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LARGE ARCHIBENTHAL GASTROPODS OF
CENTRAL CHILE: COLLECTIONS FROM AN EXPEDITION OF THE
R/V ANTON BRUUN AND THE CHILEAN SHRIMP FISHERY

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LARGE ARCHIBENTHAL GASTROPODS OF CENTRAL CHILE: COLLECTIONS FROM AN EXPEDITION OF THE R/V ANTON BRUUN AND THE CHILEAN SHRIMP FISHERY¹

James H. McLean² and Hector Andrade V.³

ABSTRACT. Fifteen species of large gastropods from off central Chile collected both by an expedition of the R/V ANTON BRUUN in 1966 and by commercial trawling for the shrimp *Heterocarpus reedi* are treated. Nine previously described species are reviewed: *Bathybembix macdonaldi*, *B. humboldti*, *Calliostoma chilena*, *Capulus ungaricoides*, *Fusitriton magellanicus*, *Aeneator fontainei*, *A. loisae*, *Miomelon alarconi*, and *Ptychosyrinx chilensis*. Six species are described as new: *Diodora codoceoae*, *Calliostoma delli*, *Trophon bahamondei*, *Columbarium tomicici*, *Aeneator castillai*, and *Cancellaria stuardoi*.

RESUMEN. Se estudiaron quince especies de macrogastropodos obtenidos en faenas de pesca camaronesa por arrastre y por la expedición del B/1 ANTON BRUUN en la zona central de Chile. De estas, nueve especies habían sido ya descritas y se hace la revisión de cada una de ellas: *Bathybembix macdonaldi*, *B. humboldti*, *Calliostoma chilena*, *Capulus ungaricoides*, *Fusitriton magellanicus*, *Aeneator fontainei*, *A. loisae*, *Miomelon alarconi* y *Ptychosyrinx chilensis*. Las seis restantes son consideradas como nuevas y se entregan sus descripciones: *Diodora codoceoae*, *Calliostoma delli*, *Trophon bahamondei*, *Columbarium tomicici*, *Aeneator castillai* y *Cancellaria stuardoi*.

INTRODUCTION

The marine invertebrate fauna of the lower continental shelf and slope off central Chile is poorly known. This region is one of the few areas of the world not covered by the great expeditions of the last century. In recent years, however, collections from two sources have become available. An expedition of the R/V ANTON BRUUN sampled the region in 1966, and, in subsequent years, the shrimp fishery for *Heterocarpus reedi* Bahamonde, 1955, has yielded abundant material of the larger species.

Over the last 14 years, six mollusks commonly taken by the shrimp fishery have been described from central Chile: Berry (1968) described *Ptychosyrinx chilensis*; Rehder (1971) described *Limopsis ruizana*, *Bathybembix humboldti*, *Calliostoma chilena*, and *Aeneator loisae*; Stuardo and Villarroel (1974) described *Miomelon alarconi*. Other new species have been recognized by marine biologists in Chile but have remained undescribed until now.

From 1976 through 1980, Andrade obtained extensive material of mollusks and other invertebrates incidental to the shrimp

fishery. Specimens were saved by crew members of the trawling vessel GODEN WIND and other vessels based in Quintero. These vessels worked the Chilean coastline to the north and south of Valparaíso between Los Vilos (31°56'S) and Constitución (35°20'S).

The following contributions treating the echinoderms and crustaceans from the Chilean shrimp fishery have been published: Andrade (1980), Andrade and Baez (1977, 1980), Baez and Andrade (1977, 1979), Codoceo and Andrade (1978, 1980, in press), Codoceo et al. (1978), Revuelta and Andrade (1978).

The offshore fauna of northern Peru has been sampled by expeditions of the ANTON BRUUN and by expeditions conducted by the Instituto del Mar, Callao, Peru. These expeditions have produced specimens of some of the species known from central Chile. The Peruvian records of these species are given in this paper.

The present paper is limited to the large gastropods of central Chile that have been taken by the shrimp fishery. Nine previously described species are reviewed, and six additional species are described. For most of the species, we have included a photograph of the radular ribbon as an aid in identification. Full discussion of radular features is beyond the scope of this paper. A more detailed study of radular structure would require the use of scanning electron microscopy.

OCEANOGRAPHIC CONDITIONS OFF CENTRAL CHILE

Depths of samples reported on here from off central Chile are archibenthal, corresponding to the upper part of the continental slope. The benthic fauna is mainly under the influence of Antarctic

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tic Intermediate Water and to a lesser degree of the overlaying Equatorial Subsurface Water, as discussed by Andrade and Baez (1980). Detailed accounts of the physical and chemical properties of the water masses in central Chile are given by Sievers and Silva (1975) and Silva and Sievers (1981).

MATERIALS AND STATION DATA

Station data for the collections reported in this paper are given in Table 1. Localities and depths for material from the shrimp fishery are necessarily less accurate than data for material collected by scientific expeditions. Depths and coordinates are not repeated in the text, except for type localities of the new species.

For lots that define the northern and southern records, the corresponding latitudes are given in the distribution heading.

Abbreviations of museums mentioned in the text are as follows: BM(NH), British Museum (Natural History); LACM, Los Angeles County Museum of Natural History, Los Angeles, California, U.S.A.; MNHN, Museo Nacional de Historia Natural, Santiago, Chile; MZICB, Instituto Central de Biología, Universidad de Concepción, Concepción, Chile; USNM, United States National Museum of Natural History, Washington, D.C., U.S.A. Type material of the six new species described herein is distributed among these institutions.

Collections upon which this report is based have been obtained from four sources:

Table 1. ANTON BRUUN, SNP-1, and Chilean shrimp fishery stations arranged north to south.

	Location		Depth (m)
PERU			
W of Lobos de Tierra, SNP-1, sta. 26	06 26 S	81 05 W	1,025
S of Lobos de Tierra, SNP-1, sta. 25	06 42	80 59	785
S of Lobos de Afuera, SNP-1, sta. 13	07 07	80 46	1,200
N of Isla Macabi, SNP-1, sta. 28	07 44	80 30	750–760
W of Isla Macabi, ANTON BRUUN, sta. 754	07 49	80 38	605–735
CHILE			
Junquillar, ANTON BRUUN, sta. 714	25 00	70 40	950
Punta Mar Brava, ANTON BRUUN, sta. 710	29 21	71 25	65–95
Punta Hornos, ANTON BRUUN, sta. 709	29 38	71 21	110
Coquimbo, trawler not identified*	29 58	—	200–400
Los Vilos, GODEN WIND	31 56	71 54	240–400
Pichidanqui, GODEN WIND	32 08	71 54	300–400
Punta Salinas, ANTON BRUUN, sta. 703	32 09	71 43	960
Caleta Molles, ANTON BRUUN, sta. 702	32 17	71 40	580
Papudo, GODEN WIND	32 31	71 54	200–350
Zapallar, GODEN WIND	32 33	71 43	350–450
Quintero, GODEN WIND	32 42	71 48	200–280
Algarrobo, trawler not identified	33 22	71 55	360
Punta Penablanca, ANTON BRUUN, no sta.	33 22	71 54	260–280
Punta Panulcillo, ANTON BRUUN, sta. 701	32 32	71 35	180–175
Puerto San Antonio, ANTON BRUUN, sta. 699	33 39	72 10	1,170–1,480
Punta Toro, trawler not identified	33 06	72 03	270
Bahia Navidad, ANTON BRUUN, sta. 686	33 58	72 05	140
Topocalma, trawler not identified	34 06	72 14	180–360
Punta Topocalma, ANTON BRUUN, sta. 687	34 07	72 19	750–730
Pichilemu, trawler not identified	34 27	72 24	240–350
Mataquito, trawler not identified	35 01	72 10	300
Constitucion, trawler not identified	35 20	72 55	260
Cabo Carranza, ANTON BRUUN, sta. 697	35 27	73 01	290–450

*For Coquimbo only, the locality refers to the home port, not the actual station, which is unknown.



Figures 1 and 2, *Diodora codoceoae* new species. Figure 1, three views of holotype, LACM 1979, 260 m off Constitución, Chile, length 40.7 mm. Figure 2, LACM 72485, 360 m off Topocalma, Chile, Length 40.6 mm.

1. Cruises of the ANTON BRUUN in Peru and Chile during 1966. This material is deposited in the LACM and USNM.

2. A cruise of the Peruvian naval vessel SNP-1 to the vicinity of the Lobos Islands in northern Peru in January 1974 on which McLean was present. Material from that cruise is deposited in the LACM and the Instituto del Mar, Callao, Peru.

3. Shrimp trawling localities (GODEN WIND and other vessels) in central Chile, 1977–1980. McLean visited the Montemar Marine Laboratory of the Universidad de Valparaíso in August 1978 and examined all of the collections then received by Andrade. This material is now deposited in the LACM, the MNHN, and the Museo Comparativo, Instituto de Oceanología, Universidad de Valparaíso.

4. Shrimp trawling vessels based in Coquimbo, Chile, 1964–1975; collections deposited at LACM by the late Harvey McMillin, Luis Ferreira Osses, and Jorge Tomiic K. In some cases, Coquimbo (29°58'S) is cited as the northern range limit of a species, although it should be understood that the actual occurrence for such a record could have been either to the north or south of Coquimbo.

SYSTEMATIC ACCOUNT

Superfamily Fissurellacea

Family Fissurellidae

Subfamily Diodorinae

Genus *Diodora* Gray, 1821

Type species (monotypy): *Patella apertura* Montagu, 1803 (= *P. graeca* Linnaeus, 1758). Recent, Europe.

Diodora species occur in most temperate and tropical regions of the world in intertidal, sublittoral, and, less frequently, archibenthal depths. Although there is considerable diversity of form

among the species, an adequate subgeneric classification has never been offered.

Diodora codoceoae new species

Figures 1–3

DESCRIPTION. Shell large for the genus, thin, conical, basal outline elongate-oval, anterior end slightly narrower than posterior, basal margin lying flat, with ends slightly elevated. Lateral slopes straight, anterior and posterior slopes slightly concave. Foramen nearly central, oval, length of foramen about 10% of shell length, highest point of shell at the posterior rim of the foramen. Periostracum thin, brown, worn away over most of the surface; underlying surface chalky, worn near summit. Sculpture of numerous fine radial ribs; under magnification, the ribs are rounded, broader than the interspaces, crossed by raised growth lamellae to give a minute beaded appearance; primary ribs remain stronger so that every fourth rib is slightly more prominent than the others. Interior chalky white, the margin finely crenulated and grooved by the ribs; position of the stronger primary ribs marked by corresponding internal grooves. Under magnification, the crossed-lamellar aragonitic structure near the margin is visible. Muscle scar weakly discernible. Callus surrounding the foramen has an oval outline and is slightly truncated and depressed at its posterior edge. Thickness of shell at summit (depth of foramen) approximately equal to the width of the internal callus.

Dimensions: length 40.7 mm, width 27.0 mm, height 11.4 mm (holotype, Fig. 1); length 40.6 mm, width 26.9 mm, height 13.7 mm (Fig. 2).

Animal of preserved specimen (Fig. 2): colorless except for darkly pigmented eyes; contracted to fit completely within the shell; uppermost fold of mantle with a very finely scalloped edge, surface of the mantle folds and the foot sides with negligible development of papillae; cephalic tentacles and epipodial tentacles well developed.

Radula (Fig. 3): typical of the genus, laterals four, rachidian three times wider than the adjacent laterals; first marginal bicuspid as in other species of *Diodora*.

MATERIAL. Chile: Pichidanqui, Zapallar, Topocalma (LACM, Fig. 2), Constitución (LACM, holotype, Fig. 1). Specimens examined: 15.

TYPE MATERIAL. Three specimens from the type locality, collected 25 March 1976, by Andrade, shrimp trawler GODEN WIND. Holotype, LACM 1979; one paratype MNHN 200488, one paratype MZICB 15.527.

TYPE LOCALITY. 260 m off Constitución, Chile (35°20'S, 72°55'W).

DISTRIBUTION. Pichidangui (34°06'S) to Constitución, Chile (35°20'S). Depth range 180–360 m.

DIAGNOSIS. A species of *Diodora* characterized by its large size, thin shell, oval aperture, and numerous radial ribs. It most resembles *D. tanneri* (Verrill, 1883), known from archibenthal depths in the western North Atlantic, from Delaware to the Caribbean (see Perez-Farfante, 1943:19). *D. codoceoeae* differs in having a less conical profile, a proportionately larger foramen, and a more chalky shell surface. We have no information about the animal of *D. tanneri*. *Diodora codoceoeae* also resembles *Stromboli beebei* (Hertlein and Strong, 1951), an offshore species in the tropical Panamic Faunal Province ranging from the Gulf of California to Ecuador (see McLean in Keen, 1971:318, fig. 29). Unlike *D. codoceoeae*, *S. beebei* has a fleshy mantle that fully envelops the edge of the shell and radial ribs that are uniformly fine, with no distinction between primary and secondary ribs; in addition, *S. beebei* has a sturdier shell than that of *D. codoceoeae*.

REMARKS. The internal callus surrounding the foramen is curved on the posterior side in *D. codoceoeae*, *D. tanneri*, and *S. beebei*, not straight-edged as in most species of *Diodora*. However, this is a variable feature among species of *Diodora*, particularly those with oval foramina.

ETYMOLOGY. We are pleased to name this species in honor of Prof. Maria Codoceo of the Museo Nacional de Historia Natural, Santiago.

Superfamily Trochacea

Family Trochidae

Subfamily Eucyclinae

Genus *Bathybembix* Crosse, 1893

Type species (original designation): *Bembix aeola* Watson, 1879. Recent, Japan.

Bathybembix species are large mud-ingesting trochids occurring on the outer continental shelf and slope (Merriman, 1967; Hickman, 1981). They are members of the subfamily Eucyclinae, which appeared in the Mesozoic. Such recent genera as *Bathybembix* Crosse, 1893, *Calliotropis* Seguenza, 1903, and

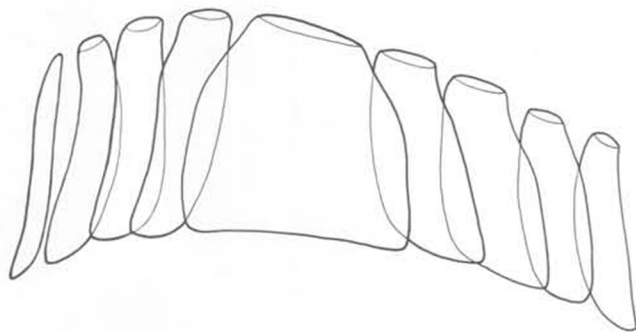


Figure 3, *Diodora codoceoeae* new species, radular dentition of holotype, rachidian and lateral teeth, maximum dimension 0.8 mm.

Cidarina Dall, 1909, have been recognized as members of the same group (McLean, 1981:335).⁴

The genus *Bathybembix* occurs in the northern Pacific, with several species in Japan, and one, *B. bairdii* (Dall, 1889), in the northeastern Pacific ranging from the Bering Sea, Alaska, to the Gulf of Tehuantepec, Mexico (McLean in Keen, 1971:331, fig. 62). The two species treated here are common off the coasts of both Peru and Chile. These species are members of the same typical subgenus in which the shells are large, the umbilicus closed, and the periostracum thick and colored greenish brown.

Bathybembix macdonaldi (Dall, 1890)

Figures 4–6

Turricula macdonaldi Dall, 1890:348, pl. 7, fig. 7; 1908:349, pl. 19, fig. 7.

Bathybembix macdonaldi, McLean in Keen, 1971:331, fig. 63.

DESCRIPTION. Shell large, thin, high-spired; final whorl rounded, early whorls strongly carinate. Periostracum thin, yellowish or greenish brown. Protoconch missing, teleoconch whorls eight on intact specimens; early whorls often eroded. Spiral sculpture of two cords per whorl, a prominent projecting peripheral cord, with short projecting spines, and another weaker, noded cord just below the suture, becoming weaker and disappearing on the final whorl. Base with prominent spiral cords. Axial sculpture lacking except for fine growth increments on the periostracum. Outer lip thin, interior nacreous; operculum large, multispiral.

Dimensions: height 69.3 mm, diameter 49.0 mm (Fig. 4); height 75 mm, diameter 60 mm (holotype, Fig. 5).

Radula (Fig. 6): rachidian tooth broadly flanged, overhanging tip bearing numerous fine serrations along the sides; lateral teeth three, marginal teeth numerous.

MATERIAL. Peru: W of Lobos de Tierra (LACM), S. of Lobos

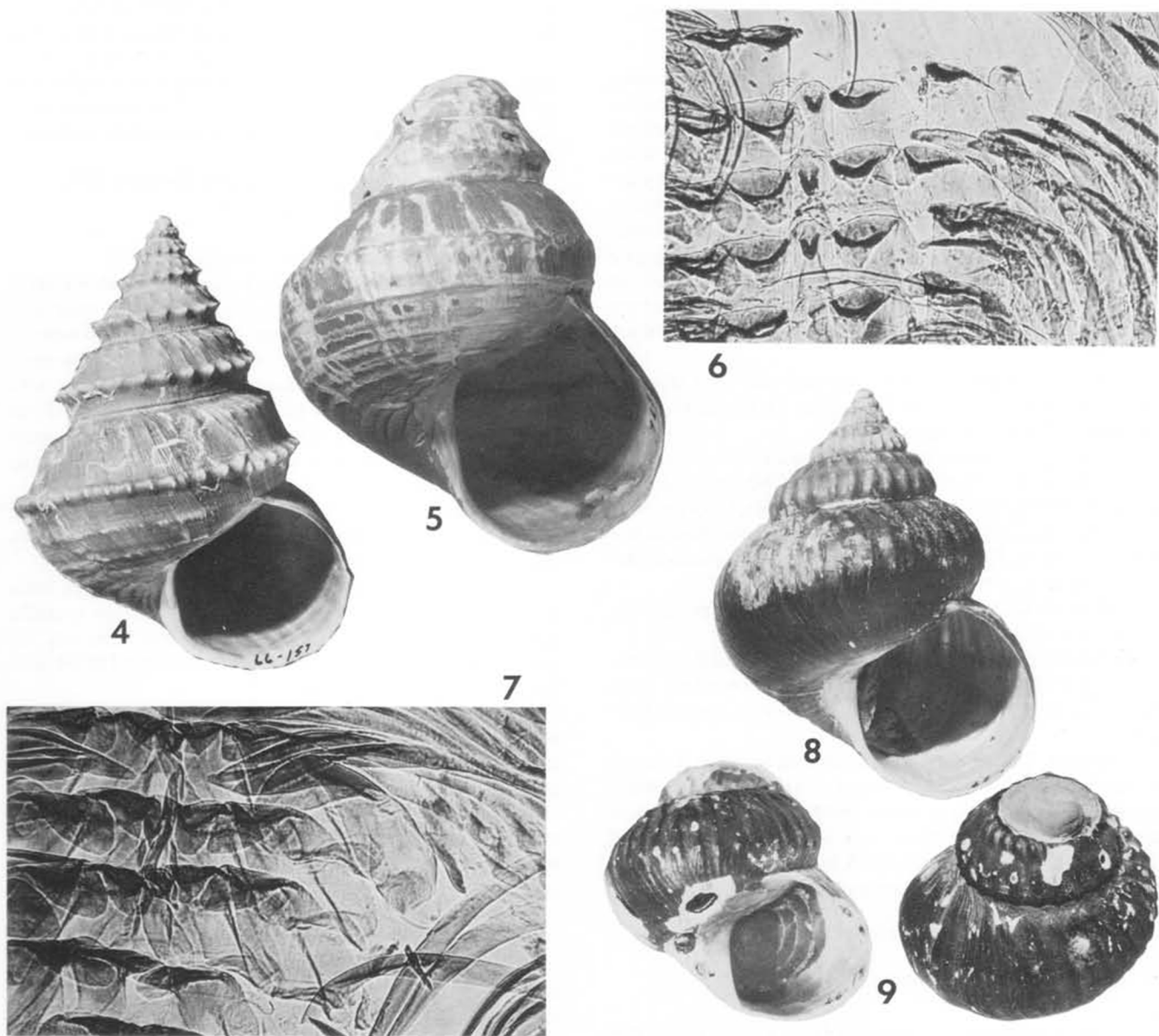
4. McLean (1981) used the subfamily Amberleyinae for this group. That name was proposed at the family level by Wenz, 1938. The older Eucyclinae must be used, a name proposed at the family level by Koken, 1896.

de Tierra (LACM), S. of Lobos de Afuera (LACM). Chile: Junquillar (LACM), Los Vilos (LACM), Punta Salinas (LACM, fig. 4), Caleta Molles (LACM), Papudo, Zapallar, Quintero, Algarrobo, Punta Penablanca (LACM), Punta Topocalma (LACM). Specimens examined: more than 100.

TYPE MATERIAL AND TYPE LOCALITY. Holotype, USNM

96559 (Fig. 5). Type locality: 401 fm (733 m) off Manta, Ecuador.

DISTRIBUTION. Off Punta Mala, Panama (LACM 10369) ($7^{\circ}28'N$) to Punta Topocalma, Chile ($34^{\circ}7'S$). As is the case with *B. humboldti*, northern specimens occurring from Panama to Peru are known only from depths of 780–1,200 m, whereas



Figures 4 through 9, *Bathybembix macdonaldi* and *B. humboldti*.

Figures 4 through 6, *B. macdonaldi*. Figure 4, LACM 66-157, 960 m off Punta Salinas, Chile, height 69.3 mm. Figure 5, holotype, USNM 96559, 733 m off Manta, Ecuador, height 75 mm. Figure 6, radula ribbon, LACM 66-152, 750-730 m off Punta Topocalma, Chile, width of field 0.6 mm.

Figures 7 through 9, *B. humboldti*. Figure 7, radula ribbon, LACM 66-171, 605-735 m, W of Isla Macabi, Peru, width of field 0.7 mm. Figure 8, LACM 66-154, 1,170-1,480 m off Puerto San Antonio, Chile, height 61.7 mm. Figure 9, two views, LACM 66-171, 605-735 m W of Isla Macabi, Chile, height 39.7 mm.

those from Chile occur in similar depths and also as shallow as 200 m.

REMARKS. *Bathybembix macdonaldi* differs from *B. humboldti* in having strong peripheral nodes and a much lighter colored periostracum. Northern specimens tend to have a fainter subsutural cord and more numerous peripheral nodes, as in the holotype (Fig. 5).

Bathybembix humboldti Rehder, 1971

Figures 7–9

Bathybembix humboldti Rehder, 1971:578, fig. 4.

DESCRIPTION. Shell large, thin, suture deeply impressed, whorls rounded. Periostracum thin, brown, varying from yellowish brown to dark brown. Protoconch missing, teleoconch whorls seven on perfect specimens, but usually the early whorls are missing and sealed over with a chalky shell layer. Axial sculpture of low, narrow ribs on the upper half of the whorl, base nearly smooth except for broadly spaced, faintly marked spiral cords. Sculpture of three spiral cords on early whorls, forming elongate nodes where intersecting the axial ribs; one cord just below the suture and two others closer together at the periphery. Aperture nearly circular, outer lip thin, interior nacreous; operculum multispiral.

Dimensions: height 61.7 mm, diameter 46.9 mm (Fig. 8); height 39.7 mm, diameter 40.8 mm (Fig. 9); height 53.1 mm, diameter 44.3 mm (holotype).

Radula (Fig. 7): similar to that of *B. macdonaldi*.

MATERIAL. Peru: N of Isla Macabi (LACM), W of Isla Macabi (LACM, Fig. 9). Chile: Coquimbo (LACM), Los Vilos, Calleta Molles (LACM), Papudo, Zapallar, Algarrobo, Puerto San Antonio (LACM, Fig. 8), Topocalma, Pichilemu. Specimens examined: more than 100.

TYPE MATERIAL AND TYPE LOCALITY. Holotype, USNM 701665, 200 m, 17–18 km NW of Valparaíso, Chile.

DISTRIBUTION. Isla Macabi, Peru (7°44'S), to Pichilemu, Chile (34°27'S). Depth range: 200–1,480 m. In northern Peru, the depth range is 605–760 m; in Chile, the depth range is 200–1,480 m.

REMARKS. This species is characterized by its dark brown periostracum and the predominance of axial sculpture. Most specimens have the apical whorls badly eroded, although such specimens may seal the apical area with internally deposited shell layers (Fig. 9). Populations of *B. humboldti* have uniformly colored periostraca, some darker than others.

Subfamily Calliostomatinae

Genus *Calliostoma* Swainson, 1840

Type species (subsequent designation Hermannsen, 1846): *Trochus conulus* Linnaeus, 1758. Recent, Europe.

Subgenus *Otukaia* Ikebe, 1943

Type species (original designation): *Calliostoma kiheziebisu* Otuka, 1939. Japan.

The calliostomatine trochids have a characteristic radula, modifications in the reproductive system, and a channel in the ventral lip—the pseudoproboscis—directed to the right (Fretter and Graham, 1962, fig. 92). Clench and Turner (1960) reviewed the Atlantic species, but a worldwide generic review has not been offered, and there are varying concepts of genera and subgenera in the family.

The two species of *Calliostoma* in the present material are members of the subgenus *Otukaia* Ikebe, 1943, a group of relatively large-shelled species broadly distributed in deep water throughout the world. They are characterized by a silky white surface layer, rather than a variegated color pattern, and sculpture of three spiral cords on the early whorls, which may or may not persist on later whorls. *Alertalex* Dell, 1956 (type species: *A. blacki* Dell, 1956, from New Zealand), is regarded as a synonym.

Calliostoma (Otukaia) chilena Rehder, 1971

Figures 10–12

Calliostoma chilena Rehder, 1971:590, figs. 2, 5.

DESCRIPTION. Shell large, thin, nonumbilicate; whorls flat to slightly convex, early spire profile slightly concave; color silky white with a gray-green nacreous sheen. Protoconch smooth, rounded, teleoconch whorls nine, early whorls with three spiral cords and axial ribs that produce square cancellations; these cords fade altogether by the fifth whorl. The suture is laid just below the basal keel; base with fine and even spiral cords, more prominent near the columella. Columella thick, slanted, outer lip sharp, thin. Operculum corneous, multispiral.

Dimensions: height 31.7 mm, diameter 26.5 mm (Fig. 10); height 32.7 mm, diameter 29.9 mm (Fig. 11); height 36.1 mm, diameter 31.9 mm (holotype).

Animal: cephalic lappets lacking, left and right neck lobes broad, rolled to form incurrent and excurrent siphons; epipodial tentacles four pairs, two in line with the neck lobes and two adjacent to the operculum; cephalic tentacles broad at the base, eye peduncles short, eyes large.

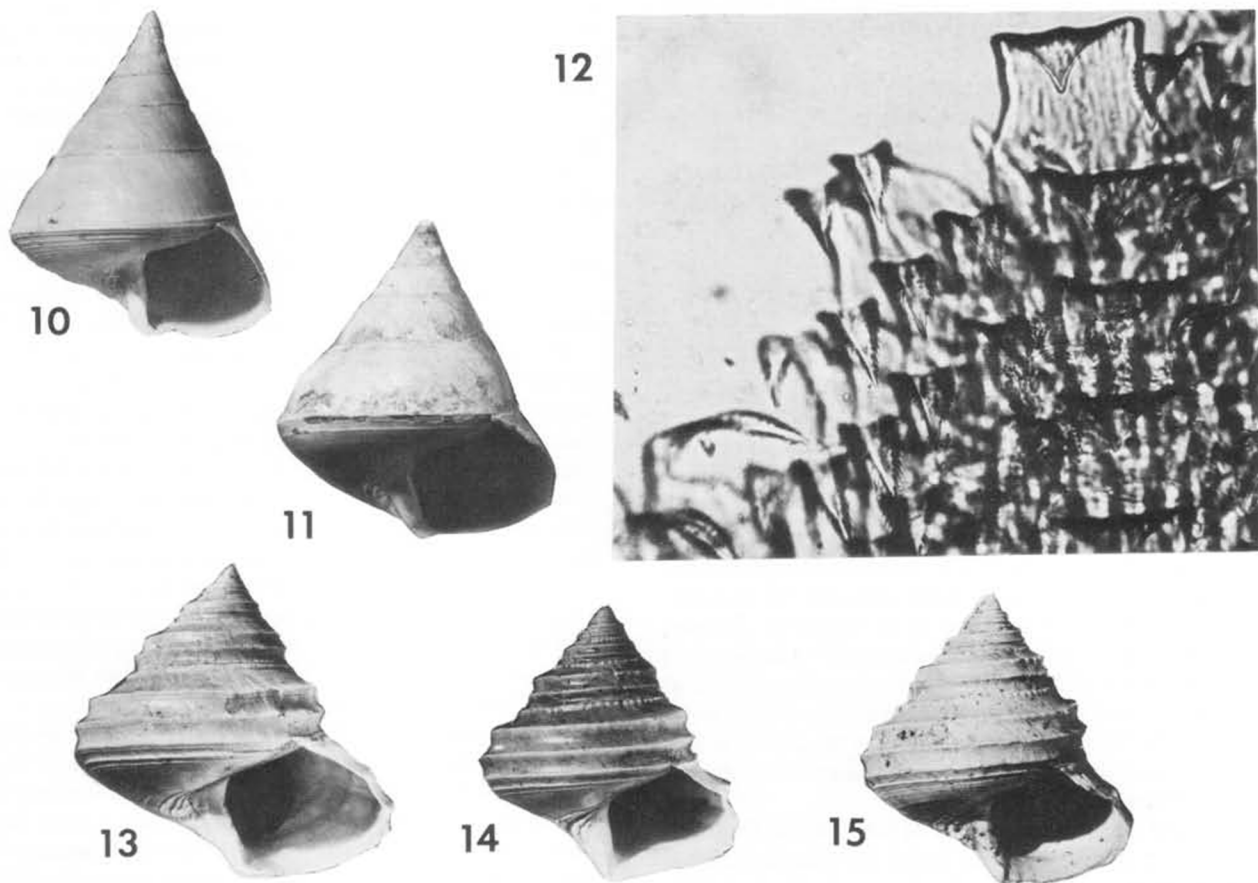
Radula (Fig. 12): the rachidian tooth is more than twice as broad as any of the lateral teeth; there are at least six pairs of lateral teeth, and the serrate, overhanging cusps of the lateral teeth are exceptionally long.

MATERIAL. Peru: W of Isla Macabi (LACM, Fig. 11). Chile: Coquimbo (LACM), Los Vilos, Punta Salinas (LACM, Fig. 10), Papudo, Zapallar, Punta Topocalma (LACM). Specimens examined: 12.

TYPE MATERIAL AND TYPE LOCALITY. Holotype, USNM 701669, 17 km NW of Valparaíso, Chile, 200 m.

DISTRIBUTION. Off Cebaco Island, Gulf of Panama (LACM 10370) (7°32'N), to Punta Topocalma, Chile (34°7'S). Depth range: 200–750 m. The minimum depth in Panama and northern Peru is 560 m; in Chile, the depths range from 200 to 750 m.

REMARKS. *Calliostoma chilena* was described originally from a single specimen. It is still known from rather few specimens. As Rehder noted, *C. chilena* most closely resembles *C. platinum* Dall, 1890, which ranges from British Columbia to southern California at depths of 150–700 m. *Calliostoma platinum* is broader and has convex rather than flat-sided whorls.



Figures 10 through 15, *Calliostoma chilena* and *C. delli* new species.

Figures 10 through 12, *C. chilena*. Figure 10, LACM 66-157, 960 m off Punta Salinas, Chile, height 31.7 mm. Figure 11, LACM 66-171, 605-735 m, W of Isla Macabi, Peru, height 32.7 mm. Figure 12, radular ribbon of specimen in Fig. 10, width of field 0.6 mm.

Figures 13 through 15, *Calliostoma delli* new species. Figure 13, holotype, LACM 1980, 400 m off Los Vilos, Chile, height 29.6 mm. Figure 14, paratype, LACM 1981a, same locality, height 24.3 mm. Figure 15, paratype, LACM 1981b, same locality, height 29.0 mm.

Calliostoma (Otukaia) delli new species

Figures 13-15

DESCRIPTION. Shell large, thin, silky white, nonumbilicate, spire whorls convex. Protoconch of one and one-fourth whorls, teleoconch whorls seven, first teleoconch whorl with three spiral cords, noded to produce square cancellations; sculpture changing by the second whorl to three prominently projecting spiral cords, the uppermost cord beaded, the other two smooth. Mature sculpture of three prominent cords, subsutural cord the least prominent, remaining close to the suture and losing its beading by about the third whorl; second cord sharply defined and separated from the subsutural cord by a broad, smooth area; third cord equally strong and projecting to form the peripheral extent of the whorl. Basal keel sharp; suture laid directly on its lower surface, not forming a channel. Basal cording of about three fine cords on the outer edge and two to three bordering the columellar wall; intermediate area of base smooth except for fine spiral striae. Columellar wall thickened, slanted, forming a spur at the

base; outer lip thin. Operculum corneous, multispiral. Animal and radula as in *C. chilena*.

Dimensions: height 29.6 mm, diameter 30.9 mm (holotype, Fig. 13); height 24.3 mm, diameter 23.2 mm (paratype, Fig. 14); height 29.0 mm, diameter 26.0 mm (paratype, Fig. 15).

MATERIAL. Chile: Los Vilos (LACM, type lot, Figs. 13-15), Papudo, Zapallar, Algarrobo, Punta Penablanca (LACM), Pichilemu, Constitución. Specimens examined: 114.

TYPE MATERIAL. Thirty-three specimens from the type locality, collected 29 May 1977, by Andrade, shrimp trawler GODEN WIND. Holotype, LACM 1980; paratypes, LACM 1981; paratypes, MNHN 200489; paratypes, MZICB 15.528; paratypes, USNM 784738.

TYPE LOCALITY. 400 m off Los Vilos, Chile (31°56'S; 71°54'W).

DISTRIBUTION. Los Vilos (31°56'S) to Constitución, Chile (35°20'S). Depth range 200-450 m.

DIAGNOSIS. A species of the subgenus *Otukaia* characterized by having three spiral cords prominent at all growth stages. It

differs from the similarly sculptured *C. blacki* (Dell, 1956) from New Zealand (see Dell, 1956:46, pl. 7, fig. 6) in being lower spired, and in having a weaker subsutural (first) cord and a stronger second cord.

REMARKS *Calliostoma delli* tends to be broader than high; one of the figured paratypes (Fig. 14) is unusually narrow, compared to most specimens in the type lot.

ETYMOLOGY. We are pleased to name this species in honor of Dr. Richard K. Dell of the National Museum of New Zealand, Wellington.

Superfamily Hipponicacea

Family Capulidae

Genus *Capulus* Montfort, 1810

Type species (original designation): *Patella ungaricus* Linnaeus, 1767. Recent, Europe.

Capulus species are sedentary, protandric, brooding limpets that are usually attached to shells of living bivalves. Most commonly, they are attached to pectinid bivalves, although the European type species may attach to stones or to *Turritella* (Thorson, 1965). Some of their nutrition is derived from filter feeding, as in the calyptraeids, but they also use the pseudoproboscis, an openly grooved proboscis, to take food from the host (Fretter and Graham, 1962). Recently, some species have been found to bore holes in the host shell, inserting the pseudoproboscis directly (Orr, 1962; Matsukuma, 1978).

The capulid in the present material from central Chile was attached to a large bivalve of the family Limidae, identified as *Acesta patagonica* (Dall, 1902). This is the second capulid species associated with a limid rather than a pectinid bivalve. Recently, Dell (1978) described *Capulus novaezelandiae*, attached to an unidentified species of *Acesta* from New Zealand waters. [For a review of *Acesta*, see Vokes, 1963].

Capulus ungaricoides (Orbigny, 1841)

Figures 16–19

Pileopsis ungaricoides Orbigny, 1841:457, pl. 78, fig. 4.

Capulus ungaricoides, Dall, 1909:234; Keen, 1966:3, pl. 1, figs. 14a, 14b; Keen, 1971:467, fig. 833.

"*Capulus chilensis* Dall," Carcelles, 1944:2, fig. 1.

DESCRIPTION. Shell large for the genus, thin but sturdy; outline nearly circular, irregular, conforming to the attachment surface. Apex narrow, strongly incurved, overhanging the posterior margin. Sculpture of fine radial ribs, rib interspaces consisting of narrow grooves. Periostracum and all traces of the radial ribs worn away on apical region but persisting near the margin; periostracum slightly overhanging the shell edge. Interior glossy white; muscle scar horseshoe-shaped.

Dimensions: diameter 39.6 mm, height 15.7 mm (Fig. 18); diameter 24.4 mm, height 9.0 mm (Fig. 16).

Animal: preserved specimens (Fig. 19) have the brood sac with a folded edge unlike that shown in other published illustrations of *Capulus* species. Animal not boring into the shell of its host but producing a notch in the shell edge (Fig. 18, left). The specimen

in Figure 18 (right) is shown attached to the left valve of *A. patagonica*, and in Figure 18 (left), the attachment scar area is shown. The area corresponding to the posterior edge of the foot is eroded in the host shell; this is not a result of boring by the *Capulus*, because it is too far from the position of the head.

Radula (Fig. 17): rachidian and lateral strongly cusped and serrate on the edges, marginals uncusped.

MATERIAL. Chile: Coquimbo (LACM, Figs. 18, 19), Los Vilos (LACM, Fig. 16), Zapallar, Quintero. Specimens examined: six.

TYPE MATERIAL AND TYPE LOCALITY. Holotype, BM(NH) 54.12.4.554. Type locality: Paita, Peru.

DISTRIBUTION. Paita, Peru (5°5'S), to Isla de Los Estados, Argentina (54°47'S). Depth range off central Chile: 200–450 m.

REMARKS. Orbigny's species *Capulus ungaricoides*, described from Paita, Peru, has not been reported (other than in faunal lists) subsequent to its original description. The present material agrees with the original description and with illustrations of the holotype given by Keen (1966), except for lacking reddish rays, which may not be significant. Although the material treated here may not be positively identified with Orbigny's species, it is premature to distinguish separate species until material conforming to Orbigny's holotype can be shown to represent a separate species. Orbigny's holotype was probably not associated with an *Acesta* species, but because many species of *Capulus* are not host-specific, that need not preclude it being conspecific with the present material.

Capulus ungaricoides has the fine spiral sculpture present in *C. chilensis* Dall, 1908, and *C. novaezelandiae* Dell, 1978, but differs from both in having a narrower, more rapidly expanding apex. *Capulus chilensis* has regular early coiling of three distinct whorls, very unlike the narrow recurved apex of *C. ungaricoides*. Type material of *Capulus chilensis* has not previously been figured. The holotype measures 25 mm in diameter; a smaller paratype specimen is figured here (Fig. 20), to show the coiling of the early whorls.

Although Carcelles (1944) reported upon a specimen from Isla de los Estados (east of Tierra del Fuego), Argentina, identified as *C. chilensis*, his description agrees with the present material and forms the basis for the distributional record of *C. ungaricoides* cited above.

Superfamily Tonnacea

Family Cymatiidae

Genus *Fusitriton* Cossmann, 1903

Type species (monotypy): *Triton cancellatus* Lamarck, 1816 [= *Neptunea magellanica* Roeding, 1798]. Recent, Magellanic.

Fusitriton is noted for its bipolar distribution; species are common in shallow water in the North Pacific, South Pacific, and South Atlantic Oceans. At lower latitudes, all of the species become deeply submergent, which helps to explain the presence of the genus in cold waters of both the Northern and Southern Hemispheres.

The genus has been thoroughly reviewed by Smith (1970), who discussed the broadly distributed species in the present ma-