lobos Islands, Peru.

## CARDIUM (TRIGONICARDIA) GRANIFERUM Broderip and Sowerby.

1829. *Cardium graniferum* BRODERIP and SOWERBY, Zool. Journ., vol. 4, p. 367. Con. Ill., *Cardium*, p. 3, no 38, pl. 49, fig. 17, 1834. Gulf of California and south to Guayaquil.

## CARDIUM (TRIGONICARDIA) OBOVALE Sowerby.

1833. *Cardium obovale* SOWERBY, Proc. Zool. Soc., p. 84; Con. Ill., *Cardium*, pl. 46, fig. 4, 1833. Magdalena Bay, Lower California, and south to the coast of Ecuador.

## CARDIUM (FRAGUM) BIANGULATUM Sowerby.

1829. *Cardium biangulatum* SOWERBY, Zool. Journ., vol. 4, p. 367. Con. Ill., *Cardium*, fig. 2, 1833. Catalina Island, California, south to Guayaquil.

## CARDIUM (FRAGUM) MAGNIFICUM Deshayes.

1857. CARPENTER, Rep. Brit. Assoc., 1857, p. 187.—*C. planicostatum* SOWERBY, Con. Ill., *Cardium*, no. 83, pl. 50, fig. 25, 1834. Lower California south to Paita, Peru.

## CARDIUM (PAPYRIDEA) ASPERSUM Sowerby.

1833. *Cardium aspersum* SOWERBY, Proc. Zool. Soc., p. 85; Con. Ill., *Cardium*, fig. 15, 1834. Magdalena Bay, Lower California, to Guayaquil.

## CARDIUM (LÆVICARDIUM) ELENENSE Sowerby.

1840. *Cardium elenense* SOWERBY, Proc. Zool. Soc., p. 109; Con. Ill., *Cardium*, pl. 181, fig. 58, 1840. Gulf of California to Guayaquil and Clarion Island.

## Superfamily VENERACEA.

## Family VENERIDÆ.

## Genus DOSINIA Scopoli.

## DOSINIA DUNKERI Philippi.

1844. *Cytherea dunkeri* PHILIPPI, Abb., vol. 1, p. 4, pl. 2, fig. 9.—SOWERBY, Thes. Con., *Artemis*, pl. 140, fig. 5. Gulf of California, south to Tumbes, Peru, and the Galapagos Islands.

## DOSINIA PONDEROSA Gray.

1838. *Artemis ponderosa* GRAY, in Analyst, vol. 8, p. 309.—PHILIPPI, Abb., vol. 1, *Cytherea*, p. 171.—SOWERBY, Thes. Con., *Artemis*, p. 656, pl. 140, fig. 2, 1852. Magdalena Bay, Lower California, south to Paita, Peru.

## Genus TIVELA Link.

## TIVELA BYRONENSIS Gray.

1838. *Trigona byronensis* GRAY, Analyst, vol. 8, p. 302-9, no. 24. Scammon Lagoon, Lower California, south to Guayaquil.

## TIVELA HIANUS Philippi.

1851. *Donax hians* PHILIPPI, Zeitschr. f. Mal., vol. 8, p. 74.—  
ROEMER, Mon. Venus, p. 9, pl. 3, fig. 3, 1869. Magdalena  
Bay, Lower California, south to Valparaiso, Chile.

## TIVELA PLANULATA Broderip and Sowerby.

1829. *Cytherea planulata* BRODERIP and SOWERBY, Zool. Journ.,  
vol. 5, p. 48.—SOWERBY, Thes. Con., *Cytherea*, pl. 127, fig. 13,  
1851. Gulf of California south to Coquimbo, Chile.

## Genus MACROCALLISTA Meek.

## MACROCALLISTA AURANTIACA Sowerby.

1831. *Cytherea aurantiaca* SOWERBY, Gen. Sh., vol. 33, fig. 6;  
Thes. Con., *Cytherea*, pl. 132, fig. 97 bis, 1853. Gulf of Cali-  
fornia to Guayaquil.

## MACROCALLISTA PANNOSA Sowerby.

1835. *Cytherea pannosa* SOWERBY, Proc. Zool. Soc., p. 47; Thes.  
Con., *Cytherea*, pl. 138, figs. 140-142; pl. 163, figs. 202-203,  
1851. Gulf of California south to Valparaiso, Chile.

## MACROCALLISTA SQUALIDA Sowerby.

1835. *Cytherea squalida* SOWERBY, Proc. Zool. Soc., p. 23; Thes.  
Con., *Cytherea*, p. 629, pl. 131, figs. 87-89, 1851. Cedros  
Island, Lower California, south to Peru.

## Genus PITARIA Roemer.

## PITARIA INCONSPICUA Sowerby.

1835. *Cytherea inconspicua* SOWERBY, Proc. Zool. Soc., p. 47;  
Thes. Con., *Cytherea*, pl. 133, figs. 133-134, 1852. Paita,  
Peru, and south to Talcahuano, Chile.

## PITARIA POLLICARIS Carpenter.

1864. *Callista pollicaris* CARPENTER, Ann. Mag. Nat. Hist.,  
vol. 13, p. 475.—REEVE, Con. Icon., *Dione (prora)*, fig. 45.  
Gulf of California to Callao, Peru.

## PITARIA TOMEANA Dall.

1902. Proc. U. S. Nat. Mus., vol. 26, p. 402, pl. 15, fig. 2.  
Gulf of Panama to Tomé, Chile, and the Galapagos Islands.

## PITARIA (LAMELLICONCHA) CIRCINATA Born.

1780. *Venus circinata* BORN, Test. Mus. Vind., p. 61, pl. 4, fig.  
8.—SOWERBY, Thes. Con., *Cytherea*, pl. 132, figs. 104-106,  
1853. Gulf of California to Paita, Peru.

## PITARIA (LAMELLICONCHA) CONCINNA Sowerby.

1835. *Cytherea concinna* SOWERBY, Proc. Zool. Soc., p. 23;  
Thes. Con., *Cytherea*, pl. 132, figs. 99-100, 1851. Magdalena  
Bay, Lower California, to Paita, Peru.

## PITARIA (LAMELLICONCHA) CUMINGI Orbigny.

1846. *Venus cumingi* ORBIGNY, Voy. Am. Mér., p. 563.—  
*Cytherea modesta* SOWERBY, Thes. Con., *Cytherea*, pl. 136,  
fig. 184, 1851. Jipijapa, Ecuador.

## PITARIA (HYSTEROCONCHA) LUPANARIA Lesson.

1830. *Cytherea lupanaria* LESSON, Voy. Coq., p. 430.—CHENU, Illustr. Con., *Cytherea*, pl. 9, fig. 9. Ballenas Lagoon, Lower California, to Paita, Peru.

## PITARIA (HYSTEROCONCHA) MULTISPINOSA Sowerby.

1851. *Cytherea multispinosa* SOWERBY, Thes. Con., *Cytherea*, p. 632, pl. 132, fig. 112. Gulf of Panama, south to Paita, Peru.

## Genus CYTHEREA Boltén.

## CYTHEREA MULTICOSTATA Sowerby.

1835. *Venus multicostata* SOWERBY, Proc. Zool. Soc., p. 22; Thes. Con., *Venus*, pl. 152, fig. 10, 1853. Gulf of California to Panama and the Galapagos Islands.

## CYTHEREA (VENTRICOLA) MACTRACEA Broderip.

1835. *Venus mactracea* BRODERIP, Proc. Zool. Soc., p. 44 (unfigured). Valparaiso, Chile.

## Genus CYCLINELLA Dall.

## CYCLINELLA KROYERI Philippi.

1848. *Venus kroyeri* PHILIPPI, Abb., vol. 3, p. 78, pl. 7, fig. 9. Gulf of California to Valparaiso, Chile.

## CYCLINELLA SUBQUADRATA Hanley.

1845. *Artemis subquadrata* HANLEY, Proc. Zool. Soc., p. 11.—SOWERBY, Thes. Con., *Artemis*, pl. 161, fig. 22, 1852. Guaymas, Mexico, south to Guayaquil.

## Genus CHIONE Megerle.

## CHIONE ALVAREZII Orbigny.

1846. *Venus alvarezii* ORBIGNY, Voy. Am. Mér., p. 557, pl. 83, figs. 3, 4. Peru (Tschudi); Patagonia (Orbigny).

## CHIONE ANTIQUA King.

1831. *Venus antiqua* KING, Zool. Journ., vol. 5, p. 336.—*V. discrepans* PHILIPPI, Abb., vol. 1, p. 174, pl. 3, fig. 2, 1844; not of SOWERBY, 1835. Callao, Peru, south to the Magellanic region.

## CHIONE COMPTA Broderip.

1835. *Venus compta* BRODERIP, Proc. Zool. Soc., p. 43.—SOWERBY, Thes. Con., *Venus*, pl. 154, figs. 32-34, 1853. Gulf of California to Sechura Bay, Peru.

## CHIONE CRENIFERA Sowerby.

1835. *Venus crenifera* SOWERBY, Proc. Zool. Soc., p. 43; Thes. Con., *Venus*, p. 156, figs. 73-74, 1853. Mazatlan, Mexico, to Paita, Peru; also Atlantic coast.

## CHIONE ELLIPTICA Lamarck.

1818. *Venus elliptica* LAMARCK, An. s. Vert., vol. 5, p. 590, no. 20. Encycl. Méth., pl. 267, fig. 5 a-b. Talcahuano to Chiloë, Chile.

## CHIONE GNIDIA Broderip and Sowerby.

1829. *Venus gnidia* BRODERIP and SOWERBY, Zool. Journ., vol. 4, p. 364.—SOWERBY, Thes. Con., *Venus*, pl. 154, fig. 25, 1853. Cedros Island, Lower California, to Paita, Peru.

## CHIONE SPURCA Sowerby.

1835. *Venus spurca* SOWERBY, Proc. Zool. Soc., p. 23; Thes. Con., *Venus*, pl. 156, fig. 97 only, 1853. Valparaiso, Chile.

## CHIONE SUBROSTRATA Lamarck.

1818. *Venus subrostrata* LAMARCK, An. s. Vert., vol. 5, p. 588; Encycl. Méth., pl. 267, fig. 7.—SOWERBY, Thes. Con., *Venus*, pl. 154, fig. 39, 1853. Mazatlan, Mexico, to Paita, Peru; also Atlantic coast.

## CHIONE UNDATELLA Sowerby.

1835. *Venus undatella* SOWERBY, Proc. Zool. Soc., p. 22; Thes. Con., *Venus*, pl. 153, fig. 22, 1853. San Pedro, California, south to Paita, Peru, and the Galapagos Islands.

## CHIONE (TIMOCLEA) ASPERRIMA Sowerby.

1835. *Venus asperrima* SOWERBY, Proc. Zool. Soc., p. 42; Thes. Con., *Venus*, pl. 155, figs. 57-58, 1853. Gulf of California to the Lobos Islands, Peru.

## CHIONE (TIMOCLEA) COLUMBIENSIS Sowerby.

1835. *Venus columbiensis* SOWERBY, Proc. Zool. Soc., p. 21; Thes. Con., *Venus*, pl. 155, figs. 53-54, 1853. Gulf of California to Pacasmayo, Peru.

## CHIONE (TIMOCLEA) TUMIDA Sowerby.

1852. *Tapes tumida* SOWERBY, Thes. Con., *Tapes*, p. 697, pl. 146, fig. 42 (not var. *tumida* Carpenter). Panama to Guayaquil.

## CHIONE (LIROPHORA) DISCREPANS Sowerby.

1835. *Venus discrepans* SOWERBY, Proc. Zool. Soc., p. 22; Thes. Con., *Venus*, pl. 155, fig. 65, 1853. Not *V. discrepans* PHILIPPI, 1853. Islay, Peru.

## CHIONE (LIROPHORA) MARLÆ Orbigny.

1846. *Venus mariæ* ORBIGNY, Voy. Am. Mér., p. 563.—SOWERBY, Thes. Con., *Venus*, pl. 157, fig. 113, 1853. Gulf of California to Guayaquil.

## CHIONE (LIROPHORA) PERUVIANA Sowerby.

1835. *Venus peruviana* SOWERBY, Proc. Zool. Soc., p. 22; Thes. Con., *Venus*, pl. 155, fig. 66, 1853. Callao and south to the Chilean coast.

## CHIONE (CLAUSINELLA) GAYI Hupé.

1854. *Venus gayi* HUPÉ, Hist. de Chile, Zool., Mol., vol. 8, p. 337, pl. 6, fig. 5. Valparaiso, south to Chiloë Island.

Genus ANOMALOCARDIA Schumacher.

## ANOMALOCARDIA SUBIMBRICATA Sowerby.

1835. *Venus subimbricata* SOWERBY, Proc. Zool. Soc., p. 21; Thes. Con., *Venus*, pl. 154, figs. 35-37, 1853. Gulf of California, south to Paita, Peru.

**ANOMALOCARDIA SUBRUGOSA** Sowerby.

1834. *Venus subrugosa* SOWERBY, Gen., *Venus*, fig. 2; Thes. Con., *Venus*, pl. 155, fig. 63, 1853. Magdalena Bay, Lower California, to Valparaiso, Chile.

Genus **MARCIA** (Adams) Fischer.**MARCIA LENTICULARIS** Sowerby.

1835. *Venus lenticularis* SOWERBY, Proc. Zool. Soc., p. 42; Thes. Con., *Venus*, pl. 161, fig. 194, 1853. Valparaiso and Coquimbo, Chile.

**MARCIA RUFa** Lamarck.

1818. *Cytherea rufa* LAMARCK, An. s. Vert., vol. 5, p. 570 (not of SOWERBY, 1853); Thes. Con., *Tapes*, pl. 150, fig. 123, 1852. Gulf of Panama and south to Concepcion, Chile.

Genus **PAPHIA** Bolten.**PAPHIA (PROTOTHACA) CINERACEA** Hupé.

1854. *Venus cineracea* HUPÉ, Hist. de Chile, Zool., Mol., p. 334, pl. 6, fig. 2. Callao, Peru, to northern Chile.

**PAPHIA (PROTOTHACA) GRATA** Say.

1831. *Venus grata* SAY, Am. Con., pt. 3, pl. 26. Lower California; south to Antofagasta, Chile.

**PAPHIA (PROTOTHACA) THACA** Molina.

1782. *Chama thaca* MOLINA, Saggio Hist. de Chile, p. 178.—PHILIPPI, Abb., vol. 1, p. 127, pl. 2, fig. 1; pl. 3, fig. 3, 1844. Ancon, Peru, and south to the Chonos Archipelago, Chile.

Genus **VENERUPIS** Lamarck.**VENERUPIS OBLONGA** Lamarck.

1834. *Petricola oblonga*, SOWERBY, Proc. Zool. Soc., p. 46; Thes. Con., *Venerupis*, p. 765, pl. 165, fig. 21, 1854. Gulf of Panama to Pacasmayo, Peru.

**VENERUPIS FERNANDEZIANA** Stempel.

1899. Fauna Chilensis, suppl. Bd. 4, fasc. 1, p. 237, pl. 12, figs. 22–23. Juan Fernandez Islands.

Family **PETRICOLIDÆ**.Genus **PETRICOLA** Lamarck.**PETRICOLA CONCINNA** Sowerby.

1834. Proc. Zool. Soc., p. 46; Thes. Con., *Petricola*, p. 773, pl. 166, fig. 3, 1854. Monte Cristi, Ecuador, to Arica, Chile.

**PETRICOLA DENTICULATA** Sowerby.

1834. Proc. Zool. Soc., p. 46; *P. dactylus* in Thes. Con., *Petricola*, p. 773, pl. 166, figs. 6, 7, 1854; not of SOWERBY, Gen. Sh. 1823. Gulf of California to Paita, Peru.

**PETRICOLA DISCORS** Sowerby.

1834. Proc. Zool. Soc., p. 46. (Unfigured.) Lambayeque, Peru.

## PETRICOLA ELLIPTICA Sowerby.

1834. Proc. Zool. Soc., p. 46; Thes. Con., *Petricola*, p. 774, pl. 166, fig. 10, 1854. Paita, Peru, to Arica, Chile.

## PETRICOLA ROBUSTA Sowerby.

1834. Proc. Zool. Soc., p. 47; Thes. Con., *Petricola*, p. 775, pl. 166, figs. 16, 17, 1854. Panama to Guayaquil.

## PETRICOLA RUGOSA Sowerby.

1834. Proc. Zool. Soc., p. 47; Thes. Con., *Petricola*, p. 773, pl. 166, figs. 13-14, 1854. Lambayeque, Peru, to Chiloë Island, Chile.

## Superfamily TELLINACEA.

## Family TELLINIDÆ.

## Genus TELLINA Linnæus.

## TELLINA COLUMBIENSIS Hanley.

1844. Proc. Zool. Soc., p. 71; Thes. Con., *Tellina*, p. 307, pl. 65, fig. 246, 1846. Monte Cristi, Ecuador.

## TELLINA CRYSTALLINA Wood.

1815. Gen. Con., p. 149; Index Test., pl. 3, fig. 10, 1825. Panama, Guayaquil; also West Indies.

## TELLINA EBURNEA Hanley.

1844. Proc. Zool. Soc., p. 61; Thes. Con., *Tellina*, p. 241, pl. 58, fig. 91, 1846. Gulf of California, to Paita, Peru.

## TELLINA HIBERNA Hanley.

1844. Proc. Zool. Soc., p. 148; Thes. Con., *Tellina*, p. 282, pl. 57, fig. 53, 1846. Panama to Guayaquil.

## TELLINA INÆQUISTRIATA Donovan.

1802. Brit. Shells, vol. 4, pl. 123. Guayaquil.

## TELLINA LYRA Hanley.

1844. Proc. Zool. Soc., p. 68; Thes. Con. *Tellina*, p. 271, pl. 62, fig. 187, 1846. Lower California to Tumbes, Peru.

## TELLINA PRINCEPS Hanley.

1844. Proc. Zool. Soc., p. 62; Thes. Con., *Tellina*, p. 238, pl. 63, fig. 206, 1846. Peru.

## TELLINA PRORA Hanley.

1844. Proc. Zool. Soc., p. 61; Thes. Con., *Tellina*, p. 243, pl. 60, fig. 152, 1846. Bay of Guayaquil.

## TELLINA RUBESCENS Hanley.

1844. Proc. Zool. Soc., p. 60; Thes. Con., *Tellina*, p. 242, pl. 60, fig. 153, 1846. Gulf of Panama to Tumbes, Peru.

## Genus TELLIDORA Mörch.

## TELLIDORA BURNETI Broderip and Sowerby.

1829. *Tellina burneti* BRODERIP and SOWERBY, Zool. Journ., vol. 4, p. 362, pl. 9, fig. 2. Mazatlan, Mexico, to Salango, Ecuador.

## Genus METIS H. and A. Adams.

## METIS DOMBEYI Hanley.

1844. *Tellina dombeyi* HANLEY, Proc. Zool. Soc., p. 144 and index; Thes. Con., *Tellina*, p. 323, pl. 62, fig. 182, 1846. Gulf of Panama to Peru.

## METIS EXCAVATA Sowerby.

1867. *Tellina excavata* SOWERBY, Con. Icon., *Tellina*, pl. 26, fig. 138. Gulf of California, to Paita, Peru, and the Galapagos Islands.

## Genus MACOMA Leach.

## MACOMA GRANDIS Hanley.

1844. Proc. Zool. Soc., p. 181; Thes. Con., *Tellina*, p. 327, pl. 65, fig. 247, 1846. Tumbes, Peru.

## MACOMA HUPEANA Dall.

1908. Dall, Albatross Rep., p. 421.—*Tellina inornata* HUPÉ, Hist. de Chile, vol. 8, Zool., Mol., p. 356, pl. 8, fig. 2, 1854; not of Hanley, 1844. Southern Chile.

## MACOMA INORNATA Hanley.

1844. *Tellina inornata* HANLEY, Proc. Zool. Soc., p. 144; Thes. Con., *Tellina*, p. 315, pl. 59, fig. 123, 1846. Gulf of California, to Concepcion, Chile.

## MACOMA PUMILA Hanley.

1844. *Tellina pumila* HANLEY, Proc. Zool. Soc., p. 69; Thes. Con., *Tellina*, p. 279, pl. 57, fig. 41, 1846. Valparaiso, Chile.

## MACOMA UNDULATA Hanley.

1844. *Tellina undulata* HANLEY, Proc. Zool. Soc., p. 72; Thes. Con., *Tellina*, p. 310, pl. 59, fig. 107, 1846. Gulf of California, and south to Santa Elena, Ecuador.

*Psammacoma aurora* Hanley, 1844, Boca de Pan, Peru

Family SEMELIDÆ.

## Genus SEMELE Schumacher.

## SEMELE CORRUGATA Sowerby.

1832. *Amphidesma corrugata* SOWERBY, Proc. Zool. Soc., p. 200; Spec. Con. ~~H~~, *Amphidesma*, fig. 18, 1833. Gulf of Panama, to Valparaiso, Chile.

## SEMELE ELLIPTICA Sowerby.

1830. Spec. Con., *Amphidesma*, fig. 17.—*Amphidesma ellipticum* SOWERBY, Proc. Zool. Soc., p. 200, 1832 (not of KOCH, 1837). Monte Cristi, Ecuador.

## SEMELE FORMOSA Sowerby.

1832. *Amphidesma formosum* SOWERBY, Proc. Zool. Soc., p. 199; Con. Ill., *Amphidesma*, fig. 8, 1833. Santa Elena, Bay of Guayaquil, Ecuador.

## SEMELE LÆVIS Sowerby.

1832. *Amphidesma læve* SOWERBY, Proc. Zool. Soc., p. 199; Con. Ill., *Amphidesma*, fig. 6, 1833. Jipijapa, Ecuador.

## SEMELE LENTICULARIS Sowerby.

1832. *Amphidesma lenticularis* SOWERBY, Proc. Zool. Soc., p. 200; Con. Ill., *Amphidesma*, fig. 9, 1833. Santa Elena, Guayaquil.

## SEMELE PALLIDA Sowerby.

1832. *Amphidesma pallidum* SOWERBY, Proc. Zool. Soc., p. 199; Con. Ill., *Amphidesma*, fig. 3, 1833. Salango, Ecuador.

## SEMELE PULCHRA Sowerby.

1832. *Amphidesma pulchrum* SOWERBY, Proc. Zool. Soc., p. 57; Con. Ill., *Amphidesma*, fig. 2, 1833. Bay of Caraquez, Ecuador.

## SEMELE PURPURASCENS Sowerby.

1832. *Amphidesma purpurascens* SOWERBY, Proc. Zool. Soc., p. 199; Con. Ill., *Amphidesma*, fig. 5, 1833. Santa Elena, Bay of Guayaquil.

## SEMELE ROSEA Sowerby.

1832. *Amphidesma roseum* SOWERBY, Proc. Zool. Soc., p. 199; Con. Ill., *Amphidesma*, fig. 1, 1833. Tumbes, Peru.

## SEMELE RUPIUM Sowerby.

1832. *Amphidesma rupium* SOWERBY, Proc. Zool. Soc., p. 199; Con. Ill., *Amphidesma*, fig. 11, 1833. California, south to Guayaquil and the Galapagos Islands.

## SEMELE SOLIDA Gray.

1828. *Amphidesma solidum* GRAY, Spicil. Zool., pl. 6, fig. 6.—HUPÉ, Hist. de Chile, Mol., pl. 7, fig. 1. Callao, Peru, south to the Chonos Archipelago.

## SEMELE VARIEGATA Lamarck.

1818. *Amphidesma variegatum* LAMARCK, An. s. Vert., vol. 5, p. 490; Encycl. Méth., pl. 291, fig. 3.—HUPÉ, Hist. de Chile, vol. 8, Mol., p. 359, pl. 7, fig. 2, 1854. Peru and Chile.

*S. proxima* C. B. Ado, Negritos, Peru, Olson.

Genus CUMINGIA Sowerby.

## CUMINGIA LAMELLOSA Sowerby.

1833. Proc. Zool. Soc., p. 34; Con. Icon., *Cumingia*, pl. 1, fig. 5, 1873. Gulf of Panama to Paita, Peru, and to northern Chile.

## CUMINGIA MUTICA Sowerby.

1833. Proc. Zool. Soc., p. 34; Con. Icon., *Cumingia*, pl. 1, fig. 3, 1873. Bay of Guayaquil to Paita, Peru, and south to Concepcion, Chile.

## Family PSAMMOBIIDÆ.

## Genus PSAMMOBIA Lamarck.

## PSAMMOBIA LATA Deshayes.

1854. Proc. Zool. Soc., p. 318.—REEVE, Con. Icon., *Psammobia*, pl. 1, fig. 7, 1857. Bay of Guayaquil.

*Tagebus (Mesopleura) violaceus* Cpr. 1857, see opp.

## PSAMMOBIA SOLIDA Gray.

1828. *Solecurtus solidus* GRAY, Spicil. Zool., pl. 3, fig. 12.—  
*Psammobia solida* PHILIPPI, Abb., vol. 1, *Psammobia*, pl. 1,  
fig. 1, 1844. Callao, Peru, to the Chonos Archipelago.

## Genus SANGUINOLARIA Lamarek.

## SANGUINOLARIA HANLEYI Bertin.

1878. *Tellina hanleyi* BERTIN, Revis. Tell., p. 268.—*Tellina  
rufescens* HANLEY, Thes. Con., *Tellina*, p. 307, pl. 53, fig. 213,  
1846; not of CHEMNITZ. Lower California, south to Panama  
and to Tumbes, Peru.

## Genus TAGELUS Gray.

TAGELUS (MESOPLEURA) DOMBEYI Lamarck. = *rufus* Bosc, 1854, Zool. M., p. 1.

1818. *Solen dombeyi* LAMARCK, An. s. Vert., vol. 5, p. 454;  
Encycl. Méth., pl. 224, fig. 1.—HUPÉ, Hist. de Chile, vol. 8,  
Mol., p. 366, pl. 7, fig. 5, 1854. Tumbes, Peru, south to  
Valdivia, Chile.

*J. (m.) violacea* Cpr. Maz. Cat. 1857,  
Family DONACIDÆ.

*negritos, Peru, Oles*  
*Santiago, Cal. sp.*

## Genus DONAX Linnæus.

## DONAX ARICANA Dall, new name.

1909. *D. radiatus*, VALENCIENNES, Humb. Voy., vol. 2, p. 221,  
pl. 50, figs. 3, 4, 1833.—BERTIN, Revis. Donacidées, p. 95,  
pl. 3, fig. 1a-b, 1879; not of GMELIN, Syst. Nat., p. 3266,  
1791. Paita, Peru, to Arica, Chile.

## DONAX ASPERA Hanley.

1845. *Donax asper* HANLEY, Proc. Zool. Soc., p. 14.—SOWERBY,  
Thes. Con., *Donax*, p. 307, pl. 1, fig. 24, 1862. Gulf of  
Panama to Tumbes, Peru.

## DONAX GRACILIS Hanley.

1845. Proc. Zool. Soc., p. 15.—SOWERBY, Thes. Con., *Donax*,  
p. 314, pl. 3, figs. 76-79, 1862. California, south to Guaya-  
quil.

## DONAX OBESA Orbigny.

1846. Voy. Am. Mér., p. 541, pl. 81, figs. 28-30; not *D. obesus*  
GOULD, 1851. Gulf of Panama to Paita, Peru.

## DONAX OBESULA Deshayes.

1854. Proc. Zool. Soc., p. 352.—REEVE, Con. Icon., *Donax*, pl.  
5, fig. 30, 1858. Peru (Deshayes).

## DONAX PAYTENSIS Orbigny.

1846. Voy. Am. Mér., p. 541 (unfigured). Panama to Paita,  
Peru, and Arica, Chile.

## DONAX PETALINA Deshayes.

1854. Proc. Zool. Soc., p. 350.—SOWERBY, Thes. Con., *Donax*,  
p. 315, pl. 3, fig. 86, 1866. Chile.

## Genus IPHIGENIA Schumacher.

## IPHIGENIA ALTIOR Sowerby.

1832. Proc. Zool. Soc., p. 196 (as *Capsa*).—ROEMER, Mon. Donacidae, p. 114, pl. 21, figs. 1-4, 1869. Gulf of California to Tumbes, Peru.

## Superfamily SOLENACEA.

## Family SOLENIDÆ.

## Genus SOLEN Linnæus.

## SOLEN GAUDICHAUDI Chenu.

1843. Illustr. Con., *Solen*, pl. 2, fig. 7. Valparaiso and Coquimbo, Chile.

## SOLEN MACHA Molina.

1782. Hist. Nat. de Chile, p. 178.—HUPÉ, Hist. de Chile, vol. 8, Mol., p. 369, pl. 8, fig. 6, 1854. Valparaiso to Chiloë, and Puerto Montt, Chile.

## Superfamily MACTRACEA.

## Family MACTRIDÆ.

## Genus MACTRA (Linnæus) Lamarek.

## MACTRA (MACTRODERMA) VELATA Philippi.

1848. *M. velata* PHILIPPI, Zeitschr. f. Mal., p. 153, no. 7; Abb., vol. 3, p. 137, pl. 3, fig. 5, 1850. Gulf of California and south to Paita, Peru, and the Galapagos Islands.

*M. californica* Conrad, Salinas Bay, St. Elena, Océano

## Genus MULINIA Gray.

## MULINIA BICOLOR Gray.

1838. Loudon's Mag. N. Hist., new ser., vol. 1, p. 375.—HANLEY, Rec. Biv. Sh., pl. 10, fig. 31, 1842.—PHILIPPI, Ann. Mus. Nac. de Chile, Zool., vol. 4, p. 11, pl. 3, figs. 9, 10, 1893. Copiapó to Valparaiso.

## MULINIA BYRONENSIS Gray.

1838. Loudon's Mag. N. Hist., new ser., vol. 1, p. 376, fig. 33; Zool. Beechey's Voy., p. 154, pl. 44, fig. 11, 1839. Salaverrí, Peru, and south to Talcahuano, Chile.

## MULINIA EDULIS King.

1831. *Mactra edulis* KING, Zool. Journ., vol. 5, p. 335.—*Mactra byronensis* HUPÉ, Hist. de Chile, vol. 8, Mol., pl. 8, fig. 1, 1854 (not of Gray, 1838). Callao, Peru, and south to Magellan straits.

## MULINIA PALLIDA Broderip and Sowerby.

1829. *Mactra pallida* BRODERIP and SOWERBY, Zool. Journ., vol. 4, p. 360.—REEVE, Con. Icon., *Mactra*, pl. 9, fig. 34, 1854. Gulf of California and south to Panama and Manta, Ecuador.

## Genus ANATINA Schumacher.

*Anatina undulata* Gould, Mancos, Peru.  
Olsson

## Family MESODESMATIDÆ.

Genus MESODESMA Deshayes.

## MESODESMA DONACIUM Lamarck.

1818. *Mactra donacia* LAMARCK, An. s. Vert., vol. 5, p. 479.—  
CHENU, Man., vol. 2, p. 79, fig. 341, 1862. Sechura Bay,  
Peru, south to Valparaiso, Chile.

## Superfamily MYACEA.

*Cryptomya californica* Conrad. Negritos, Peru, Atlantic.

## Family CORBULIDÆ.

Genus CORBULA Bruguière.

## CORBULA BICARINATA Sowerby.

1833. Proc. Zool. Soc., p. 35.—REEVE, Conch. Icon., *Corbula*,  
pl. 3, fig. 23, 1844. Panama to Guayaquil.

## CORBULA BIRADIATA Sowerby.

1833. Proc. Zool. Soc., p. 35.—REEVE, Con. Icon., *Corbula*,  
pl. 1, fig. 3, 1844. Gulf of Panama to Guayaquil.

## CORBULA NASUTA Sowerby.

1833. Proc. Zool. Soc., p. 35.—REEVE, Con. Icon., *Corbula*,  
pl. 1, fig. 1, 1844 (not of Conrad). Gulf of Panama to Jipi-  
japa, Ecuador.

## CORBULA OVULATA Sowerby.

1833. Proc. Zool. Soc., p. 35.—REEVE, Con. Icon., *Corbula*,  
pl. 1, fig. 7, 1844. Gulf of Panama to Guayaquil.

## Family SAXICAVIDÆ.

Genus SAXICAVA F. de Bellevue.

## SAXICAVA PURPURASCENS Sowerby.

1834. Proc. Zool. Soc., p. 88; Thes. Con., *Saxicava*, p. 133,  
pl. 471, fig. 7, 1884. Bay of Guayaquil.

## SAXICAVA SOLIDA Sowerby.

1834. Proc. Zool. Soc., p. 88; Thes. Con., *Saxicava*, p. 133,  
pl. 471, fig. 12, 1884. Bay of Guayaquil and south to Punta  
Arenas, Magellan straits.

## Family GASTROCHÆNIDÆ.

Genus GASTROCHÆNA Spengler.

## GASTROCHÆNA DENTICULATA Deshayes.

1854. Proc. Zool. Soc., p. 327; Thes. Con., *Gastrochæna*, p. 129,  
pl. 470, fig. 7, 1884. Ecuador coast.

## GASTROCHÆNA OVATA Sowerby.

1834. Proc. Zool. Soc., p. 21; Thes. Con., *Gastrochæna*, p. 128,  
pl. 470, fig. 9, 1884. Panama to La Plata Island, Ecuador.  
Also Atlantic.

## GASTROCHÆNA RUGULOSA Sowerby.

1834. Proc. Zool. Soc., p. 22; Thes. Con., *Gastrochæna*, p. 128, pl. 470, fig. 25, 1884. Galapagos Islands.

Genus SPENGLERIA Tryon.

## SPENGLERIA TRUNCATA Sowerby.

1834. Proc. Zool. Soc., p. 21; Thes. Con., *Gastrochæna*, p. 130, pl. 470, fig. 13, 1884. Panama and southward.

## Superfamily ADESMACEA.

## Family PHOLADIDÆ.

Genus PHOLAS Linnæus.

## PHOLAS CHILOËNSIS Molina.

1782. Saggio stor. nat. de Chile, pp. 104 (note), p. 348.—PHILIPPI, Abb., vol. 3, p. 134, pl. 1, figs. 4, 5, 1849.—HUPÉ, Hist. de Chile, vol. 8, Mol., p. 381, pl. 6, fig. 3, 1854. Gulf of Panama to Peru, and south to Chiloë Island.

Genus BARNEA Leach.

## BARNEA CRUCIGERA Sowerby.

1834. *Pholas cruciger* SOWERBY, Proc. Zool. Soc., p. 69; Thes. Con., *Pholas*, p. 489, pl. 104, figs. 24–26, 1849. Gulf of Panama to Guayaquil. Also Atlantic.

## BARNEA SUBTRUNCATA Sowerby.

1834. *Pholas subtruncatus* SOWERBY, Proc. Zool. Soc., p. 69.—*P. lamellosa* ORBIGNY, Voy. Am. Mér., p. 498, pl. 77, figs. 20, 21, 1846. Guayaquil and southward to Paita, Peru, Magellan strait, and the Atlantic coast of southern Argentina.

## BARNEA PACIFICA Stearns.

1871. *Pholas pacifica* STEARNS, Proc. Cal. Acad. Sci., vol. 5, p. 81, pl. 1, figs. 6, *a-c*. San Francisco Bay, Cal., and south to Paita, Peru, and the coast of Chile.

Genus PHOLADIDEA Turton.

## PHOLADIDEA (NETTASTOMELLA) DARWINI Sowerby.

1849. Thes. Con., *Pholas*, p. 490, pl. 107, figs. 76–77. Esqui-mault, British Columbia, and south to Chiloë Island, Chile.

## PHOLADIDEA (HATASIA) MELANURA Sowerby.

1834. *Pholas melanura* SOWERBY, Proc. Zool. Soc., p. 70; Thes. Con., *Pholas*, p. 499, pl. 107, figs. 78–79, 1849. Gulf of California and south to Ecuador.

## PHOLADIDEA PENITA Conrad.

1837. *Pholas penita* CONRAD, Journ. Acad. Nat. Sci. Phila., vol. 7, p. 237, pl. 18, fig. 7. California, south to Guayaquil.

## PHOLADIDEA QUADRA Sowerby.

1834. *Pholas quadra* SOWERBY, Proc. Zool. Soc., p. 71; Thes. Con., *Pholas*, p. 499, pl. 106, figs. 62, 63, 1849. Monte Cristi, Ecuador.

## PHOLADIDEA TRIDENS Gray.

1851. *Pholas tridens* GRAY, Ann. Mag. Nat. Hist., 2nd ser., vol. 8, p. 385.—SOWERBY, Thes. Con., *Pholas*, p. 498, pl. 106, figs. 60, 61, 1849. Ecuador coast.

## PHOLADIDEA TUBIFERA Sowerby.

1834. *Pholas tubifera* SOWERBY, Proc. Zool. Soc., p. 71; Thes. Con., *Pholas*, p. 499, pl. 106, figs. 64, 65, 1849. Gulf of Panama to Paita, Peru.

## Genus JOUANNETIA Desmoulins.

## JOUANNETIA PECTINATA Conrad.

1849. *Pholadopsis pectinata* CONRAD, Proc. Acad. Nat. Sci. Phila., for 1849 (August) p. 156; Journ. Acad. Nat. Sci. Phila., 2d ser., vol. 1, p. 279, pl. 39, fig. 3, 1850. Guayaquil and Gulf of Panama.

## Genus MARTESIA Leach.

## MARTESIA CURTA Sowerby.

1834. *Pholas curta* SOWERBY, Proc. Zool. Soc., p. 71; Thes. Con., *Pholas*, p. 494, pl. 104, figs. 33, 34; pl. 108, fig. 105, 1849. Gulf of Panama to Tumbes, Peru. Also Atlantic and Antilles.

## Genus XYLOTOMEA Dall.

## XYLOTOMEA GLOBOSA Sowerby.

1835. *Xylophaga globosa* SOWERBY, Proc. Zool. Soc., p. 110; Thes. Con., *Pholas*, p. 503, pl. 108, figs. 101-102, 1849. Panama south to Valparaiso and Juan Fernandez Island.

## Family TEREDINIDÆ.

## Genus TEREDO Linnæus.

## ? TEREDO NAVALIS Linnæus.

1854. *Teredo navalis* HUPÉ, Hist. de Chile, vol. 8, Mol. p. 384, 1854 (? not of Linnæus). Valparaiso.

## Genus XYLOTRYA Leach.

## XYLOTRYA DRYAS Dall.

1909. Proc. U. S. Nat. Mus., Vol. 37, p. 162, pl. 25, figs. 2, 3, 5, 6, 7. Tumbes, Peru, at Estero del Palo Santo, boring in the heart of living mangroves.

## XYLOTRYA MARTENSI Stempel.

1899. *Teredo* (*X.*) *martensi* STEMPELL, Fauna Chilensis, Suppl. Bd. 4, fasc. 1, p. 240, pl. 12, figs. 24-27. Punta Arenas, Chile.

## XYLOTRYA SAULII Wright.

1884. *Teredo saulii* (WRIGHT Ms.) SOWERBY, Thes. Con., *Teredo*, p. 123, pl. 469, fig. 18. Callao.

## SUBKINGDOM MOLLUSCOIDEA.

## Class BRACHIOPODA.

## Order ATREMATA.

## Superfamily LINGULACEA.

## Family LINGULIDÆ.

## Genus GLOTTIDIA Dall.

## GLOTTIDIA AUDEBARDI Broderip.

1833. *Lingula audebardi* BRODERIP, Proc. Zool. Soc., p. 125; Trans. Zool. Soc. Lond., vol. 1, p. 143, pl. 23, fig. 14, 1834. Gulf of California, south to Guayaquil.

## GLOTTIDIA SEMEN Broderip.

1833. *Lingula semen* BRODERIP, Proc. Zool. Soc., p. 125. Trans. Zool. Soc. Lond., vol. 1, p. 144, pl. 23, fig. 17, 1834. Bay of Guayaquil.

## Order NEOTREMATA.

## Superfamily DISCINACEA.

## Family DISCINIDÆ.

## Genus DISCINISCA Dall.

## DISCINISCA CUMINGI Broderip.

1833. *Orbicula cumingi* BRODERIP, Proc. Zool. Soc., p. 124; Trans. Zool. Soc., vol. 1, p. 143, pl. 23, fig. 1, 1834. Gulf of California, to Paita, Peru.

## DISCINISCA LÆVIS Sowerby.

1822. *Orbicula lævis* SOWERBY, Trans. Linn. Soc., vol. 13, pt. 2, p. 468, pl. 26, figs. 1a-d.—REEVE, Con. Icon., *Orbicula*, pl. 1, fig. 4, 1862. Guayaquil to Callao, Peru.

## DISCINISCA LAMELLOSA Broderip.

1833. *Orbicula lamellosa* BRODERIP, Proc. Zool. Soc., p. 124; Trans. Zool. Soc. Lond., vol. 1, p. 142, pl. 23, fig. 2, 1834. Guayaquil and southward throughout the Peruvian Province.

## Order TELÖTREMATA.

## Superfamily TEREBRATULACEA.

## Family TEREBRATULIDÆ.

## Genus LIOTHYRINA Oehlert.

## LIOTHYRINA UVA Broderip.

1834. *Terebratula uva* BRODERIP, Trans. Zool. Soc. Lond., p. 142, pl. 23, fig. 2. Coast of Guatemala, and south to Peru and the Galapagos Islands.

## Genus TEREBRATELLA Orbigny.

## TEREBRATELLA DORSATA Gmelin.

1791. *Anomia dorsata* GMELIN, Syst. Nat., vol. 8, p. 3348.—*T. chilensis* BRODERIP, Trans. Zool. Soc. Lond., vol. 1, p. 141, pl. 22, fig. 1, 1834. Valparaiso, Chile, to Magellan Straits.

## Genus MAGELLANIA Bayle.

## MAGELLANIA VENOSA Solander.

1788. *Anomia venosa* SOLANDER, Dixon's Voy., p. 355, pl. 11.—DAVIDSON, Rec. Brach., Trans. Linn. Soc., 2nd ser., vol. 4, p. 49, pl. 8, figs. 1-5, 1886. Southern Chile, and the Magellanic region.

## SYNONYMOUS NAMES.

The student of the preceding list, familiar with the names contained in Orbigny's "Voyage," will miss a number of names which he would naturally have expected to find. It would have broken up the unity and conciseness of the faunal list to have it include any synonymy not necessary to the references given, i. e., the name used at the time of the description of the species and that used in connection with one or more good figures of the species. In order that the student may be able to identify synonyms with the name adopted in the list, an alphabetical summary of the chief synonyms is here given. The summary does not claim to contain all synonyms, for the work of bringing them together would have amounted to a monograph of the Peruvian provincial mollusk fauna, for which at present time could not be spared. Nor is the accuracy of this summary more exact than it could be made during the search of the literature and the comparison of the species in the collection of the U. S. National Museum. A thorough and complete study of the fauna would doubtless reveal the necessity for a certain number of changes. The present summary may be regarded as a step toward a future monograph. I have profited much in preparing it by the data given in Tryon's Manual, especially the volumes due to Dr. H. A. Pilsbry, without invariably accepting the decisions in that work. The works cited in the bibliography preceding the Faunal List have been carefully examined, together with many others which will be found cited in the List, and it is believed that nearly all the conspicuous synonyms will be found in the following summary. In adopting generic names the International Code of Rules for Zoological Nomenclature has been rigidly adhered to, and, while it would be too much to expect that absolute accuracy has been attained, the author has done his best in that direction. Eight hundred and sixty-nine species are cited in the Faunal List, and for the whole about 650 synonyms have been noted. This would indicate that the nomenclature is in a tolerably satisfactory state.

## SUMMARY OF THE CHIEF SYNONYMS.

- Acmaea cymbula* Hupé=*Scurria scurra* Lesson.  
*Acmaea nisoria* Philippi=*A. viridula* Lamarck.  
*Acmaea plana* Philippi, not Reeve=*A. viridula* Lamarck.  
*Acmaea pretrei* Orbigny=*A. viridula* Lamarck.  
*Acmaea punctatissima* Philippi=*Scurria parasitica* Orbigny.  
*Acmaea spectrum* Wimmer=*A. variabilis* Sowerby.  
*Aeolis auctorum*, cf. *Aeolidia* Cuvier.  
*Amalthea* Schumacher, not *Amaltheus* Montfort=*Hipponix* DeFrance.  
*Amphidesma croceum* Gould=*Semele solida* Gray.  
*Amphidesma orbiculare* Hupé=*Semele solida* Gray.  
*Amyxa* Troschel=*Prisogaster* Mörch.  
*Anomia electus* Gray=*A. peruviana* Orbigny.

- Anomia hamillus* Gray = *A. peruviana* Orbigny.  
*Anomia lampe* Gray = *A. peruviana* Orbigny.  
*Anomia larbas* Gray = *A. peruviana* Orbigny.  
*Aplysia* Linnæus, 1767 = *Tethys* Linnæus, 1758.  
*Arca brasiliensis* Reeve, not Lamarck = *A. cardiiformis* Sowerby.  
*Arca hemicardium* Koch = *A. reversa* Sowerby.  
*Arca inaequalis* Reeve, not Bruguière = *A. cardiiformis* Sowerby.  
*Arca sowerbyi* Orbigny = *A. biangulata* Sowerby, not *A. biangula* Lamarck.  
*Artemis macilenta* Reeve = *Cyclinella kroyeri* Philippi.  
*Artemis tenuis* Sowerby, 1852, not Recluz = *Cyclinella subquadrata* Hanley.  
*Arthemis saccata* Gould = *Cyclinella subquadrata* Hanley.  
*Astraliium*, see *Astræa*.  
*Auricula nigra* Philippi = *Marinula marinella* Küster.  
*Avicula* Lamarck, see *Pteria* Scopoli.  
*Barnea truncata* Tryon, not Say = *B. pacifica* Stearns.  
*Buccinum bolivianum* Souleyet, see *Cantharus bolivianus*.  
*Buccinum cochlidium* Kiener, cf. *B. paytensis* Kiener.  
*Buccinum cribrarium* Lamarck, see *Nitidella ocellata*, Gmelin.  
*Buccinum fusiforme* Souleyet = *Solenosteira fusiformis* Blainville.  
*Buccinum insignis* Reeve, 1846 = *Cantharus elegans* Gray.  
*Buccinum pagodus* Reeve = *Solenosteira fusiformis* Blainville.  
*Buccinum parvulum* Dunker = *Nitidella ocellata* Carpenter.  
*Buccinum pristis* Deshayes, 1844 = *Northia northia* Gray.  
*Buccinum serratum* Dufresne, 1834, not of Brocchi, 1814, see *Northia*.  
*Bulla* Linnæus, 1758, p. 725, not p. 425 = *Bullaria Rafinesque*.  
*Bulla ampulla* Troschel, not Linnæus = *B. gouldiana*?  
*Bulla nebulosa* Gould, 1852, not Schröter, 1804 = *B. gouldiana*?  
*Bulla panamensis* Philippi, 1848 = *B. aspersa*?  
*Bulla punctata* A. Adams, 1850 = *B. punctulata* Adams.  
*Bulla striata* Orbigny, 1837 = *B. punctulata*?  
*Cadulus panamensis* Pilsbry and Sharp, cf. *C. perpusillus* Sowerby.  
*Callista longispina* Mörch = *Pitaria multispinosa*.  
*Calyptrea*, see also *Crucibulum* and *Crepidula*.  
*Calyptrea amygdala* Valenciennes = *Crepidula onyx* Sowerby.  
*Calyptrea araucana* Lesson = *Trochita trochiformis* Gmelin.  
*Calyptrea cornea* Broderip = *Cheilea equestris* Linnæus.  
*Calyptrea dilatata* Sowerby, 1824 = *Trochita trochiformis* Gmelin.  
*Calyptrea echinus* Broderip = *Crepidula aculeata* Gmelin.  
*Calyptrea foliacea* Broderip = *Crepidula dilatata* Sowerby.  
*Calyptrea hystrix* Broderip = *Crepidula aculeata* Gmelin.  
*Calyptrea rudis* Broderip = *Cheilea equestris* Linnæus.  
*Calyptrea rugosa* Deshayes, not Lesson = *Crucibulum quiriquinæ* Lesson.  
*Calyptrea sordida* Broderip = *Trochita trochiformis* Gmelin.  
*Calyptrea strigata* Broderip = *Crepidula dilatata* Sowerby.  
*Calyptrea tubifera* Lesson = *Crucibulum spinosum* Sowerby.  
*Calyptrea umbrella* Deshayes = *Cheilea equestris* Linnæus.  
*Calyptrea umbrella* Deshayes (part) = *Crucibulum imbricatum* Sowerby.  
*Calyptrea unguis* Broderip = *Trochita, testa juvenis*.  
*Calyptrea varia* Broderip = *Cheilea equestris* Linnæus.  
*Cancellaria ovata* Sowerby, 1832 = *C. obesa* Sowerby.  
*Cancellaria unifasciata* Orbigny, cf. *C. uniplicata* Sowerby.  
*Cardita arcella* Valenciennes = *C. radiata* Sowerby.  
*Cardita flammea* Michaud = *Venericardia crasscostata* Sowerby.  
*Cardita tricolor* Sowerby, 1832 = *C. laticostata* Sowerby var.

- Cardita tumida* Broderip = *Venericardia crassicostata* Sowerby.  
*Cardita turgida* Valenciennes, 1846 = *C. laticostata* Sowerby.  
*Cardita varia* Broderip = *Venericardia crassicostata* Sowerby.  
*Cardium aspersum* Sowerby, cf. *C. spinosum* Meuschen.  
*Cardium laticostatum* Sowerby = *C. procerum* Sowerby.  
*Cardium panamense* Sowerby = *C. procerum* Sowerby.  
*Cardium planicostatum* Sowerby, 1833, not of Sedgwick and Murchison, 1829 = *C. magnificentum* Deshayes.  
*Cardium rastrum* Reeve = *C. senticosum* Sowerby.  
*Cardium rotundatum* Carpenter = *C. procerum* junior.  
*Cardium subelongatum* Valenciennes, 1846, not of Sowerby, 1840.  
*Cassis lactea* Kiener = *Phalium abbreviatum* Lamarck.  
*Cerithidea fortiuscula* Bayle = *C. montagnei* Orbigny.  
*Cerithidea valida* C. B. Adams = *C. montagnei* Orbigny.  
*Cerithidea varicosa* Sowerby, not DeFrance = *C. montagnei* Orbigny.  
*Cerithium galapaginis* Adams = *C. interruptum* Menke.  
*Cerithium humboldtii* Valenciennes = *C. pacificum* Sowerby.  
*Cerithium irroratum* Gould = *C. stercusmuscarum* Valenciennes.  
*Cerithium nebulosum* Sowerby, not Philippi = *C. maculosum*.  
*Chatopleura hahni* Rochebrune = *Chiton fremblyi* Broderip.  
*Chama thaca* Molina, see *Paphia thaca* Dall.  
*Chione antiqua* King, cf. *Chione alvarezii* Orbigny.  
*Chione biradiata* Gray = *Macrocallista squalida* Sowerby.  
*Chione tumens* Verrill = *Anomalocardia subimbricata* Sowerby.  
*Chionella*, see *Paradione*.  
*Chiton aculeatus* Sowerby, in Beechey's Voyage, not of Linnæus.  
*Chiton bicostatus* Orbigny = *C. pulchellus* Gray.  
*Chiton coquimbensis* Frembly = *Enoplochiton niger* Barnes.  
*Chiton glaber* Clessin, cf. *Tonicia elegans* Frembly.  
*Chiton magnificus* Deshayes = *C. latus* Sowerby.  
*Chiton olivaceus* Frembly = *C. latus* Sowerby.  
*Chiton patulus* Sowerby = *C. stokesii* Broderip.  
*Chiton scabriculus* Sowerby = *Chatopleura lurida* Sowerby.  
*Chiton spiniferus* Frembly = *C. echinatus* Barnes.  
*Chiton striatus* Barnes, 1823, not of Lamarck, 1819, nor of Fischer, 1809.  
*Chiton tuberculiferus* Sowerby = *C. echinatus* Barnes.  
*Chlorostoma*, cf. *Tegula*.  
*Chlorostoma tropidophorum* Adams = *Tegula luctuosa* Orbigny.  
*Columbella argus* Orbigny = *Nitidella ocellata* Gmelin.  
*Columbella castanea* Gould = *C. unicolor* Sowerby.  
*Columbella costata* Duclos = *Anachis fluctuata* Sowerby.  
*Columbella ebumum* Gould, cf. *C. unifasciata* Sowerby.  
*Columbella fusiformis* Hinds = *Strombina lanceolata*.  
*Columbella gibbosula* Broderip = *Strombina gibberula* Sowerby.  
*Columbella meleagris* Duclos = *C. fuscata* Sowerby.  
*Columbella nodalina* Duclos = *C. fuscata* Sowerby.  
*Columbella paytalida* Duclos = *C. paytensis* Lesson.  
*Columbella recurva* Sowerby, cf. *Strombina lanceolata*.  
*Columbella sordida* Orbigny = *C. unicolor* Sowerby.  
*Columbella spurca* Sowerby, 1832 = *C. paytensis* Lesson.  
*Columbella suturalis* Gray = *Anachis fluctuata* Sowerby.  
*Columbella tessellata* C. B. Adams, not of Gaskoin = *C. guatemalensis* Reeve.  
*Columbella triumphata* Duclos = *Cantharus distortus*.  
*Columbella unizonalis* Gray = *C. unifasciata* Sowerby.

- Columbella venilia* Duclos = *C. labiosa* Sowerby.  
*Concholepas imbricatus* Küster = *C. concholepas* Bruguière.  
*Concholepas oblongus* Reeve = *C. concholepas*, var.  
*Concholepas peruvianus* Lamarck = *C. concholepas* Bruguière.  
*Conovulus columbiensis* Anton, 1839 = *M. luteus* Quoy.  
*Conus diadema* Sowerby = *C. brunneus* Mawe.  
*Conus incurvus* Sowerby, 1841 = *C. recurvus* Broderip.  
*Conus interruptus* Broderip and Sowerby, 1829, not of Mawe, 1828.  
*Conus reticulatus* Sowerby, 1841 = *C. lucidus* Mawe.  
*Crepidula adolphi* Lesson = *C. dilatata* Sowerby.  
*Crepidula arcuata* Orbigny = *C. dilatata* Sowerby.  
*Crepidula arenata* Broderip = *C. onyx* Sowerby.  
*Crepidula cerithicola* C. B. Adams = *C. onyx* Sowerby.  
*Crepidula costata* Menke = *C. aculeata* Menke.  
*Crepidula fimbriata* Reeve = *C. squama* Broderip.  
*Crepidula hepatica* C. B. Adams = *C. onyx* Sowerby.  
*Crepidula hepatica* Menke = *C. incurva* Broderip.  
*Crepidula lessoni* Broderip = *C. squama* Broderip.  
*Crepidula nivea* C. B. Adams = *C. squama* Broderip.  
*Crepidula pallida* Broderip = *C. dilatata* Sowerby.  
*Crepidula patula* Deshayes = *C. dilatata* Sowerby.  
*Crepidula peruviana* Lamarck = *C. dilatata* Sowerby.  
*Crepidula plana* Say = *C. crepidula* Linnæus.  
*Crepidula striolata* Menke = *C. squama* Broderip.  
*Crepidula unguiculus* Broderip = *C. squama* Broderip.  
*Crepidula unguiformis* Lamarck = *C. crepidula* Linnæus.  
*Crucibulum auritum* Reeve = *C. quiriquinæ* Lesson.  
*Crucibulum cinereum* Gray = *C. tubiferum* Lesson.  
*Crucibulum dentatum* Carpenter = *C. imbricatum* Sowerby.  
*Crucibulum ferrugineum* Reeve = *C. quiriquinæ* Lesson.  
*Crucibulum hispidum* Broderip = *C. tubiferum* Lamarck.  
*Crucibulum lignarium* Broderip = *C. quiriquinæ* Lesson.  
*Crucibulum maculatum* Broderip, not Quoy = *C. quiriquinæ* Lesson.  
*Crucibulum pectinatum* Carpenter = *C. imbricatum* Sowerby.  
*Crucibulum peziza* Gray = *C. tubiferum* Lesson.  
*Crucibulum rude* Broderip = *C. imbricatum* Sowerby.  
*Crucibulum rugosum* Lesson = *C. imbricatum* Sowerby.  
*Crucibulum serratum* Broderip, cf. *C. imbricatum* Sowerby.  
*Crucibulum striatum* Broderip, not Say = *C. quiriquinæ* Lesson.  
*Crucibulum tenue* Broderip = *C. quiriquinæ* Lesson.  
*Ctenoconcha nuculoides* Valenciennes = *Malletia chilensis* Desmoulins.  
*Cuma*, *Cumia*, *Fasciolina* = *Cymia* Mörch.  
*Cumingia cleryi* Adams = *C. mutica* Sowerby.  
*Cumingia grandis* Deshayes = *C. mutica* Sowerby.  
*Cumingia striata* A. Adams = *C. mutica* Sowerby.  
*Cumingia trigonularis* Sowerby = *C. lamellosa* Sowerby.  
*Cumingia ventricosa* Sowerby = *C. mutica* Sowerby.  
*Cypræa cervinetta* Kiener = *C. exanthema* Linnæus, var.  
*Cypræa ferruginosa* Kiener, not Gmelin = *C. annettæ* Dall.  
*Cypræa irina* Kiener = *C. nigropunctata* Gray.  
*Cypræa lathyrus* Kiener = *Trivia sanguinea* Gray.  
*Cypræa punctulata* Gray = *C. robertsi* Hidalgo.  
*Cypræa rota* Weinkauff = *Trivia radians* Lamarck.  
*Cypræa zonata* Sowerby, Con. Ill., not Lamarck = *C. annettæ* Dall.

- Cyrena cardiformis* Sowerby = *C. cordiformis* Recluz.  
*Cyrena peruviana* Deshayes = *C. anomala* Deshayes.  
*Cytherea*, see *Macrocallista* and *Pitaria*.  
*Cytherea affinis* Broderip = *Pitaria concinna* Sowerby.  
*Cytherea aurantia* Hanley = *C. aurantiaca* Sowerby.  
*Cytherea brevispinosa* Sowerby = *C. multispinosa* Sowerby, var.  
*Cytherea chionæa* Menke = *Macrocallista squalida* Sowerby.  
*Cytherea corbicula* Menke, not Lamarck = *Tivela byronensis*.  
*Cytherea dionæa* Gray = *Pitaria lupanaria* Lesson.  
*Cytherea gigantea* Sowerby, not Gmelin = *Dosinia ponderosa* Gray.  
*Cytherea lutea* Philippi = *Macrocallista pannosa* Sowerby.  
*Cytherea mactroides* Lamarck, not Born = *Tivela planulata*.  
*Cytherea obliquata* Rømer = *Pitaria pollicaris* Carpenter.  
*Cytherea pacifica* Troschel = *Dosinia dunkeri* Philippi.  
*Cytherea pallida* Broderip = *Pitaria multispinosa* Sowerby.  
*Cytherea pulla* Philippi = *Tivela byronensis* Gray.  
*Cytherea semilamellosa* Gaudichaud = *Pitaria lupanaria* Lesson.  
*Cytherea stultorum* Menke, not Mawe = *Tivela byronensis* Gray.  
*Cytherea subsulcata* Menke = *Anomalocardia subrugosa* Sowerby.  
*Cytherea suppositrix* Menke = *Pitaria concinna* Broderip.  
*Cytherea tortuosa* Broderip = *Pitaria concinna*, var.  
*Cytherea undulata* Sowerby = *Tivela planulata* Broderip and Sowerby.  
*Delphinula*, see *Liotia*.  
*Dione brevispina* Deshayes = *Pitaria multispinosa* Sowerby.  
*Dione exspinata* Reeve = *Pitaria lupinaria* Lesson.  
*Dione prora* Reeve, not Conrad = *Pitaria pollicaris* Carpenter.  
*Diplodonta tellinoides* Reeve = *Phacoides tellinoides* Reeve.  
*Diplodontina*, see *Kellia*.  
*Discina*, see *Discinisca*.  
*Dolium latilabre* Valenciennes = *Malea ringens* Swainson.  
*Donacilla chilensis* Orbigny = *Mesodesma donacia* Lamarck.  
*Donax assimilis* Hanley = *D. aspera* Hanley.  
*Donax cayennensis* (part) Roemer = *D. obesula* Deshayes.  
*Donax lessoni* Deshayes = *Tivela planulata* Broderip and Sowerby.  
*Donax panamensis* Philippi = *D. paytensis* Orbigny.  
*Dosina antiqua* Gray = *Chione antiqua* King.  
*Dosinia simplex* Hanley, 1845 = *D. dunkeri* Philippi, 1844.  
*Drillia duplicata* Weinkauff, not Sowerby = *Surcula maura*.  
*Entodesma chilensis* Philippi = *E. cuneata* Gray.  
*Entodesma (saxicola* Baird) Carpenter = *Agriodesma* Dall, 1909, new name.  
*Euthria* Gray, 1850 = *Atractodon* Charlesworth, 1837.  
*Fissurella affinis* Gray = *F. peruviana* Lamarck.  
*Fissurella atrata* Reeve = *F. philippiana* Reeve.  
*Fissurella biradiata* Fremby = *F. latimarginata* Sowerby, var.  
*Fissurella chilensis* Sowerby = *F. costata* Lesson.  
*Fissurella chlorotrema* Menke = *F. rugosa* Sowerby.  
*Fissurella concinna* Philippi = *F. maxima* Sowerby.  
*Fissurella cumingii* Reeve = *F. latimarginata* var.  
*Fissurella elegans* "Phil." (inedit.?) Peru (Tschudi).  
*Fissurella excelsa* Reeve = *Fissuridea alta* Adams.  
*Fissurella galericulum* Reeve = *F. latimarginata* Sowerby, var.  
*Fissurella grandis* Sowerby = *F. nigra* Lesson.  
*Fissurella humilis* Menke = *F. rugosa* Sowerby.  
*Fissurella macrotrema* Sowerby, cf. *F. longifissa* Sowerby.

- Fissurella mus* Reeve = *Fissuridea inæqualis* Sowerby var.  
*Fissurella nigra* Philippi = *F. philippiana* Reeve.  
*Fissurella nigropunctata* Sowerby = *F. virescens* Sowerby var.  
*Fissurella occidentens* Gould = *F. peruviana* Lamarck.  
*Fissurella oriens* Sowerby, cf. *F. mexicana* Sowerby.  
*Fissurella pica* Sowerby = *F. inæqualis* Sowerby, var.  
*Fissurella rudis* Deshayes = *F. costata* Lesson.  
*Fissurella subrotunda* Deshayes = *F. peruviana* Lamarck.  
*Fissurella viminea* Menke, not Reeve, cf. *F. rugosa* Sowerby.  
*Fissurella violacea* Eschscholtz = *F. nigra* Lesson.  
*Fusus alternatus* Philippi, 1847 = *Austrofuscus fontainei* Orbigny.  
*Fusus fusiformis* Potiez and Michaud = *Trophon cassidiformis*.  
*Fusus purpuroides* Orbigny = *Solenosteira fusiformis* Blainville.  
*Fusus wiegmanni* Philippi = *Cymatium wiegmanni*.  
*Gadinia pentagoniostoma* Carpenter, 1857 = *G. peruviana* Sowerby.  
*Gadinia stellata* Sowerby, 1835 = *G. peruviana* Sowerby.  
*Genia planulata* Lamarck. Philippines. Australia.  
*Haminea natalensis* Sowerby = *H. peruviana* Orbigny.  
*Hipponix australis* Menke, not Deshayes = *H. barbata* Sowerby.  
*Hipponix mitrata* Orbigny = *H. antiquata* Linnæus.  
*Hipponix mitrula* DeFrance = *H. antiquata* Linnæus.  
*Hipponix pilosus* Deshayes, 1831, cf. *H. barbata* Sowerby, 1835.  
*Hipponix radiata* Gray, not Quoy and Gray = *H. grayana* Menke.  
*Hyalæa australis* Orbigny, not Person = *Clio antarctica* Dall.  
*Hyalæa flava* Orbigny, 1836 = *Cavolina gibbosa* Rang.  
*Hyalæa gegenbauri* Pfeffer, 1880 = *Cavolina gibbosa* Rang.  
*Hyalæa tridentata* Forskål, 1775 = *Cavolina telemus* Linnæus.  
*Infundibulum*, cf. *Trochita*.  
*Kellia miliaris* Philippi = *Lasæa*, cf. *petitiana* Recluz.  
*Lamellaria kerguelensis* Studer = *Marseniopsis pacifica* Bergh.  
*Latirus nassatulus* Schubert and Wagner. Indo-Pacific.  
*Latirus spadiceus* Reeve, 1847 = *L. concentricus* Reeve.  
*Latirus tuberculatus* Broderip, 1833 = *L. ceratus* Gray.  
*Lavignon coarctata* Orbigny = *Cumingia lamellosa* Sowerby.  
*Leda inornata* A. Adams = *L. acuta* Conrad.  
*Leda lugubris* Adams = *Tindaria sulculata* Couthouy.  
*Leda orangica* Mabile = *Tindaria sulculata* Couthouy.  
*Lima orientalis* Adams = *L. angulata* Sowerby.  
*Liotia cobijensis* Reeve = *L. cancellata* Gray, not Kiener.  
*Lithodomus*, see *Lithophaga*.  
*Littorina costulata* Souleyet = *L. varia* Sowerby.  
*Littorina fasciata* Gray = *L. varia* Sowerby.  
*Littorina paytensis* Philippi = *L. araucana* Orbigny.  
*Littorina striata* King, cf. *L. peruviana* Lamarck.  
*Littorina variegata* Souleyet = *L. varia* Sowerby.  
*Littorina zebra* Philippi = *L. peruviana* Lamarck.  
*Lotorium* Montfort = *Cymatium* Bolten.  
*Lottia conica* Gould = *Scurria scurra* Lesson.  
*Lottia cymbiola* Gould = *Scurria parasitica* Orbigny.  
*Lottia pallida* Sowerby = *Scurria scurra* Lesson.  
*Lottia punctata* (Gray) Orbigny, 1835, not of Lamarck, 1822.  
*Lucina brasiliensis* Mittré = *Diplodonta punctata* Say.  
*Lucina cornea* Reeve = *Diplodonta sericata* Reeve.  
*Lucina guaraniana* Orbigny = *Diplodonta punctata* Say.

- Lucina jancirensis* Reeve = *Diplodonta punctata* Say.  
*Lucina nilens* Reeve = *Diplodonta sericata* Reeve.  
*Lucina venezuelensis* Dunker = *Diplodonta punctata* Say.  
*Lucinopsis kroyeri* Poulsen is not *Cyclinella kroyeri* Philippi.  
*Lunatia* Gray cf. *Euspira* Agassiz.  
*Lyonsia brevifrons* Sowerby = *Entodesma cuneata* Gray.  
*Lyonsia cuneata* Orbigny = *Entodesma cuneata* Gray.  
*Lyonsia patagonica* Orbigny = *Entodesma cuneata* Gray.  
*Macoma picta* Sowerby = *Entodesma cuneata* Gray.  
*Macoma occidentalis* Dall = *M. undulata* Hanley.  
*Maetra calbucana* Philippi, 1893 = *Mulinia byronensis* Gray.  
*Maetra cibaria* Philippi, 1893 = *Mulinia edulis* King.  
*Maetra cuneola* Gould = *Mulinia edulis* King.  
*Maetra epidermia* Philippi, 1893 = *Mulinia edulis* King.  
*Maetra jonasi* Philippi, 1893 = *Mulinia bicolor* Gray.  
*Maetra lotensis* Philippi, 1893 = *Mulinia edulis* King.  
*Maetra marcida* Gould = *Mulinia edulis* King.  
*Maetra paitensis* Philippi, 1893 = *M. velata* Philippi, 1848.  
*Maetra pencana* Philippi, 1893 = *Mulinia byronensis* Gray.  
*Marginella cypræola* Sowerby = *Erato scabriuscula* Gray.  
*Marginella granum* Kiener, 1835 not of Philippi 1850 = *Erato scabriuscula* Gray.  
*Marinula callaënsis* Petit, 1854 = *M. marinella* Küster.  
*Meleagrina* Lamarck, see *Margaritiphora* Megerle.  
*Melongena* Schumacher, 1817 = *Galeodes* Bolten, 1798.  
*Mesodesma chilensis* Orbigny = *M. donacium* Lamarck.  
*Mitra chilensis* Kiener, 1836 = *M. orientalis* Gray.  
*Mitra foraminata* Swainson, 1835 = *M. lens* Mawe.  
*Mitra funiculata* Reeve, 1844 = *M. sulcata* Swainson.  
*Mitra inca* Orbigny, 1841 = *M. lens* Mawe.  
*Mitra lignaria* Reeve, 1844 = *M. lens* Mawe.  
*Mitra lineata* Swainson, not Gmelin = *M. sulcata* Swainson.  
*Mitra maura* Swainson, 1835 = *M. orientalis* Gray.  
*Mitra rupicola* Reeve, 1844 = *M. lens* Mawe.  
*Mitrularia*, cf. *Cheilea*.  
*Mitrularia cepacea* Broderip = *Cheilea equestris* Linnæus.  
*Modiola caudigera* Lamarck = *Lithophaga aristata* Dillwyn.  
*Modiola ovalis* Clessin = *Modiolus purpuratus* Lamarck.  
*Modulus trochiformis* Eydoux and Souleyet = *M. perlatus* Dillwyn.  
*Monoceros* Lamarck, not Bloch = *Acanthina* Fischer.  
*Monoceros citrinum* Sowerby = *Acanthina calcar longum* Martyn.  
*Monoceros costatum* Sowerby = *Acanthina calcar longum* Martyn.  
*Monoceros crassilabrum* Sowerby = *Acanthina calcar longum* Martyn.  
*Monoceros cymatum* Sowerby = *Acanthina lugubris* Sowerby.  
*Monoceros fusoides* King = *Chorus giganteus* Gray.  
*Monoceros glabratum* Deshayes = *Acanthina calcar longum* Martyn.  
*Monoceros globulus* Sowerby = *Acanthina calcar longum* Martyn.  
*Monoceros imbricatum* Sowerby = *Acanthina calcar longum* Martyn.  
*Monoceros maculatum* Gray = *Acanthina brevidentata* Mawe.  
*Monoceros muricatum* Reeve = *Acanthina muricata* Broderip.  
*Monoceros unicorne* Gray = *Acanthina calcar longum* Martyn.  
*Monodonta carchidonius* Lamarck, cf. *Modulus perlatus* Dillwyn.  
*Monodonta catenifera* Potiez and Michaud, 1838, not of Kiener, 1836 = *Tegula quadri-*  
*costata* Gray.  
*Mouretia reticulata* Sowerby, 1835 = *Gadinia peruviana* Sowerby.

- Mulinia angulata* Carpenter, 1855 = *Mulinia pallida* Broderip and Sowerby.  
*Mulinia bistrigata* Mörch, 1862 = *M. pallida* Broderip and Sowerby.  
*Mulinia carinulata* (Deshayes) Reeve = *M. pallida* Broderip and Sowerby.  
*Mulinia coquimbana* Philippi, 1893 = *M. byronensis* Gray.  
*Mulinia donaciformis* Gray, not Reeve = *M. pallida* Broderip and Sowerby.  
*Mulinia exalbida* Gray = *M. byronensis* Gray.  
*Mulinia typica* Gray = *M. edulis* King.  
*Murex boivini* Kiener = *Trophon horridus* Broderip and Sowerby.  
*Murex crispus* Broderip, 1832 = *M. tortuosus* Sowerby.  
*Murex ducalis* Broderip, 1833 = *M. brassica* Lamarck.  
*Murex erinaceoides* Valenciennes, 1846 = *M. rhamatus* Hinds. *catligos*  
*Murex erythrostomus* Swainson = *Phyllonotus bicolor* Valenciennes.  
*Murex exiguus* Kiener, Reeve, Garrett, not of Broderip.  
*Murex hippocastanum* Philippi = *Phyllonotus bicolor* Valenciennes.  
*Murex incisus* Carpenter, not Broderip = *M. gemma* Sowerby.  
*Murex labiosus* see *Tritonalia crassilabrum* Gray.  
*Murex labiosus* Orbigny = *M. crassilabrum* Gray.  
*Murex lepidus* Reeve, 1845 = *M. vittatus* Broderip.  
*Murex lugubris* Tryon, 1880, not of Broderip.  
*Murex monoceros* Orbigny, 1841, not Sowerby = *M. fontainei* Tryon.  
*Murex multicostatus* Dunker, 1869 = *M. tortuosus* Sowerby.  
*Murex multicrispatus* Dunker = *M. tortuosus* Sowerby.  
*Murex parthenopeus* v. Salis = *Cymatium costatum* Sowerby.  
*Murex peruvianus* Sowerby, 1840 = *M. dipsaccus* Broderip.  
*Murex pliciferus* Sowerby, 1840. West Africa, not Chile.  
*Murex radicans* Hinds, 1844 = *M. lappa* Broderip.  
*Murex rhodocheilus* King, 1831 = *M. brassica* Lamarck.  
*Murex tortuosus* Catlow, 1845 = *M. tortuosus* Sowerby.  
*Murex tricolor* Valenciennes, 1833 = *M. regius* Wood, 1828.  
*Murex vitellus* Sowerby, 1870 = *M. vittatus* Broderip.  
*Mytilus americanus* Orbigny = *M. ater* Molina.  
*Mytilus augustanus* Lamarck, cf. *M. ater* Molina.  
*Mytilus bifurcatus* Conrad, part = *M. stearnsii* Pilsbry.  
*Mytilus bifurcatus* Dautzenberg, 1896, Valparaiso. (=?)  
*Mytilus cordatus* Gould = *M. granulatus* Hanley.  
*Mytilus cuneiformis* Reeve = *M. ater* Molina.  
*Mytilus curvatus* Stempel = *M. magellanicus* var.  
*Mytilus dactyloides* Philippi, 1860 = *M. dactyliformis* Hupé.  
*Mytilus hupéanus* Mabile = *M. chilensis* Hupé.  
*Mytilus orbignyianus* Hupé = *M. ater* Molina.  
*Mytilus ovalis* Lamarck = *Modiolus purpuratus* Lamarck.  
*Mytilus pyriformis* Gould = *M. magellanicus* Lamarck.  
*Mytilus ungulatus* Valenciennes, not Lamarck = *M. chorus* Molina.  
*Mytilus violaceus* Clessin, 1889, cf. *M. chilensis* Hupé.  
*Nassa* Lamarck, 1799, not Bolten, 1798 = *Alectrion* Montfort.  
*Nassa flammulata*, Preston, 1909, cf. *Alectrion*, species.  
*Nassa fontainei* Orbigny = *Nassa exilis* Powys.  
*Nassa gemma* Philippi = *Alectrion complanatus*.  
*Nassa panamensis* Adams = *N. exilis* Powys.  
*Nassa panamensis* C. B. Adams = *N. exilis* Powys.  
*Nassa rubricata* Gould = *Alectrion gayii* Kiener.  
*Nassa scabriuscula* Adams, 1852 = *Alectrion complanatus*.  
*Nassa tschudii* Troschel, cf. *N. dentifera* Powys.  
*Nassa unidentata* Powys = *N. dentifera* junior.

- Nassa xanthostoma* Gray, n. n. for *N. teleostoma* Broderip and Sowerby.  
*Natica atacamensis* Philippi = *Polinices dubius* Recluz.  
*Natica bonplandi* Valenciennes = *Polinices glaucus* Humboldt.  
*Natica chemnitzii* Pfeffer = *N. unifasciata* junior.  
*Natica elongata* Troschel = *Polinices cora* Orbigny.  
*Natica excavata* Carpenter = *N. elenæ* Recluz.  
*Natica galapagana* Recluz = *Polinices otis* Broderip.  
*Natica haneti* Recluz = *N. elenæ* Recluz.  
*Natica iostoma* Menke = *N. broderipiana* Recluz.  
*Natica patula* Sowerby = *Polinices glaucus* Humboldt.  
*Natica perspicua* Recluz = *Polinices otis* Broderip.  
*Natica prichardi* Forbes = *N. unifasciata* junior.  
*Natica rapulum* Reeve = *Polinices dubius* Recluz.  
*Natica salangoënsis* Recluz = *Polinices otis* Broderip.  
*Natica taslei* Recluz = *N. broderipiana* Recluz.  
*Nerita bernhardi* Recluz, cf. *N. fulgurans* Gmelin.  
*Nerita deshayesii* Recluz = *N. scabricosta* Lamarck.  
*Nerita fuscata* Menke = *N. scabricosta* Lamarck.  
*Nerita multijugis* Menke = *N. scabricosta* Lamarck.  
*Nerita ornata* Sowerby, 1823 = *N. scabricosta* Lamarck.  
*Nerita peruviana* Philippi = *N. yoldii* Recluz. China.  
*Neritina fontaineana* Orbigny = *N. owenii* Mawe.  
*Neritina globosa* Broderip = *N. owenii* Mawe.  
*Neritina guayaquilensis* Sowerby, cf. *N. owenii* Mawe.  
*Neritina intermedia* Sowerby = *N. owenii* Mawe.  
*Neritina latissima* Broderip = *N. owenii* Mawe.  
*Neritina zebra* Sowerby, not Lamarck = *N. sobrina* Recluz.  
*Nettastoma* see *Pholadidea*.  
*Nettastomella* see *Pholadidea*.  
*Nitidella cribraria* Lamarck = *N. ocellata* Gmelin.  
*Nucula cuneata* Sowerby = *Leda acuta* Conrad.  
*Nucula lyrata* Hinds = *Leda eburnea* Sowerby.  
*Nucula obliqua* Gray, Sowerby, not of Lamarck = *N. grayi*.  
*Nucula semiornata* Orbigny = *N. pisum* Sowerby.  
*Ocenebra* (Leach) Gray, 1847 = *Tritonalia* Fleming, 1828.  
*Oliva hiatula* Gmelin, S. Africa, cf. *O. testacea* Lamarck.  
*Oliva razamola* Duclos, 1835 = *Olivella volutella* Lamarck.  
*Orbicula lamellata* Troschel = *Discinisca lamellosa* Broderip.  
*Orbicula strigata* Broderip = *Discinisca cunningi* Broderip.  
*Orbicula tenuis* Sowerby, cf. *Discinisca lævis* Sowerby.  
*Ostrea chiloënsis* Sowerby = *O. chilensis* Philippi.  
*Ostrea cibialis* Hupé = *O. chilensis* Philippi.  
*Onula* Bruguière, cf. *Simnia* Risso.  
*Patella atramentosa* Reeve = *P. magellanica* Gmelin.  
*Patella chiloënsis* Reeve = *P. magellanica* Gmelin.  
*Patella concepcionis* Lesson = *Scurria zebrina* Orbigny.  
*Patella diaphana* Reeve = *Scurria mesoleuca* Menke.  
*Patella goreënsis* Gmelin, cf. *Crepidula crepidula* Linnæus.  
*Patella grammica* Philippi = *Acmæa variabilis* Sowerby.  
*Patella lepas* Gmelin = *Concholepas concholepas* Bruguière.  
*Patella leucophæa* Philippi = *Scurria parasitica* Orbigny.  
*Patella lineata* Philippi = *Acmæa variabilis* Sowerby.  
*Patella maxima* Orbigny = *P. mexicana* Broderip and Sowerby.  
*Patella meridionalis* Rochebrune = *P. magellanica* Gmelin.

- Patella metallica* Rochebrune = *P. magellanica* Gmelin.  
*Patella penicillata* Reeve = *Acmæa variabilis* Sowerby.  
*Patella plana* Reeve, not Philippi = *Acmæa araucana* Orbigny.  
*Patella pupillata* Rochebrune = *P. magellanica* Gmelin.  
*Patella scutellata* Gray, Wood = *Crucibulum imbricatum* Sowerby.  
*Patella striata* Reeve = *Scurria mesoleuca* Menke.  
*Patella venosa* Reeve = *P. magellanica* Gmelin.  
*Patella vespertina* Reeve = *Scurria mesoleuca* Menke.  
*Pecten aspersus* Sowerby = *P. tumbezensis* Orbigny.  
*Pecten inca* Orbigny = *P. ventricosus* Sowerby.  
*Pecten magnificus* Sowerby = *P. subnodosus* var.  
*Pecten pomatia* Valenciennes cf. *P. ventricosus* Sowerby.  
*Pecten sowerbii* Reeve, 1852 = *P. tumbezensis* Orbigny.  
*Pecten tumidus* Sowerby, 1835 = *P. ventricosus* Sowerby.  
*Pectunculus* Lamarck = *Glycymeris* Da Costa.  
*Pectunculus assimilis* Sowerby = *Glycymeris inæqualis* Sowerby.  
*Pectunculus inæqualis* Sowerby, 1839, not 1832 = *P. bicolor* Reeve.  
*Pectunculus intermedius* Broderip = *P. ovatus* Broderip.  
*Pectunculus pectiniformis* Wood, not Lamarck = *P. inæqualis* Sowerby.  
*Petitella conradi* Valenciennes = *P. penita* Conrad.  
*Petitella wilsoni* Conrad = *Pholadidea melanura* Sowerby.  
*Peractis bispinosa* Pelseneer, 1888 = *P. reticulata* Orbigny.  
*Perna* Lamarck, see *Melina* Retzius.  
*Petricola chiloënsis* Philippi = *P. rugosa* Sowerby.  
*Petricola nivea* Gmelin. Indo-Pacific—Nicobar Islands.  
*Petricola ovata* Troschel = *P. rugosa* Sowerby.  
*Petricola solida* Sowerby = *P. elliptica* Sowerby.  
*Petricola tenuis* Sowerby = *P. rugosa* Sowerby.  
*Petricola ventricosa* Deshayes = *P. denticulata* Sowerby.  
*Philippina* Dall, 1901 = *Entodesma* Philippi, 1845.  
*Pholadopsis*, see *Jouannetia*.  
*Pholas beauviana* Recluz = *Martesia curta* Sowerby.  
*Pholas concamerata* Deshayes = *Pholadidea penita* Conrad.  
*Pholas crucifera* Sowerby, Thes., see *Barnea crucigera* Sowerby.  
*Pholas cucullata* Gray = *Pholadidea penita* Conrad.  
*Pholas gibbosa* Orbigny = *Xylotomea globosa* Sowerby.  
*Pholas grayana* Sowerby, cf. *Martesia curta* Sowerby.  
*Pholas lamellosa* Orbigny = *Barnea subtruncata* Sowerby.  
*Pholas laqueata* Sowerby, 1849 = *P. chiloënsis* Molina.  
*Pholas parva* Sowerby, 1834 = *P. chiloënsis* Molina, var.  
*Pholas pulcherrima* Sowerby = *Jouannetia pectinata* Conrad.  
*Pileopsis pilosus* Deshayes = *Hipponix* sp.  
*Pileopsis subrufa* Lamarck, see *Hipponix*.  
*Pleurotoma*, Lamarck, 1799 = *Turris* Bolten, 1798.  
*Pleurotoma cincta* Sowerby, not Lamarck = *P. zonulata* Reeve  
*Pleurotoma cornuta* Sowerby, 1833 = *P. nigerrima* Sowerby.  
*Pleurotoma corrugata* Sowerby, not Kiener = *P. sowerbyi* Reeve.  
*Pleurotoma incrassata* Sowerby, 1833 = *Drillia bottæ* Valenciennes.  
*Pleurotoma turricula* Sowerby, 1833 = *P. sowerbyi* Reeve.  
*Pneumodermon violaceum* Boas, part = *P. boasi* Pelseneer.  
*Pollia hæmastoma* Gray = *Cantharus sanguinolentus* Duclos.  
*Psammobia crassa* Hupé = *P. solida* (Gray) Philippi.  
*Psammosolen* Hupé, see *Tagelus* Gray.

- Purpura* Lamarck, 1799, not of Martyn, 1784=*Thais* Bolten, 1798.  
*Purpura* Martyn, 1784, not Lamarck, 1799=*Cerostoma* Conrad, 1837.  
*Purpura angulifera* Duclos=*Cymia tectum* Wood.  
*Purpura biscostalis* Reeve, 1846=*P. biserialis* Blainville, 1832.  
*Purpura blainvillei* Deshayes, 1846=*Thais delessertiana* Orbigny.  
*Purpura callaënsis* Blainville=*Thais delessertiana* Orbigny.  
*Purpura callaënsis* Kiener=*P. biserialis* Blainville.  
*Purpura carolensis* Reeve, 1846=*Thais triangularis* Blainville.  
*Purpura concholepas* Orbigny=*Concholepas* Bruguière.  
*Purpura cornigera* Blainville=*Acanthina brevidentata* Mawe.  
*Purpura diadema* Reeve, 1846=*Thais costata* Blainville.  
*Purpura fasciolaris* Lamarck, Mediterranean, not Peru.  
*Purpura hæmastoma* Tryon, Peru=*Thais peruensis* Dall, n. n.  
*Purpura janellii* Valenciennes=*Cantharus sanguinolentus* Duclos.  
*Purpura lepas* v. Martens=*Concholepas concholepas* Bruguière.  
*Purpura melo* Duclos=*Thais crassa* Blainville.  
*Purpura ocellata* Kiener=*Acanthina brevidentata* Mawe.  
*Purpura orbignyi* Reeve, 1846=*Solenosteira fusiformis* Blainville.  
*Purpura peruviana* Blainville=*Concholepas concholepas* Bruguière.  
*Purpura peruviana* Lesson, cf. =*Trophon cassidiformis* Blainville.  
*Purpura peruviana* Souleyet=*Thais delessertiana* Orbigny. *peruensis* Dall  
*Purpura truncata* Duclos=*Acanthina muricata* Broderip.  
*Purpura xanthostoma* Broderip, 1833=*Trophon cassidiformis* Blainville, 1832.  
*Pyrgula ochroleuca* Philippi=*Trophon cassidiformis* Blainville.  
*Ranella kingi* Orbigny=*Argobuccinum vexillum* Sowerby.  
*Ranella tenuis* Potiez and Michaud=*Bursa ventricosa* Broderip.  
*Ranella triquetra* Reeve=*Eupleura muriciformis* Broderip.  
*Rissina pulchra* C. B. Adams=*R. cancellata* Philippi.  
*Saxicava antarctica* Philippi=*S. solida* Sowerby.  
*Saxicava chilensis* Hupé=*S. solida* Sowerby.  
*Saxicava solida* Sowerby, cf. *S. arctica* Linnæus.  
*Saxicava tenuis* Sowerby, 1834=*S. solida* Sowerby.  
*Saxidomus squalidus* Deshayes, not Carpenter=*Marcia rufa* Lamarck.  
*Scala* (anonymous)=*Epitonium* Bolten.  
*Scalaria simillima* Tapparone-Canefri, 1876=*S. ducalis* Mörch.  
*Sigaretus* Lamarck, 1799, cf. *Sinum* Bolten, 1798.  
*Sigaretus cymba* Menke=*Sinum concavum* Lamarck.  
*Sigaretus grayi* Deshayes=*Sinum concavum* Lamarck.  
*Sigaretus maximus* Philippi=*Sinum concavum* Lamarck.  
*Siphonaria æquilirata* Carpenter, 1856=*S. maura* Sowerby.  
*Siphonaria characteristica* Reeve, 1842=*S. gigas* Sowerby.  
*Siphonaria concinna* Sowerby. Gambia and Mauritius.  
*Siphonaria lecanium* Philippi, 1846=*S. maura* Sowerby.  
*Siphonaria palmata* Carpenter, 1856=*S. maura* Sowerby.  
*Siphonaria scutellum* Deshayes, 1841. New Zealand.  
*Solecortus coquimbensis* Sowerby=*Tagelus dombeji* Lamarck.  
*Solen gladiolus* Gray, 1839=*S. macha* Molina, 1782.  
*Solenella norrisii* Sowerby=*Malletia chilensis* Desmoulin.  
*Spondylus dubius* Broderip=*S. crassisquama* Lamarck.  
*Spondylus ducalis* Lamarck. Philippines, not Peru.  
*Spondylus leucacantha* Broderip=*S. crassisquama* Lamarck.  
*Spondylus pictorum* Sowerby=*S. crassisquama* Lamarck.  
*Spondylus princeps* Broderip=*S. crassisquama* Lamarck.  
*Strombus gibberulus* Linnæus, is Indo-Pacific (Peru, Tschudi).

- Strombus luhuanus* Linnæus, is Indo-Pacific (Peru, Tschudi).  
*Styliola recta* Gray, 1850=*S. acicula* Rang.  
*Talena* Gray, see *Pholadidea*.  
*Tectarius atyphus* Stearns=*T. galapagensis* Stearns.  
*Tegula atra* Lesson, var., cf. *T. mæsta* Jonas.  
*Tellina coarctata* Philippi=*T. lacunosa* Hanley. West Africa.  
*Tellina sanguinea* Wood=*T. inæquistriata* Donovan.  
*Terebra belcheri* Smith, 1873, not of Philippi, 1851.  
*Terebra chilensis* Deshayes, 1859=*T. gemmulata* Kiener.  
*Terebra elongata* Wood, 1828=*T. strigata* Sowerby.  
*Terebra flammea* Lesson, 1830=*T. strigata* Sowerby.  
*Terebra patagonica* Orbigny, 1841; cf. *T. gemmulata* Kiener.  
*Terebra zebra* Kiener=*T. strigata* Sowerby.  
*Terebratula chilensis* Orbigny, not Broderip=*Magellania venosa* Solander.  
*Terebratula dilatata* Lamarck=*Magellania venosa* Solander.  
*Terebratula eximia* Philippi=*Magellania venosa* Solander.  
*Terebratula fontaineana* Orbigny=*Magellania venosa* Solander.  
*Terebratula gaudichaudi* Blainville=*Magellania venosa* Solander.  
*Terebratula globosa* Lamarck=*Magellania venosa* Solander.  
*Terebratula kochii* Kuster=*Magellania venosa* Solander.  
*Terebratula physema* Valenciennes=*Magellania venosa* Solander.  
*Tivela radiata* Sowerby, not Megerle=*T. byronensis* Gray.  
*Tivela suffusa* Sowerby=*T. planulata* Broderip and Sowerby.  
*Trigona hindsii* Hanley=*Tivela byronensis* Gray.  
*Trigona semifulva* Menke=*Tivela byronensis* Gray.  
*Triumphalia* Sowerby=*Jouannetia* Desmoulins.  
*Triton, auctorum*, cf. *Cymatium* Bolten.  
*Triton chemnitzii* Gray=*Cymatium wiegmanni* Anton.  
*Triton ranelliformis* King, not Sismondá<sup>3/2</sup>=*Argobuccinum vexillum* Sowerby. 1841.  
*Triton succinctus* Lamarck=*Cymatium costatum* Born.  
*Tritonium cancellatum* Valenciennes=*Distorsio constrictus* Broderip.  
*Trivia costispunctata* Gaskoin=*Trivia radians* Lamarck?  
*Trochus araucanus* Orbigny=*Monodonta nigerrima* Gmelin.  
*Trochus bicarinatus* Potiez and Michaud=*T. luctuosus* Orbigny.  
*Trochus brasiliensis* Menke=*Tegula reticulata* Gray.  
*Trochus buschii* Philippi=*Astræa buschii* Philippi.  
*Trochus carinatus* Koch=*T. luctuosus* Orbigny.  
*Trochus kieneri* Hupé=*T. euryomphalus* Jonas.  
*Trochus microstomus* Orbigny=*T. tridentatus* Potiez and Michaud.  
*Trochus perlatus* Dillwyn=*T. tectum* Gmelin, part.  
*Trochus radians* Lamarck=*Trochita trochiformis* Gmelin.  
*Trochus stenomphalus* Jonas=*T. tridentatus* Potiez and Michaud.  
*Trochus torulosus* Philippi=*T. quadricostatus* Gray.  
*Trochus tridens* Menke=*T. tridentatus* Potiez and Michaud.  
*Trochus unidens* Chemnitz=*T. tectum* Gmelin, part.  
*Turbinella ardeola* Valenciennes, 1833=*Vasum cæstum* Broderip.  
*Turbinella muricata* Born, 1780=*Vasum cæstum* Broderip.  
*Turbo assimilis* Kiener=*T. fluctuosus* Wood.  
*Turbo atrum* Kiener=*Tegula atra* Lesson.  
*Turbo brevispinosus* Sowerby=*Astræa buschii* Philippi.  
*Turbo depressus* Carpenter=*T. fluctuosus* Wood.  
*Turbo fluctuatus* Reeve=*T. fluctuosus* Wood.  
*Turbo inermis* Lamarck, not Kiener=*Astræa buschii* Philippi.  
*Turbo lugubris* King=*T. niger* Wood.

- Turbo lugubris* Philippi, not King, cf. *Tegula atra* junior.  
*Turbo moltkeanus* Reeve, not Gmelin = *T. fluctuosus* Wood.  
*Turbo nigerrimus* Philippi = *Monodonta araucana* Orbigny.  
*Turbo propinquus* Hupé = *T. elevatus* Eydoux and Souleyet.  
*Turbo quoyi* Kiener = *Monodonta araucana* Orbigny.  
*Turbo tessellatus* Kiener = *T. fluctuosus* Wood.  
*Turritella banksii* Reeve = *T. goniostoma* Valenciennes.  
*Turritella broderipiana* Reeve = *T. goniostoma* Valenciennes.  
*Turritella lentiginosa* Reeve = *T. goniostoma* Valenciennes.  
*Turritella marmorata* Kiener = *T. goniostoma* Valenciennes.  
*Turritella punctata* Kiener = *T. goniostoma* Valenciennes.  
*Turritella tricarinata* King = *T. cingulata* Sowerby.  
*Turritella ungulata* err. typ. pro *T. cingulata* Sowerby.  
*Venerupis fernandeziana* Stempel, cf. *V. oblonga* Sowerby.  
*Venerupis fimbriata* Sowerby, cf. *V. oblonga* Sowerby.  
*Venus alternata* Broderip = *Pitaria circinata* Born.  
*Venus beauri* Recluz = *Chione subrostrata* Lamarck.  
*Venus bilineata* Reeve, cf. *Anomalocardia subimbricata* Sowerby.  
*Venus californica* Carpenter = *Chione compta* Broderip.  
*Venus cardioides* Lamarck, cf. *Chione asperrima* Sowerby.  
*Venus chilensis* Sowerby = *Paphia thaca* Molina.  
*Venus costellata* Sowerby = *Chione antiqua* King.  
*Venus crenifera* Sowerby = *Chione subrostrata* Lamarck.  
*Venus cycloides* Orbigny = *Dosinia ponderosa* Gray.  
*Venus cypria* Sowerby, 1835, not Brocchi, 1814 = *V. mariæ* Orbigny.  
*Venus discors* Sowerby = *Paphia grata* Say.  
*Venus discrepans* Philippi, not Sowerby, cf. *Chione antiqua* King.  
*Venus dombeyi* Lamarck = *Paphia thaca* Molina.  
*Venus entobapta* Jonas = *Chione undatella* Sowerby.  
*Venus excavata* Carpenter = *Chione undatella* Sowerby.  
*Venus expallescens* Philippi = *Marcia rufa* Lamarck.  
*Venus histrionica* Sowerby = *Paphia grata* Say.  
*Venus ignobilis* Philippi = *Paphia thaca* Molina.  
*Venus intersecta* Sowerby, cf. *Chione asperrima* Sowerby.  
*Venus lithoida* Jonas = *Marcia rufa* Lamarck.  
*Venus modesta* Sowerby = *Pitaria cumingi* Orbigny.  
*Venus neglecta* Sowerby = *Chione subrostrata* Lamarck.  
*Venus nuttalli* Conrad = *Chione undatella* Sowerby.  
*Venus opaca* Sowerby = *Marcia rufa* Lamarck.  
*Venus paytensis* Orbigny = *Pitaria concinna* Sowerby.  
*Venus pectunculoides* Valenciennes = *Chione asperrima* Sowerby.  
*Venus perdix* Valenciennes = *Chione undatella* Sowerby.  
*Venus portesiana* Orbigny = *Chione subrostrata* Lamarck.  
*Venus simillima* Sowerby = *Chione undatella* Sowerby.  
*Venus solangensis* Orbigny = *Tivela byronensis* Gray.  
*Venus subrostrata* Reeve, not Lamarck = *Chione undatella* Sowerby.  
*Venus thouarsi* Valenciennes = *Cytherea multicosata* Sowerby.  
*Venus triradiata* Anton = *Anomalocardia subrugosa* Sowerby.  
*Voluta coerulea* Hanley's Index Test. = *Olivella volutella* Lamarck.  
*Waldheimia*, see *Magellania*.  
*Xylophaga* Turton, not *Xylophagus* Meuschen = *Xylotomea* Dall.  
*Xylophaga dorsalis* Stempel = *Xylotomea globosa* Sowerby.

## EXPLANATION OF PLATES.

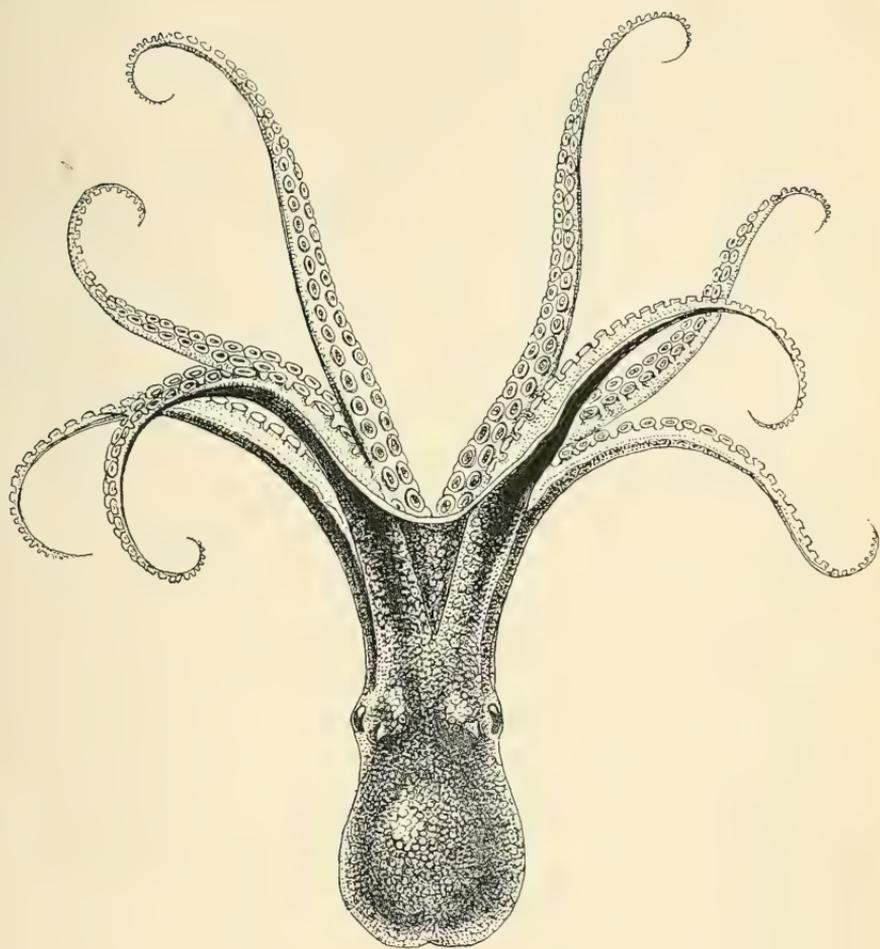
	PLATE 20.	Page.
FIG. 1.	<i>Polypus fontaineanus</i> Orbigny, length 25 cm., see.....	181
	PLATE 21.	
FIG. 1.	<i>Loligo gahi</i> Orbigny, length 30 cm.....	181
	2. Endostyle of the same.	
	PLATE 22.	
FIG. 1.	<i>Concholepas concholepas</i> Bruguière, natural size.....	168
	2. <i>Thais chocolata</i> Duclos, natural size.....	169
	3. <i>Solenosteira fusiformis</i> Blainville, natural size.....	167
	4. <i>Thais kiosquiformis</i> Duclos, natural size.....	170
	PLATE 23.	
FIG. 1.	<i>Trochita trochiformis</i> Gmelin, natural size, from above.....	175
	2, 5. <i>Crepidula onyx</i> Sowerby, natural size.....	174
	3. <i>Bulimulus cokerianus</i> Dall; height 27 mm.....	164
	4. <i>Oliva peruviana</i> Lamarck, showing animal as contracted by alcohol, with the "pocket" at the posterior end of the foot turned inside out.....	165
	6. <i>Acanthopleura echinata</i> Barnes, natural size, from above.....	180
	7. <i>Littorina peruviana</i> Lamarck, $\frac{2}{3}$ natural size.....	172
	8. <i>Enoplochiton niger</i> Barnes, natural size, from above.....	181
	PLATE 24.	
FIG. 1, 2.	<i>Acmæa viridula</i> Lamarck, natural size.....	178
	3, 7. <i>Megatebennus cokeri</i> Dall, length 27.5 mm.....	178
	4. <i>Tegula atra</i> Lesson, natural size.....	176
	5, 6. <i>Fissurella crassa</i> Lamarck, interior and profile; length 50 mm.....	177
	PLATE 25.	
FIG. 1.	<i>Mytilus chorus</i> Molina, $\frac{1}{3}$ natural size.....	151
	2. Palette of <i>Xylotrya dryas</i> , inside view, $\frac{2}{3}$ .....	162
	3. Palette of <i>Xylotrya dryas</i> , outside view, $\frac{2}{3}$ .....	162
	4. <i>Mytilus magellanicus</i> Lamarck, $\frac{1}{2}$ natural size.....	151
	5, 6, 7. <i>Xylotrya dryas</i> Dall; 6, outside of left valve; 5, interior of the two valves conjoined; 7, interior of left valve, natural size.....	162
	8. <i>Iphigenia altior</i> Sowerby, natural size.....	159
	9. <i>Arca (Anadara) grandis</i> Broderip and Sowerby, umbonal view, natural size, of an adolescent specimen.....	154
	10. The same, in profile.....	154
	PLATE 26.	
FIG. 1.	<i>Ostrea chilensis</i> Philippi, interior of attached valve, $\frac{1}{2}$ natural size...	148
	2. <i>Ostrea columbiensis</i> Hanley, interior of attached valve, natural size ..	149
	3. <i>Anomalocardia subrugosa</i> Sowerby, natural size.....	158
	4. <i>Cyrena isocardioides</i> Deshayes, natural size.....	159
	5. <i>Pecten purpuratus</i> Lamarck, $\frac{1}{2}$ natural size.....	149
	6. <i>Pecten purpuratus</i> , part of the external sculpture, much enlarged...	149

## PLATE 27.

	Page.
FIG. 1. <i>Mesodesma donacium</i> Lamarck, natural size.....	161
2. <i>Modiolus guyanensis</i> Lamarck, natural size.....	152
3. <i>Tagelus (Mesopleura) dombeyi</i> Lamarck, natural size.....	160
4. <i>Arca (Scapharca) tuberculosa</i> Sowerby, in profile, natural size.....	154

## PLATE 28.

FIG. 1. <i>Pteria peruviana</i> Reeve, $\frac{1}{2}$ natural size.....	150
2. <i>Modiolus arciformis</i> Dall, restored from fragments, length 65 mm...	152
3. <i>Tellina (Angulus) eburnea</i> Hanley, natural size, view of interior of left valve .....	160
4. <i>Anomia peruviana</i> Orbigny, natural size. Shell viewed from the base of attached valve.....	148
5, 6. <i>Aligena cokeri</i> Dall, umbonal view and profile, enlarged from 7.5 mm. long.....	155
7. <i>Donax aspera</i> Hanley, natural size .....	159
8. <i>Diplodonta (Felamiella) artemidis</i> Dall, $\frac{2}{3}$ natural size, length 12 mm.	156
9. <i>Tivela planulata</i> Broderip and Sowerby, natural size.....	157
10. <i>Semele solida</i> Gray, interior of left valve, natural size.....	160

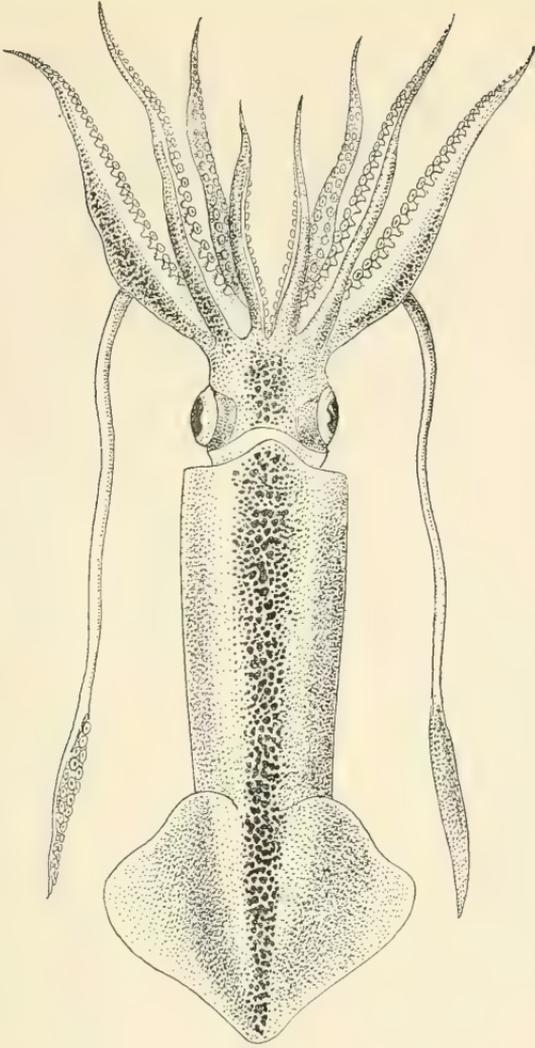


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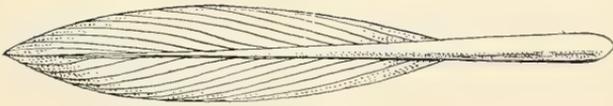
POLYPUS FONTANEANUS ORBIGNY.

FOR EXPLANATION OF PLATE SEE PAGE 181.





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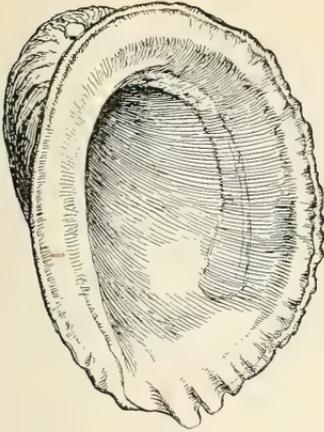


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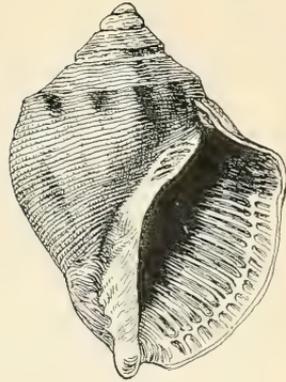
*LOLIGO GAHI* ORBIGNY.

FOR EXPLANATION OF PLATE SEE PAGE 181.

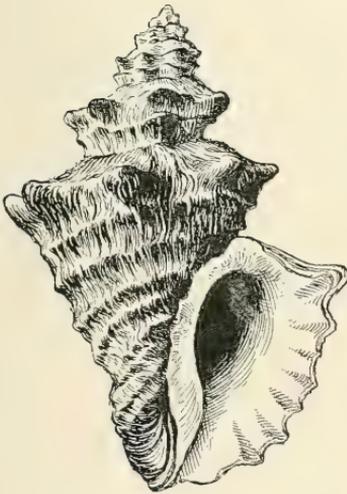




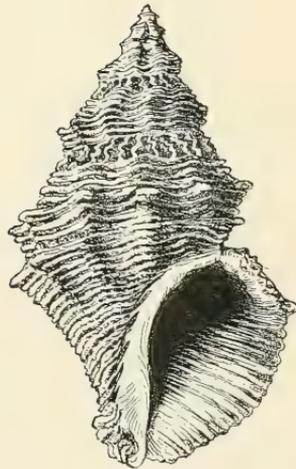
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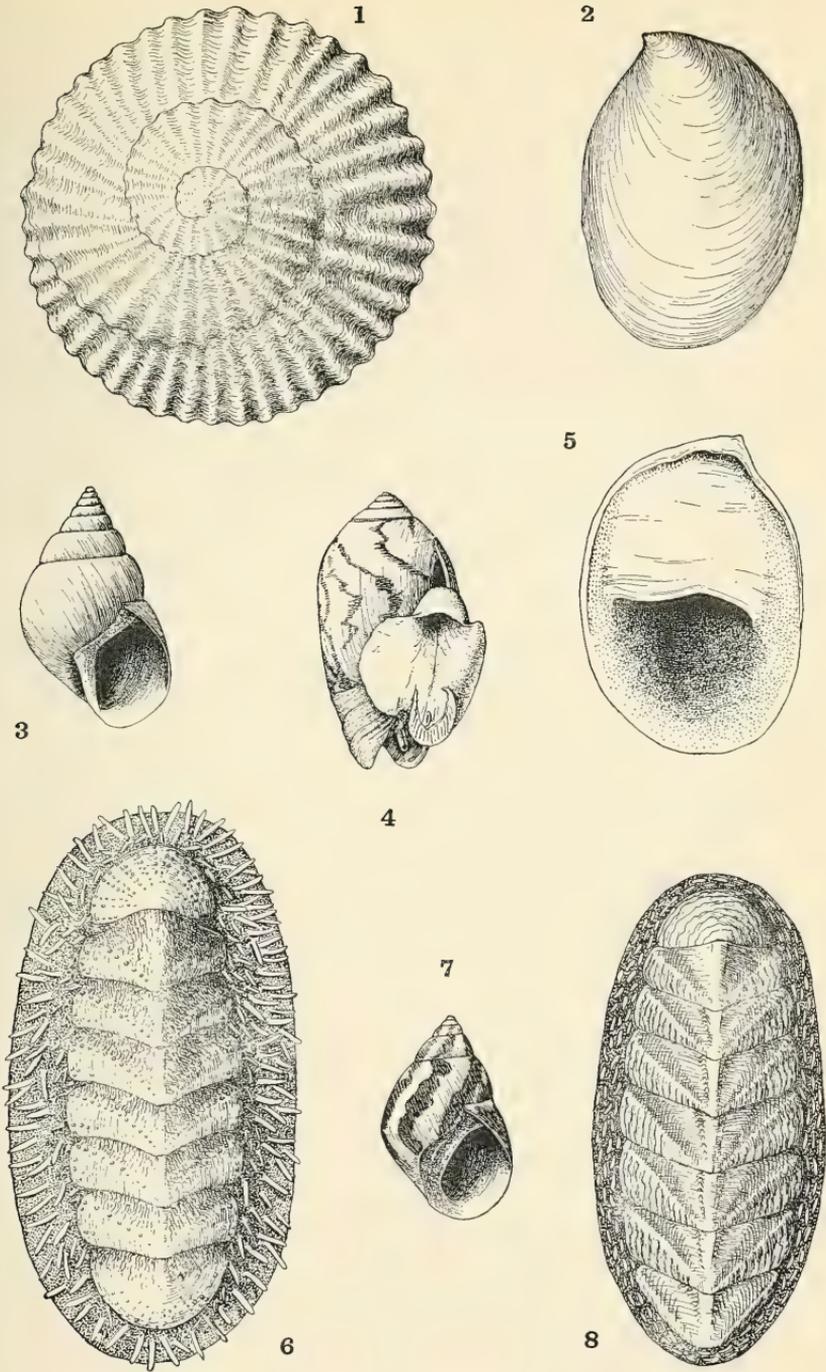


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PERUVIAN GASTROPODS.

FOR EXPLANATION OF PLATE SEE PAGES 167, 168, 169, 170.

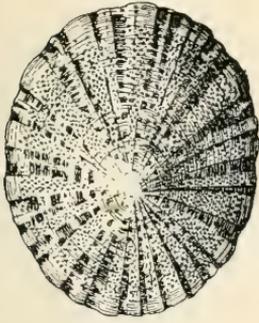




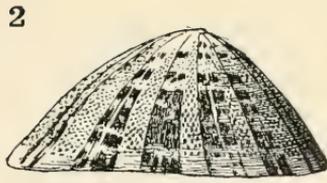
PERUVIAN GASTROPODS.

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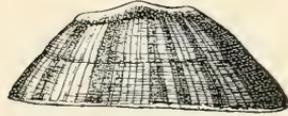




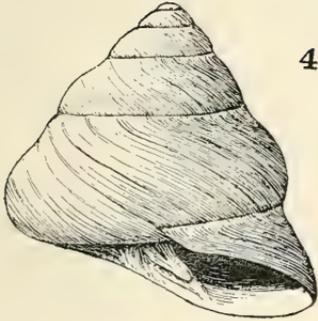
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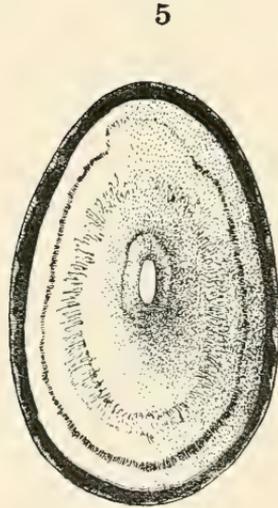
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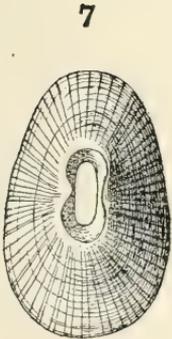
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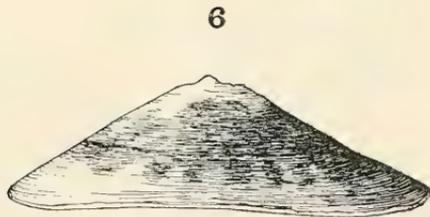
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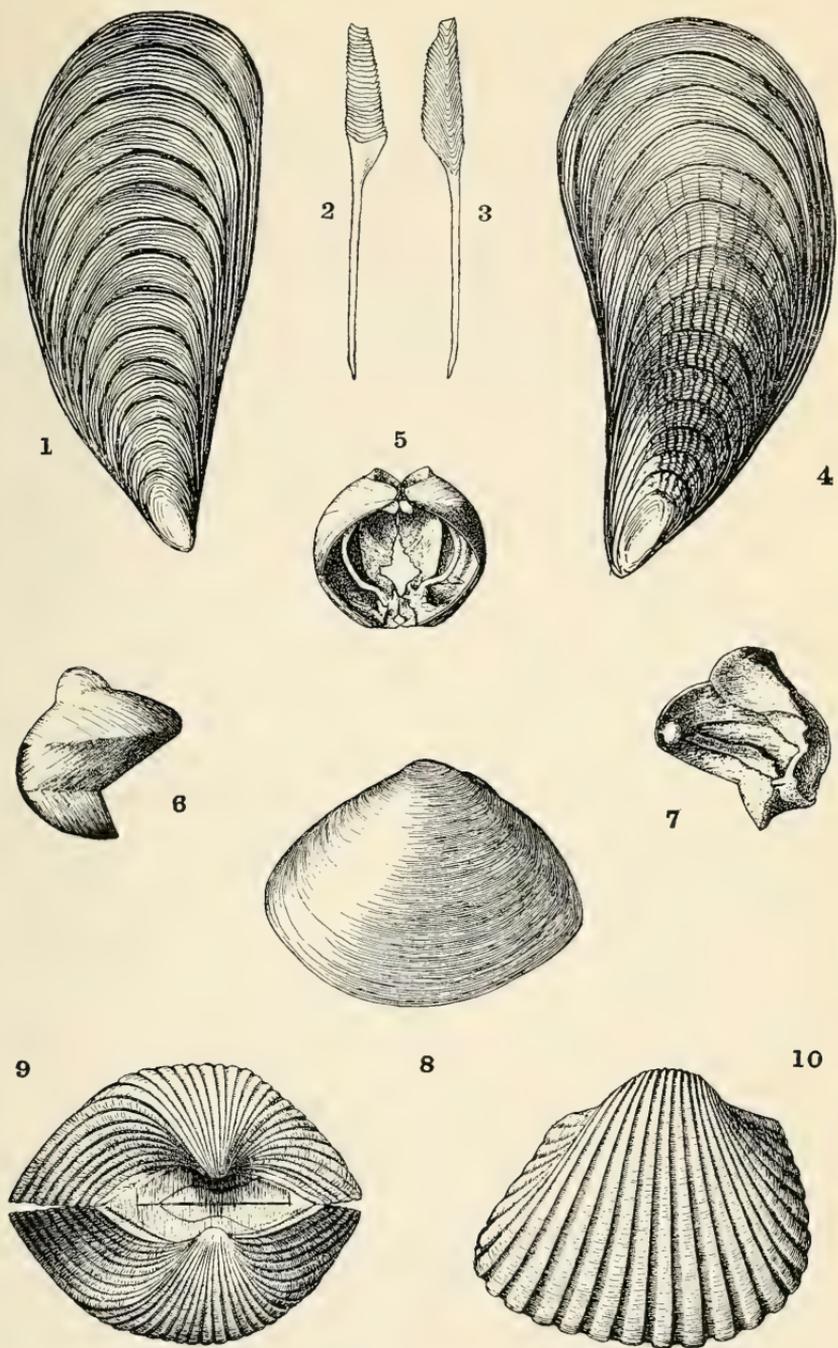


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PERUVIAN GASTROPODS.

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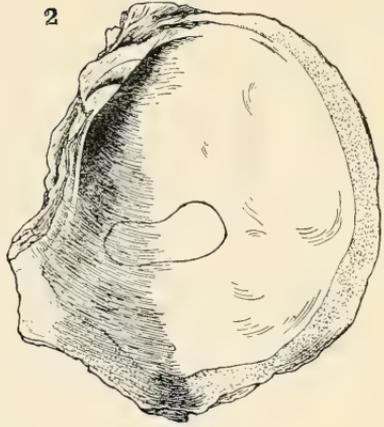
PERUVIAN PELECYPODS.

FOR EXPLANATION OF PLATE SEE PAGES 151, 154, 159, 162.

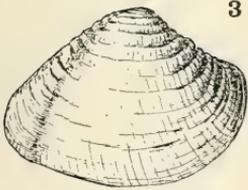




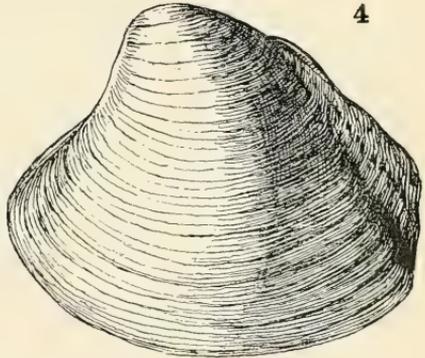
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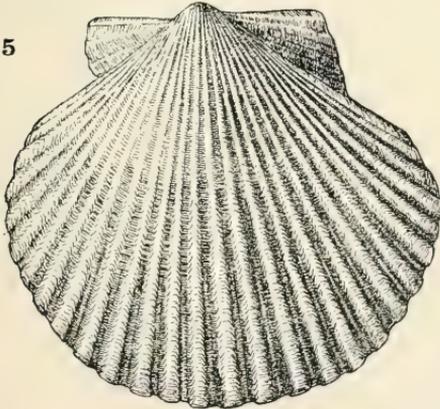
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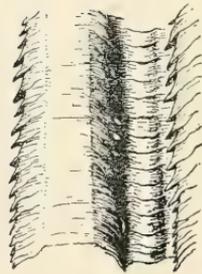
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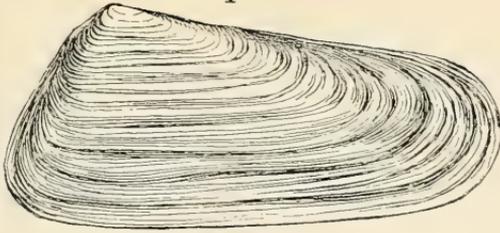
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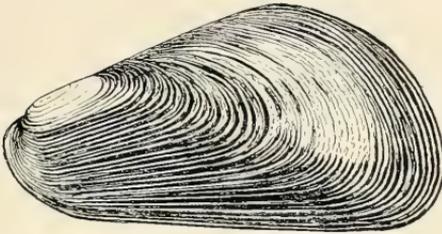
FOR EXPLANATION OF PLATE SEE PAGES 148, 149, 158, 159.



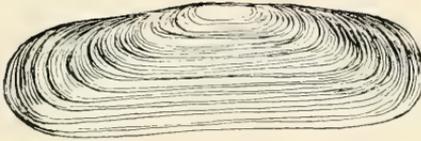
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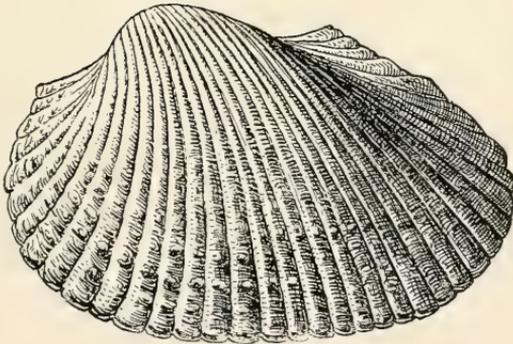
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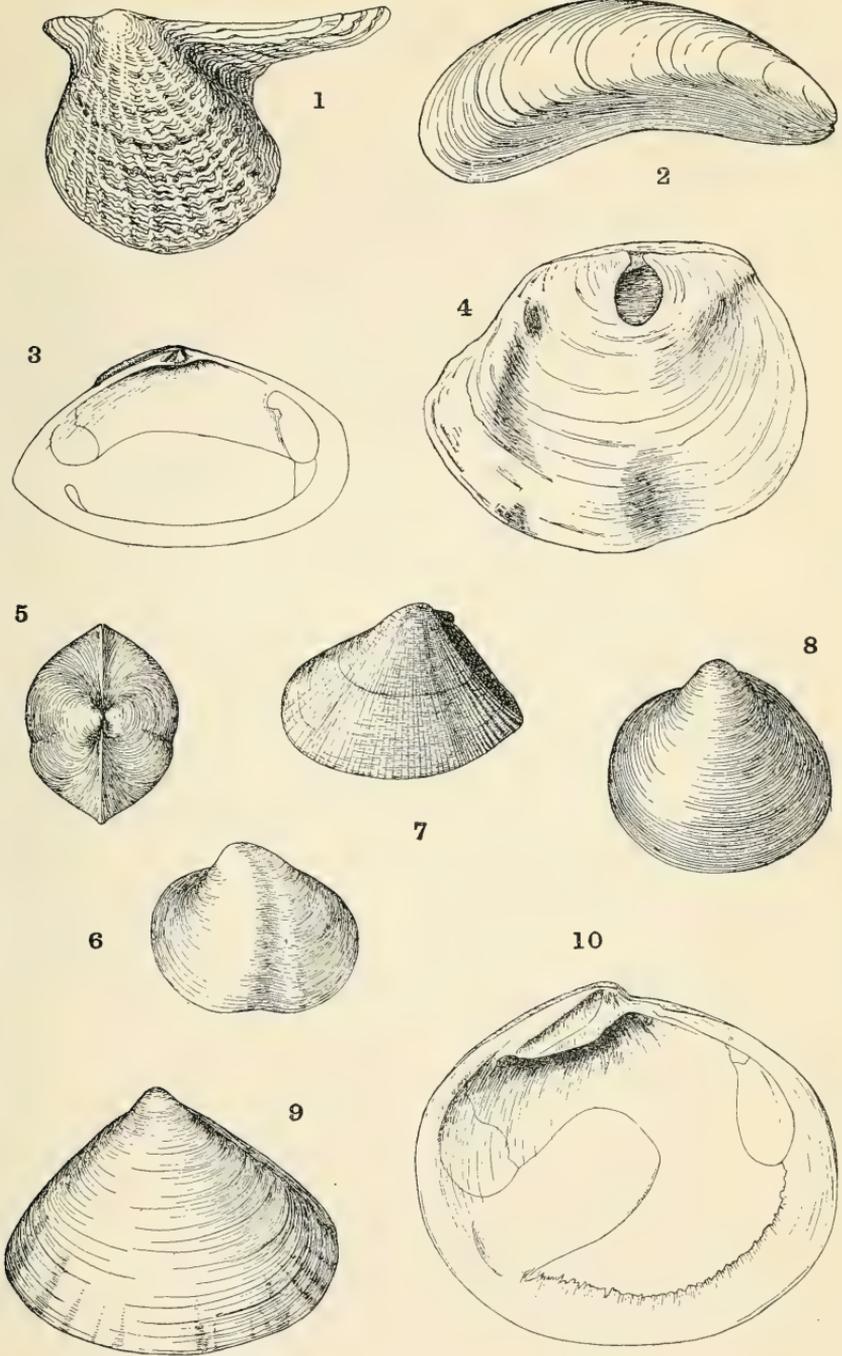
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PERUVIAN PELECYPODS.

FOR EXPLANATION OF PLATE SEE PAGES 152, 154 160, 161.





PERUVIAN PELECYPODS.

FOR EXPLANATION OF PLATE SEE PAGES 148, 150, 152, 155, 156, 157, 159, 160.



# AN OUTLINE REVIEW OF THE GEOLOGY OF PERU

BY

GEORGE I. ADAMS

---

FROM THE SMITHSONIAN REPORT FOR 1908, PAGES 385-430  
(WITH PLATES 1-5)



(No. 1901)

WASHINGTON  
GOVERNMENT PRINTING OFFICE

1909



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# AN OUTLINE REVIEW OF THE GEOLOGY OF PERU.

[With 5 plates.]

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By GEORGE I. ADAMS.

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## INTRODUCTION.

More than a century has elapsed since Humboldt beheld the grand Cordilleras in northern Peru, and more than three-quarters of a century has passed since d'Orbigny studied the section of the Andes in the southern part of the country. Since then many scientists have been attracted to the region and have contributed to the knowledge of its geology. Their writings are scattered in numerous publications in English, German, French, and Spanish, and no summary of this information has been made. The writer in attempting to learn what is known concerning the subject has gleaned the material which constitutes this paper. The arrangement and presentation of it in the form of an outline review has been undertaken with the hope that it may serve as an introduction to the broader problems with which later geologists may have to deal.

The author's contributions to the geology of Peru have been published in bulletins of the Corps of Engineers of Mines of Peru, and relate principally to the distribution of the Tertiary formations of the coast of which he made a reconnaissance. Later, while engaged in private work, he traveled in the Titicacan region of Peru and Bolivia, crossed the Cordilleras, and entered the forest region of southern Peru, and also saw something of the Cordilleras of the central part of the country. It is not his intention, however, to attempt to incorporate his observations during these journeys to any great extent in this paper, but rather to use them as an aid to the interpretation of the work of others.

The geologic relations of the rocks of Peru have thus far been explained by written descriptions accompanied in some cases by sections, but there are practically no geologic maps. It is to be hoped that the mapping of some type localities may soon be undertaken and that the columnar sections for the various regions may be established and the paleontologic studies correlated with them. The time has arrived when simple geologic reconnaissance can not be expected to yield satisfactory results.

Accompanying this paper will be found a bibliography of the more important literature, and in the footnotes some additional references are given. Nearly all of the literature of the subject has been consulted in the preparation of this review, but it has not been deemed advisable to publish a more complete bibliography, since some of the articles with elaborate titles have in reality little value and, being quite inaccessible to the general student, can hardly hope to hold a place with the more important contributions, which embody the essential truths with fewer errors.

## PHYSICAL AND CLIMATIC REGIONS.

### THE THREE REGIONS OF PERU.

The dominant physical feature of Peru is the lofty range of the Andes which lies near the Pacific Ocean and forms a barrier between the narrow strip of desert coast and the extensive wooded plains of the Amazon. Accordingly, the country is commonly recognized as presenting three naturally defined regions which differ in their physical features and climate; namely, the coast, the sierra, and the forest, or "montaña," as it is called in Peru. The use of these terms originated with the inhabitants, and they have to a considerable extent found their way into scientific literature. The name "montaña" is apt to be misleading, especially to a foreigner, since it suggests mountains. "Selva," meaning forest, would seem to be more appropriate. If terms are selected which may be broadly used in considering the South American continent one may appropriately speak of the Pacific coastal region, the Andes Mountain region, and the Amazon plains region. These terms have physiographic signification and should come into use in scientific writings. The extension of these regions may be learned from the accompanying map (pl. 1).

### PACIFIC COASTAL REGION.

#### *Definition.*

The distinction between the coast and the sierra as commonly made is one of climate and is indicated by differences in agriculture. In the coast the agricultural products are those of the tropical and subtropical climates, while those of the sierra are such as are found in the temperate zones. The transition from one region to the other is abrupt because of the steep declivity of the Pacific slope of the Andes.

With the exception of the part of Peru adjacent to the Gulf of Guayaquil, the division between the coast and the sierra corresponds with the approximate western limit of general annual rainfall on

the Pacific slope of the Andes. This is largely determined by elevation and temperature, and is indicated as one travels from town to town by the character of the roofs of the houses of the natives. The writer in drawing the line upon his published maps<sup>a</sup> used this as a basis for his observations and inquiries in order to obtain reliable information.

Near the Gulf of Guayaquil, where the zone of rainfall is deflected to the westward from the slope of the Andes over the coastal plains and to the Pacific Ocean, the division between coast and sierra would be made by continuing the trend of the line into Ecuador, taking into consideration the character of the agriculture, which varies with the temperature dependent on elevation. For Peru the distinction based on climate holds fairly well, but in Ecuador it is less satisfactory, since under the Equator and in a region of rainfall the zones of vegetation and agriculture do not correspond with the topographic distinction also implied.

#### *Divisions of the coastal region.*

The coastal region of Peru may be divided into plains areas and mountainous areas. The plains, according to their geographic positions in the country, may be called the "northern," "south central," and "southern." Between the northern and south central plains, and likewise between the south central and southern, the coast is mountainous. The northern and south central plains extend inland from the shore of the Pacific, but the southern plains are separated from the sea by a coast range of hills. The mountainous divisions of the coast are diversified by the stream valleys and their tributary dry valleys and present a very broken topography. The southern one of these two mountainous areas, considered as a mass, rises abruptly from the sea and presents many aspects of a dissected plateau. The northern area is characterized by a more broken coast line and the mountains rise in a ragged, irregular way toward the sierra. It would seem to be an open question as to whether these mountainous areas should be classed with the coast or the Andes region. Along the inner border of the plains are the "foothills" rising to the sierra, and at a corresponding distance inland in the mountainous divisions of the coast there is a transition zone known as the "valley heads of the coast" (*cabezeras de los valles*), where the valley floors become narrow and stony, so that the agriculture of the coast is impossible, and the mountains rise on either side into the temperature and climate of the sierra.

---

<sup>a</sup> Maps reproduced in this report as Plates Nos. 2, 3, 4, and 5.

## THE ANDES MOUNTAIN REGION.

The distinction between the coast and the sierra has already been explained. [The division line between the sierra and the Amazon region would seem to be simple enough if it is based on the presence of the forest, as is implied when the word "montaña" is used. (See p. 386 above.)] The tree line, however, especially in the northern part of Peru, according to the data which the writer has obtained from reading, rises well up onto the flanks of the Andes, and indeed covers some of the mountains which may be appropriately classed with the Andes region. It may also be noted that the limits of the forest have never been accurately shown on any map. It would seem

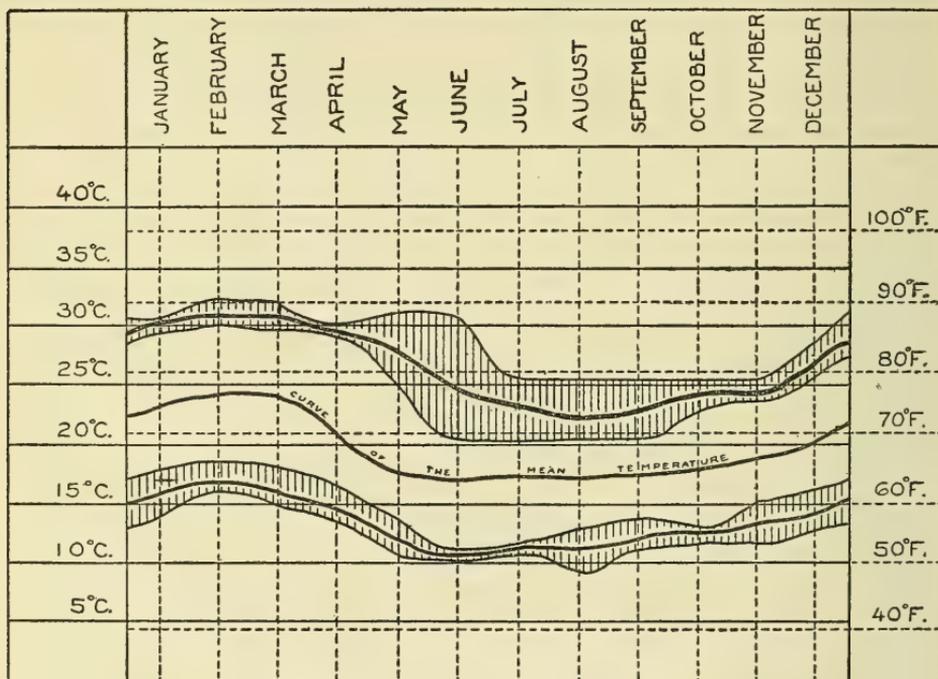


FIG. 1.—Variations of temperature at Lima.

proper to restrict the Amazon region to the plains lying to the east of the mountains in order to make the division a physiographic one. It is not possible to draw this line from information now available. In the accompanying sketch map of the Cordillera of the Andes the hachuring of the mountainous area has been done as accurately as possible from available data, but it will be remembered that Raimondi's map of Peru, which is the most detailed, is known to be defective, and to a considerable extent the hachuring on it is imaginary.

*Divisions of the Andes region.*

The main features of the Andes are the Cordilleras proper, which will be described in some detail later. Corresponding with them

are the great inter-Andean valleys, which are occupied by streams tributary to the Amazon and which are shown in a general way on the hachured map, and which may be named from the rivers occupying them. On the Pacific slope there is one inter-Andean valley between the Cordillera Negra and Blanca known as the "Valley of Huaylas" (Callejon de Huaylas). In addition should be noted the Titicaca Lake basin. If one attempts to go further into the classification of the physiographic features, there are many short ranges of mountains or spurs from the main Cordillera, some of which are named on Raimondi's map, and also high plains and tablelands (frequently called "punas") which are worthy of distinction.

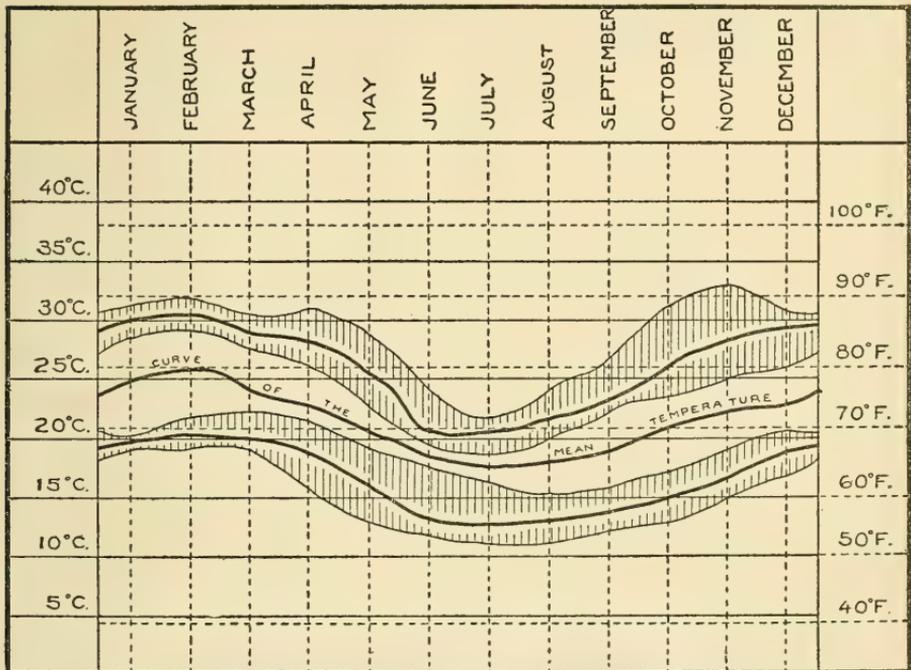


FIG. 2.—Variations of temperature at Ica.

### *Rainfall in the Andes.*

The rain which falls in the Andes region is brought as vapor from the Atlantic and most of it is precipitated in the Amazon region or on the eastern flank of the first Cordillera which it encounters. During the summer season the clouds rise higher and pass farther to the west, distributing their moisture on the Cordilleras and a part of it crosses the Continental Divide or the western Cordillera. It is generally believed that the rainfall on the Pacific slope, the limit of which has already been discussed, comes over the Cordilleras, except in the region of the Gulf of Guayaquil. This is in accordance with the observations of many travelers and the general theory of the

influence of the trade winds. Clouds are not seen passing to the Cordillera from the Pacific. The mists of the coast which drift inland from the Pacific form at the season when the sky in the Cordillera is clear and their movements are with the land and sea breezes. Systematic observations of the rainfall in the Andes region have been carried on at only one locality, namely, Cailloma, which is situated north of Arequipa and just to the east of the Continental Divide.

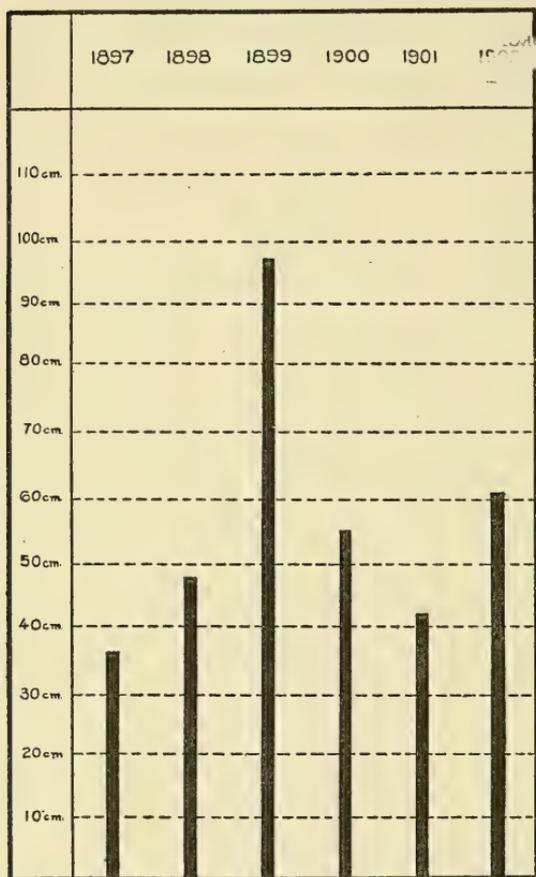


FIG. 3.—Annual variation of rainfall at Cailloma during seven years.

From the published data the writer has constructed the accompanying diagrams (figs. 3 and 4) which show the annual and monthly variations of the rainfall.

### *The Cordilleras of the Andes.*

DESCRIPTION BY HUMBOLDT,  
1802.

Although Humboldt did not have Peru as an object of special study and did not visit the country excepting to see the coast at Pisco and Lima and to travel in the northern highlands between Cajamarca and the Marañon,<sup>a</sup> he nevertheless gave a graphic and to a large extent a correct description of the chain of the Andes, availing himself of data furnished by others. He says, in substance, that in southern

Peru there are two branches of the Andes which include between them the Titicaca basin. To the north of the Titicaca basin there is a knot which includes Vilcanota, Carabaya, Abancay, Huando, and Parinacochas. After this knot of Cuzco and Parinacochas, in latitude 14° S., the Andes present a second bifurcation, and northward the two chains lie on the east and west of the river Jauja.

<sup>a</sup> Raimondi, *El Peru*, Volume I, page 15.

The eastern chain extends on the east of Huanta, the convent of Ocopa and Tarma, the western chain passes Castrovereyna, Huanavelica, Huarochari, and Yauli, inclosing a lofty table-land. In latitude  $10^{\circ} 11'$  the two branches unite in the knot of Huanuco and Pasco (Cerro de Pasco). From this point northward the Andes divide into three chains. The eastern lies between the Huallaga and Pachitea (Ucayali) rivers, the second or central between the Hualaga and the Marañon, while the third lies between the Marañon and the coast. The eastern range lowers to a range of hills, and is lost in latitude  $6^{\circ} 15'$  on the west of Lamas. The central, after forming the rapids and cataracts of the Amazon, turns to the northwest and joins the knot of Loja in Ecuador. From the most certain information which he obtained he concluded that to the east of the chain which passes to the east of Lake Titicaca and northward to Huanuco a wide mountainous land is situated, which is not a widening of the eastern chain itself, but rather that it consists of heights which surround the foot of the Andes like a penumbra, filling in the whole space between the Beni and the Pachitea (Ucayali).

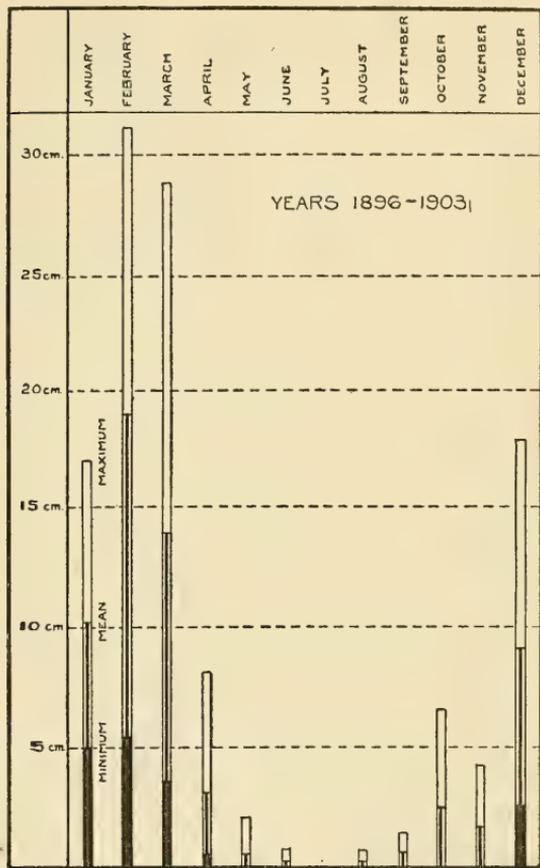


FIG. 4.—Monthly variation of rainfall at Cailloma during seven years.

Humboldt also made interesting comments on the direction of the Andes. He noted that in Chile and Upper Peru (Bolivia), from the Straits of Magellan to the parallel of Arica ( $18^{\circ} 28' 35''$  S.), the whole mass of the Andes runs from south to north in the direction of a meridian at the most  $5^{\circ}$  NE., but from the parallel of Arica the coast and the two Cordilleras east and west of the alpine lake of Titicaca abruptly change their direction and incline to the northwest.

In this region, as in general in every considerable widenings of the Cordillera, the grouped summits do not follow the principal axes in uniform and parallel directions, and he remarked that the general disposition of the Andes in this latitude is well worth the attention of geologists. From where the Cordilleras unite in the knot of Cuzco (Vilcanota) their direction is N.  $80^{\circ}$  W. He calls attention to the fact that the direction of the coast follows these changes, and remarks that the parallelism between the coast and the Cordilleras of the Andes is a phenomenon the more worthy of attention as it occurs in several parts of the globe where the mountains do not in the same manner form the shore.

DESCRIPTION BY RAIMONDI.

It is to be regretted that Raimondi did not publish a description of the Andes. However, his writings contain much information, and in his edited notes published in the chapter "Apuntes Orograficos," in Volume IV of *El Peru* there is a partial description of the Cordilleras. He adopted the nomenclature of Humboldt. The Andes is used as a general term for the whole mountain system, and the various branches are spoken of as "Cordilleras." The branch to the east of Lake Titicaca he called the "Cordillera Oriental" and the one to the west the "Cordillera Occidental." The union of these branches to the north of Lake Titicaca he calls the "Knot of Vilcanota," taking the name from a snow-capped peak. From this knot northward he recognized three branches instead of the two somewhat vaguely described by Humboldt. The Cordillera Occidental follows the direction of the coast. The Cordillera Central separates the valleys of the Apurimac and the Vilcanota or Urubamba rivers, while the Cordillera Oriental separates the inter-Andean region from the forest region of the interior. These three Cordilleras unite in the Knot of Cerro de Pasco, from which point northward three branches diverge. The Cordillera Occidental for a portion of its way is divided into two, the western of which is known as the "Cordillera Negra" (Black Cordillera) and the eastern or main one takes in that region the name "Cordillera Blanca" (White Cordillera) because of its snow-covered peaks. The Cordillera Central separates the Marañon and Huallaga rivers, while the Cordillera Oriental separates the Huallaga from the Pachitea and Ucayali. The Cordillera Central describes a curve, and is cut by the Marañon at the falls of Manseriche. The Cordillera Oriental lowers, and is cut by the Huallaga at the Falls of Aguirre and then runs in a north-west direction and joins the Cordillera Central. Humboldt states that it dies out in latitude  $6^{\circ} 15'$ . With this exception, it will be seen that in the northern part of Peru the description by Raimondi does

not differ materially from that by Humboldt. Raimondi gives a description of the Cordillera Occidental and notes a list of 42 of its passes, which vary from 2,186 meters to 5,075 meters. From Huamachuco in latitude  $7^{\circ} 45'$  southward the 27 passes are more than 4,000 meters above the sea. The lowest pass is that of Huarmaca, in the department of Piura, which is 2,180 meters.

His further description of this Cordillera as to structure, age, and snow line, etc., will be given under other heads in this paper. Here, however, it will be noted that he says the southern part of the Cordillera Occidental is not a single range, but rather a broad elevated band or high plateau, on which are situated volcanic peaks. It may perhaps be added here with propriety that the Continental Divide is a continuous range and that the volcanic peaks do not follow the Cordillera, but are found in an irregular double line crossing the western part of the high plateau. The relation of this line of peaks to the change in direction of the Cordillera is not unlike that of a string to a bow.

It will be remembered that Humboldt spoke of a mountainous area to the east in the forest region. Raimondi did not touch on this point, and indeed it is not yet possible to tell just what is the disposition of the mountains of this region, for although many explorations have been made the wooded country has prevented the mapping of the topographic features. The Cordillera Central, according to Humboldt, joins the Occidental in the knot of Loja, in Ecuador. Perhaps Raimondi did not touch on this point in his description because Loja is outside of Peru, and consequently beyond the limit of his explorations. He seems to have accepted the statements of Humboldt in his mapping.

Wolf, however (1892), in his description of the Andes, says that he does not agree with the opinion that the Cordillera Oriental unites in the knot of Loja, as is shown on the map of Ecuador by Santiago y Morona and of Peru by Raimondi. He states that the Cordillera cut by the Pongo de Manseriche (Falls of Manseriche) is the last branch of the Peruvian mountains which reaches the Amazon. It appears not to be very high, since explorers speak of 600 meters at the locality of the falls, and he thinks that to the north it lowers and is lost in the plains between the rivers Santiago and Morona.

Wolf also says that to the east of Ecuador from where the rivers are navigable the country is a great plain, with only small areas of gradual undulations, and that the high mountains of the old maps, as also those of Raimondi, are imaginary and do not exist.

The accompanying sketch map (pl. 1) shows the disposition of the Cordilleras according to the foregoing description. The Ecuadoran portion is from the sketch published by Wolf.

## THE AMAZON PLAINS REGION.

It is to be regretted that so little systematized information is available concerning the Amazon region. It has been explored principally along its great waterways, and the forest has prevented travelers from obtaining comprehensive views of its physical features, which are of relatively minor relief. There are some grassy plains. These are of insignificant extent as compared with the tree-covered area. Most of the sheets of Raimondi's map in the Amazon region are without hachures, and Wolf has called attention to the fact that the mountains shown to the east of Ecuador and in a region which Raimondi did not visit are wholly fanciful. A chain of hills or an escarpment gives rise to the falls of the Madierra River, but further than this there is little found in the writings of explorers excepting the mention of bluffs along the streams and occasionally hilly areas. Accordingly, the region must be for the present dismissed without further attempt to describe or outline its physical features.

## SEDIMENTARY FORMATIONS.

## CAMBRIAN.

The Cambrian has not been identified in Peru by means of fossils. In some instances in the literature the Cambrian has evidently not been considered as a separate era, but has been included in the Silurian according to former usage. Accordingly formations have been discussed in connection with the Silurian which may be of Cambrian age. Steinmann (1904) has described green slates near Chanchamayo, which he says are surely pre-Silurian, but the absence of fossils does not permit of their age being proved. He mentions <sup>a</sup> having lost his collections of fossils from Bolivia which would have thrown light on the Cambrian and Silurian formations.

## SILURIAN.

In his section from southern Peru into Bolivia d'Orbigny (1848) described the Silurian as represented in the Cordillera Oriental, where it has associated with it granite, which he stated forms the axis of the mountain range and constitutes some of the highest peaks.

Forbes (1861) outlined the area of the Silurian as extending from north of Cuzco in Peru along the Cordillera Oriental into Bolivia and southward to beyond Potosi. He found it to present physical features similar to the Silurian of Europe. He says that it consists

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<sup>a</sup> Introduction to paper by A. Ulrich on "Palæozoische Versteinerungen aus Bolivien."

of clay slates, shales, and quartzites, but he found no limestones. The fossils which he collected were examined by Salter and showed that probably the whole Silurian is represented. Forbes called attention to the fact that the formation contains quartz veins, and that these have given rise to auriferous gravels. He contradicted the statement of d'Orbigny that the peak Illimani in Bolivia is a granite peak as shown in the section, and says that Illimani and Illampu (Sorata) are composed of slates.

Raimondi (1867) described the Cordillera Occidental as containing slates cut by quartz veins carrying gold, and later (1873) in outlining the geology of the Department of Ancachs he classes the slates as Silurian.

In southern Peru Balta (1897) has classed the slates in the Province of Carabaya and Sandia as Silurian because of the presence of graptolites, and this classification was followed by Pflucker<sup>a</sup> who, however, contributed little to our knowledge of the Silurian.

Ochoa, in his bulletin<sup>b</sup> on the Province of Huanuco, in the central part of the Peruvian Andes, makes a brief reference to the finding of graptolites near Huacar, from which fact he concluded that the Silurian is present there.

Steinmann (1904) identified by means of graptolites the lower Silurian in the region of Tarma, also in the central region of the Peruvian Andes, and he states that the granite associated with the Silurian in the Cordillera Oriental made its appearance in lower Silurian time.

Farther to the north Raimondi (1873), in describing the geology of the Department of Ancachs, states that in the Province of Huari, near Uco, in the valley of the Marañon, there are older sediments with a great formation of talcose slates with quartz veins, which he refers to the Silurian, although he did not mention any fossils. He also states that there is a similar area on the western slope of the Cordillera Nevada (Occidental) at Pallasca. Farther to the north and in the foothills of the Cordillera Occidental, in passing over the divide from Motupe to Olmos and in the vicinity of Olmos, the writer saw extensive exposures of slates cut by numerous quartz veins and stringers which have been prospected for gold. Mention is here made of the area because of its resemblance to the Silurian, but it should not be definitely classed until fossils have been found.

A paper which has an important bearing on the paleontology of the Silurian was published by A. Ulrich (1892) describing an ex-

<sup>a</sup> Informe sobre los yacimientos auriferos de Sandia, Bol. del Cuerpo de Ingenieros de Minas del Peru No. 26, 1905, Luis Pflucker.

<sup>b</sup> Recursos minerales de la provincia de Huanuco, Bol. del Cuerpo de Ingenieros de Minas del Peru No. 9, 1904, Nicanor G. Ochoa.

tensive collection of fossils from the Silurian and Devonian of Bolivia made by Steinmann. Inasmuch as the same faunas probably extend into Peru the descriptions of the fossils will be of value when similar studies are undertaken farther northward. Recently Dereims (1906) has described the occurrence of the Silurian at many places in Bolivia, some of which are near the border of Peru in the Titicaca basin, although most of them are to the south in the Cordillera Real (Oriental) of Bolivia, but he has not yet described his collections of fossils.

#### DEVONIAN.

The first recognition of a Devonian locality which has a bearing on the geology of Peru was by d'Orbigny (1842), who made collections in the Titicaca Lake region in Bolivia and found fossils which he described as characteristic of that period.

Forbes (1861) when in the field did not distinguish the Devonian, but included it with the upper Silurian. Later he was induced by Salter, who studied the collections of fossils, to show the Devonian in his section because of the finding of *Phacops latifrons*, which is admitted to be a truly Devonian species. Forbes's localities are in Bolivia, near Lake Titicaca.

Mention has already been made of the collections from Bolivia made by Steinmann which were studied by A. Ulrich (1892) and found to contain an interesting series of Silurian and Devonian fossils. The descriptions by Ulrich will be of value when the Devonian in adjacent parts of Peru receives critical study.

Still later Dereims (1906) has described the occurrence of the Devonian in Bolivia, near Lake Titicaca. He says it consists of sandstones of different colors and thicknesses, alternating with shales of less importance. He obtained a collection of fossils, some of which he mentions, but he has not yet published his paleontologic studies.

All the foregoing literature pertains to Bolivia, but it has a direct bearing on the geology of Peru, since the Devonian undoubtedly extends across the border in the Titicaca basin. Thus far no Devonian fossils have been described from Peru, but Dueñas<sup>a</sup> (1907) obtained fossils from Taraco northwest of Lake Titicaca which Bravo has reported to be Devonian, although he did not determine them specifically.

#### CARBONIFEROUS.

The Carboniferous in Bolivia was studied by d'Orbigny (1848), who described a number of fossils. This was the first information which gave a definite reason to suppose that the Carboniferous exists

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<sup>a</sup> Enrique I. Dueñas. Bol. del Cuerpo de Ingenieros de Minas del Peru No. 53, p. 156. See footnote.

in Peru, since the localities are very near the border. D'Orbigny also referred the rocks at Arica to the Carboniferous on very slight evidence, but this has been refuted by Forbes. The writer<sup>a</sup> found fossils at Arica, which, according to Bravo, are Cretaceous, although he did not determine them specifically.

The Carboniferous areas examined by Forbes (1861) are on the peninsula of Copacabana and the projecting headland opposite on Lake Titicaca. On account of a declaration of war Forbes was placed in a suspicious position, since these localities are on the frontier between Peru and Bolivia. He, however, obtained a collection of fossils which were determined by Salter. Forbes states that the Carboniferous is also to be found to the north of Lake Titicaca.

The fossils collected by Agassiz (1876), together with some others, were studied by Derby (1876), who described 9 Carboniferous species from Yampata and the island of Titicaca. He also found a *Spirifer* in materials brought by James Orton from the Pichis River, and in his notes says that he has recognized *Productus* and *Streptorhynchus* from near Mayobamba in northern Peru. Agassiz, in the notes accompanying Derby's paper, states that specimens of *Fusulina* were sent to Mr. Brady for identification. The notes as to the occurrence of the Carboniferous are by Agassiz, who says that near Lake Titicaca it lies in a rather limited elongated basin, with the axis in a northwest-southeast direction. He identified the Carboniferous at Vilca, Santa Lucia, and Sumbay, and says that Mr. Orrego stated that Carboniferous is found as far north as Caylloma, and quotes Orton as saying that Raimondi reported he had traced the Carboniferous series to a height of 1,400 feet on the Apurimac at a locality intermediate between the Pichis River and Cuzco. It would seem to the writer that until fossils are found the identification of the Carboniferous at the places mentioned by Agassiz, and especially those reported by Mr. Orrego, should not be definitely referred to the Carboniferous. The writer in journeying to Caylloma observed sedimentary formations which appear to be Cretaceous.

Balta (1899) reviewed the Carboniferous of Peru and published a sketch map showing two areas in which the Carboniferous had been shown to exist, namely, in the Titicaca basin and the locality from which Orton's Carboniferous fossils were obtained. He added nothing especially new.

A small Carboniferous area was reported<sup>b</sup> by Fuchs (1900) as being found in the peninsula of Paracas, just south of Pisco, on the Pacific coast. The formation there contains some thin coal which

<sup>a</sup> See Boletín del Cuerpo de Ingenieros de Minas del Perú, No. 45, p. 19, 1906.

<sup>b</sup> Nota sobre el Terreno Carbonífero de la península de Paracas, F. C. Fuchs, Bol. de Minas, T. XVI, 1900.

an attempt is being made to exploit. With the coal, fossil plants were found by Fuchs. This is an important addition to our knowledge of the distribution of the Carboniferous because of the geographic position of the area.

Steinmann (1904) reported the finding of a few characteristic Carboniferous fossils southeast of Tarnia.

The Carboniferous in Bolivia, especially in the region of Lake Titicaca, was studied by Dereims (1906), who describes the formation as composed of sandstones and shales, with a bed of dark limestone at the base and with coal beds. He investigated the coal four leagues north of Mocomoco, at Ococoya and Calacala, where it does not exceed 80 centimeters and consists largely of shale impregnated with carbonaceous matter and is not workable. In the peninsula of Copocabaña, near Yamupata, he saw thin beds of coal, which have formerly been worked, but the coal is mixed with shale and contains so much sulphur that it can not be used. He states that on the island of Titicaca it is of the same general character. His conclusion in regard to the Carboniferous in Bolivia is that it is the lower or Dimantian stage, and is everywhere marine and contains no workable or good coal.

#### PERMIAN.

The Permian is not known to be present in Peruvian territory. Certain sandstones in Bolivia which extend into southern Peru in the Titicaca region were early classed as Permian or Triassic by Forbes because of their resemblance to the typical Permian of Russia described by Murchison. Forbes, however, states that no fossils having been found, the age of the beds is a question for inquiry. The formation contains salt and gypsum beds and native copper, the celebrated mines of Cora-Cora being found in them.

Steinmann (1906) has discussed the Cora-Cora copper deposits and has given the name Puca sandstone to the formation in which they are found. He says that the formation comprises the youngest marine sediments in Bolivia and has a thickness of more than 1,000 meters. By the finding of fossils near Potosi, in southern Bolivia,<sup>a</sup> in related formations a higher age than Jura is indicated, and accordingly he assigns them to the Cretaceous.

Dereims (1906) says that at Santa Lucia, near Potosi, he found reddish sandstones and reddish gypsiferous shales with some beds that are calcareous, which are of Permian age. The calcareous bed is full of *Chemnitzia potosensis*, first described by d'Orbigny. He remarks that d'Orbigny has referred this formation to the Trias on lithologic grounds, but from the fossils it appears that it is Permian-

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<sup>a</sup> Compare Steinmann, Hoek, and V. Bistraus. *Zentralblatt für Mineralogie etc.*, 1904, p. 3, zur Geologie des sudostichen Boliviens.

Carboniferous or Permian. It will be remembered that d'Orbigny described *Chemnitzia potosensis* from the Triassic, but the diagnostic value of the genus for indicating the Carboniferous or Permian may well be questioned, since the genus is also found in the Mesozoic. Moreover, it will be recalled that the evidence by Steinmann just cited is opposed to the conclusions of Dereims.

#### TRIASSIC.

D'Orbigny (1842) referred to the Triassic a series of variegated reddish sandstones in Bolivia. He found a number of fossils but mentions only one, *Chemnitzia potosensis*, the others having been lost. The age of these beds seems to still be in doubt, Dereims having referred them (1906) to the permo-Carboniferous as has already been mentioned.

Later Forbes (1861) commented on the classification by d'Orbigny and states that it would appear that d'Orbigny proceeded on the supposition that no link in the geologic chain should be deficient. Forbes classed these rocks as Permian or Jurassic, but stated that their age is a question requiring more study.

Raimondi (1873) in his volume on the Department of Ancachs classed as Triassic certain red sandstones and shales with salt and gypsum. This seems to have been done in accordance with the general relations of the rocks and to make the geologic succession complete. It will be remembered that the fossils sent by Raimondi to Gabb were not given close diagnostic values, and so the classification by Raimondi has really little value. In several places Raimondi speaks of the Triassic as being present, but unfortunately little reliance can be placed on this. According to Steinmann's later writings (1904) the red sandstones and shales with salt and gypsum beds are to be classed as Cretaceous (Lower Liassic).<sup>a</sup>

#### JURASSIC.

D'Orbigny (1842) found no fossils of Jurassic age and did not color any part of his section as Jurassic. He discussed the probabilities of its being present in South America.

Crosnier (1852), in his explorations on the east slope of the Cordillera Occidental, found some fossils which were determined by M. Bayle as Jurassic. He mentions an Arca like *Arca gabnelis* of the Neocomian. Also an Ammonite from near Oroya was likewise determined as Jurassic.

Forbes (1860) classed as Jurassic or Permian a series consisting principally of sandstones aggregating more than 6,000 feet. These

<sup>a</sup> Bol. No. 12, p. 24.

rocks were classed by d'Orbigny as Devonian and Carboniferous and in part Triassic, but he cited no fossils. Forbes says that the beds contain plant remains (coniferous indeterminable) and he was informed that a complete Saurian head had been extracted from the beds by M. Ramon Due, but was not successful in obtaining it nor some fossil bones and teeth now in the Museum of Avignon in France, sent there by M. Granier of La Paz. The character of these beds, as already stated in describing the Permian, is like the typical Permian of Russia. Forbes concluded that their age must await the finding of fossils.

Raimondi (1873), in his study of the Department of Ancachs, classes as Jurassic certain formations containing coal and yielding ammonite fossils. However, he had no other determination for his fossils than that furnished by Gabb, which was not very critical and so we must rely on later work for the differentiation of the Jurassic. It will be seen later that the plants and invertebrates from the coal horizon of the Cordillera Occidental have been shown to be Cretaceous. However, Raimondi in some instances was probably correct in assigning formations to the Jurassic, since it is now known to be present and has yielded numerous fossils. Bravo has called attention to the fact that Gottsche<sup>a</sup> has made mention of an ammonite from Morococha which is in the Freiburg collections.

Fossil ammonites from Huallanca, in the Department of Ancachs, collected by Durfeldt and belonging to the Freiburg Museum, were studied by Steinmann (1881) and considered by him as indicating the Tithon (which is homotaxial with the Portlandian) and belonging in the upper part of the Jurassic.

#### CRETACEOUS.

The island of San Lorenzo at Callao was examined by Dana, and his description is published in the report of the Wilkes expedition (1849). He made some detailed sections of the rocks and found some fossils which he considered as indicating the oolitic. He refers in a footnote to the fact that James Delafield had reported<sup>b</sup> upon some fossils which Doctor Brinkerhoff had collected from the island and presented to the New York Lyceum of Natural History. Delafield did not venture an opinion as to the age of the fossils.

Doctor Pickering, who was with Dana, found an ammonite at the head of the Chancay Valley at an elevation of 15,000 feet in rocks similar to those of San Lorenzo Island. This specimen is described in the appendix of the report as *Ammonites pickeringi*. Some fossils from Trujillo are also figured.

<sup>a</sup> Uber Jurassische versteinierungen aus der Argentinische Cordillere. Dr. Carl Gottsche, Cassel, 1878.

<sup>b</sup> Amer. Journ. Sci., Vol. 38, p. 201, 1839.

D'Orbigny discussed the occurrence of the Cretaceous in South America, and in his section shows an extension of porphyritic rocks on the west slope of the Cordillera Occidental; he did not differentiate the Cretaceous, but evidently included them with the porphyries with which they are interbedded.

In the section which Forbes made from Arica to Bolivia he classified (1861) as oolitic (Liassic) the rocks at Arica, which he describes as shales, claystones, and embedded porphyries, and stated as his reason for doing so that to the south of the district which he studied the rocks are abundantly fossiliferous and had yielded to the researches of Bayle and Coquand and Phillipi about 35 species of recognized oolitic forms. On his map he showed a considerable extent of oolitic in the Cordillera Occidental of southern Peru.

Apparently, Raimondi attempted to identify the fossils which he collected, although he did not describe them. He evidently used the fossils as a guide in determining as best he could the age of the sedimentary formation, which he discusses in his various writings. When he sent his collections to Gabb to be described he accompanied them by a letter (1867) in which he outlined the geographical distribution of the sedimentary formations of Peru. According to his idea, Cretaceous (with Jurassic, Lias, and Trias) is distributed principally in the western Cordillera. He thought the stratified rocks near the Port of Ancon, at San Lorenzo, near Callao, and at Chorillos, to be Jurassic or Liassic. These localities have since proven to be Cretaceous, as will soon appear in this paper. Unfortunately, Gabb's determination of the Mesozoic fossils was delayed and, moreover, he did not give to them such diagnostic value as would help Raimondi to revise his ideas in his later writings.

In his volume on the Department of Ancachs he classed (1873) as Cretaceous certain limestones with echinoderms, oysters, and other fossils. This seems to be correct as viewed in connection with the determination of the Cretaceous in other localities, where it consists largely of limestone and contains similar fossils.

In his geological sketches (1876) Agassiz states that Mr. William Chandless, upon his return from the River Purus, presented him with fossil remains of the highest interest and undoubtedly belonging to the Cretaceous. They were collected on the River Aquiry, latitude  $10^{\circ}$ – $11^{\circ}$  south, longitude  $67^{\circ}$ – $69^{\circ}$  west, in localities varying from 430 to 650 feet above sea level. Among the material, remains of a *Morosaurus* and of fishes were found. Chandless<sup>a</sup> says that the material identified by Agassiz consisted of two perfectly preserved vertebræ of *Morosaurus*. These are the only vertebrate remains thus

<sup>a</sup> "Notes on the River Aquiry, the principal affluent of the Purus," William Chandless, *Journal Royal Geogr. Soc.*, Vol. 36, p. 119.

far mentioned as from the Cretaceous of Peru. It may not be improper to recall, in this connection, that Forbes in discussing the Permian or Triassic of Bolivia says that he was informed that a complete Saurian head had been extracted from the beds and also some fossil bones and teeth. This material appears never to have been studied critically and not even a generic name has been applied.

The Mesozoic fossils sent to Gabb by Raimondi were described (1877) and figured, but since then they have not been reviewed critically and studied in connection with further collections, excepting that the descriptions have been referred to by later workers. The opinions which Gabb ventured to give were not very definite, as would naturally be the case in dealing with meager and scattered collections. In several instances he simply stated the age of the beds according to the opinion of Raimondi. Gabb gave with his paper a synopsis of the South American invertebrate paleontology and a bibliography of South American paleontology.

A number of fossils collected by Durfeldt from the coal-bearing formation at Pariatambo, Peru, and belonging to the Freiburg Museum, were studied by Steinmann (1881) and determined as indicating the Albien and marine origin of the beds.

This was the first paper by Steinmann dealing critically with the paleontology of Peru. To him and his colaborers we are indebted for a number of subsequent papers which are published under his supervision as Contributions to the Geology and Paleontology of South America.

The material from Peru studied by Gerhardt (1897) consisted of a block containing fossils from Morococha (Pariatambo), sent by Don Jose Barranca, of Lima, to Doctor Steinmann. By dissolving the stone in acid a small fauna was obtained. The additional fossils from the Strasburg Museum were those collected by Reiss and Stubel from the same place. With this material he was better able to determine the age of the beds which Gabb had considered as Liassic and Steinmann had determined as Albien on the border between upper and lower Cretaceous. He concludes that the coal-bearing beds of Pariatambo are of marine origin, and that certainly in Albien time in Peru a fauna reigned which was related to that of Europe and north Africa. In studying the fossils of Venezuela he identified *Ammonites Andii* Gabb from Peru with a Venezuela Lenticras, and so concluded that the lower Senon was present in Peru.

The paleontological paper on the Cretaceous of South America, by Paulcke (1903), in so far as it pertains to Peru, is a filling out of the fauna studied by Gerhardt and extends our knowledge of the upper Cretaceous. Most of the specimens were collected by Reiss and Stubel in Cajamarca and nearby places in northern Peru, but some were collected by J. Bamberger. He found the Senonian of the

upper Cretaceous represented. He says, in summing up concerning the lower Cretaceous, that in Peru the only highest part of the lower Cretaceous (the Albien) is certainly known and the Neocomian probably may be present.

In various bulletins <sup>a</sup> of the Corps of Engineers of Mines of Peru J. J. Bravo has published (1904–1906) determinations of Cretaceous fossils and has described some species. This is the most important work done in paleontology by a Peruvian. Through his efforts the corps is gradually acquiring a collection of fossils and developing a paleontologic literature. Bravo has called attention to the fact that previously Pflucker y Rico had collected fossils and given a relation <sup>b</sup> of localities and a list of fossils obtained in the districts of Yauli (Morococha), but the collections were lost. He also cites two species of Pseudo-ceratites from Yauli, described by Hyatt.<sup>c</sup>

In 1904 Habich, in his report on the coal deposits of Checras, in the Province of Chancay,<sup>d</sup> mentions the finding of Cretaceous fossils in limestones and plants in the coal-bearing beds.

Similarly Malaga Santolalla (1904) found fossils in Hualgayoc<sup>e</sup> and concluded that the middle or upper part of the Cretaceous is represented there. He also gives <sup>f</sup> a list of fossils from the Province of Cajamarca described by various authors.

In his report on the Province of Colendin <sup>g</sup> he likewise gives a list of Cretaceous fossils. Lisson (1905) collected a few fossils from near Chorullos, just south of Lima, and described <sup>h</sup> some Annelid tubes, and a new species *Sonnerata Pfluckeri* and redescribes *S. Raimondianus* Gabb.

In the winter of 1903–4 Steinmann made some collections in the Cordillera east of Lima and from the Island San Lorenzo in front of Callao. This material was studied by Neumann, who also included some fossils in the Hamburg Museum, from Lucha, and the quebrada of Huallauca, in the Province of Ancachs. In his report (1907) he says that up to this time the Cretaceous was very incompletely known and that according to his knowledge no lower Cretaceous had been found. The fossil plants from San Lorenzo, studied by Neu-

<sup>a</sup> Bulletins Nos. 10, 19, 21, 25, 35, 51, dealing with the Provinces of Cajatambo, Cajabamba, Pataz, the district of Morococha, the Provinces of Jauja and Huancaayo, and the Province of Huamachuco, respectively.

<sup>b</sup> Apuntes sobre el distrito mineral de Yauli, Annales de Const. Civiles y de Minas del Peru, Tome III, 1883.

<sup>c</sup> Pseudo-ceratites of the Cretaceous, U. S. Geol. Survey Monograph XLIV, 1903.

<sup>d</sup> Bol. de Cuerpo de Ing. de Minas del Peru No. 18, E. A. V. de Habich.

<sup>e</sup> Bol. No. 6.

<sup>f</sup> Bol. No. 31.

<sup>g</sup> Bol. No. 32.

<sup>h</sup> Bol. No. 17, Los Tigillites del Salto del Fraile y algunos *Sonneratia* del Morro Solar. Carlos I. Lisson.

mann, were found to be Neocomian (Wealdan) flora. The fauna from San Lorenzo was also referred to the Neocomian. The fauna from Huallauca, Lucha, and Chaco was found to be Albién, with the Rotomagien (?) lower Cenomian also represented at Huallauca. The Santonien was determined at Abra de Charata (between Oroya and Tarma), and from Lucha and Huallauca and Le Quinua. The rich material described increased the number of Senonian fossils from Peru and contained some entirely new forms, while the Wealdan flora was the first found in South America.

It will be remembered that Steinmann (1906) has referred to the Cretaceous the Puca sandstone formation, so named by him and which includes the Cora-Cora copper mines of Bolivia. This has already been discussed under the heading of the Permian. The Puca sandstone extends into Peru.

#### TERTIARY.

##### *Marine Tertiary of the Pacific coast.*

The marine Tertiary of the southern coastal plains was described by Forbes (1860), who called it the "Tertiary and diluvial formation of the coast." This formation is also shown in the section by d'Orbigny (1842) and by Pissis (1856), who, however, did not devote much attention to it. According to Forbes the Tertiary extends inland from the stretch of low coast lying to the north of Arica, forming gently sloping plains which show evidence of ancient sea beaches. The plains are composed of sand, earth, and gravel, with abundant fragments of porphyritic rocks from the mountains to the east. Forbes mentions a trachytic volcanic formation seemingly contemporaneous with the plains formation, which appears to have been deposited while they were still under water. This volcanic material is in the form of tuffs and ashes and has subsequently been covered by other deposits.

In discussing the saline deposits of the coastal plains (especially in territory that now is in Chile) Forbes advances the idea that with the exception of the boracic-acid compounds, the presence of which is due to volcanic causes, all the salines are such as would be left by evaporating sea water or by mutual reactions of saline matters thus left. This lacustrine hypothesis he applies to the nitrate deposits and states that the chain of hills to the west is such as might on elevation have inclosed a series of lagoons in tidal communication with the sea. For the saline deposits at high elevations he includes the factor of rainfall and states that they are not so characteristic of the lagoon type as the lower deposits near the coast.

The next reference to the Tertiary of the coast is concerning the formations in the northern coastal plains. Among the fossils sent

by Raimondi to Gabb there was a collection from Payta. Gabb, in addition to describing them (1869), states that one set of four or five specimens was made up of extinct forms, while the remainder appeared to be Pliocene.

Orton (1870) mentions some fossil shells of living species which he collected from the bluff at Payta and which were determined by Gabb.

The portion of the Tertiary formations of the northern coastal plain lying between Payta and the Ecuadorian frontier was explored and described by Grzybowski (1899). He traveled from Payta to Talara, thence to Tumbes, and up the Tumbes River to Casadero, from which place he returned to the coast. He made the following divisions of the Tertiary:

Pliocene-----	Conglomerate-----	Payta formation.
Upper Miocene---	{ Brown shales-----	Talara formation.
	{ Sandstone-----	Zorritos formation.
Lower Miocene---	Bituminous shales-----	Heath formation.
Oligocene-----	Hieroglyphic and massive sandstone-----	Ovibos formation.

He collected and described fossils from these formations. The Oligocene, however, he distinguished more from stratigraphic relations than by fossils. The paper is accompanied by a sketch map and sketch sections showing the localities where the formations were found. He observed a granite outcrop at Rica Playa, on the Tumbes River, and called certain rocks in the region of Casadero Paleozoic, but did not identify them by means of fossils. He regarded the Paleozoic as pushed up through the broken Tertiary. At Payta he noted a shale formation (no fossils) on which the Tertiary rests.

#### *Lacustrine Tertiary of the Sierra.*

In the Bolivian Plateau d'Orbigny (1842) described an ancient alluvial and pampean formation, the relations of which are shown in the section accompanying his report. Pissis (1856) also showed this formation but with an interbedded stratum of volcanic tuff in the Titicaca basin region.

Forbes (1860) described the same deposits under the name "De-luvial of the Interior" and explained that it varies from place to place according to the rocks from which it is derived. In his section he shows locally a bed of trachytic tuff and explained that it is seen in the valley of La Paz, in Bolivia.

Agassiz (1876), in the paper accompanying his hydrographic sketch of Lake Titicaca, noted the lake deposits in the Titicaca basin and said that there are terraces up to 300-400 feet above the present level of the lake, and made some comments as to its former exten-

sion when at that stage. The most definite of these comments is, that in the direction of Pucara (to the northwest) the lake reached to Sta. Rosa. He also remarked that Tiahuaucaco, which is a ruin of a temple older than the Inca civilization, is 75 feet above the present level of the lake. From this we may judge that since the Indo-humanic period, as recorded by the oldest monuments in the region, the lake has not fallen more than 75 feet.

In journeying to the departments of Huacavelica and Ayacucho, Crosnier passed through the valley of Jauja, where he found a formation which he considered (1852) to have been formed in an inter-Andean lake about 30 miles long and from 9 to 12 miles wide. The deposits are described as consisting of clays and gravels such as would have been transported by streams. He estimated the thickness at from 600 to 700 feet (200 to 300 meters). In the basin of Ayacucho he also found a Tertiary deposit consisting of marls and tuffs. No proof as to the age of these beds was given, but they were classed as Tertiary from their general relations.

In his bulletin on the Mineral Resources of the Provinces of Jauja and Huancayo,<sup>a</sup> Dueñas (1906) says that the valley of Jauja was in former times the bottom of a great lake, which, by cutting the canyon which is its natural outlet, has gone dry. The lake deposits he considered to be of glacio-fluvial origin. He published two photographs of river terraces cut in these deposits. Dueñas does not refer to the description of the lacustrine formation by Crosnier, with which he no doubt was familiar. The action of glaciers in connection with fluvial action brings in a new factor to explain the origin of the beds. The author has seen a portion of the Jauja Valley, and is inclined to doubt that glaciers contributed directly to form the deposits, although products of glacial action were undoubtedly brought in by rivers. If, however, lake beds were all deposited during the glacial period we must refer them to the Pleistocene of the Quaternary and not to the Tertiary, as was done by Crosnier. This is a matter for further study.\*

To the northwest of the Titicaca Basin, Dueñas (1907) observed certain deposits in the Department of Cuzco,<sup>b</sup> which he says are probably of lacustrine origin. They occur at several localities, differing considerably in character. He mentions beds of tuffs and a stratum of tripoli, in which he reported finding sponge spicules. Because of finding these spicules he says that one might be induced to suppose that in Tertiary times southern Peru was under the Pacific Ocean. This is an unfortunate remark, since it is liable to be perpetuated in the literature by being quoted without questioning whether spicules

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<sup>a</sup> Bol. del Cuerpo de Ing. de Minas No. 35.

<sup>b</sup> Aspecto Minero del Departamento del Cuzco, Bol. del Cuerpo de Ing. de Minas del Peru No. 53. Enrique I. Dueñas, 1907.

of marine sponges are actually present in the deposits. Although Dueñas finally accepts the lacustrine theory for the deposits, he goes rather far when he remarks that it is nothing wonderful to suppose that Lake Titicaca once extended into the Department of Cuzco. From what the writer has seen of the topography it appears altogether improbable; and, moreover, the theory of local lakes would account in a more satisfactory manner for the occurrence of the formations.

*Tertiary of the Amazon region.*

James Orton, in his explorations of the upper Amazon Valley, collected some shells from Pebas, which he submitted to Gabb, who determined them (1868) as late Tertiary. Because of the finding of these shells, Orton refuted the theory of the glacial origin of the clays of the Amazon basin presented by Agassiz and discussed later in this report. Orton (1870) gives a description of the exposures along his route of travel. He says that along the Napo River the only spot where the rocks are exposed is near Napo village, where there is a bed of dark slate dipping east. Farther west, at the foot of the Ecuadorian Andes, the prevailing rock was found by him to be mica schist. The entire Napo country is covered with an alluvial bed on an average 10 feet thick. The formation of the bluff near Pebas he described as consisting of fine laminated clays of many colors, resting on a bed of lignite or bituminous shale and a coarse iron-cemented conglomerate.

After Gabb described the collection of shells from Pebas, a larger collection was made by Mr. Hauxwell, a part from Pebas but most of them from 30 miles below Pebas, at Pichua. Among them Conrad found (1870) seven species of *Pachydon* (Gabb), a genus which does not have any living representative and is very different from any existing fresh-water genus. He says that it is not possible to state without doubt what the relative stratigraphic position of the group may be, but if all the species are extinct it can not be later than Tertiary, and that it may have lived in fresh or brackish water, but it is certainly not of marine origin.

A collection made by Mr. Steere at Pebas was examined by Conrad (1874), who questioned there being evidence of the marine origin of the shells.

QUATERNARY.

*Pleistocene glaciation.*

OCCURRENCE OF SNOW PEAKS.

Humboldt, in his personal narrative (1814), called attention to the absence of snow peaks between the Nevada Huaylillas in latitude  $7^{\circ} 55'$  and Chimborazo in Ecuador.

Raimondi (1873), in speaking of the Cordillera Occidental, says that snow peaks are numerous in southern Peru, but that the most colossal and gigantic are those in the portion known as the Cordillera Blanca, in the Department of Ancachs. Cerro Hundoy, in front of Caraz, is 6,828 meters high, while the bicuspedate mountain Huascan, which dominates Yungay, rises to an elevation of 6,668 meters in its northern peak and 6,721 meters in its southern peak. This is near the northern termination of the perpetual snow. He also states that Huayllillas is the most northern snow peak in Peru.

In the Cordillera Central and likewise in the Oriental there are snow peaks which are mentioned by many writers, but thus far no special study of the distribution of the perpetual snow has been made.

#### THE LOWER LIMIT OF PERPETUAL SNOW.

Pentland (1830) made numerous observations as to the occurrence and lower limit of perpetual snow in southern Peru and in territory which is now in Bolivia. He placed the limit at 17,061 feet, and arrived at the conclusion that it is higher than would naturally be expected and especially when compared with peaks nearer the Equator. He attempted to explain this anomaly as due to aridity and excessive evaporation. Raimondi (1879) has given 14,700 feet as the average of the lowest limits in the Department of Ancachs. In the Cordilleras, in the southern part of Peru, he places the limit at 15,100 feet or more. He commented on the previous observations and explained that there seems to be a considerable error in Pentland's determinations of altitudes and considers the deductions from them as erroneous. Raimondi gives the following table of the generally admitted elevation of the lower limits of perpetual snow:

	Meters.
0°, or at the Equator-----	4, 800
20° south -----	4, 600
45° south -----	2, 500
60° south -----	1, 500

#### GLACIATION.

After examining the evidences of glaciation in Bolivia and southern Peru, Hauthal <sup>a</sup> (1906) in a short notice gave as his opinion that climatic conditions similar to those of the present prevailed during the glacial period, but that a lower temperature, due to cosmic causes, gave rise to glaciers from certain centers, and that there was no general glaciation.

Dueñas (1907), in his report on the Department of Cuzco, examined the glaciated mass of igneous rock known as the "Rodadero" on the

<sup>a</sup> Quartare vergletscherung der Anden in Bolivien und Peru, Zeitschrift für gletscherkunde, Band I, Heft 3, September, 1906, p. 203,

hill above the town of Cuzco, and expressed his opinion that the whole valley in which Cuzco lies was occupied by a glacier. The evidence given for so great a glacier is not quite so complete as might be wished, at least its lowest limit should be determined. According to Dueñas the elevation of the Rodadero is 3,900 meters; the present limit of perpetual snow in that region is at 4,300 meters, and Cuzco is at 3,450 meters.

Undoubtedly the limit of perpetual snow was much lower during the glacial period. Just how much lower, is a question deserving of study. Raimondi has noted (1873) the occurrence of moraines much below the present snow line in the Cordillera Blanca.

At many places near the snow fields abandoned cirques may be seen below the limits of the perpetual snow and the diminutive glaciers of the present time. The writer has studied the glacier beds and moraines in the vicinity of Poto to the north of Lake Titicaca in the Cordillera Oriental and has estimated that in the glacial period the ice fields extended about 2,500 feet lower than the present glaciers.<sup>a</sup>

*Recent elevation of the coast.*

OBSERVATIONS AT SAN LORENZO ISLAND BY DARWIN.

In 1835 Darwin visited Peru and landed at Callao, but because of the troubled political condition he saw but little of the country. He reported finding on San Lorenzo Island, in front of the bay, three obscure terraces, the lower one of which, at a height of 85 feet above the sea, is covered by a bed a mile in length almost wholly composed of shells of 18 species now living in the adjoining sea. He found a bed of more weathered shells at an elevation of 170 feet. Among the shells at 85 feet above the sea he found some thread, plaited rushes, and the head of a stalk of Indian corn. From these facts he concludes that within the Indo-human period there has been an elevation of 85 feet. [These observations by Darwin have been often quoted, and only last year an excursion composed of professors and students from the School of Mines at Lima visited the island to study these terraces, and failed to reach a definite opinion in regard to the value of Darwin's conclusions.]

OBSERVATIONS AT SAN LORENZO ISLAND BY DANA.

Fortunately, the views of Darwin have been competently criticized by Dana, who (1840) visited the locality as a member of the Wilkes

<sup>a</sup> In northern Bolivia Arthur F. Wendt has observed that the glaciers of Illimani and Sorata have their lower termination at an elevation of about 18,000 feet, and that the ancient glaciers reached down to 15,000 feet. (Proc. Amer. Inst. Mining Eng., 1890, vol. 19, p. 85.) Agassiz (1868), it will be remembered, regarded the clays and superficial deposits of the Amazon Valley as glacial deposits, but later recognized his error.

expedition. His writings on this question seem to have been overlooked, or are at least not so well known as those of Darwin. He doubts the conclusions of Darwin, and says that the San Lorenzo shells are in an irregular bed and not stratified, but are spread out just underneath the soil, and, moreover, there is an absence of an inner cliff on the island, and nothing was seen which could confidently be referred to as terraces. He studied the sea cliff on the front of the delta formation to the south of Callao at a place where it is from 45 to 65 feet high. In this cliff he found remnants of trees and, in an upper layer, comminuted recent shells. He regards this cliff as furnishing evidence of an elevation since the beds were deposited, but says that to fix the time may require some further attention than the facts observed.

#### PREHISTORIC INDIAN VILLAGE AT ANCON.

A short distance to the north of Callao is the small port of Ancon. Archeologic researches have made known to us the very interesting remains of a fishing town of at least great antiquity. These remains and especially the interred mummies are but a few feet above the present beach. The proximity of Ancon to Callao precludes the probability that an elevation of the coast at Callao which would have raised San Lorenzo Island 85 feet would not have affected Ancon, and the writer wishes to adduce this as the most definite proof obtainable that the coast in that vicinity has remained nearly stationary during the Indo-human period.

#### OBSERVATIONS AT ARICA BY LIEUTENANT FREYER.

In a letter to Charles Lyell,<sup>a</sup> Lieutenant Freyer says that to the south of the Morro of Arica, on indistinct terraces, wherever the rock is exposed there are Balani and encrusting Millepora, and that at a height of about 20 to 30 feet they are as abundant and almost as perfect as at the shore. At upwards of 50 feet they still occur, but are abraded by the blowing sand, and there are traces of them at still greater heights.

#### OBSERVATIONS AT ARICA BY FORBES.

From Mejillones, in Chile, northward to Arica Forbes found at intervals shell beds containing exclusively shells of species now inhabiting these waters. These shells are at small intervals above the sea, but do not reach a height of 40 feet. He stated that he was not successful in finding Balani and Milleporas attached to the sides of the Morro of Arica, and argues that no very perceptible elevation

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<sup>a</sup> Geol. Proc., Vol. II, p. 179, published 1835.

can have taken place during three hundred and fifty years as is shown by the position of Indian tumuli. He called attention to how shells may be transported inland by human agencies, by birds, winds, and drifting sands, and advises caution in accepting the mere presence of shells as a proof of elevation.

OBSERVATIONS IN NORTHERN CHILE BY ALEXANDER AGASSIZ AND L. F. POURTALES.

In line with the statements by Lieutenant Freyer it may be noted that in northern Chile, in a ravine 20 miles inland from Pisagua at Beringuela (at Tilibiche), at an elevation of 2,900–3,000 feet, “recent corals” were found by Agassiz, who says that they indicate an inland sea connected with the Pacific Ocean, and that there is accordingly reason to believe that the continent has been raised “within a comparatively recent period.”

The corals were described by Pourtales. It is stated that they were fossilized into a compact limestone and consisted of two new species. One was referred to a genus not represented in any lower strata than the Tertiary, and is not now living on the Pacific coast of America. The other species was referred to a genus which had up to that time been described only from Jurassic and Triassic formations.

The writer wishes to call attention to the fact that the fossils do not date the “comparatively recent period” and do not furnish evidence which is more convincing than the relations of the Tertiary sediments, which are widely distributed in the coast region.

RAPID RECONNAISSANCE OF THE TERTIARY AND QUATERNARY OF THE COAST.

The writer in traveling through the coast of Peru studying the geology in relation to the underground waters, observed the occurrence and distribution of the Tertiary formations in so far as was possible in the time allotted to his work, and has outlined the occurrence of the formations in the bulletins by him published by the Corps of Engineers of Mines of Peru. From what he has written the following summary, which includes a few modifications, is presented with the hope that future observers may use it to correct and amplify a knowledge of the subject.

TERTIARY OF THE NORTHERN COASTAL PLAIN.

*The Amotape formation.*

This name was given to the formations which are exposed near the village of Amotape, which is situated in the valley of the Chira River and is particularly well seen in the western end of the Brea

or Amotape hills (see pl. 2). The lithologic characters of the beds vary considerably, consisting of shales, sandstones, conglomerates, and in some places beds filled with shells and occasionally there are coral reefs. The changes observed in the nature of the formation are due to the varying distance from the shore at which they were deposited and to the deepening and shallowing of the water during the time of sedimentation. It is probable that the materials were derived from the mountainous area which during Tertiary time formed the ocean shore to the east, approximately where now are the foothills of the Andes.

The strata of the formation are not much lithified and the shales and sandstones grade into each other and into conglomerates. In the Brea hills the Amotape formation has been uplifted in an anticline, giving good exposures where the stream valleys have been eroded. The thickness of the beds has not been studied carefully, but from the outcrops seen it is safe to say that on the average it is not less than 1,000 meters, although the thickness may be much less in some places and greater in others, depending upon the distance from the Tertiary shore.

Fossils are very abundant and well preserved at many places, one of the most noticeable being a large oyster which is found in such great numbers that it is used locally for burning lime.

The principal mineral substance which is exploited at the present time is petroleum, of which there are superficial indications at two places called la Brea and la Breita. The productive localities are Negritos, Lobitos, and Zorritos located on the coast. Besides these some prospecting has been done farther inland. It has been reported that coal has been found at various localities within the limits of this formation. That which the writer examined at Bahia de la Cruz is a lignite, and prospecting failed to reveal a bed of any importance. The writer has been assured that north of Sullana, at the base of the Brea hills, a good quality of lignite has been found and of sufficient thickness to warrant its extraction. However, the bed has never been worked and further exploration would be necessary to prove its commercial value. The Amotape formation contains various mineral salts, especially gypsum, which render the water obtained from it unfit for domestic uses. The formation extends throughout the plains region from the Ecuadorian border southward into the table-land to the east of Pita. Undoubtedly it extends farther south, but the exposures are obscured by drifting sands and have not been studied by the writer. It may be noted in this connection that Wolf in his geologic map of Ecuador has erroneously indicated a recent formation in the plains region to the north of the Brea hills.

In the Brea hills the formation has been thrown up in an anticline. To the south in the plains region the formation is relatively horizontal. To the north of the hills there are steep dips and local folds. These may be well seen along the valley of the Tumbes River and in the stream which empties into the ocean at Boca de Pan. It is interesting to note that the direction of the Brea hills is almost at right angles to the trend of the Andes and parallel with the border of the Gulf of Guayaquil and with the coast of the Province of Tumbes, which forms the southern part of the Gulf of Guayaquil. Moreover, the direction of the dips to the north of the range of hills suggests that the folding which produced them was actuated from the north.

The writer has not examined the axis of the range, but has been assured by travelers that it contains igneous rocks. Where the Tumbes Valley merges from the flank of the hills there are some exposures of granite, which the writer saw and the presence of which was also noted by Grzybowski, but this granite may be older than the Tertiary. The anticlinal structure of the range of hills may be due to the eruption of igneous rocks which form the axis, but the writer did not see anything to indicate this at their western termination, and he is inclined to believe that it should be correlated with the subsidence which produced the embayment of the coast in the region of the Gulf of Guayaquil.

Grzybowski was the first to study the Amotape formation, and what the writer has included under the name "Amotape formation" has been divided by Grzybowski into the Heath stage, which he calls "Lower Miocene," and above it the Zorritos and Talara stages, which he calls "Upper Miocene." He also identified, principally upon stratigraphic grounds, the Ovibos stage, which he refers to the Oligocene. The exposures which he included in this stage have not been seen by the writer, who regrets that he did not have access to Grzybowski's paper until after his own manuscript was written. It will be remembered that Raimondi sent some fossils from Paita to Gabb for determination; the localities from which they were collected were unfortunately not sufficiently specific to show whether they were from the Amotape formation or not. A collection of fossils from Zorritos was also described by Nelson, who made no special determination of their age other than late Tertiary, as suggested by the title of his paper.

#### *Pliocene formation at Paita.*

In the sea cliff at the port of Paita the writer observed two formations separated by an unconformity. The lower he considered to be the Amotape. The upper consists principally of sand in imperfect sandstone. When he boarded the steamer in the bay the writer made



FIG. 5.—Section of sea cliff at Paita.

a sketch (fig. 5) of the relation of these two formations, and upon sailing southward made a similar sketch (fig. 6) showing the relations of the bed as seen after rounding the point. The presence of the bubonic plague at Paita during the writer's visit, and especially the establishing of the hospital to the west of the town, prevented a thorough examination of the locality. Grzybowski, in his article, mentions some shales cut by minute quartz veins which he found outcropping to the west of Paita near Paita Point. These shales, which were not well seen by the writer, were included by him in his sketch as a part of the Amotape formation. The division between the Amotape and upper formation shown in the sketch corresponds approximately with the dividing line between the shales and sandstones of Grzybowski's section at Paita<sup>a</sup> (fig. 7). Grzybowski has described what he calls the "Paita stage" from the locality at Paita, and if it had not been for this the writer would apply the name Paita formation to the upper one, which he has differentiated.

The age of the beds at Paita was not well determined by the fossils which Gabb received. He states that some of the fossils were extinct forms, and that the remainder appeared to be Pliocene. Grzybowski assigned the Pliocene age to his Paita stage. The writer thinks that the unconformity which he has shown in his section is unmistakable, and that accordingly he would call the upper beds Pliocene. The extent of this formation has not been determined with certainty, but it apparently occupies the upper portion of the table-land of Paita. To the north, in the plains around la Brea hills, it is not to be found in extensive areas, since the good exposures which were seen all belong to the Amotape formation. The Brea hills were perhaps above the level of the sea during the time it was deposited. It may be more appropriately expected southward, underlying the desert of Sechura.

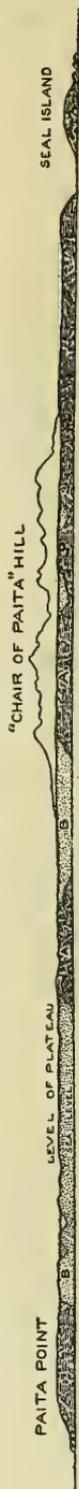


FIG. 6.—Section of sea cliff to west of Paita.

<sup>a</sup> Original figure in Neues Jahrbuch für Mineralogie, Beilageband XII, Pl. XVI, fig. 1.

## TERTIARY OF THE SOUTH CENTRAL COASTAL PLAIN.

*The Pisco formation.*

In the low hills to the north of Pisco, which is called "Cerro de Tiza" (meaning chalk), there are exposed white and yellowish rocks which have a calcareous aspect much like chalk (see pl. 4). At the end of the bridge over the Pisco River they may also be seen, and at this place they have steep dips and strike to the northwest. This structure is continued into Cerro de Tiza, and crosses the Pisco River to the south until the rocks disappear beneath the sands of the plains toward Ica. Many outcrops of this formation may be seen, especially in the landscape to the south of the railroad station at mile 18, but there the beds are practically horizontal. In the Ica River valley the same formation is found resting on igneous and older stratified and metamorphic rocks. In a hill to the west of the Hacienda Ocucaje, in a hill called "Cerro Blanco," the writer saw the remains of a whale embedded in the Pisco formation. There

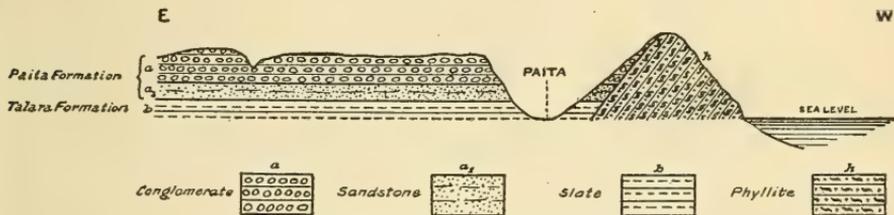


FIG. 7.—Section at Paita, by Grzybowski.

was also some strata in which a few marine shells are found and others in which phosphate nodules occur, but to an extent so limited that they have no commercial value. Farther south in the valley of the Rio Grande the Pisco formation is cut by the canyon of that river. The tributaries of the Rio Grande which flow past Palpa and Nazca have cut deep valleys, in the walls of which the formation is seen to contain a mixture of rounded stones in a matrix of sand and clay materials, but with a sufficient amount of the white chalky matter which characterizes the formation to demonstrate that it is only a littoral phase of the Pisco formation.

The Pisco formation is also found in the plains to the east of the port of Lomas, where the remains of a whale were seen by the writer, and in one of the valleys which cut the plain a conglomerate of marine shells was found. To the southward the plains narrow and the mountains come to the seacoast, but at Chala there is a small area of Pisco formation in which the beds consist largely of variegated clays.

In the northern part of the plains, to the east of the Cañete, the Pisco formation was found presenting a littoral phase, but containing

some of the white chalk material and some beds of impure concretionary limestones similar to what occurred at the type locality near Pisco. The so-called chalk material was analyzed by the Corps of Engineers of Mines and found to consist principally of silica, with small amounts of lime and alumina. A microscopic examination showed it to contain many diatoms and what appeared to be volcanic ash.

In traveling by steamer from Pisco to Lomas the Pisco formation can be seen forming the sea cliffs and rising to the table land of Ica.

Although some fossils have been found, they have not been studied critically. The age of the Pisco formation is not surely known. The writer has assigned it to the Pliocene provisionally, since it is overlain by deposits which are probably of Pleistocene age, and there is no information which shows the necessity of assigning it to an earlier time.

#### TERTIARY OF THE SOUTHERN COASTAL PLAINS.

##### *The Moquegua formation.*

The writer has given this name to the formation which occupies the southern coastal plains. It has been described locally, by Forbes and others, as already mentioned in this paper, but no one had journeyed sufficiently over the plains to learn that it was coextensive with them. The strata which constitute it can be studied conveniently in the valley of the Moquegua River, especially near the town of the same name. It is also well exposed in the valleys of all the streams which cross the plains, since they have cut deep canyons. The eastern limit of the formation is at the foothills of the Andes, and the western limit is formed by the chain of coast hills. It reaches to the Pacific Ocean in the interval between the coast hills of Peru and the Morro of Arica, which is the northern extremity of the coast hills of Chile. The character of the rocks which constitute the Moquegua formation has been well outlined by Forbes. They consist of sands with some clays, a large quantity of detrital material derived from igneous rocks, but especially noticeable are the thick beds of volcanic material which appear to have been deposited in water and interbedded with sands. In the valley of the River Vitor, which descends from the Andes past the volcano Misti which is located near Arequipa, beds of lava may be seen which have descended from the volcano and extended over the plains, where they form a capping on the Moquegua formation. The age of the volcanic rocks is not certainly known, and there has been no opportunity to determine the age of the Moquegua formation, since no fossils have been found. It is generally stated that the volcanoes of southern

Peru began their activity in Tertiary times and some of them are still active, although no great lava flows have come from them in recent times. The writer has provisionally assigned the Pliocene age to the Moquegua formation, thus making it contemporaneous with the Pisco formation to the north. There appears to be no reason for considering it as of greater age, and in outlining the history of the coast the Pliocene age seems for the present satisfactory.

The thickness of the Moquegua formation is variable, since it was apparently deposited in a trough between the coast hills and the foothills of the Andes (see fig. 8). From measurements made in some of the canyons a thickness of 1,500 feet may be assigned.

#### QUATERNARY DEPOSITS.

##### *Pleistocene.*

#### THE PACASMAYO FORMATION.

At Pacasmayo, in the southern part of the northern coastal plains, the sea cliff consists of stratified conglomerates mixed with sand and occasional clay beds (see pl. 3). The formation is also well exposed at the mouth of the Jequetepeque and along that stream inland. At Eten the sea cliff consists of a homogeneous sandy clay. To the north of Eten for a considerable distance the coast is low near the shore and there are no good exposures, so that the writer has not been able to trace the Pacasmayo formation

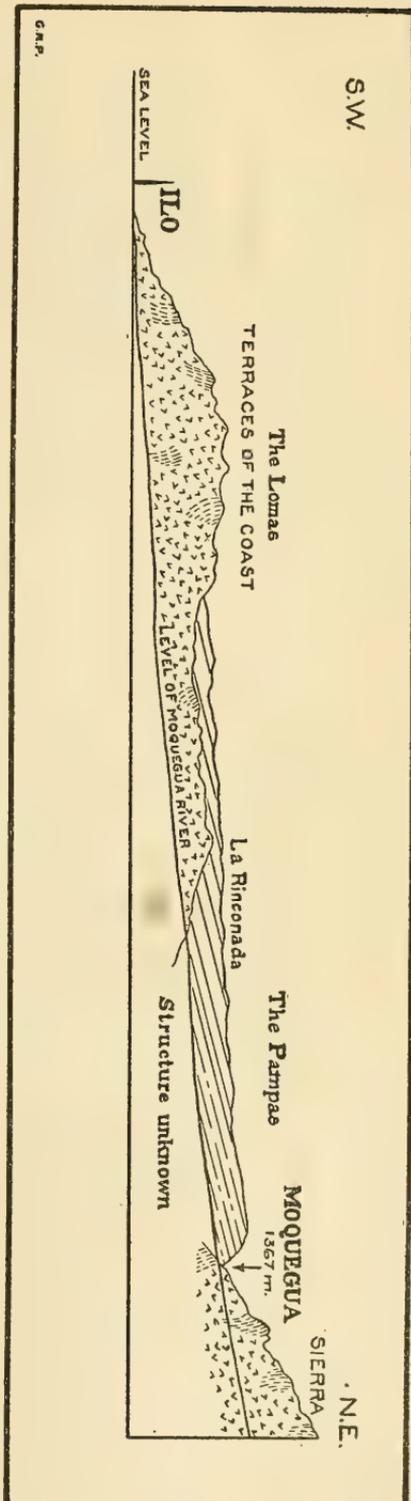


Fig. 8.—Section showing relations of the Moquegua formation.

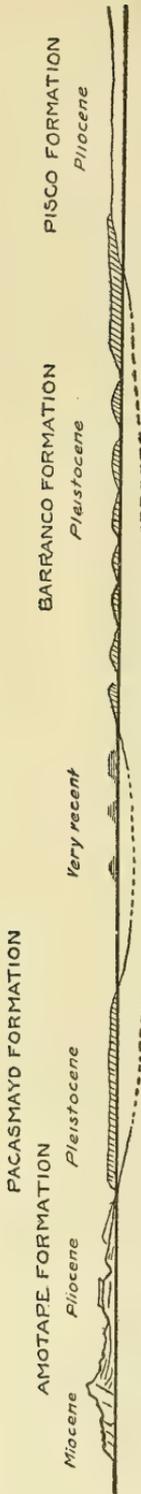


FIG. 9.—Section correlating the formations of the coast.

farther in that direction. To the south of Pacasmayo the coastal plains narrow until the mountains descend to the shore south in the valley of Viru. Throughout this extent the Pacasmayo formation is represented in its various phases. The age and relations of this formation will be more clearly understood when it is considered in connection with the Barranco formation next to be described, with which it has been correlated (see fig. 9). It is to be regretted that in the region of the Sechura desert the relations of the Tertiary formations of the northern part of the northern coastal plains and the Pacasmayo of the southern portion are obscured by the drifting sands, which obliterates any exposures which might otherwise be seen in this area of slight relief.

#### BARRANCO FORMATION.

At the valleys of the Pativilca, Huaura, Chancay, and Rimac rivers there are sea cliffs cut in what appear to be raised delta formations. In other valleys to the south and north smaller areas of a similar formation may be seen (see pl. 4). At Tambo de Mora the sea cliff has the same character as at the mouths of the rivers, but there the formation extends inland and northward continuously to the valley of the Cañete. The writer regards this area, which constitutes a part of the south-central coastal plains, as furnishing the key to the proper understanding of the Barranco formation. It undoubtedly lies upon the Pisco formation, although its relations to the latter south of the Chincha River are not very clear because of the intervention of the wide stream valley. Its relation to the Pisco formation may also be seen in the Cañete Valley. The character of the materials and the degree of cementation in the Pacasmayo and Barranco formations is similar.

No fossils have been found with the exception of comminuted shells and occasional branches of trees. The writer has assigned the Pleistocene age to these deposits and would correlate the coarse sediments and boulders which have been deposited in the form and structure of deltas with the in-

creased volume of the streams and the erosion which accompanied the glacial period.<sup>a</sup>

#### RECENT FORMATIONS OF THE COAST.

The recent formations consist principally of materials transported by the rivers and deposited at their deltas and of the wind-blown sands which sweep over the coastal plains. In addition there are places along the coast where the materials eroded by wave action and transported by ocean currents have accumulated in the form of recent beaches. The beaches here referred to should not be confounded with the raised beaches, which will be discussed later in this paper. The deltas of the coast are usually unsymmetrical because of the northward direction of the coast currents. In many cases the deltas blend with the recent beaches, due to marine action. The delta of the Tumbes River, which is the northernmost of the coast, lies in front of a clearly defined sea cliff. Similarly the delta of the Chira River blends with the recent sea beaches lying in front of a sea cliff, which extends from the mouth of the river northward to Negritos.

The remaining rivers of the northern coastal plains do not have deltas worthy of special mention. In the extent of mountainous coast between the northern coastal plains and the south central coastal plains there are a number of localities where recent beaches may be found, and in this part of the coast the Quaternary and Tertiary deposits already described are absent.

To the north of the Santa River there is an area of recent beaches in which salt is manufactured by evaporation, the brine being obtained by digging shallow pits, into which it filters. The area of the beaches is extensive, and the slight depth to the salt water indicates the fact that they are but slightly above sea level. The materials which have accumulated and formed the beaches have largely been brought by the Santa River and drifted northward by the ocean currents. The immediate delta of the Santa River has extended seaward and so connected an island with the mainland. In Chimbote and Samanco harbors one may see an area of drowned mountainous coast. At some former time the two bays were one, but the accumulation of sand has formed a bar and connected one of the larger islands with the mainland. The front of the raised delta of the Rimac River, on which Lima, the capital of the country, is located, has been largely cut away by marine erosion, and the currents have drifted the materials northward, forming the spit of land called la Punta, which is a feature of the harbor of Callao. This spit is

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<sup>a</sup> A description of the Rimac delta by the author may be found in Bulletin No. 33 of the Corps of Engineers of Mines of Peru, published in 1905.

gradually extending, and lying between it and the island of San Lorenzo there is now a bank on which the waves break. The ultimate outcome of this process may be a connection between the mainland and San Lorenzo Island.

At Port Cerro Azul the rocky promontory which protects the port was once an island. It has been connected with the mainland by the growth of the delta of the Cañete River. Similarly there are a number of delta deposits and recent beaches in the southern part of the coast. In riding on a train from Mollendo along the beach before the ascent of the range of coast hills is made one may see recent conglomerates, which have been partially eroded, and marine beaches in process of formation.

The material transported by the winds has in places accumulated in areas of sand dunes which are moving with the general direction of the wind, but the more common condition is to find the sand forming a mantle on the hill slopes and rounding the contours of the hills, and often rising well up on to the sides and in some cases even to the crests of the mountains. The most extensive area of drifting sand is to be found in the Sechura Desert and the plains to the east of Piura. In the latter place the sand is held by a sparse growth of drouth-resisting trees and bushes. The height of this drifting sand as seen in the topography of the country reaches perhaps 200 feet, but proof of its great thickness was obtained when a well was drilled in it. The drillers could hardly be expected to distinguish the point at which they passed out of the wind-drifted sand, but they found nothing but sand and had no difficulty in driving the casing of the well to a depth of something over 3,000 feet.

If one refers to the map of the coast of Peru and observes the configuration of the coast in the region of the desert of Sechura, he will see that the direction changes more to the west so that the winds blowing from the Pacific have a clean sweep over the desert, and the sand is carried inland by the winds in a nearly northern direction. It is this fact which accounts for the low relief near the coast where the sand has been derived and the great thickness of the Aeolian deposits to the east of Piura.

In the south central coastal plains there is a conspicuous area of sand hills between Ica and Pisco; also some smaller ones to the west of Ica and Palpa. There are numerous areas of migrating sand hills in the southern coastal plains, but none of the dunes attain great altitudes, the surface of the plain is hard and the sand moves in crescentic dunes as over a floor. These dunes may be seen from the railway in traveling from Mollendo to Ariquipa and are one of the sights usually remembered by the traveler. Mixed with the sand which drifts over the southern coastal plains there is a large amount of white volcanic ash or sand derived from volcanic materials.

## RAISED BEACHES.

The action of the sea in cutting cliffs may be well observed along the coast of the northern coastal plains, where the Tertiary formations at many places rise in sheer bluffs. The same process has been in operation at other places on the coast where elevation has taken place and the cutting action of the sea is displayed in a succession of marine terraces. These are especially noticeable on the coast between Pisco and Lomas, where the Pisco formation displays approximately ten distinct terraces rising to a height of perhaps 1,000 feet. Along

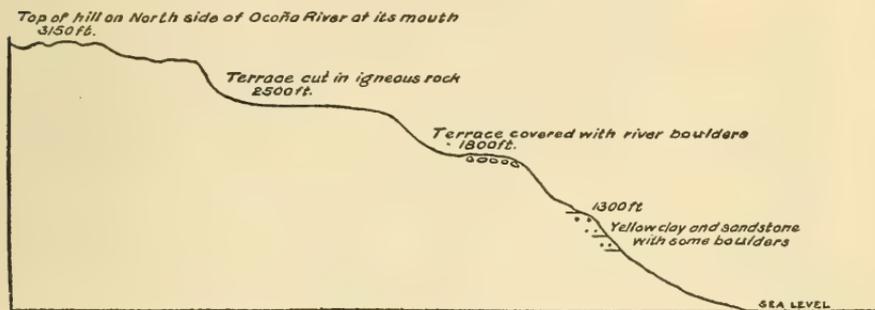


FIG. 10.—Section showing marine cut terraces at the mouth of the Ocoña River.

the southern part of the Peruvian coast in front of the range of coast hills where the rivers have cut their canyons through, there are terraces in the igneous rocks which constitute the hills and also in the remnants of what were once delta formations of these streams. The terraces at the mouth of the Ocoña River, as seen by the writer and measured with an aneroid, are represented in the following sketch (fig. 10). The upper terrace at Ocoña is the highest one which was found on the coast.

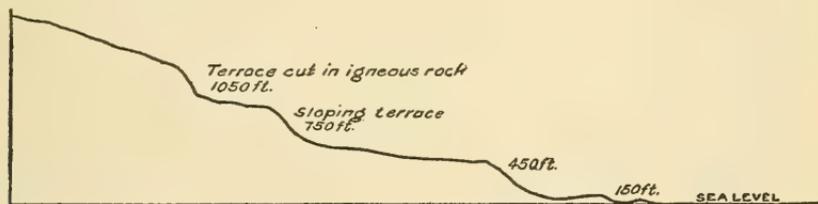


FIG. 11.—Section showing marine cut terraces at the mouth of the Ilo River. (Compare fig. 8.)

The railroad station, Tambo near Mollendo, on the Southern Railway, has an elevation of 1,000 feet and is situated on the north side of the River Tambo near its mouth, on an extensive terrace which must have attracted the attention of many travelers, although its origin is not explained in any scientific article which has come to the writer's notice.

The terraces south of the Ilo River, near its mouth, are indicated in the above sketch (fig. 11).

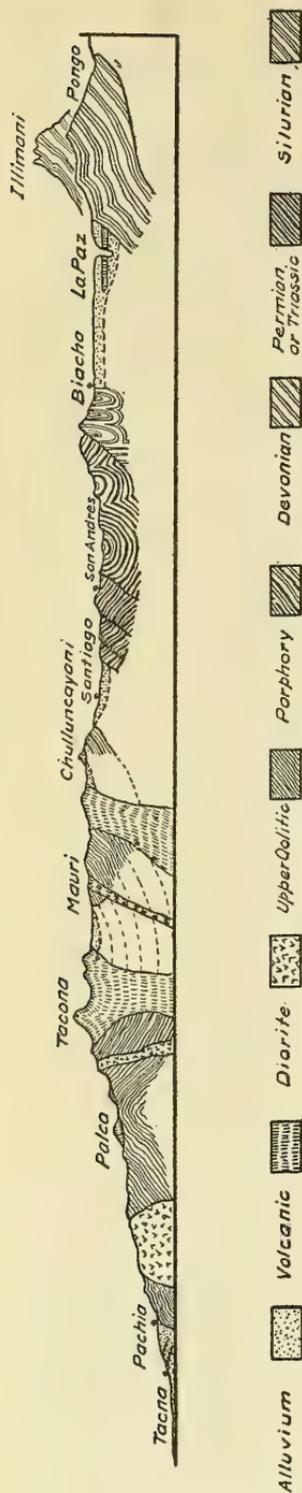


FIG. 12.—Geologic section from Arica to La Paz, by Forbes.

Incidentally it may be said that at the mouth of the canyon just north of Pisagua in Chile similar terraces may be seen, the upper one being at an elevation of something more than 1,000 feet.

These terraces, taken together with the elevation at which the Pliocene Tertiary formations on the coast are found, record the rising of the land. Accordingly, the upper terraces may be Pleistocene and the lower ones Recent, but there is nothing to indicate two periods of movement, and the spacing and disposition of the terraces cut in the Pisco formation indicate a gradual elevation.

#### GEOLOGIC SECTIONS OF THE ANDES.

SECTION OF SOUTHERN PERU, ARICA TO LA PAZ, BY DAVID FORBES (1860).

If the general section of Peru by Forbes <sup>a</sup> (fig. 12) is divided so that it may be compared with the succession of zones parallel to the trend of the Andes, as distinguished by Steinmann at a later date, the following may be enumerated from the coast toward the interior:

1. Mesozoic sediments with interstratified porphyries of the coast range (at Arica).
2. The Tertiary (and diluvial) formation of the coast plains with trachytic tuffs and ash beds.
3. The diorites of post-Cretaceous (post oolitic) age.
4. The Mesozoic sedimentaries with interstratified porphyries of the western slope of the Cordilleras cut by diorites.
5. Volcanic trachytes and trachytic rocks of the Cordillera Occidental cutting the Mesozoic sedimentaries.
6. Zone of Paleozoic (Carboniferous and Devonian) sediments of the Titicaca basin with later "diluvial," including a bed of interstratified trachytic tuff.

<sup>a</sup> Original in Quart. Journ. Geol. Soc. London, Vol. XVII, Pl. III.

### 7. Zone of slates (Silurian) and granites.

Comparing these zones with those enumerated by Steinmann, later to be mentioned, it will be seen that there are no granitic rocks in the coast and that the coast range which extends from Arica southward into Chile is not comparable with the coast range at Mollendo. In fact, there is a gap between the two just north of Arica. In other respects the zones are quite comparable excepting for the difference due to the structure of the Titicaca basin. The rocks which Forbes called "Permian" or "Triassic" are now called "Cretaceous" by Steinmann, and above are included with the Mesozoic.

#### SECTION THROUGH THE DEPARTMENT OF ANCACHS, BY RAIMONDI (1873).

It should be remembered in considering this region that the Cordillera Occidental divides into two branches, the western known as the "Cordillera Negra" and the eastern or principal one, the "Cordillera Blanca." Raimondi made no section, but from his writings one may recognize the following zones:

1. Granites and syenites of the coast.
2. Mesozoic sediments with porphyries and diorites. The sedimentaries are rare in the coast but are found more abundantly inland.
3. The diorites are seen in the Cordillera Negra and the Cordillera Blanca up to the limit of snow, but not in the crest of the range or axis. The eruption of the diorites posterior to the Jurassic removed and lifted some formations of the Cretaceous and introduced metallic veins.
4. Trachytes anterior to the present, there now being no volcanoes. These rocks are present in the Cordillera Blanca and to some extent in the Cordillera Negra but not forming peaks in the latter. Raimondi thinks the eruption of the trachytes occurred at a time when the two Cordilleras formed one mass and that they have since been separated by erosion.
5. In the valley of the Marañon are found older sediments, talcose slates with quartz veins which are referred to the Silurian. A small area of similar rocks was also noted at Pallasca on the western slope of the Cordillera Nevada.

#### SECTION OF ECUADOR, BY WOLF (1892).

Reviewing the geology of Ecuador as outlined by Wolf and coordinating the data in such a way as to compare it with the sections already given of Peru we find the following more or less distinct zones:

1. The Tertiary and Quaternary formations of the coast of marine origin.

2. The Cretaceous, principally in the western Cordillera <sup>a</sup> of Ecuador. This rock presents three facies: (a) Toward the coast and in the hills of the coastal plains, limestones, siliceous limestones, and shales with variegated sandstones and quartzites; (b) in the mountain basins, sandstones, and clay shales and slates; (c) conglomerates and breccia form conglomerates, sandstones, and clay shales predominating in the Cordillera.

3. With the Cretaceous are associated porphyries and greenstones, some being contemporaneous and others post-Cretaceous. With these igneous rocks, of which the diorites are the most common, are associated the mineral deposits.

4. The gneisses and crystalline schists of Archean age principally in the eastern Cordillera. There are granites in genetic relation with the gneisses and syenites in genetic relation with the schists.

5. The volcanic rocks which are related to the still active group of volcanoes of Ecuador. The volcanic tuffs contain bones of Quaternary mammals, but the volcanic activity may have commenced in the Tertiary.

6. Lacustrine Tertiary in some of the inter-Andean basins.

SECTION FROM LIMA TO CHAUCHAMAYO, BY GUSTAV STEINMANN (1904).

According to Steinmann there are in Peru six zones, well marked by their distinct geologic composition, which extend parallel to the axis of the Cordilleras. These zones are designated as follows:

1. The granitic-Tertiary zone of the coast.
2. The first zone of Mesozoic sediments.
3. The zone of diorites.
4. The second zone of Mesozoic sediments with a porphyritic facies.
5. The third zone of Mesozoic sediments with a calcareous facies.
6. The zone of slates and granites.

The first zone is not represented in the vicinity of Lima, but may be found to the south from Pisco to Mollendo. The granitic rocks are siluric or pre-siluric, cut by Mesozoic porphyries.<sup>b</sup> The Tertiary formations are probably Pliocene.

The second zone near Lima contains sandstones and quartzites, shales, and slates, with some limestones. The age of the formations is Cretaceous (Neocomian) as is shown by invertebrate and plant remains. The structure is in the form of an anticlinal fold. The sedimentary rocks are cut by dikes of porphyry.

<sup>a</sup> Because of the fact that the Cordilleras Oriental and Occidental in Ecuador are not the equivalents of the Cordilleras Occidental and Oriental of Peru, they are here spoken of as the "western" and "eastern" to avoid confusion.

<sup>b</sup> The writer wishes to suggest that the small Carboniferous area near Pisco should be included in this zone.

In order to make clear the aspects under which the porphyries present themselves, the following explanation is offered: From the close of the Triassic, during Jurassic and Cretaceous time, a shallow sea with a gradually sinking bottom occupied the region which to-day constitutes the western part of the Andes. In this sea, in which normal sediments were being deposited, immense eruptions of basic volcanic rocks occurred, taking the forms of flows, conglomerates, breccias, sandstones, and stratified tuffs.

The third, or diorite, zone is found on the western slope of the Cordillera Occidental. The diorites are clearly younger than the Cretaceous sedimentaries, since they have cut and metamorphosed them. The normal diorite contains dikes and masses of a darker, more basic, and finer-grained diorite. The Mesozoic rocks which occupied this zone have nearly all disappeared.

The fourth zone includes the crest and eastern slope of the Cordillera Occidental. Here the porphyritic facies in the Mesozoic rocks is typical. The formations, Jurassic and Cretaceous, are strongly folded, and the inclination of the beds is more frequently to the west than to the east. In this region andesitic eruptions abound (for the most part quartzitic) and extend eastward into the next zone. The mineral deposits of the region are related to these andesites.

The fifth zone in the calcareous formations gradually replaces the porphyritic facies until it becomes a great limestone formation, which, from the fossils, is shown to be of Jurassic and Cretaceous age.

In the sixth zone granite and slate are found. Although no fossils have been found in the slates, they are considered to be Silurian because of their resemblance to the known zone of Silurian in southern Peru and Bolivia.

Below the Mesozoic sediments there is a series of dark siliceous slates and sandstones, with some conglomerates, which are believed to be Paleozoic and especially Carboniferous, the existence of Carboniferous in the region being proven by finding a few characteristic fossils. Inasmuch as the Permian is not present in the Cordillera of Peru, the red sandstones and shales, with salt and gypsum, which overly the Silurian quartzites and slates, are referred to the lower Lias, no fossils having been found as yet, and they accordingly belong to the series of Mesozoic sediments.

#### AGE OF THE CORDILLERAS AND DEVELOPMENT OF THE SOUTH AMERICAN CONTINENT.

In the atlas accompanying d'Orbigny's monograph there is a map of South America showing the general distribution of the geologic formations according to his ideas. The map is very conventional and is of little value to-day. The most noticeable error as regards Peru is

that he breaks the continuity of the Cretaceous in the Andes between northern Peru and Ecuador, so that the Tertiary of the Pacific coast connects with the Tertiary of the Amazon basin in the latitude of the Gulf of Guayaquil. D'Orbigny also published four small maps showing the development of the South American continent. He took as a nucleus a small area of gneissic and primordial rocks along the Brazilian coast. From this area the land mass developed to the northwest. After the Carboniferous he shows a land mass in Guiana in addition to the larger one in Brazil. After the Triassic he shows an isolated land mass in the eastern Cordilleras of Peru and Bolivia, and following the Cretaceous he unites the Brazilian and Andean land masses by a fringing border of Cretaceous, and shows an isolated mass of Cretaceous in Ecuador and Colombia and Venezuela. The remaining parts of the continent were formed by the addition of Tertiary and diluvial. [The maps by d'Orbigny are of only historical interest as showing the development of geological science at that time.]

Agassiz appears to have followed in a measure the ideas advanced by d'Orbigny. He says in substance (1868) that the valley of the Amazon was first sketched out by the elevation of two tracts of land, namely, the plateau of Guiana on the north and the central plateau of Brazil on the south. It is probable that, at the time these two tablelands were lifted above the sea level, the Andes did not exist and the ocean flowed between them through an open strait. At a later period the upheaval of the Andes took place, closing the western side of this strait and thus transformed it into a gulf open toward the east. It seems certain that at the close of the secondary age the whole Amazon basin was lined with a Cretaceous deposit, the margins of which crop out at various localities on its borders. They have been observed along its southern limits on its western outskirts along the Andes, in Venezuela along the shore line of mountains, and also in certain localities near its eastern edge.

Orton evidently followed the ideas advanced by Agassiz, but his poetical and cataclastical account of the geological development of South America is of no value to science. He says, for example: "Three times the Andes sank hundreds of feet beneath the ocean level and again were slowly brought up to their present height."

The first attempt which Raimondi made to outline the geology of Peru was in his letter to Gabb (1867). He stated that the eastern Cordillera is of greater age geologically, appearing to be composed of micaceous and talcose slates which have been metamorphosed by the elevation of the granites, that have also introduced numerous veins of quartz which in some places are quite rich in gold. The western Cordillera, he says, is made up in nearly the whole of its length of rock of much more recent age (Mesozoic). Another group

of rocks, probably Carboniferous, form the great basin of Lake Titicaca, and a small spot in the heights of Huanta.

In his volume on the Department of Ancachs (1873) he elaborates his ideas somewhat more fully. He says that the first land relief produced within the limits of Peru was not the Cordillera which forms the continental divide, but the grand mountain chain which in Bolivia forms the Cordillera real and extends northward into Peru.

This grand chain is formed for the most part of talcose and clay slates and owes its relief to the eruption of granitic rocks, which, however, did not always find their way to the surface, being rare in the southern part of the chain, but in many places the eruption introduced quartz veins into the slates. Contemporaneous with this relief perhaps occurred the eruption of the granites and syenites of the coast, which in many places contain thin veins of auriferous quartz.

After the Jurassic began the eruption of the porphyries, and when the Cretaceous had begun the grand eruption of the diorites took place. Following the deposition of the Cretaceous the axis of the Cordillera was brought into relief.

A sketch of the geology of South America was read by Steinmann before the Geological Society of America in 1891. This sketch is explanatory of a map which was prepared by him for a second edition of Berghausen's Physical Atlas. Unfortunately the map is very small, and, moreover, data were not available for an accurate map. From the sketch the following points may be gathered which are of interest here.

In Devonian times, as is indicated by the sediments, there was an extensive sea embracing the larger part of South America, especially Brazil and Bolivia (and extending also into Peru).

The Carboniferous deposits were more restricted, but are known from Peru, Bolivia, and Brazil.

During the Permian, Triassic, and Jurassic the greater part of the South American continent was above sea level; however, the Triassic and Jurassic marine deposits have been found on the western part of the continent, rich collections of Jurassic fossils having been obtained from the Cordilleras of the Argentine, Chile, and Peru.

In contrast to the small extension of marine Triassic and Jurassic the Cretaceous covers a large area, marine Cretaceous being found in all parts of the Cordillera of the Andes from Venezuela to Patagonia.

The Cordillera of South America is famous for its eruptive formations of the latest time, but it merits no smaller attention for its submarine eruptions during Mesozoic time and the injection of the Mesozoic strata by dioritic rocks.

## BIBLIOGRAPHY.

The papers mentioned in this list are referred to in the text by the dates of publication.

1814.—Humboldt, Alexander. *Voyage aux régions équinoxiales du Nouveau Continent, fait en 1799–1804*. Pt. I. *Relation historique*, Paris, 1814. Personal narrative of travels to the equinoctial regions of the New Continent during the years 1709–1804, translated by H. M. Williams, published London, 1818–19. Also translation by Thomasina Ross, in three volumes (see Vol. III), published in 1853.

1830.—Pentland, William. On the height of the perpetual snows in the Cordilleras in Peru. *Edinburgh New Philosophical Journal*, Vol. VIII, p. 311, 1830.

1835.—Pentland, J. B. On the general outline and physical configuration of the Bolivian Andes; with observations on the line of perpetual snow upon the Andes between 15° and 20° south latitude. *Geogr. Soc. Journal*, V, 1835, pp. 70–89.

1838.—Darwin, Charles. "Observations of proofs of recent elevation on the coast of Chile made during the survey of His Majesty's ship *Beagle*, commanded by Captain Fitzroy." Read before the Geological Society of London and published in *Proceedings*, Vol. II, p. 446–449, 1838. (See fuller account in "Geological Observations in South America," being the third part of the geology of the voyage of the *Beagle* during 1832–1836, published London, 1846. Also later editions.)

1842.—D'Orbigny, Alcide. *Voyage dans l'Amérique Méridionale, Paléontologie et Géologie*. Vol. III, Pt. III, IV, 1842.

1849.—Dana, James D. United States exploring expedition during the years 1838–1842, under command of Charles Wilkes, U. S. Navy. Vol. X, *Geology*, published 1849.

1852.—Crosnier, L. *Géologie du Pérou*. Notice géologique sur les départements de Huaucavelica et d'Ayacucho. *Annales des Mines*, Paris, 1852 (5th ser.), Vol. II.

1856.—Pissis, M. "Recherches sur le système de soulèvement de l'Amérique du Sud." *Annales des Mines* (1856), 5<sup>me</sup> sér., Tome IX.

1861.—Forbes, David. On the Geology of Bolivia and Southern Peru. *Quart. Journ. Geol. Soc.*, 1861, Vol. XVII, pp. 7–62 (with geological map and sections). Also translated into Spanish by Edmundo Sologuren and published by the Sociedad Geográfica de La Paz, Bolivia, 1901, with the title *Geología de Bolivia y del Sud del Perú*, por David Forbes.

1861.—Salter, J. W. On the fossils from the High Andes (Bolivia) collected by David Forbes. *Quart. Journ. Geol. Soc.*, London, 1861, Vol. XVII, pp. 62–73, pls. 4–5 (Palaeozoic fossils).

1867.—Raimondi, Antonio. Letter to William Gabb. *Proceedings Cal. Acad. Nat. Sci.*, III, 1867, pp. 359–360. Treats of geology of Peru, only part of letter published.

1868.—Agassiz, Louis. *Geological Sketches*. Second series, 1876. Previously published in "A Journey in Brazil," by Professor and Mrs. Agassiz, 1868.

1868.—Gabb, William. Descriptions of fossils from the clay deposits of the upper Amazon. *Amer. Journ. Conchology*, Vol. IV, p. 197, 1868.

1869.—Gabb, W. M. Description of new species of South American fossils. Tertiary by W. M. Gabb. *American Journal of Conchology*, Vol. V, part 1, p. 25, 1869.

1870.—Orton, James. *The Andes and the Amazon*. Harper Brothers, published 1870.

- 1870.—Conrad, T. A. Description of new fossil shells from the Upper Amazon Tertiary. *Amer. Journ. Conchology*, Vol. VI, p. 192, 1870.
- 1870.—Nelson, Edward T. On the molluscan fauna of the late Tertiary of Peru. (From Zorritos, presented to Yale College in 1867 by E. P. Larkin and Prof. F. H. Bradley.) *Trans. Conn. Acad. Sci.*, Vol. 2, p. 186, 1870.
- 1873.—Raimondi, Antonio. El departamento de Ancachs y sus riquezas minerales. Lima, 1873. Parte segunda: Geología.
- 1874.—Conrad, T. A. Remarks on the Tertiary clays of the upper Amazon, with description of new shells. *Proc. Acad. of Nat. Sci. Phila.*, Vol. XXVI, p. 25, 1874.
- 1876.—Agassiz, Alexander. Hydrographic sketch of Lake Titicaca. *Proc. Amer. Acad. of Arts and Sci.*, 1876. New Series, Vol. III, p. 283.
- 1876.—Derby, O. A., and Agassiz, Alexander. Notice of the Paleozoic fossils (from Lake Titicaca region), with notes by Alexander Agassiz. *Bull. Mus. Comp. Zoology*, Harvard College, 1876, Vol. III, No. 12, pp. 276–286.
- 1876.—Agassiz, Alexander, and Pourtales, L. F. Recent corals from Tilibiche, Peru (now in Chile). *Bull. Mus. Comp. Zool. Harvard College*, Vol. III, p. 287, 1876.
- 1877.—Gabb, W. M. Description of a collection of fossils made by Dr. Antonio Raimondi, in Peru. *Journ. Acad. Nat. Sci.*, Philadelphia, 1877, new series, Vol. VIII, Part III, p. 263. (Contains a synopsis of South American invertebrate paleontology and a bibliography of South American paleontology).
- 1881.—Steinmann, Gustav. Über Tithon und Kreide in den Peruanischen Anden. *Neues Jahrbuch*, 1881, p. 130.
- 1883.—Pflücker y Rico, L. Apuntes sobre el distrito mineral de Yauli. *Anales de Const. Civiles y de Minas del Perú*, Tomo III, 1883.
- 1891.—Steinmann, G. "A sketch of the geology of South America." *American Naturalist*, 1891, pp. 855–860. Read before the Geological Society of America Aug. 25, 1891. This sketch accompanies a map which forms a second edition of the Physical Atlas of Berghausen (Gotha Justus Perthes). Abstract and discussion, *Bull. Geol. Soc. Amer.*, 1891, Vol. III, p. 13. Full paper in *American Naturalist*.
- 1892.—Ulrich, Arnold. Palaeozoische Versteinerungen aus Bolivien. Beilageband. *Neues Jahrbuch*, Vol. VII, p. 5, 1892.
- 1892.—Wolf, Theodoro. Geografía y Geología del Ecuador. Publicado por orden del Supremo Gobierno de la República (with 2 maps). Leipzig, 1892.
- 1897.—Balta, José. Observaciones hechas en un viaje á Carabaya 1897. *Bol. de la Soc. Geogr. de Lima*, T. VII, Nos. 1–2–3, Vol. for 1897–8.
- 1897.—Gerhardt, K. Beiträge zur Kenntniss der Kreideformation in Venezuela und Peru. *Neues Jahrbuch*, Beilageband XI, 1897.
- 1899.—Grzybowski, Josef. Die Tertiärablagerungen des nördlichen Peru und ihre Molluskenfauna. *Neues Jahrbuch*, Beilageband XII, 1899.
- 1899.—Balta, José. El system carbonífero en el Perú con un mapa. *La Revista Científica*, Tomo II, Lima, 1899.
- 1899.—Peruvian Meteorology, Solon I. Bailey and Edward C. Pickering. Cambridge, 1899. *Annals of the Astronomical Observatory of Harvard College* (at Arequipa, Peru), vol. 39, part 1. (See Chapter II on configuration and heights of the Andes, limits of perpetual snow, etc.)
- 1900.—Fuchs, F. C. Nota sobre el terreno carbonífero de la península de Paracas. *Bol. de Minas*, Tomo XVI, p. 50, Lima, 1900.
- 1902.—Raimondi, Antonio. El Perú. Tomo IV. Estudios mineralógicos y geológicos (primera serie), (1902), edited by José Balta.

1903.—Paulcke, W. Über die Kreideformation in Südamerika und ihre Beziehungen zu andern Gebieten. Neues Jahrbuch, Beilageband XVII.

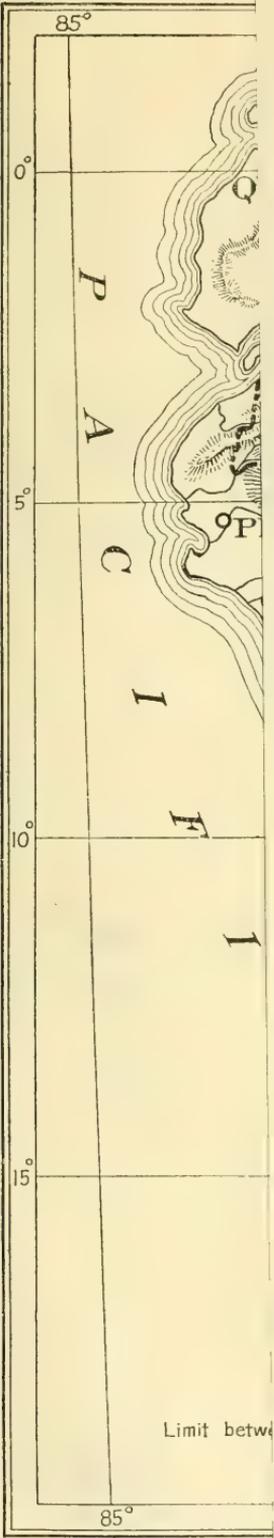
1904.—Steinmann, Gustav. Observaciones Geológicas de Lima á Chanchamayo. Bol. del Cuerpo de Ing. de Minas del Perú No. 12.

1906.—Steinmann, Gustav. Die Entstehung der Kupfererzlagerstätten von Coro-Coro (Bolivia). Rosenbusch Festschriften, 1906, pp. 335-368.

1906.—Dereims, Alfredo. Excursiones científicas 1901-4. Informe del Ingeniero Geologo, Alfredo Dereims, La Paz, 1906. Anexo de la Memoria de Gobierno y Fomento.

1906.—Hauthal, R. Quartäre vergletscherung der Anden in Bolivien und Peru. Zeitschrift für gletscherkunde Band I, Heft 3, p. 203, 1906.

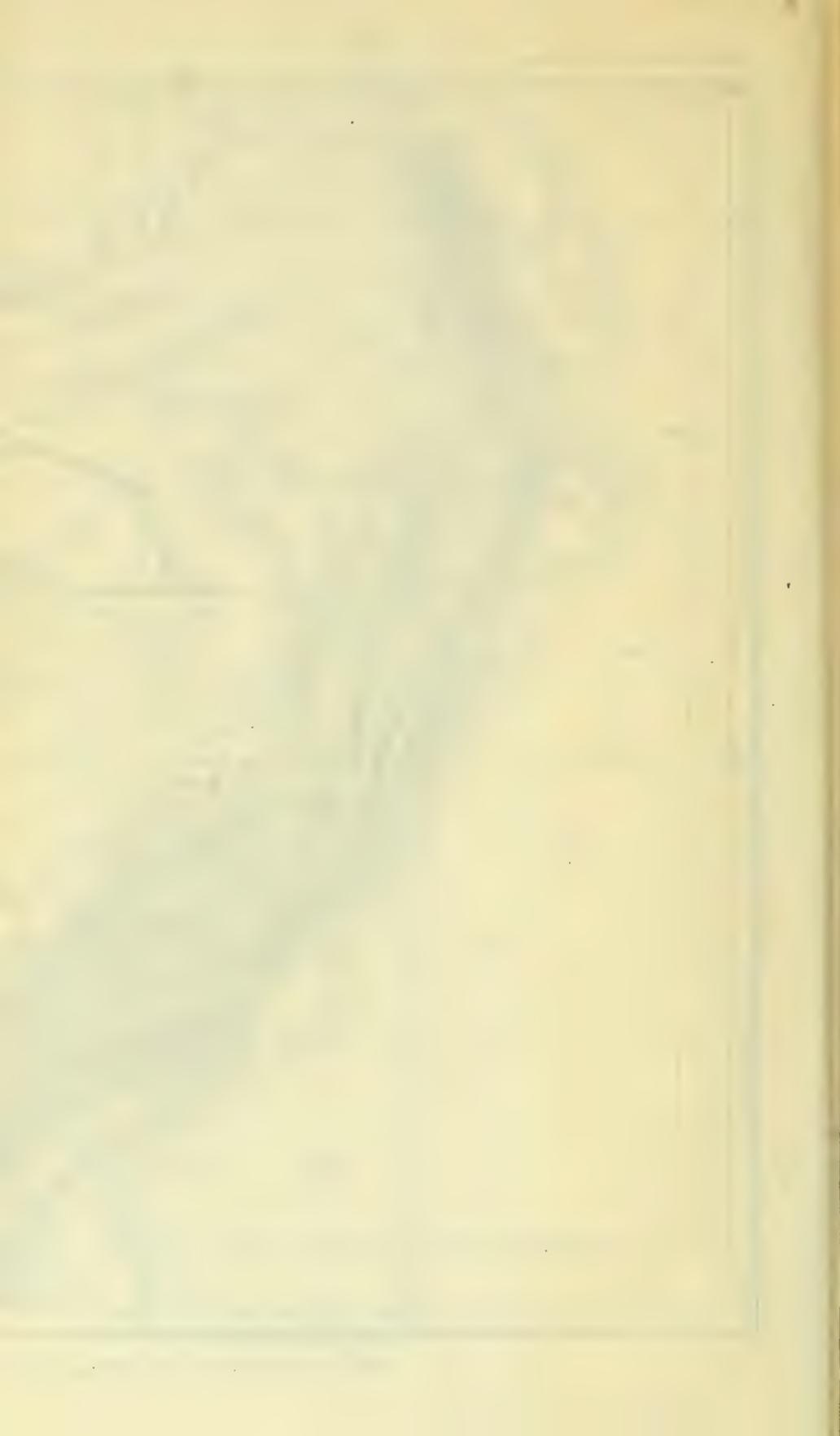
1907.—Neumann, Richard. Beiträge zur Kenntniss der Kreideformation in Mittel-Peru. Neues Jahrbuch, Beilageband XXIV, 1907.

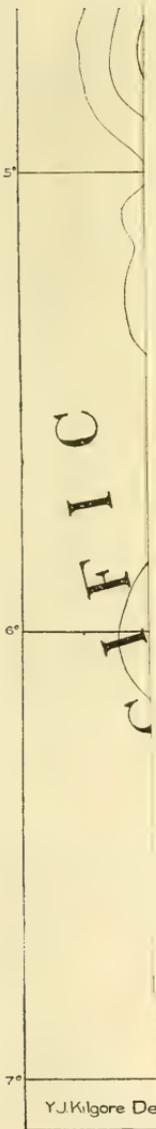






MAP OF PERU, SHOWING THE CORDILLERAS OF THE ANDES.





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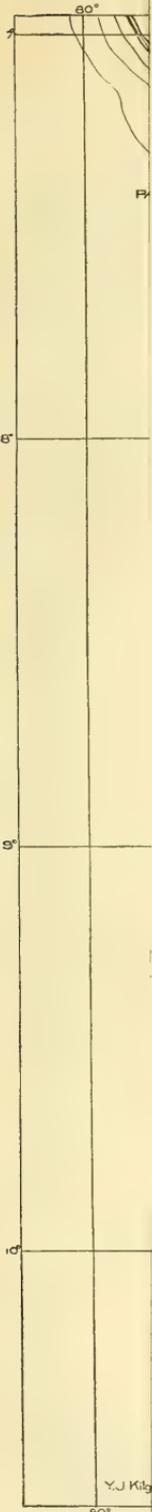
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HYDROLOGIC MAP OF THE NORTHERN DIVISION OF THE PACIFIC SLOPE OF PERU. DEPARTMENTS OF TUMBES, PIURA, AND LAMBAYEQUE.





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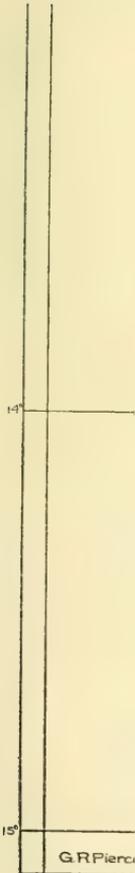
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75° West from Greenwich

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HYDROLOGIC MAP OF THE NORTH CENTRAL DIVISION OF THE PACIFIC SLOPE OF PERU. DEPARTMENTS OF LIBERTAD AND ANCACHS.





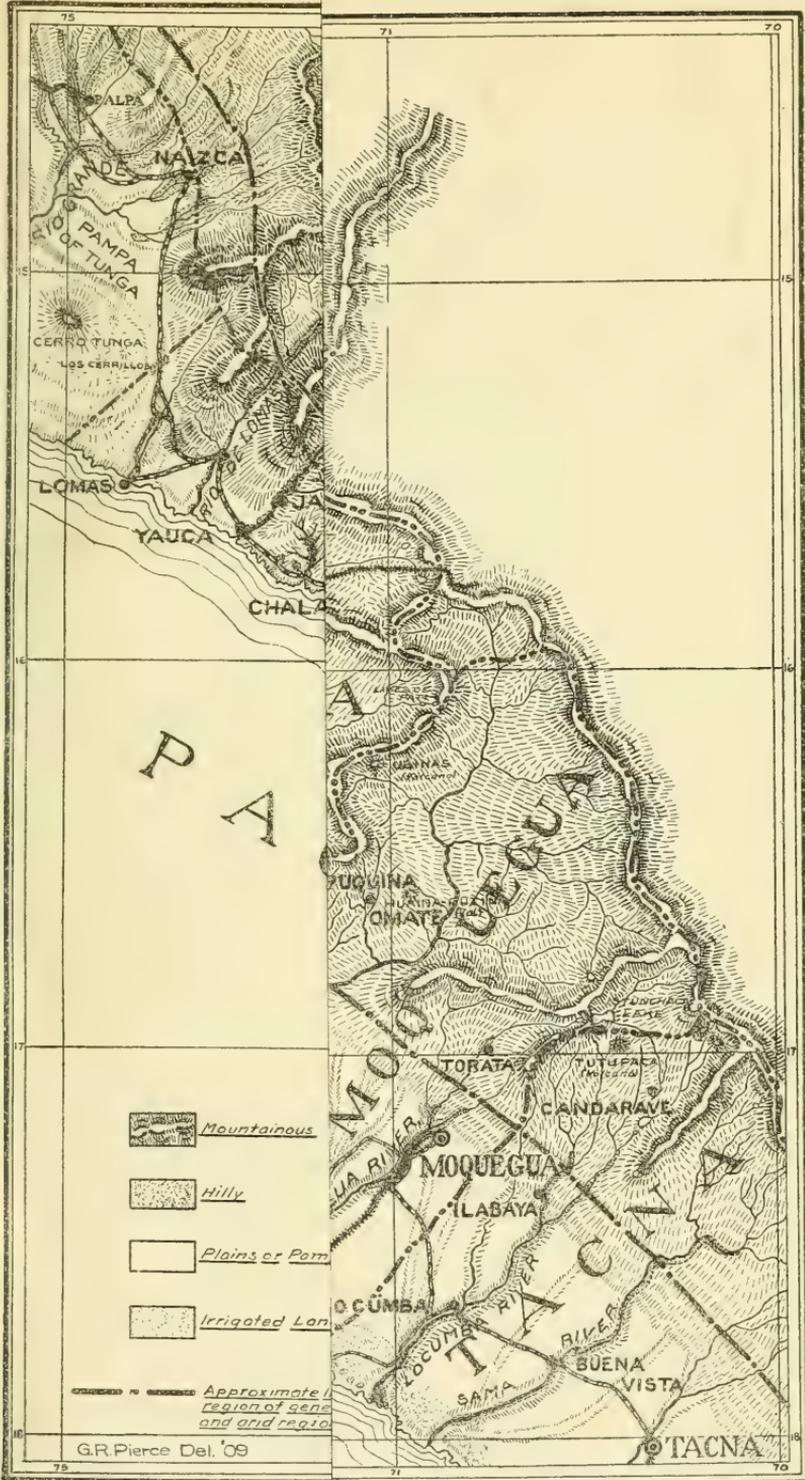
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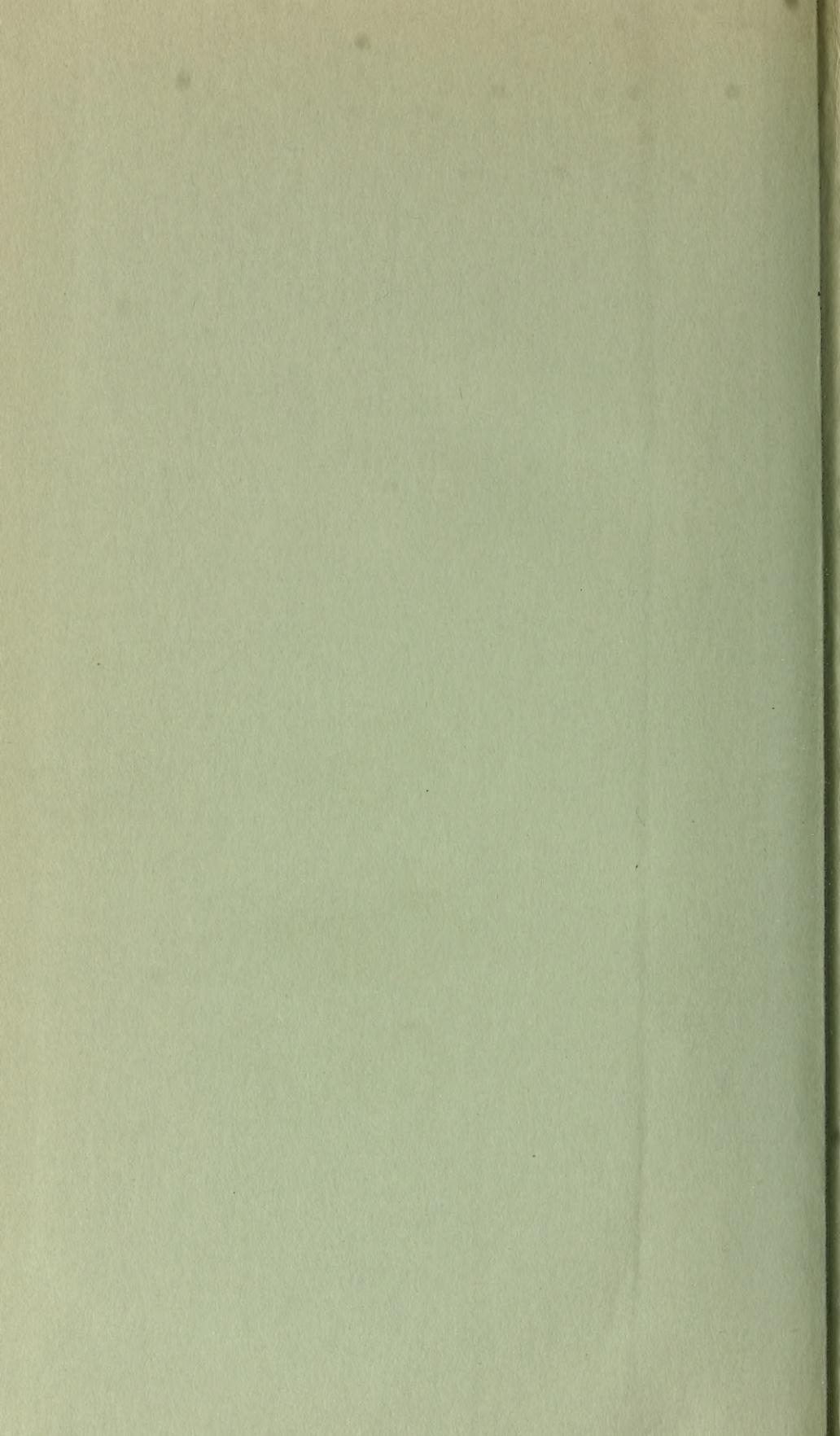
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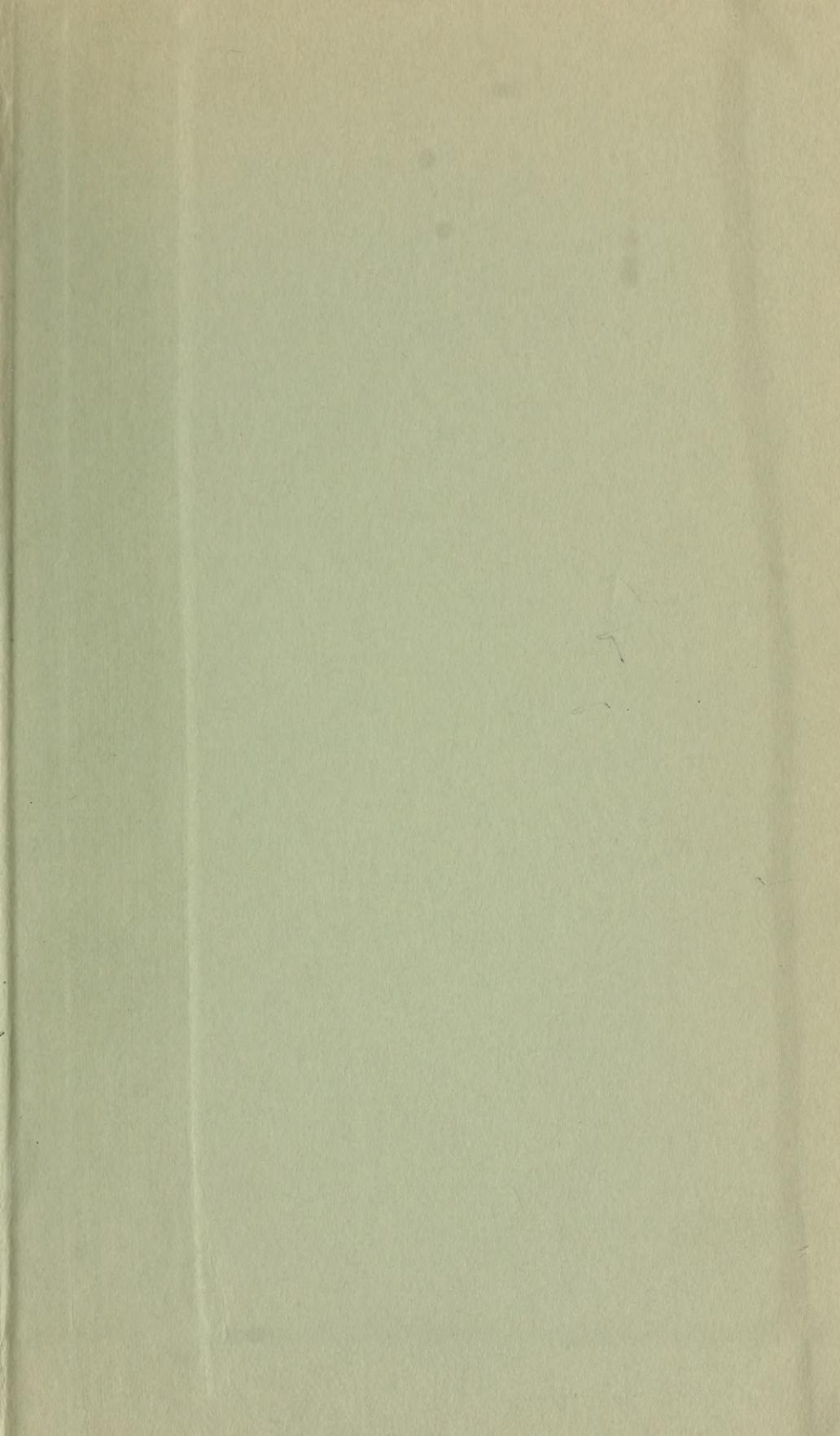
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