

# INTERTIDAL MOLLUSKS OF IQUIQUE, CHILE

---

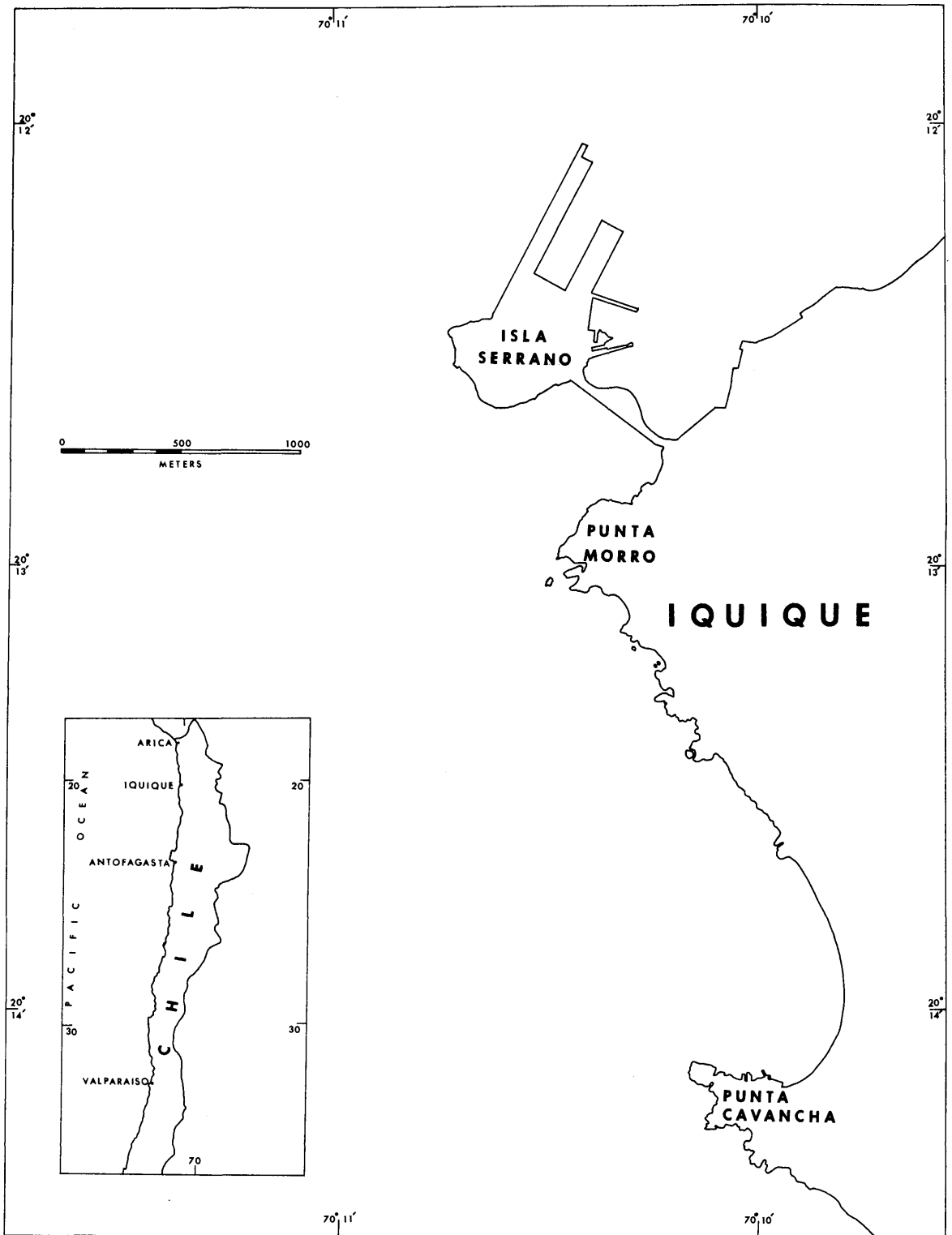
*By* LOUIE MARINCOVICH, JR.



NATURAL HISTORY MUSEUM  
LOS ANGELES COUNTY  
SCIENCE BULLETIN 16

FEBRUARY 20, 1973

INTERTIDAL MOLLUSKS OF IQUIQUE, CHILE



Location of Iquique in northern Chile

# INTERTIDAL MOLLUSKS OF IQUIQUE, CHILE

---

*By* LOUIE MARINCOVICH, JR.



NATURAL HISTORY MUSEUM  
LOS ANGELES COUNTY  
SCIENCE BULLETIN 16

FEBRUARY 20, 1973

PROFESSIONAL PUBLICATIONS OF THE NATURAL HISTORY  
MUSEUM OF LOS ANGELES COUNTY

The professional publications of the Natural History Museum of Los Angeles County include two series, *Contributions* and *Bulletins*. In the past, articles, monographs and catalogs in the fields of history and science have appeared under various headings—*Contributions*, *Science Series*, *History Leaflet Series* and unnumbered catalogs of exhibitions and collections. To simplify and to standardize matters, all professional publications of the History and Science Division of the Museum will now be issued at irregular intervals either as *Contributions*, or as *Bulletins*. The former will contain short, technical papers which may be occasionally gathered in volumes, octavo in size. The latter will contain longer, separate monographs and catalogs, usually quarto in size, although this will depend on the needs of the presentation. Papers in each series are to be numbered consecutively.

These papers are original articles and studies based on the collections and work of the Museum, presenting newly acquired information and understanding in the fields of Anthropology, Botany, Geology, History, Mineralogy, Paleontology, Technology and Zoology.

GILES W. MEAD, *Director*  
*Natural History Museum of*  
*Los Angeles County*

VIRGINIA D. MILLER  
*Editor*

All communications concerning science manuscripts, exchange of science publications, and the purchase of science publications should be sent to the Editor, Natural History Museum of Los Angeles County, 900 Exposition Boulevard, Los Angeles, California 90007.

*TABLE OF CONTENTS*

ABSTRACT .....	1
INTRODUCTION .....	1
ACKNOWLEDGMENTS .....	2
COLLECTING AREAS .....	2
FAUNAL CONSIDERATIONS .....	3
BIOGEOGRAPHY .....	6
LOCAL USE OF MOLLUSKS FOR FOOD .....	6
SYSTEMATIC ACCOUNT .....	7
RESUMEN .....	44
LITERATURE CITED .....	45

# INTERTIDAL MOLLUSKS OF IQUIQUE, CHILE<sup>1</sup>

By LOUIE MARINCOVICH, JR.<sup>2</sup>

**ABSTRACT:** Collections of intertidal mollusks made in the area of Iquique, northern Chile, in 1964 and 1970 were found to contain some new and many poorly known species of mollusks. Because little work has been done on Chilean mollusks, this report gives a synonymy, distribution, habitat, and illustration of each species, with additional remarks about some.

One new genus, *Salitra*, and 10 new species are described: *Nucula (Nucula) interflucta*, *Lyonsia delicata*, *Tricolia macleani*, *Eatoniella (Eatoniella) latina*, *Eatonina (Saginofusca) atacamae*, *Fartulum moorei*, *Aesopus aliciae*, *Salitra radwini*, *Iselica chilensis*, and *Iselica carotica*. Apparently undescribed species of *Bittium*, *Triphora*, and *Cerithiopsis* are only briefly described for lack of good specimens. Two new species of *Marinula* will be discussed by another worker.

## INTRODUCTION

Marine invertebrate faunas of the Peruvian province along the west coast of South America are of particular interest because they have not been extensively collected and studied. The steep, rugged coastline throughout much of the province is accessible by road at only a few places, so collecting has mostly taken place at widely scattered ports. One of the localities commonly cited in reports on mollusks of the Peruvian province is Iquique, on the coast of northern Chile at latitude 20° 13'S, but even there the fauna has never been thoroughly described.

The present report is based upon a collection of intertidal mollusks made by me at Iquique from June to September of 1964 and from June to July of 1970. Although most of the species reported here were found by carefully searching the intertidal zone, many of the mollusks are too small to be easily seen. Such small species were collected by using the common micropaleontological technique of flotation in heavy liquids to separate the mollusks and sediment.

Neglect of the Peruvian faunal province by modern molluscan workers is shown by a review of the literature, since the principal works on this region are long out-of-date. The first important work to mention Chilean mollusks was "Saggio sulla storia naturale del Chile" of Molina (1782), in which many of the most common mollusk species were described. The monumental "Voyage dans l'Amerique Meridionale" of Orbigny (1834-1847) is the most useful early work to include Chilean mollusks, giving a brief description and colored drawing of each species, and also cataloging numerous species from Peru and Argentina. The reports by G. B. Sowerby, I. W. J. Broderip and others in the 1830's on the prolific collecting of Hugh Cuming in western South America contain new locality data and descriptions of many new species, but lack the illustra-

tions that make Orbigny's work so valuable. An extensive work on the general zoology of Chile by Gay (1854) includes much descriptive material on mollusks written by Hupé, but illustrates only 39 species. Additional species were described by Philippi (1860) in his account of a natural history trip through the desert of northern Chile. Most later workers have neglected to adequately illustrate their works on Peruvian province mollusks, and the resultant difficulty in identifying specimens has been one major reason for the notable lack of interest in this region.

Dall's (1909) report on a collection of shells from Peru includes a checklist of all known littoral marine mollusks of the Peruvian province, with line drawings of a few common species, and is still the most useful reference for mollusks of this area. The Lund University reports on Chilean mollusks by Leloup (1956) on Polyplacophora, Marcus (1959) on Lamellariacea and Opisthobranchia, and Soot-Ryen (1959) on Pelecypoda include more up-to-date range and locality data, especially for the southern part of the Chilean coastline, plus photographs and line drawings of some species. A review of Panamic-Pacific pelecypods by Olsson (1961) deals mainly with species that occur to the north of the Peruvian province, but does include a few of the more common and widely ranging Chilean forms. Olsson's work also gives a concise historical account of early zoological expeditions to western South America. Illustrations of several species and detailed distributional data are included in a report by Ramorino (1968) on pelecypods from Valparaíso Bay. A recent checklist of Chilean

<sup>1</sup>REVIEW COMMITTEE FOR THIS BULLETIN

Eugene V. Coan  
William K. Emerson  
James H. McLean

<sup>2</sup>Museum Associate in Invertebrate Zoology, Natural History Museum of Los Angeles County; and Department of Geological Sciences, University of Southern California, Los Angeles, Calif. 90007

pelecypods by Osorio and Bahamonde (1970) is a summary of species reported in the literature. The revised edition of the major work by Keen (1971) on tropical west American mollusks includes several species that range into the Peruvian province. Peña (1970) gives a list of 203 gastropod species collected by him in Peru, and Dell (1971) reports on mollusks of the Royal Society of London Expedition to southern Chile.

A few shorter papers dealing with particular groups of mollusks such as the Fissurellidae (Riveros-Zuñiga, 1951) and the Veneridae (Riveros-Zuñiga and Gonzalez, 1950) or descriptions of new species (Stuardo, 1962) have also appeared, but the Peruvian province still contains the least adequately described molluscan fauna in the eastern Pacific. The high percentage of new species in the present collection, which almost exclusively contains intertidal mollusks, demonstrates the need for more descriptive work in Chile and Peru.

The geographic and bathymetric ranges of mollusks from this region are especially poorly known, owing to sparse modern collecting and imprecise locality data in the early literature. Thus, major changes in our knowledge of the ranges of some species are to be expected as the fauna becomes more thoroughly studied.

In this paper an attempt has been made to refine the northern range limits of Peruvian province species that are frequently cited as occurring in the Panamic province, particularly by Dall (1909). The Hancock collection of mollusks at the LACM contains sufficient material from Ecuador to suggest that absence in the collection of the questioned Peruvian province species is possibly evidence that they do not occur there. Accordingly, some ranges are restricted based on LACM records.

More so than for most other areas, the early literature on Chilean mollusks abounds in bibliographic inaccuracies, providing a serious problem in locating original species citations or constructing synonymies. The obscurity of many of the oldest works adds to the problem and means that an interested worker must devote more time to untangling the literature than to studying specimens. In the present report the synonymies are not intended to be exhaustive, but give works that contain illustrations, name changes, or detailed discussions.

Repositories of type materials described herein are as follows: AMNH, American Museum of Natural History, New York; ANSP, Academy of Natural Sciences, Philadelphia; CAS, California Academy of Sciences, San Francisco; LACM, Natural History Museum of Los Angeles County; SDNHM, San Diego Natural History Museum;

USNM, United States National Museum of Natural History.

#### ACKNOWLEDGMENTS

Throughout the course of preparing this report I have had the assistance of Dr. James H. McLean, Curator of Invertebrate Zoology at the Natural History Museum of Los Angeles County, and here gratefully acknowledge his part in it. During its early stages the text as a whole has been criticized by Dr. Clarence A. Hall, Jr., of the University of California at Los Angeles, and Dr. William H. Easton of the University of Southern California. I am particularly grateful to Dr. Eugene V. Coan, Research Associate at the California Academy of Sciences, and Dr. William K. Emerson, Curator of Living Invertebrates at the American Museum of Natural History, for their helpful suggestions.

I have benefited greatly from help with identification of some species, through correspondence or discussion, with a number of workers. Dr. Myra Keen of Stanford University was of particular help with bivalves; Dr. James H. McLean with the acmaeid limpets; Dr. Donald R. Moore, University of Miami, with the minute gastropods; and Mr. Spencer R. Thorpe, of El Cerrito, California, with the chitons. Others who assisted with specific problems of determinations are: Dr. S. Stillman Berry, of Redlands, California; Dr. Richard K. Dell of the Dominion Museum, Auckland, New Zealand; Mrs. Eveline Marcus of São Paulo, Brazil; Dr. Joseph P. E. Morrison of the U. S. National Museum of Natural History; Dr. Winston F. Ponder of the Australian Museum, Sydney; Dr. George E. Radwin of the San Diego Natural History Museum; and Dr. Joseph Rosewater of the U. S. National Museum. Their contributions are mentioned in the text.

Mrs. Dorothy Halmos, former librarian of the Allan Hancock Foundation Library, University of Southern California, and Miss Mary Ellen Pippin, the present librarian, greatly assisted in locating older works on Chilean mollusks.

I especially thank my father, Louie Marinovich, Sr., for making possible my first trip to Chile and helping me to collect specimens.

#### COLLECTING AREAS

Alternating rocky and sandy beaches form the coastline at Iquique (Frontispiece). The rocky beaches are a series of broad shelves and ledges, unprotected from the full force of the sea except for a few large nearshore rocks. I collected intensively in the intertidal zone immediately west of



the town and for one kilometer southward. Since wave action is strong, only coarse sand and gravel are found in the tide pools, and the molluscan assemblage is typical of an open coast. The physical environment affecting intertidal organisms at Iquique has been described by Guiler (1959).

The large brown alga *Lessonia nigrescens* Bory, 1826, is common at Iquique, where its holdfasts are attached in the area exposed at lowest tide and below. The limpet *Scurria scurra* (Lesson) lives exclusively in depressions that it excavates on the algal stipes and holdfasts, and *Hiatella solida* (Sowerby) is commonly nestled in the holdfasts, while *Entodesma cuneata* (Gray) is often attached to holdfasts washed ashore.

The sandy beaches near Iquique are also unprotected and subject to heavy wave action. The only mollusks found on them are *Oliva peruviana* Lamarck, which lives shallowly buried in sand of the swash zone, and *Mesodesma donacium* (Lamarck), which is buried just seaward of the area exposed at low tide. The only protected beach near Iquique was on the rocky headland of Punta Morro, immediately west of the town. It was a small beach, 40 m deep by 15 m wide at low tide, consisting of sandy black silt with interspersed cobbles and boulders. Many of the small gastropods not present elsewhere lived at this locality. When I revisited Iquique in June and July of 1970, this small beach, unique in the Iquique area, had been destroyed by housing construction.

In addition to Iquique, less complete collections were made at Playa Blanca, Punta Gruessa, and Patillos, about 8, 17, and 65 kms south of Iquique, respectively. Playa Blanca is an exposed low rocky shelf of gently dipping shale beds uncovered at low tide. The mollusks most common at Iquique are the only ones present at Playa Blanca, and even these do not occur in large numbers.

Punta Gruessa is a small point consisting of volcanic rocks that are distinctly green when seen from a distance, with outcrops that are massive, steep, and fully exposed to heavy surf. *Scurria viridula* (Lamarck), *Enoplochiton niger* (Barnes), and *Acanthopleura echinata* (Barnes) are common on bare rock surfaces and along wave-cut channels and ledges, especially around the holdfasts of *Lessonia nigrescens*, which seem to afford some protection from the waves. On the south side of the point, a small boulder and gravel beach is semiprotected by rock outcrops on both sides. Many of the mollusks common at Iquique are found here and the small gastropod *Tricolia umbilicata* (Orbigny) is especially abundant.

The fishing village of Patillos is another rocky shore locality, consisting of many massive rocky

fingers projecting seaward and separated by narrow (7-20 m wide) wave-cut channels that have boulder and gravel beaches at their heads. The rock walls bounding the channels are vertical and up to 10 m high. *Acanthopleura echinata* (Barnes) and *Scurria viridula* (Lamarck) are abundant on exposed surfaces and *Diloma nigerrima* (Gmelin) is clustered in crevices and beneath boulders on the gravel beaches.

#### FAUNAL CONSIDERATIONS

The Peruvian faunal province includes 1800 kms of coastline in Peru (south of 5°40'S) and 2800 kms of coastline in Chile (to about 42°S) (Olsson, 1961). On the basis of published records and personal observations, Olsson (1961:35) estimated a total of 386 species of shell-bearing mollusks from the region between Punta Aguja, Peru, and Chiloe Island, Chile, of which only 292 were considered indigenous to the Peruvian province. At least three times as many species are known from a region of similar size and environmental diversity along the coast of western North America from Alaska to Baja California. This great difference in numbers of species between the two similar regions partly indicates the extent to which the mollusks of the Peruvian faunal province have been neglected.

Garth (1957) has emphasized that the geographical and hydrological similarities between the west coast of South America (below 6°S) and the west coast of North America from Punta Eugenia (28°N) to the Bering Sea are reflected by the generally analogous development of the crustacean faunas. Both the Peruvian province of South America and the combined Californian, Oregonian and Aleutian provinces of North America include long stretches of rugged and exposed coastline with interspersed sandy beaches and occasional embayments. Both regions have relatively cool currents that flow toward the equator, profoundly affecting the faunas. Upwelling cold water and its effects on the coastal faunas of the north temperate region have long been recognized. Upwelling is also common in the south temperate region, but the distribution of the mollusks there is still too imperfectly known to show its effects.

The occurrence of genera common to both northern and southern regions is striking and is well illustrated in the present collection, in which 49 molluscan genera out of a total of 68 are also found in the combined Californian, Oregonian, and Aleutian provinces. Similarities between the molluscan faunas of the two areas can also be seen



TABLE 1 (continued)

Species	Californian Province		Panamic Province			Peruvian Province				Magellanic Province
	40°N	30°N	20°N	10°N	0°	10°S	20°S	30°S	40°S	50°S
<i>Eatoniella latina</i> , sp. nov.							-			
<i>Eatonina atacamae</i> , sp. nov.							-			
<i>Rissoina inca</i>							.....			
<i>Omalogyra</i> cf. <i>O. atomus</i>							-			
<i>Cyclostremiscus trigonatus</i>			-	.....			-			
<i>Turritella cingulata</i>						.....	-			
<i>Caecum chilense</i>						-	-			
<i>Fartulum moorei</i> , sp. nov.							-			
<i>Bittium</i> , sp. indet.							-			
<i>Cerithiopsis</i> , sp. indet.							-			
<i>Triphora</i> , sp. indet.							-			
<i>Calyptrea trochiformis</i>						-	-			
<i>Crepipatella dilatata</i>						-	-			
<i>Crucibulum quiriquinae</i>						-	-		.....	
<i>Priene rude</i>						-	-			
<i>Xanthochorus buxeus</i>						-	-			
<i>Crassilabrum crassilabrum</i>						-	-			
<i>Thais chocolata</i>						.....	-			
<i>Thais haemastoma</i>			-	-		-	-			
<i>Concholepas concholepas</i>			-	-		-	-		.....	
<i>Aesopus aliciae</i> , sp. nov.							-			
<i>Mitrella unifasciata</i>							-			
<i>Cilara secalina</i>							-			
<i>Salitra radwini</i> , sp. nov.							-			
<i>Nassarius dentifer</i>							-			
<i>Nassarius gayi</i>							-			
<i>Oliva peruviana</i>						.....	-			
<i>Mitra orientalis</i>						.....	-			
<i>Agathotoma ordinaria</i>						-	-			
<i>Iselica chilensis</i> , sp. nov.							-			
<i>Iselica carotica</i> , sp. nov.							-			
<i>Odostomia chilensis</i>							-			
<i>Onchidella marginata</i>							-			
<i>Marinula</i> , sp. A							-			
<i>Marinula</i> , sp. B							-			
<i>Sarnia frumentum</i>							-			
<i>Siphonaria lessoni</i>						-	-			
<i>Trimusculus peruvianus</i>						.....	-			
<i>Chiton cumingsii</i>						-	-			
<i>Chiton granosus</i>						-	-			
<i>Enoplochiton niger</i>						.....	-			
<i>Acanthopleura echinata</i>						-	-			
<i>Chaetopleura peruviana</i>							-			

in the like number of species of common genera. For example, there are a similar number of species of *Tegula* reported from the Peruvian province and from the western North American provinces, and both areas have abundant and diverse acmaeid limpet assemblages. Fifty-two chitons are listed by Leloup (1956) from Chile alone, with more species living only in Peru, while over 100 are described from the more thoroughly collected coast of western North America.

It is tempting to draw parallels in numbers and species of mollusks common to the cool-temperate regions of western North and South America, but as Garth (1957) has noted for the crustaceans, this would require a more detailed knowledge of the Chilean and Peruvian species than we have at present. It is equally important to keep in mind the differences between the two regions, the most obvious of which is the presence of numerous *Fissurella* species in the south and only one in the north, and the many *Haliotis* species in the north compared to none in the south. In general, however, overall similarity between the two molluscan faunas is apparent and will surely be emphasized as knowledge of the Peruvian province mollusks accumulates.

#### BIOGEOGRAPHY

Table 1 lists the intertidal mollusks found at Iquique, Chile, and graphically gives their distributions throughout eastern Pacific latitudes. Reliable range data, based on museum specimens or literature citations, are given as solid lines in the table, whereas less reliable data are given as dotted lines. In the case of *Sinezona rimuloides* (Carpenter) the dotted line represents the apparent absence of this species between two verified but widely separate occurrences. Of the 88 species of mollusks in this report, 10 are new species, and five are identified only to the genus level. Of the 73 remaining species, 46 have well-documented ranges entirely within the limits of the Peruvian faunal province, although some of these species have been doubtfully reported from adjoining provinces. Only two of the 73 species are known to occur throughout the entire province, with their northern and southern end-points at the provincial boundaries. Seven of the species overlap significantly into the Panamic province, and 18 overlap into the Magellanic province. Based on reliable data, only seven of the species have their southern end-points at about 42°S latitude, the traditional southern limit of the Peruvian Province, whereas 15 species have their northern end-points near the accepted provincial

limit of about 5°40'S. An additional five species have their southern end-points at 45°S. The southern tip of South America is at about 55°S, and is the known end-point for several Peruvian province mollusks.

Several of the common end-points of ranges are artifacts of collecting, including Callao, Peru (12°S), and Iquique (20°S), Valparaíso (33°S), and Bahía Concepción and Talcahuano (37°S), Chile. These places have been visited more often by collectors, and thus appear commonly as localities in the literature.

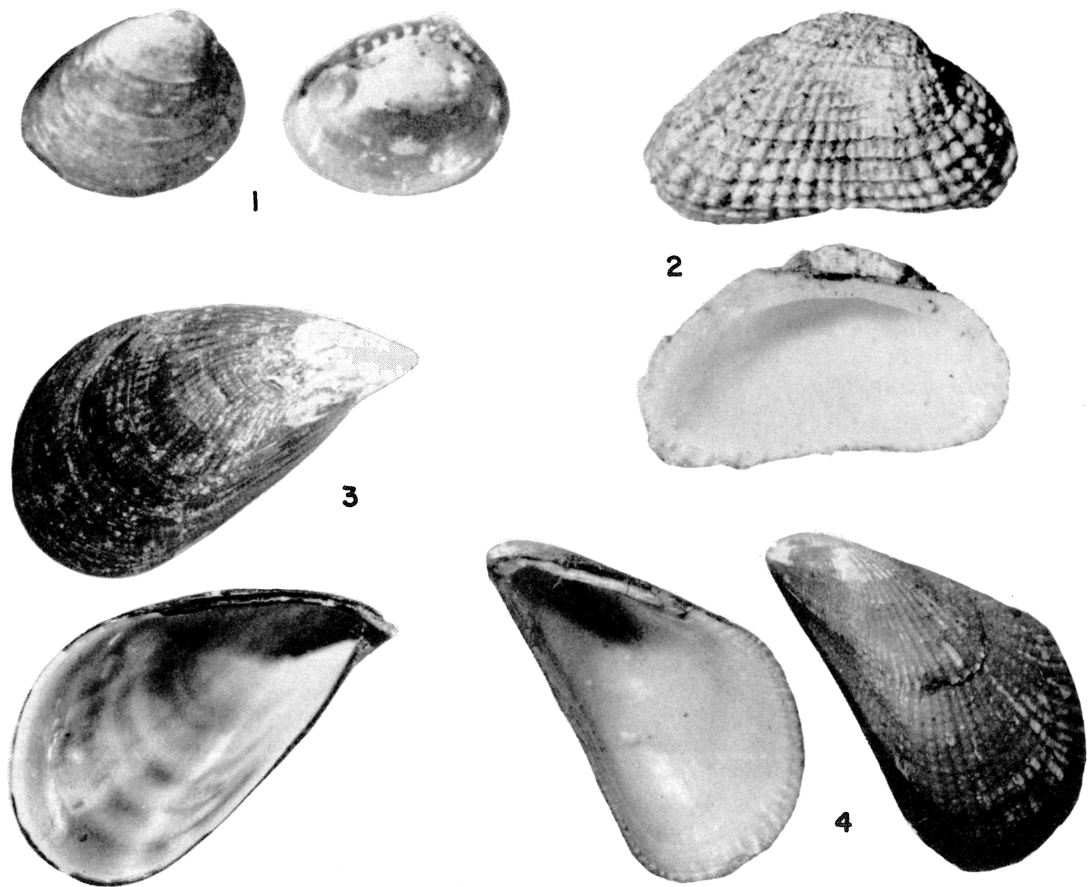
Based on the 73 species discussed above, the following conclusions may be reached: 1) the presently known range end-points of many, and perhaps most, Peruvian province mollusks are the result of limited collecting rather than environmental conditions; 2) the northern limit of the Peruvian province is much better documented than is the southern limit; 3) the transition from cool-temperate to tropical waters at the northern limit of the Peruvian province may be a more effective barrier to species dispersal than is the transition from cool-temperate to subantarctic waters at the southern limit of the province.

#### LOCAL USE OF MOLLUSKS FOR FOOD

Several species of mollusks are commercially exploited for food in Iquique. *Concholepas concholepas* (Bruguère) is called "loco" and is so popular a food that large specimens cannot be found within 2 kms of Iquique, and discarded shells litter the local beaches. The various species of *Fissurella*, collectively called "lapas", are also popular and always available in outdoor markets. Because even small specimens of these are collected and eaten, they are also hard to find near Iquique. Large individuals of *Scurria viridula* (Lamarck) are occasionally eaten.

*Protothaca thaca* (Molina), *Semele solida* (Gray), *Gari solida* (Gray) and *Eurhomalea rufa* (Lamarck) are the clams most commonly sold in markets and are all called "almejas." Even though these species are heavily harvested, they are still abundant near Iquique. *Mesodesma donacium* (Lamarck) is referred to as "macha" and appears in the markets occasionally, while the large mussel *Aulacomya ater* (Molina) is sold in large quantities.

Large chitons such as *Acanthopleura echinata* (Barnes) and *Enoplochiton niger* (Barnes) are not sold in markets, but are often eaten raw by people collecting food along the shore. They are not popular because the foot is very tough. Large specimens can still be found near Iquique.



FIGURES 1-4. 1, *Nucula (Nucula) interflucta* sp. nov., Holotype, length 1.12 mm; 2, *Barbatia (Acar) pusilla*, length 10 mm; 3, *Aulacomya ater*, length 70 mm; 4, *Brachidontes granulata*, length 11 mm.

#### SYSTEMATIC ACCOUNT

Phylum Mollusca  
 Class Bivalvia  
 Subclass Palaeotaxodonta  
 Order Nuculoida  
 Family Nuculidae  
*Nucula* Lamarck, 1799  
 Subgenus *Nucula*, s.s.

***Nucula (Nucula) interflucta***, new species  
 Figure 1

*Diagnosis:* Distinguished from other Chilean *Nucula* species by its small size, rounded trigonal outline, and regular concentric ribs, and by having five anterior teeth and three posterior teeth in each valve.

*Description of holotype:* Shell small for genus, buff to medium brown in color; valves thin, polished and semi-opaque. Anterior end produced and rounded, posterior end shorter and more broadly rounded. Beaks small; anterior dorsal margin

slightly elevated and gently rounded; ventral margin essentially smooth, with trace of crenulations on inner side. Sculpture of closely spaced concentric ribs with somewhat wrinkled appearance, and obsolete on beaks. Interior of shell smooth and glossy, with faint marginal crenulations; pallial line faint; adductor muscle scars subequal; chondrophore deep, elongate, triangular, with oblique axis. Hinge teeth long, well developed, pointed, and slightly curved, with five in anterior series and three in posterior series. Dimensions (in mm): height 1.00, width 1.12.

*Type locality:* Punta Morro, Iquique, Chile, 20° 13'S, 70° 10' 25"W; lower intertidal zone, in black sandy silt among cobbles and boulders of a protected beach, August, 1964, 2069 specimens.

*Type material:* Holotype, LACM 1581; 1968 paratypes, LACM 1582; 20 paratypes, USNM; 20 paratypes, CAS; 20 paratypes, AMNH; 20 paratypes, SDNHM; 20 paratypes, ANSP.

*Discussion:* *Nucula interflucta* is the smallest

recorded species of this genus from the eastern Pacific, and seems to be the only one reported from the intertidal zone. It resembles *N. schencki* Hertlein and Strong, 1940, from the Pacific coast of southernmost Mexico, more closely than it does any other eastern Pacific species. However, the more trigonal outline, smaller size, lack of radiating exterior striae, and fewer hinge teeth of the present species easily separate it from the latter. *N. schencki* also has marginal crenulations better developed than does *N. interflucta*.

The species name is derived from the Latin words *inter*, between, and *fluctus*, flood, referring to the intertidal occurrence of this species.

Subclass Pteriomorphia

Order Arcoida

Family Arcidae

*Barbatia* Gray, 1842

Subgenus *Acar* Gray, 1857

*Barbatia (Acar) pusilla* (Sowerby, 1833)

Figure 2

*Byssarca pusilla* Sowerby, I, 1833:18-19.

*Acar pusilla*, Reinhart, 1939:39-45, pl. 3, figs. 2a-b; Rost, 1955:191-192, pl. 12, fig. 13; Soot-Ryen, 1959:20.

*Barbatia (Acar) pusilla*, Noda, 1966:68-69.

**Occurrence:** Attached to undersides of rocks and in crevices, usually in clusters of three to five, common. Shells oriented with ventral margins pressed firmly to the substrate by a short, ribbon-like byssus originating from midway along the ventral margin, or slightly anteriorly. Iquique specimens: 94.

**Distribution:** Dall (1909) records this species from Ecuador south to Isla Blanca, Chile (23°37'S). However, it is not known in the Panamic province, and its northern range limit is probably in northern Peru. Type locality: Iquique, Chile (Sowerby, 1833).

**Remarks:** *Barbatia pusilla* has been considered a fairly rare species with an imperfectly known habitat. The presence of this species at Iquique confirms that its habitat is at least in part intertidal, and that it is not rare at all locations.

Order Mytiloida

Family Mytilidae

*Aulacomya* Mörch, 1853

*Aulacomya ater* (Molina, 1782)

Figure 3

*Mytilus ater* Molina, 1782:202; Carcelles and Williamson, 1951:329.

*Mytilus magellanicus* Lamarck, 1819, vol. 6, pt. 1:119; Dall, 1909:151, 258, pl. 25, fig. 4.

*Aulacomya ater*, Soot-Ryen, 1955:33-34, pl. 1, fig. 6, text-figs. 17, 18; 1959:26-27.

**Occurrence:** Common in masses within the lower intertidal zone and subtidally, attached by byssal threads to exposed rocks. Iquique specimens: 144.

**Distribution:** Callao, Peru, to the Magellanic region and north to southern Brazil and the Falkland Islands (Soot-Ryen, 1959). Type locality: Straits of Magellan (Soot-Ryen, 1959).

**Remarks:** The valves of this mussel commonly bear attached specimens of *Crepipatella dilatata* (Lamarck).

*Brachidontes* Swainson, 1840

*Brachidontes granulata* (Hanley, 1843)

Figure 4

*Mytilus granulatus* Hanley, 1843:246, pl. 24, fig. 33.

*Hormomya granulata*, Carcelles and Williamson, 1951:330; Soot-Ryen, 1955:40, pl. 3, fig. 12, text-fig. 26; 1959:27-28; Dell, 1971:172.

**Occurrence:** Attached by short byssal threads to the undersides of rocks in the lower intertidal zone, usually in clusters of 10-20 individuals, sometimes in clusters of several hundred. Iquique specimens: 284.

**Distribution:** Lobos, Peru, to the northern part of Isla Chiloé (Canal Chacao) and in Seno Reloncaví, Chile (Soot-Ryen, 1959). Type locality: South America (Hanley, 1843).

**Remarks:** *Hormomya* Mörch, 1853, is considered to be a junior synonym of *Brachidontes* by Ken in Keen (1971:61). Individuals of *B. granulata* almost always have specimens of *Lasaea* cf. *L. petitiana* (Récluz) among their byssal threads.

*Lithophaga* Röding, 1798

Subgenus *Labis* Dall, 1918

*Lithophaga (Labis) peruviana* (Orbigny, 1846)

Figure 5

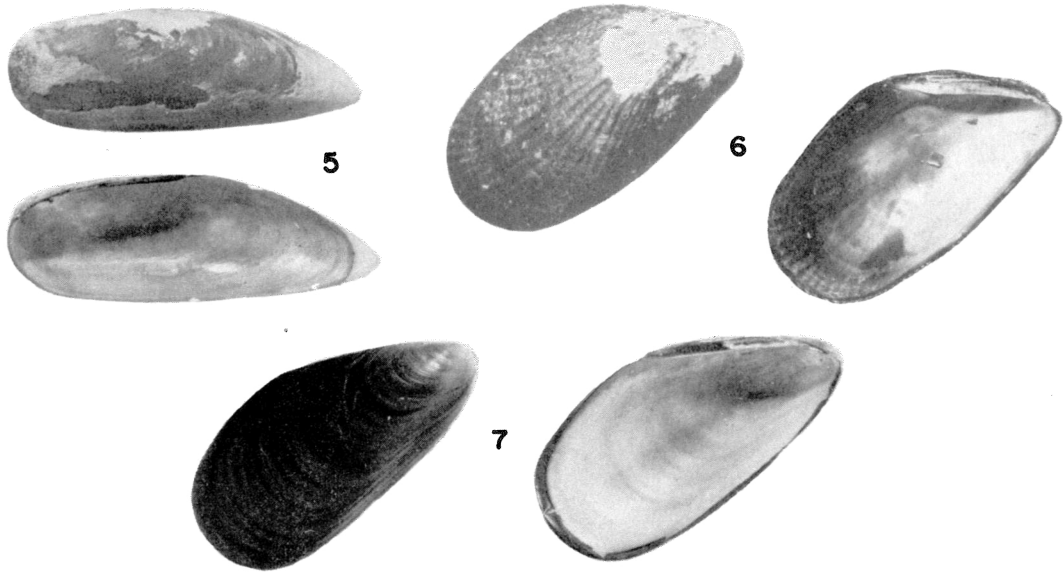
*Lithodomus peruvianus* Orbigny, 1846, vol. 5:651.

*Lithophaga peruviana*, Dall, 1909:259; Carcelles and Williamson, 1951:328; Soot-Ryen, 1955:100-101, pl. 10, fig. 58; Olsson, 1961:135, pl. 15, figs. 2, 2a.

**Occurrence:** Boring into the thick portions of the shell of *Concholepas concholepas* (Bruguière), as many as 8 borers living in the same large gastropod shell. Iquique specimens: 101.

**Distribution:** Callao, Peru, to Concepción, Chile (Carcelles and Williamson, 1951). Type locality: Callao, Peru (Orbigny, 1846).

**Remarks:** These specimens confirm the presence of this species in Chile, as Soot-Ryen (1959:23-24,



FIGURES 5-7. 5, *Lithophaga (Labis) peruviana*, length 32 mm; 6, *Perumytilus purpuratus*, length 25 mm; 7, *Semimytilus algosus*, length 21 mm, from Valparaíso.

28) noted that previous records from Chile have unreliable locality data. Since *L. peruviana* is very common at Iquique, its range probably extends farther southward along the Chilean coast. Although *L. attenuata* (Deshayes) has been reported from Chile (Hertlein and Strong, 1946:74-75), I did not find it at Iquique. The spinelike median posterior projection on the Iquique specimens serves to identify them as *L. peruviana*. The largest specimen has the following dimensions (in mm): length 33.5, height 10.5, diameter 10.3.

*Perumytilus* Olsson, 1961  
*Perumytilus purpuratus* (Lamarck, 1819)  
 Figure 6

*Modiola purpurata* Lamarck, 1819, vol. 6, pt. 1:113.  
*Modiolus purpuratus*, Dall, 1909:153, 258.

*Brachidontes purpuratus*, Carcelles and Williamson, 1951:328; Soot-Ryen, 1955:45, pl. 4, fig. 18, text fig. 30; 1959:28; Dell, 1971:172.

*Perumytilus purpuratus*, Olsson, 1961:117, pl. 12, fig. 1, pl. 14, figs. 1, 1b.

**Occurrence:** Attached by byssal threads, it occurs throughout the intertidal zone, especially on the outer portion of rocky reefs, where it forms densely packed masses. Iquique specimens: 621.

**Distribution:** Ecuador, south to the Straits of Magellan, and north to Santa Cruz, Argentina (Soot-Ryen, 1959). Type locality: unknown.

**Remarks:** This is the most common mussel in the area studied and can be observed wherever there is suitable rocky substrate.

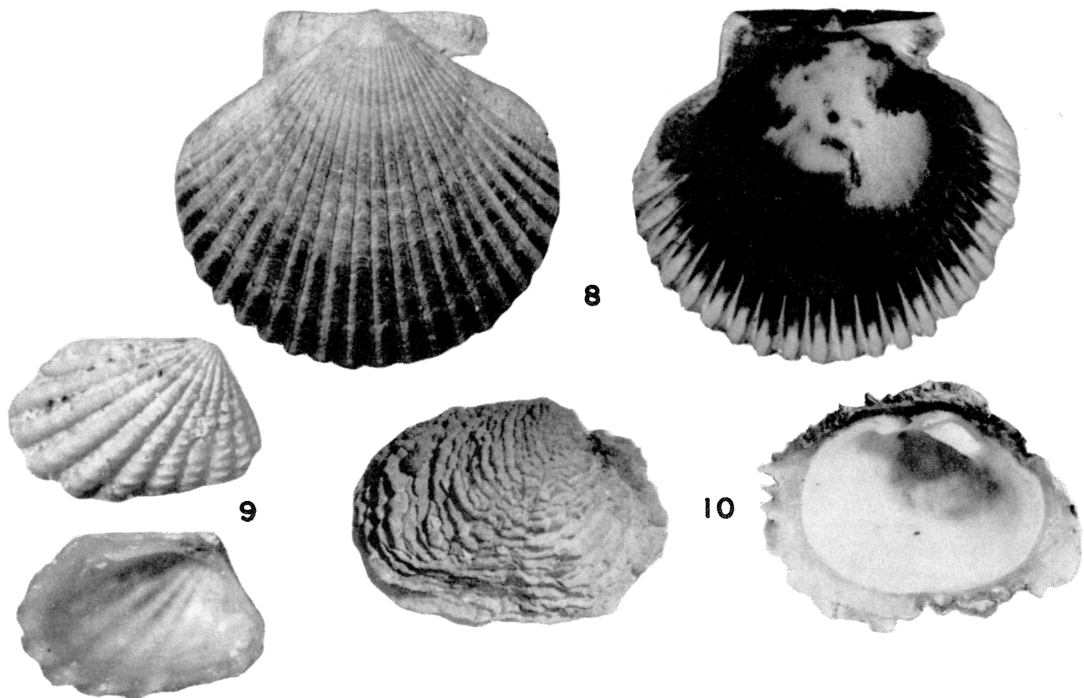
*Semimytilus* Soot-Ryen, 1955  
*Semimytilus algosus* (Gould, 1850)  
 Figure 7

*Mytilus algosus* Gould, 1850:344.

*Semimytilus algosus*, Soot-Ryen, 1955:25-29, pl. 4, fig. 17, text figs. 8, 9, 14-16; 1959:25-26; Olsson, 1961:114-115, pl. 14, fig. 8.

**Occurrence:** Masses of individuals bound together by their interwoven byssal threads are common in semiprotected parts of the lower intertidal zone, especially along the walls of tide pools. Specimens collected at Iquique average about 10 mm in length, while specimens taken from the bottom of a fishing boat in drydock at Valparaíso average about 20 mm in length. One of the Valparaíso specimens is figured. Iquique specimens: approximately 500; Valparaíso specimens: 56.

**Distribution:** Olsson (1961) indicates that this species is probably confined to waters south of the Panamic province. It is known at Paita, Peru (LACM), and as far south as the Gulf of Arauco (Soot-Ryen, 1959). Type locality: Valparaíso, Chile (designated by Soot-Ryen, 1959).



FIGURES 8-10. 8, *Argopecten purpuratus*, length 100 mm; 9, *Carditella tegulata*, length 4.5 mm; 10, *Chama pellucida*, length 44 mm.

Order Pterioida  
Family Pectinidae

*Argopecten* Monterosato, 1889

*Argopecten purpuratus* (Lamarck, 1819)

Figure 8

*Pecten purpuratus* Lamarck, 1819, vol. 6, pt. 1:166; Reeve, 1852, vol. 8, *Pecten*, pl. 5, sp. 25; Dall, 1909:256.

*Pecten (Aequipecten) purpuratus*, Grant and Gale, 1931:207-212, pl. 4, figs. 2a-c, pl. 5, figs. 1, 4, pl. 8, fig. 3.

*Chlamys (Argopecten) purpurata*, Grau, 1959:103-105, pl. 34.

*Plagioctenium purpuratum*, Soot-Ryen, 1959:31.

*Aequipecten (Plagioctenium) purpuratus*, Olsson, 1961:162-163, pl. 19, figs. 1, 1a-b.

*Chlamys (Aequipecten) purpurata*, Herm, 1969:107-109, pl. 4, figs. 1-5.

*Argopecten purpuratus*, Waller, 1969:48-49, pl. 7, figs. 7-10.

**Occurrence:** Sandy bottom, in 5 m depth near shore. Iquique specimens: 7.

**Distribution:** Sechura Bay and Paita, Peru (Olsson, 1961), to Coquimbo, Chile (Dall, 1909). Grau (1959) gave the northern range limit as Corinto, Nicaragua, but Keen (1971) does not mention this species from the Panamic Province. Type locality: Callao, Peru (designated by Grau, 1959).

Subclass Heterodonta

Order Veneroidea

Family Carditidae

*Carditella* Smith, 1881

*Carditella tegulata* (Reeve, 1843)

Figure 9

*Cardita tegulata* Reeve, 1843 (September), vol. 1, *Cardita*, pl. 9, fig. 48; 1843 (December): 194. *Carditella tegulata*, Dall, 1909:262; Carcelles and Williamson, 1951:334; Soot-Ryen, 1959:40, pl. 1, fig. 11.

**Occurrence:** Attached by a thin byssal thread to the undersides of rocks in gravel of lower intertidal zone, abundant. Iquique specimens: 959.

**Distribution:** Callao, Peru, to the Straits of Magellan (Soot-Ryen, 1959). Type locality: Valparaíso, Chile (Reeve, 1843).

**Remarks:** The byssal attachment of *C. tegulata* was noted as follows: a single thin and colorless thread issues from the middle of the ventral shell margin. This thread is flexible and can be stretched three to four times its original length before breaking. At its attachment point on the substrate the thread divides into three to five parts that branch off at different points. I have seen this byssus in the field, and its more detailed nature was observed on an individual attached to the inside of a plastic vial.



## Family Chamidae

*Chama* Linnaeus, 1758*Chama pellucida* Broderip, 1835

## Figure 10

*Chama pellucida* Broderip, 1835b:302-303, pl. 38, fig. 3; 1836:149; Soot-Ryen, 1959:40; Olsson, 1961:225, pl. 33, figs. 2, 2a, pl. 34, fig. 5; Herm, 1969:115, pl. 5, fig. 6.

non *Chama pellucida* "Sowerby", Keep, 1888:182, fig. 155.

**Occurrence:** Attached to cobbles firmly wedged into gravel-filled crevices in lower intertidal zone. Iquique specimens: 22.

**Distribution:** Santa Elena, Ecuador (Olsson, 1961) to Tocopilla, Chile, and the Juan Fernandez Islands (Soot-Ryen, 1959). Type locality: Iquique, Chile (Broderip, 1835).

**Remarks:** Many previous workers have mistakenly cited Broderip, 1836, as the original species description, but published compilations of dates for the Zoological Society of London (Waterhouse, 1937; Peavot, 1937) show that their Transactions volume appeared before their Proceedings volume. The authorship of this species has also mistakenly been attributed to Sowerby by many authors, beginning with Keep (1888).

A species long identified as *C. pellucida* also occurs in the Californian province of western North America, but not in the Panamic province. How-

ever, the northern species apparently differs from *C. pellucida* in its form (S.S. Berry, personal communication) and shell microstructure (H. Lowenstam, personal communication), and will be re-named by others at a later date.

## Family Erycinidae

*Lasaea* Brown, 1827*Lasaea* cf. *L. petitiana* (Récluz, 1843)

## Figure 11

*Poronia petitiana* Récluz, 1843:175.

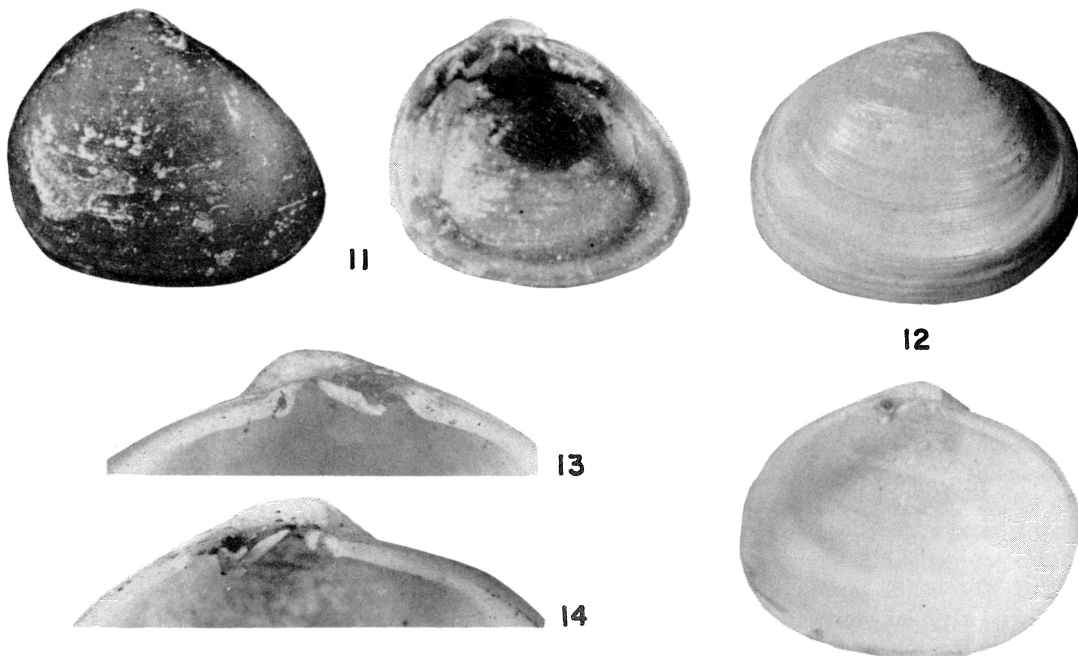
*Lasaea petitiana*, Dall, 1909:264; Keen, 1938:19, 22; Hertlein and Strong, 1947:136; Carcelles and Williamson, 1951:339; Soot-Ryen, 1959: 51-52, pl. 2, fig. 20; Dell, 1971:174, pl. 1, fig. 5, pl. 2, fig. 7.

*Lasaea helenae* Soot-Ryen, 1959:52, pl. 2, fig. 21.

**Occurrence:** Abundant among byssal threads of *Brachidontes granulata* (Hanley), infrequently associated with *Perumytilus purpuratus* (Lamarck). A cluster of *Brachidontes granulata* may have 100-200 *Lasaea petitiana* among the byssal threads. Iquique specimens: 133.

**Distribution:** Callao, Peru, to the Straits of Magellan and the Juan Fernandez Islands (Dall, 1909), and the Galápagos Islands (Hertlein and Strong, 1947). Type locality: Callao, Peru (Récluz, 1843).

**Remarks:** The outline of the Iquique specimens



FIGURES 11-14. 11, *Lasaea* cf. *L. petitiana*, length 2.8 mm; 12, *Kellia* cf. *K. tumbesiana*, length 8.9 mm; 13, same specimen, enlargement of right hinge; 14, same specimen, enlargement of left hinge.

varies from oval to quadrate. The minute wrinkling and pitting said to be characteristic of Pacific species of *Lasaea* are not clearly seen in these specimens. The microscopic radial lines on the presumed type specimens in the British Museum (Dell, 1971) are not present on the Iquique specimens.

*Lasaea helenae* Soot-Ryen, 1959, was described from Iquique specimens that are more quadrate in outline and have more wrinkled sculpture than typical *L. cf. L. petitiana*, but these two forms intergrade completely in the present collection. Hinge dentition is identical between the two forms. Many individuals have somewhat distorted shapes because of their nestling habit and high population density. The Iquique specimens are only tentatively referred to *L. petitiana* for lack of comparative specimens from other localities in Chile and Peru.

#### Family Leptonidae

*Kellia* Turton, 1822

*Kellia cf. K. tumbesiana* (Stempell, 1899)

Figures 12 to 14

*Diplodontina tumbesiana* Stempell, 1899:232, figs. 18, 19, 19a.

*Tellimya (Diplodontina) tumbesiana*, Carcelles and Williamson, 1951:340.

*Kellia tumbesiana*, Dall, 1909:264; Soot-Ryen, 1959:50, fig. 4a; Dell, 1964:213.

*Occurrence*: Nestling in massive heads of a colonial polychaete worm, middle to lower intertidal zone. Iquique specimens: 48.

*Distribution*: Iquique (present report) to Cobija, Chile (Stempell, 1899), is the most precise range data known to me. Dell (1964) lists this species from "southern South America." Type locality: Cobija, Chile (Stempell, 1899).

*Remarks*: The largest Iquique specimen, figured here, is 7.4 mm high and 8.9 mm wide, and several other individuals are near to it in size. The sculpture is of fine, closely set growth lines covered with a thin, glossy, yellowish brown periostracum. The right valve bears a small but prominent, vertically-oriented cardinal tooth. The left valve has a pair of divergent cardinal teeth. Each valve has a low, elongate posterior lateral tooth. The posterior adductor muscle scars are oval, and the anterior muscle scars are slightly larger and more irregularly rounded. The pallial line is broad and indistinct. Indistinct, irregular vertical wrinkling is often present on the dorsal half of the internal shell surface, although this feature is absent in some specimens.

A similar species, *K. suborbicularis* (Montagu,

1803), occurs in Europe, the western Atlantic, and is reported in the eastern Pacific from British Columbia to Peru (Olsson, 1961). However, the maximum size given for *K. suborbicularis* by Olsson (1961) is 5.5 mm, whereas several of the present specimens are larger. In addition, the right valves of the Iquique specimens bear a posterior lateral tooth which is shorter and deflects the hinge-line more than in *K. suborbicularis*. The left valves of the present specimens have cardinal teeth that are more vertically oriented, and have a less prominent cardinal tooth than seen on *K. suborbicularis*.

The Iquique specimens are tentatively referred to *Kellia tumbesiana* on the basis of the hinge sketch given by Soot-Ryen (1959) which, however, lacks the prominent anterior cardinal tooth and has a straighter hinge than the left valve shown in the type drawing of Stempell (1899). Dell's comments on the difficulty of identifying *Kellia* species certainly apply to the present specimens, and no Chilean *Kellias* can be identified with confidence until the group has been reviewed.

#### Family Veneridae

*Eurhomalea* Cossmann, 1920

*Eurhomalea rufa* (Lamarck, 1818)

Figure 15

*Venus rufa* Lamarck, 1818, vol. 5:593.

*Marcia rufa*, Dall, 1909:269.

*Protothaca rufa*, Riveros-Zuñiga and Gonzalez, 1950:148-150.

*Eurhomalea rufa*, Keen, 1951:7; 1954:54; Soot-Ryen, 1959:59; Herm, 1969:129, pl. 6, figs. 5, 6.

*Occurrence*: In black sandy silt among cobbles and boulders intertidally at Iquique, and in sand in 1-2 m depth at Patillos. Iquique specimens: 2; Patillos specimens: 25.

*Distribution*: The northern range limit of this species is not known, but is probably within the cool waters of the Peruvian province. It is reported as far south as Concepción, Chile (Soot-Ryen, 1959). Type locality: Peru (Lamarck, 1818).

*Protothaca* Dall, 1902

Subgenus *Protothaca*, s.s.

*Protothaca (Protothaca) thaca* (Molina, 1782)

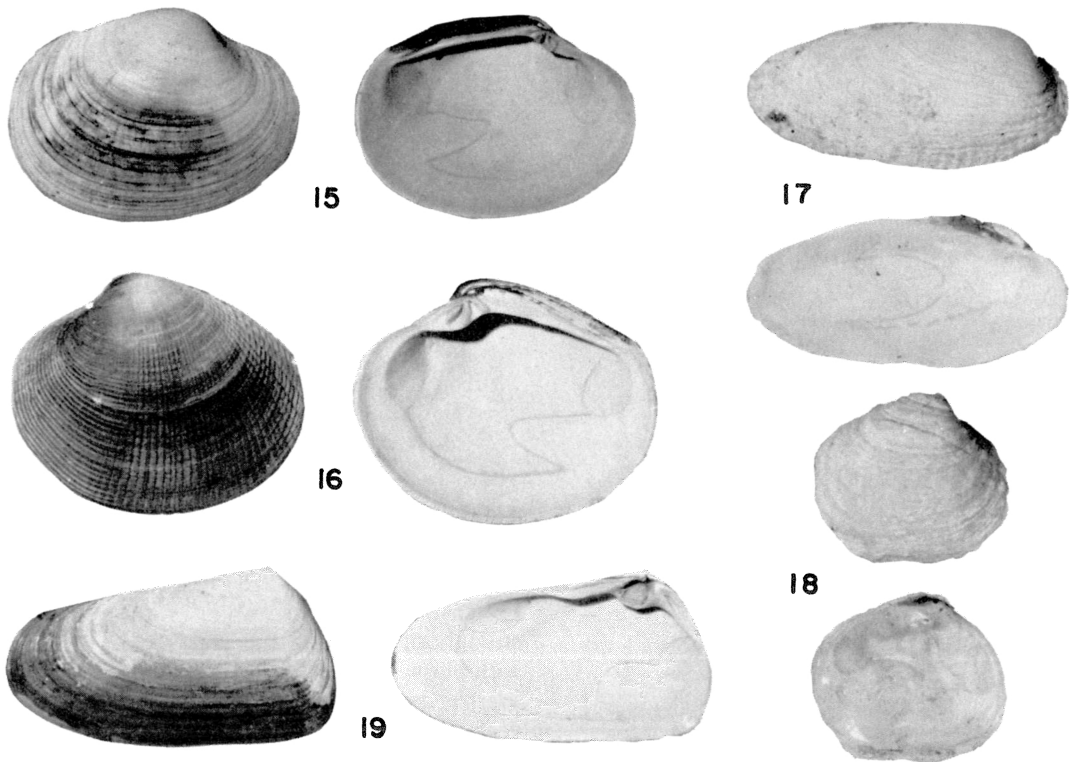
Figure 16

*Chama thaca* Molina, 1782:178.

*Venus dombeii* Lamarck, 1818, vol. 5:590-591; Philippi, 1844, vol. 1, *Venus*:127, pl. 2, *Venus*, fig. 1.

*Paphia thaca*, Dall, 1909:169.

*Protothaca thaca*, Carcelles and Williamson, 1951:342; Soot-Ryen, 1959:57-58; Olsson, 1961:304-



FIGURES 15-19. 15, *Eurhomalea rufa*, length 62 mm; 16, *Protothaca (Protothaca) thaca*, length 63 mm; 17, *Petricola (Petricolaria) rugosa*, length 8.4 mm; 18, *P. (P.) rugosa*, specimen distorted by nestling, length 5 mm; 19, *Mesodesma donacium*, length 86 mm.

305, pl. 41, fig. 1, pl. 53, figs. 1, 1a; Herm, 1969: 122-123, pl. 10, figs. 11, 12.

*Occurrence*: Buried 2-5 cm deep in silt, sand and gravel of lower intertidal zone. Iquique specimens: 212.

*Distribution*: Callao, Peru, to the Chonos Archipelago, Chile (Soot-Ryen, 1959). Type locality: unknown.

*Remarks*: *P. thaca* is the type species of *Protothaca*.

Family Petricolidae

*Petricola* Lamarck, 1801

Subgenus *Petricolaria* Stoliczka, 1871

*Petricola (Petricolaria) rugosa* (Sowerby, 1834)

Figures 17 and 18

*Petricola rugosa* Sowerby, 1, 1834:47; Reeve, 1874, vol. 19, *Petricola*, pl. 2, fig. 8; Dall, 1909:270. *Petricolaria rugosa*, Carcelles and Williamson, 1951:343; Soot-Ryen, 1959:60.

*Occurrence*: Nestling in massive heads of a colonial polychaete worm in middle to lower intertidal zone. Iquique specimens: 6.

*Distribution*: Lobos Island, Peru, south to the

Chonos Archipelago, Chile (Soot-Ryen, 1959). Type locality: Concepción, Chile (Sowerby, 1834).

Family Mesodesmatidae

*Mesodesma* Deshayes, 1830

*Mesodesma donacium* (Lamarck, 1818)

Figure 19

*Maetra donacia* Lamarck, 1818, vol. 5:479.

*Donacilla chilensis* Orbigny, 1845, vol. 5, Moll.: 530.

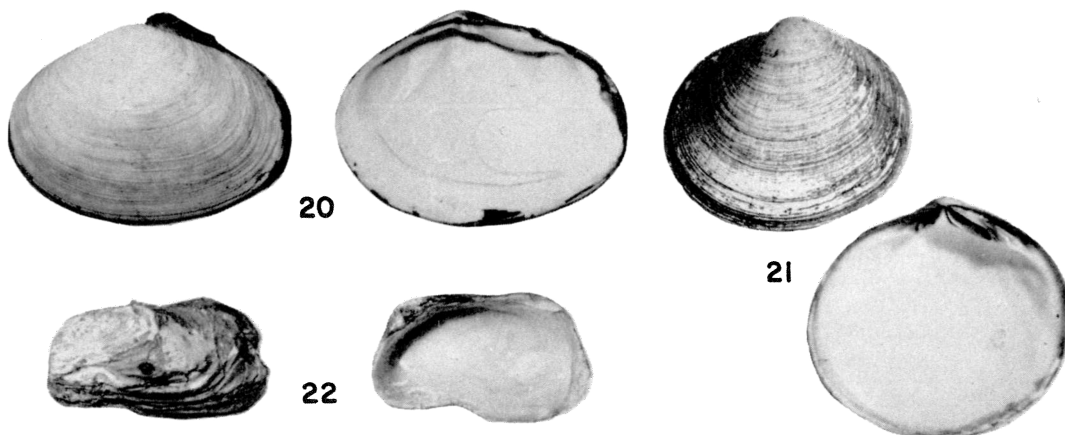
*Mesodesma donacium*, Hupé in Gay, 1854, vol. 8: 352-353, Atlas, Malacologia, pl. 7, fig. 3; Reeve, 1854, vol. 8, *Mesodesma*, pl. 2, fig. 11; Dall, 1909:161, 257, pl. 27, fig. 1; Soot-Ryen, 1959: 65; Herm. 1969:118-119, pl. 9, figs. 8-11.

*Occurrence*: Buried at a depth of 1 cm or less in sand on exposed beaches, lowest intertidal zone and subtidally. Iquique specimens: 109.

*Distribution*: Sechura Bay, Peru, to Valparaíso, Chile (Dall, 1909). Type locality: unknown.

Family Tellinidae

Thirty-five juvenile specimens of a tellinid species were found in the intertidal gravel at Iquique, but are not mature enough to be identified.



FIGURES 20-22. 20, *Gari solida*, length 76 mm; 21, *Semele solida*, length 80 mm; 22, *Hiatella solida*, length 15 mm.

Family Psammobiidae  
*Gari* Schumacher, 1817  
*Gari solida* (Gray, 1828)  
 Figure 20

*Solen solidus* Gray, 1828:7, pl. 3, fig. 12.  
*Psammobia crassa* Hupé in Gay, 1854, vol. 8:364-365, Atlas, Malacologia, pl. 7, fig. 1, 1a-c.  
*Psammobia solida*, Dall, 1909:273; Carcelles and Williamson, 1951:344.  
*Gari solida*, Soot-Ryen, 1959:61.

*Occurrence*: Buried in sand and gravel of lower intertidal zone. Iquique specimens: 105.

*Distribution*: Pucusana, Peru (LACM), to the Chonos Archipelago, Chile (Soot-Ryen, 1959). Type locality: Arica, Chile (Gray, 1828).

Family Semelidae  
*Semele* Schumacher, 1817  
*Semele solida* (Gray, 1828)  
 Figure 21

*Amphidesma solida* Gray, 1828:6, pl. 6, fig. 6; Reeve, 1853, vol. 8, *Amphidesma*, pl. 21, fig. 10; Hupé, in Gay 1854:359, Malacologia, pl. 7, fig. 1; Dall, 1909:272; Schröder, 1916:101-129, figs. 1-13.

*Occurrence*: Buried in sand and gravel among boulders in lower intertidal zone. Iquique specimens: 81.

*Distribution*: Callao, Peru, to the Chonos Archipelago, Chile (Dall, 1909). Type locality: Arica, Chile (Gray, 1828).

*Remarks*: This species is close to *Semele corrugata* (Sowerby, 1833), which is recorded from southern Ecuador (Olsson, 1961) to the Chonos Archipelago, Chile (Soot-Ryen, 1959). According to the drawings in Reeve (1853), *S. solida* has a

white interior, a "fawn-white" exterior, and a more strongly developed hinge, whereas *S. corrugata* has an orange interior, white exterior, and a less strongly developed hinge. Both species are shown with purple staining on the hinge. Specimens from Iquique have white exteriors with remnants of a dark brown periostracum, white interiors with purple hinges, and relatively weakly developed hinges.

Order Myoida  
 Family Hiatellidae  
*Hiatella* Daudin, 1801  
*Hiatella solida* (Sowerby, 1834)  
 Figure 22

*Saxicava solida* Sowerby, I, 1834:88-89; Reeve, 1875, vol. 20, *Saxicava*, pl. 1, fig. 6; Sowerby, II, 1884, vol. 5:133, pl. 471, fig. 12; Dall, 1909:275; Carcelles, 1944:293, pl. 13, fig. 107.

*Saxicava tenuis* Sowerby, I, 1834:88; Reeve, 1875, op. cit., pl. 2, fig. 9; Sowerby, II, 1885, op. cit., pl. 471, fig. 11.

*Saxicava purpurascens* Sowerby, I, 1834:88; Reeve, 1875, op. cit., pl. 2, fig. 14; Sowerby, II, 1885, op. cit., pl. 471, fig. 7; Dall, 1909:275.

*Hiatella solida*, Carcelles and Williamson, 1951:346; Soot-Ryen, 1959:67-68; Olsson, 1961:425-426, pl. 77, figs. 6, 6a; Dell, 1964:224-226, pl. 7, fig. 11; 1971:177-178; Keen, 1971:271, fig. 698.

*Occurrence*: Nestling in rock crevices, middle to lower intertidal zone, and in holdfasts of *Lessonia nigrescens* Bory, in lower intertidal zone and subtidally. Iquique specimens: 11.

*Distribution*: The range of this species is uncertain, but is generally cited as extending from the tropical Pacific coast of South America to

Tierra del Fuego, the Falkland Islands, and north on the Atlantic coast to about southern Brazil. Dell (1964) discusses the distribution of this species at length. Type locality: Santa Elena, Ecuador, and Paita and Isla de Muerte, Peru, are given as localities by Sowerby (1834). Santa Elena is probably the type locality, as indicated by Dell (1964).

*Remarks:* The disparate range citations in the literature for this species are indicative of the confusion in dealing with *Hiatella*. *Hiatella solida* and the more northern *H. arctica* (Linnaeus, 1767) are very similar and the present specimens from Iquique could be assigned to the latter species. Until this confusing group is thoroughly studied, however, I follow Olsson (1961:425) in considering *H. solida* a distinct South American species.

Subclass Anomalodesmata

Order Pholadomyoidea

Family Lyonsiidae

*Lyonsia* Turton, 1822

*Lyonsia delicata*, new species

Figures 23 and 24

*Diagnosis:* A small shell, characterized by beaded radial ornamentation on the prodissoconch, anterior end narrower than the posterior end, and a lithodesma without a ridge.

*Description of holotype:* Shell small, elongate, thin, covered with thin brown periostracum extending slightly beyond posterior and ventral margins and thickened at posterior margin. Dorsal margin very slightly convex, anterior margin narrowly rounded, ventral margin slightly concave anteriorly, becoming convex posteriorly, and posterior margin broadly rounded. Umbones positioned near anterior end. Posterior dorsal part of shell narrowly compressed. Surface ornamentation of 15 thin, radiating ridges more distinct toward the shell margins with tufts of minute periostracal hairs localized along them; early portion of exterior surface completely covered with fine, radiating lines consisting of minute raised beads and extending only part way to shell margins. Lithodesma about two and one-half times as long as wide and tapering slightly to anterior. Dimensions (in mm): length 5.5, height 3.2, diameter 1.8.

*Type locality:* Rocky beach at north end of Playa Cavanha, Iquique, Chile, 20° 13'S, 70° 10'W; lower intertidal zone, on undersides of rocks, August, 1964 (holotype and 33 other specimens) and July, 1970 (3 specimens).

*Type material:* Holotype, LACM 1583; 29 paratypes, LACM 1584; 2 paratypes, USNM; 2 paratypes, CAS; 2 paratypes, ANSP.

*Discussion:* The outline and sculpture of this

species separate it from *L. fretalis* Dall, 1915 (Talcahuano, Chile, to Straits of Magellan, 40 m), which tapers posteriorly and lacks beaded ornamentation. Differences between *L. delicata* and *L. elegantula* Soot-Ryen (1957:3; 1959:36, pl. 1, fig. 10; Golfo de Ancud, Chile, 45 m), are even more marked. *Lyonsia delicata* lacks the ridge on the lithodesma possessed by *L. elegantula*; the umbones are set much closer to the anterior end in *L. elegantula*; the posterior margin is truncated on *L. elegantula* and broadly rounded on *L. delicata*. The present species is also much smaller than either of the other two: the type of *L. fretalis* has the following dimensions (in mm): length 10, height 7, whereas *L. elegantula* measures length 15, height 8.

All of the specimens of *L. delicata* have sand grains adhering to their periostraca, especially along the ventral valve margins.

The specific name of *L. delicata* is a Latin adjective meaning delicate, and refers to the nature of the fine, radial beading on the early part of each valve.

*Entodesma* Philippi, 1845

*Entodesma cuneata* (Gray, 1828)

Figure 25

*Anatina cuneata* Gray, 1828:6, pl. 3, figs. 14a-b.

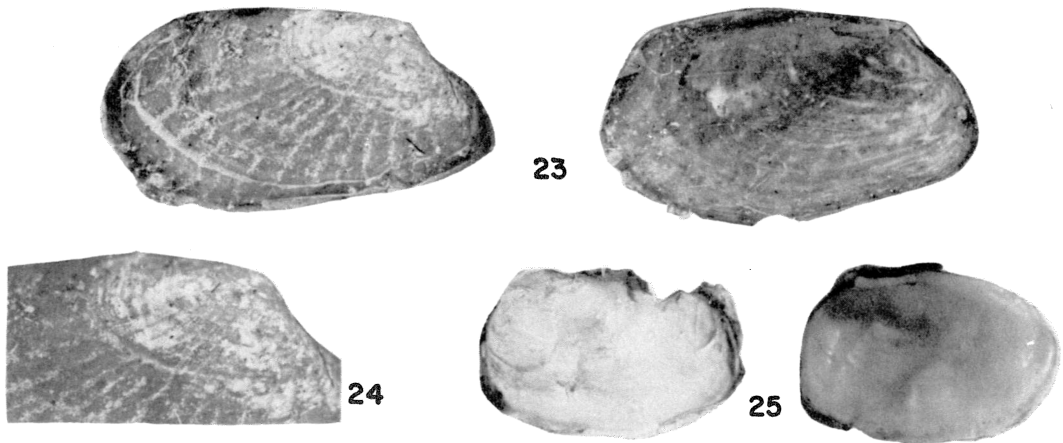
*Entodesma cuneata*, Dall, 1909:259; Soot-Ryen, 1959:35; Osorio and Bahamonde, 1970:195; Dell, 1972:29-30, fig. 23.

*Occurrence:* Nestling in holdfasts of *Lessonia nigrescens* Bory; dead specimens only. Iquique specimens: 3 complete specimens and 4 unpaired valves.

*Distribution:* Ecuador to the Magellanic region (Dall, 1909). Type locality: Arica, Chile (Gray, 1828).

*Remarks:* The type description and line drawing for this species do not give diagnostic characters. However, the Iquique specimens agree well with the photograph of Gray's type in Dell (1972).

The largest specimen in the present collection, slightly broken off at the posterior end, measures 36.2 mm in length and 17.6 mm in height at the umbo. An average specimen is about 25 mm long and 16 mm high, based on the small sample at hand. The lithodesma of an average specimen measures 5.6 mm long by 1.6 mm wide, is concave dorsally, and straight or concave at its posterior end. The periostracum is thin, smooth and light grayish brown at the anterior end of the valves, but becomes thickened (to about 0.1 mm) toward the posterior end and medium to dark brown in



FIGURES 23-25. 23, *Lyonsia delicata* sp. nov., Holotype, length 5.5 mm; 24, same specimen, enlargement of early part of shell; 25, *Entodesma cuneata*, length 20 mm.

color. The periostracum extends beyond the shell margins and is complete across the dorsal commissure. The valves are inflated and gaping ventrally and posteriorly. Ornamentation consists of broad concentric undulations, as the specific name implies, which become obsolete posteriorly.

The valves are nacreous and translucent within. The posterior adductor muscle scar is slightly larger than the anterior one, and both are oval in shape. Irregular areas on the dorsal half of the valve interiors are minutely roughened by shallow pits. The central portion of the interior of one unpaired valve shows 20-25 shallow, radiating grooves ending ventrally in shallow pits that are nearly round and the same width as the grooves.

*Entodesma cuneata* seems to differ from *E. chilensis* (Philippi, 1845), which occurs from Valparaíso to Chiloé Island, Chile, by being smaller, lacking a keel on the sides of the resilium, and lacking radiating striae on the exterior of the valves.

Class Gastropoda  
Subclass Prosobranchia  
Order Archaeogastropoda  
Family Scissurellidae

*Sinezona* Finlay, 1927  
*Sinezona rimuloides* (Carpenter, 1865)

Figure 26

*Scissurella rimuloides* Carpenter, 1864:548 [*nomen nudum*]; 1865:271 [described].

*Sinezona rimuloides*, McLean, 1967:408, pl. 56, figs. 13, 14 [complete synonymy]; Keen, 1971:309, fig. 5.

*Occurrence*: In black sandy silt among cobbles

and boulders, lower intertidal zone. Iquique specimens: 37.

*Distribution*: Farallon Islands, California, to Mazatlán, Mexico, and Iquique, Chile (McLean, 1967). The southward range extension by McLean is based on the present specimens. Other specimens in LACM collections extend the distribution along the Mexican coast 470 kms southward to Manzanillo (20° N) and to the Chincha Islands, Peru. Type locality: Mazatlán, Mexico (Carpenter, 1865).

Family Fissurellidae

*Fissurella* Bruguière, 1789

*Fissurella costata* Lesson, 1830

Figure 28

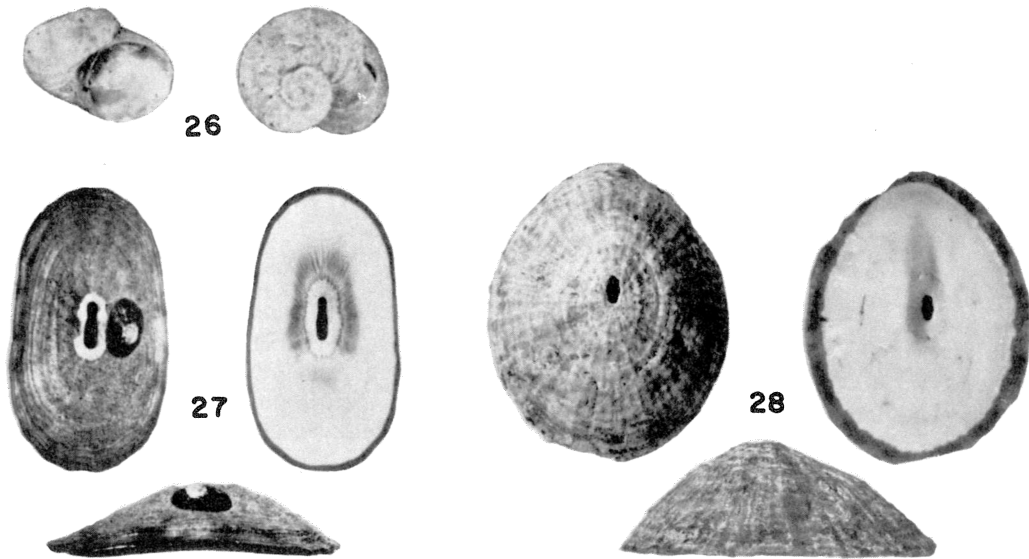
*Fissurella costata* Lesson, 1830, vol. 2, pt. 1:410-411, no. 170; Orbigny, 1841, vol. 5:474-475; Pilsbry, 1890, vol. 12:148, pl. 30, fig. 10, pl. 35, fig. 11; Dall, 1909:177, 241; Riveros-Zuñiga, 1951:108-111, fig. 21; Dell, 1971:183-184, pl. 4, figs. 7, 8.

*Fissurella chilensis* Sowerby, II, 1835 (January), *Fissurella*: 3, fig. 36; Sowerby, I, 1835a (March): 124.

*Occurrence*: Lower intertidal zone of rocky reefs. Iquique specimens: 3.

*Distribution*: Mollendo, Peru (Dall, 1909) to Talcahuano and Bahía San Vicente, Chile (Lesson, 1830). Type locality: Talcahuano and San Vicente, Chile (Lesson, 1830).

*Remarks*: The largest specimen of *F. costata* from Iquique measures 68 mm long, 55 wide and 25 high. The outer surface is light gray, tinted with pink, on its central portion and with violet on its



FIGURES 26-28. 26, *Sinezona rimuloides*, diameter 0.9 mm; 27, *Fissurella crassa*, length 57 mm, with specimen of *Scurria parasitica*; 28, *F. costata*, length 68 mm.

outer third. Ornamentation consists of low, irregular radial ribs that bear slightly raised nodes. The nodes are aligned among the ribs to form concentric sculpture. The sculpture is somewhat eroded in the Iquique specimens. The interior is glossy white with a marginal band of alternating light and dark gray.

*Fissurella crassa* Lamarck, 1822

Figure 27

*Fissurella crassa* Lamarck, 1822, vol. 6, pt. 2:11; Orbigny, 1841, vol. 5:472-473; Pilsbry, 1890, vol. 12:154, pl. 34, figs. 51-53; Dall, 1909:177, 241, pl. 24, figs. 5, 6; Riveros-Zuñiga, 1951:93-95, fig. 14; Carcelles and Williamson, 1951:255; Dell, 1971:184.

*Occurrence:* Lower intertidal zone of rocky reefs. Iquique specimens: 25.

*Distribution:* LACM collections contain specimens from the Chincha Islands, Peru ( $13^{\circ}38'S$  latitude) and from Coquimbo and Talcahuano, Chile. Carcelles and Williamson (1951) record this species from the Galápagos Islands and the Magellanic region. Type locality: unknown.

*Remarks:* The figured specimen of *F. crassa* measures 57 mm long, 32 mm wide, and 12 mm high, and is of average size for the species. When not tinted green by encrusting algae, the glossy outer surface is caramel brown and ornamented with very fine, closely spaced concentric growth

lines. The interior is glossy white, with the central portion stained violet, and has a narrow brown margin. Most of the interior surface, including the muscle scar, is textured with irregular radial wrinkles.

*Fissurella latimarginata* Sowerby, 1835

Figure 29

*Fissurella latimarginata* Sowerby, I, 1835a:126; Pilsbry, 1890, vol. 12:153, pl. 32, figs. 36-38; Dall, 1909:242; Dell, 1971:187, pl. 3, figs. 12-14. *Fissurella latemarginata* [sic], Riveros-Zuñiga, 1951:125-126, fig. 33.

*Occurrence:* Lower intertidal zone of rocky reefs. Iquique specimens: 53.

*Distribution:* Peru (Dall, 1909) to Concepción, Chile (Carcelles and Williamson, 1951). Type locality: Valparaíso and Iquique, Chile (Sowerby, 1835).

*Remarks:* The figured specimen of *F. latimarginata* is 68 mm long, 47 mm wide, and 12 mm high, and is of average size for an Iquique specimen. However, the largest specimen in the present collection is 101 mm long, 76 mm wide and 24 mm high. These shells are almost always completely covered with red algae. The outer surface is purple and ornamented with low, fine, closely spaced radial ribs and minute concentric growth lines. The interior surface is glossy white with a broad purple border.

*Fissurella limbata* Sowerby, 1835

## Figure 30

*Fissurella limbata* Sowerby, I, 1835a:123-124; Orbigny, 1841, vol. 5:474; Pilsbry, 1890, vol. 12:149-150, pl. 32, figs. 26, 39; Riveros-Zuñiga, 1951:114-116, fig. 24; Dell, 1971:188, pl. 5, fig. 5.

*Occurrence:* Lower intertidal zone of rocky reefs. Iquique specimens: 11.

*Distribution:* Laguna Grande, Peru (LACM), to Valparaíso, Chile (Dall, 1909) and the Straits of Magellan (Dell, 1971). Type locality: Valparaíso (Sowerby, 1835).

*Remarks:* The figured specimen of *F. limbata* is 50 mm long, 34 mm wide and 14 mm high, and is of average size for an Iquique specimen. The central and outer portions of the exterior surface are white and separated by an irregular band of purple. Rays of purple emanate from the purple band and extend faintly to the shell margin. The inner surface is glossy white and the margin has an inner purple band and an outer white one.

*Fissurella maxima* Sowerby, 1835

## Figure 31

*Fissurella maxima* Sowerby, I, 1835a:123; Pilsbry, 1890, vol. 12:145-146, pl. 30, figs. 8, 9, pl. 33, figs. 46, 47; Dall, 1909:242; Riveros-Zuñiga, 1951:102-104, fig. 18; Dell, 1971:188, pl. 4, figs. 1-3.

"*Fissurella maxima* Young, 1834, Sowerby," Orbigny, 1841, vol. 5:475-476; vol. 9, Moll., pl. 64, figs. 4-7.

*Occurrence:* Lower intertidal zone of rocky reefs. Iquique specimens: 93.

*Distribution:* LACM collections contain specimens from localities ranging from Laguna Grande, Peru, to Valparaíso, Chile. Type locality: Valparaíso (Sowerby, 1835).

*Remarks:* The figured specimen is the largest in the present collection and measures 62 mm long, 36 mm wide and 10 mm high. Several other specimens are near to it in size. However, several specimens in LACM collections from Coquimbo and Valparaíso are much larger and one measures 134 mm long, 93 mm wide and 42 mm high. The outer surface is covered with alternating cream colored and purple rays and ornamented with numerous noded radial ribs and minute concentric growth lines. The inner surface is glossy white, and the margin has an inner cream colored band and an outer cream and purple band. The muscle scar is very faint.

## Family Acmaeidae

This review of Acmaeidae has been prepared with the collaboration of Dr. James McLean, who has further work in progress on the eastern Pacific species of the family. The systematics of the Peruvian province species have not been reviewed since the treatment by Pilsbry in the "Manual of Conchology" in 1891. The collections available to us are not adequate to give a clear picture of species distributions, nor is sufficient anatomical material on hand. On the basis of LACM material, we feel that the following eight species, which are all known at Iquique, include all of the Chilean representatives of this family. As in acmaeids from other provinces, the species are highly variable and several unallocated names remain in the literature, particularly some described by Philippi.

Generic allocation of the species presents problems that are not fully resolved at this time. The genus *Scurria* Gray, 1847 [type species *S. scurra* (Lesson, 1830)], is characterized by a branchial cordon, which is a secondary gill structure of leaf-like flaps located just inside the mantle margin. The branchial cordon is absent in *Collisella* Dall, 1871, the type of which is the west American *C. pelta* (Rathke, 1833). Unlike North American *Collisellas*, Chilean species show partial development of a branchial cordon, consisting of a swollen ridge. This ridge is best developed in *C. zebrina* (Lesson, 1830), which has evenly spaced constrictions along the ridge, instead of projecting leaflike flaps as in true *Scurrias*. The assignment of the Chilean species to one of these two genera is arbitrary.

*Scurria* and *Collisella* have a similar radular formula consisting of three pairs of lateral teeth, of which the middle lateral is the largest, and one pair of vestigial marginal teeth or uncini. In *Acmaea* Eschscholtz in Rathke (1833) the three laterals are of equal size and the marginals are absent. No radular distinction is apparent between *Scurria* and *Collisella*.

*Collisella* Dall, 1871*Collisella araucana* (Orbigny, 1839)

## Figure 32

*Patella araucana* Orbigny, 1839, vol. 5:482 (1841), vol. 9, pl. 65, figs. 4-6 (1839); Reeve, 1855, vol. 8, *Patella*, pl. 26, figs. 66a-c; Keen, 1966:2.

*Collisella araucana*, Dall, 1871:257.

*Acmaea araucana*, Pilsbry, 1891, vol. 13:35, pl. 16, figs. 21-23 [copy of Orbigny]; Dall, 1909:237.

*Occurrence:* Middle and lower intertidal zone,