

A new early Miocene *Muracypraea* Woodring, 1957 (Gastropoda: Cypraeidae) from the Pisco Basin of southern Peru

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ABSTRACT

The cypraeid gastropod, *Muracypraea ormenoi* new species, is described from lower to middle Miocene beds of the uppermost Oligocene to middle Miocene Chilcatay Formation, Pisco Basin, southern Peru. It is the first cypraeid reported from southern Peru and represents the southernmost occurrence of this genus. *Muracypraea* is normally a warm-water gastropod and its occurrence in the study area indicates dispersal by means of coastal countercurrents into waters possibly cooled by coastal upwelling. The new species shares a neritic habitat with endemic molluscan taxa and with taxa ranging northward from the Navidad Basin of central Chile.

INTRODUCTION

Muracypraea ormenoi new species is described from the Chilcatay Formation of the Pisco Basin, southern Peru. Associated mollusks and microfossils from correlative nearby strata indicate an age of approximately 20 Ma (early Miocene) for its occurrence. The new species is represented by a well preserved holotype and a poorly preserved specimen. This new species represents the southernmost occurrence of *Muracypraea* Woodring, 1957, and indicates a dispersal into waters of austral-coastal upwelling environments. The new species also shares a neritic habitat with endemic molluscan taxa and taxa ranging northward from the Navidad Basin of central Chile (DeVries and Frassinetti, 2003). Its occurrence at 15°S also accentuates the modern-day diminishment of the range of *Muracypraea* since the early and middle Miocene, because *M. mus* (Linnaeus, 1758), the last living representative of the genus, is restricted to the southwestern Caribbean coasts of Venezuela and Colombia (Lorenz and Hubert, 2000).

STRATIGRAPHY AND AGE

The Pisco Basin is a forearc basin that extends along the narrow coastal plain of southern Peru from Paracas to Nazca, Ica Department (Figure 1). Figure 2 indicates the type locality of the new species. Cenozoic marine beds are exposed throughout the coastal desert, including those of the upper Oligocene to middle Miocene Chilcatay Formation and the overlying lower middle Miocene through middle upper Pliocene Pisco Formation (DeVries, 1998).

CHILCATAY FORMATION

The name Chilcatay Formation was assigned to upper Oligocene to lower Miocene strata near Pampa Chilcatay, approximately 60 km west of Ica, by Dunbar et al. (1990). The Chilcatay Formation consists of basal sandstones associated with a transgression at approximately 25 Ma (DeVries, 2001), tuffaceous and diatomaceous siltstone indicative of shelf depths and a coastal-upwelling regime (Dunbar et al., 1990), and intercalated coarse-grained sandstone that may represent short-lived early Miocene eustatic sea-level events (DeVries, 1998). Macharé and Fourtanier (1987) estimated the stratigraphic thickness of the Chilcatay Formation at approximately 250 m.

PISCO FORMATION

Unconformably overlying the Chilcatay Formation is the Pisco Formation of Adams (1909), named for steeply dipping, white and yellowish rocks exposed at the end of the Huamaní bridge over the Río Pisco north of Pisco, Peru. Dunbar et al. (1990) reported that the age of the Formation is late middle Miocene through Pliocene (4–12 Ma), based on K/Ar dates combined with siliceous microfossil zonation, whereas DeVries and Schrader (1997), DeVries (1998), and DeVries and Frassinetti (2003) assigned an early middle Miocene to middle late

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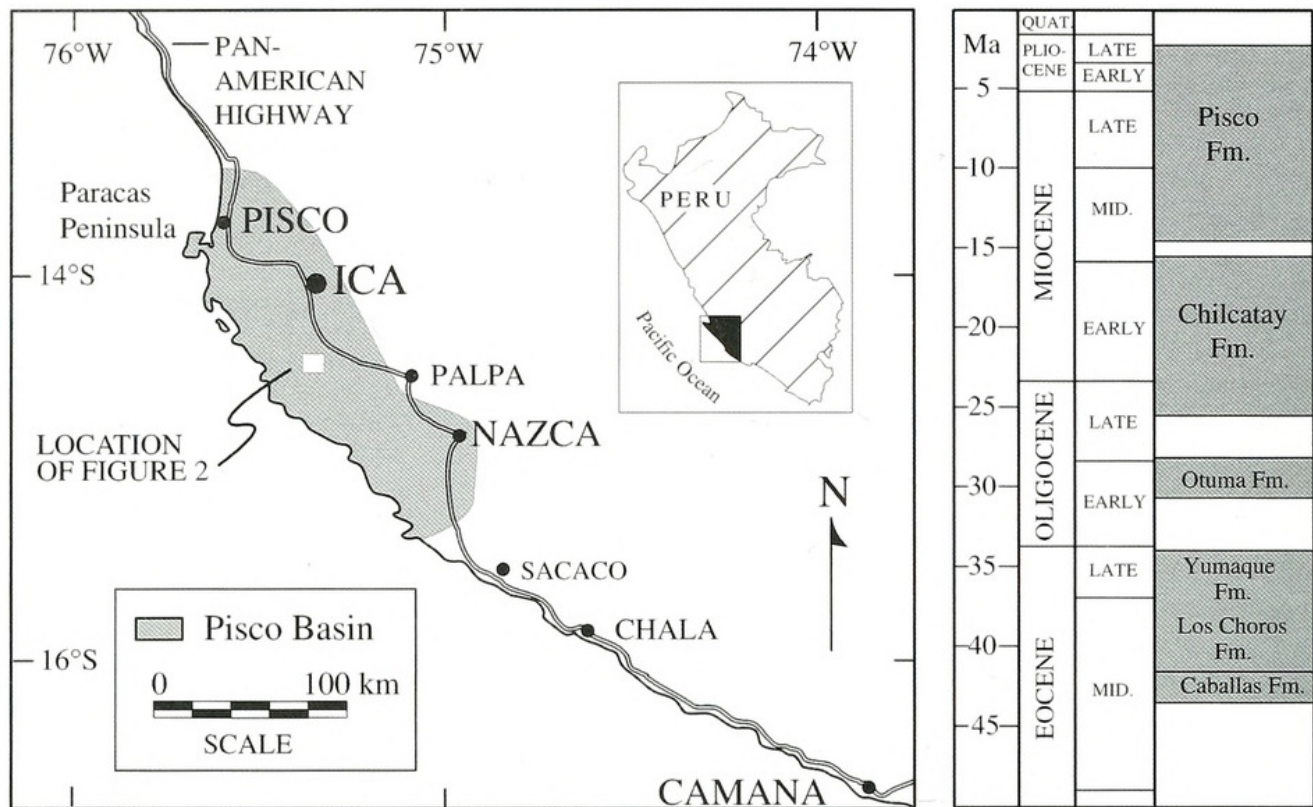


Figure 1. Index map showing location of the Pisco Basin in southern Peru and chronostratigraphy of the Pisco Basin (DeVries and Schrader, 1997).

Pliocene age to the bioclastic conglomerates, tuffaceous siltstones, and diatomaceous siltstones based on diatom biostratigraphy and their revised molluscan biostratigraphy. The formation varies in thickness throughout the Pisco Basin from about 200 to 1000 m thick (Dunbar et al., 1990).

Abbreviations: Abbreviations used for institutional catalog and/or locality numbers are as follows: DV, collecting localities of Thomas J. DeVries; LACMIP, Natural History Museum of Los Angeles County, Invertebrate Paleontology Section; USNM, National Museum of Natural History, Smithsonian Institution, Washington, DC.

Measurement parameters are defined as follows: length = greatest distance between anterior and posterior termini, width = greatest distance between lateral margins, and height = greatest distance between base and dorsum. The systematic classification herein follows that of Schilder and Schilder (1971) with modifications by Kay (1996).

SYSTEMATIC PALEONTOLOGY

Superfamily Cypraeoidea Rafinesque, 1815
 Family Cypraeidae Rafinesque, 1815
 Subfamily Bernayinae Schilder, 1927
 Genus *Muracypraea* Woodring, 1957

Type Species: *Cypraea mus* Linnaeus, 1758, by original designation. Recent, Venezuela and Colombia.

Diagnosis: Medium to large size, pyriform or triangular shaped; posterior portion of dorsal surface smooth,

warty, or bituberculate, or rarely a central "spike-like" dorsal tubercle present; labial lip wide, slightly constricted near anterior end, teeth moderately strong; columella wide, teeth strong to weak or absent; aperture wide, curving in posterior direction toward columella; fossula indistinct, wide, shallow, smooth; anterior terminal ridges strong and may extend forward in a flattened or flange-like manner; terminal canals prominent.

Geologic Range: Early Miocene (Aquitainian) to Recent.

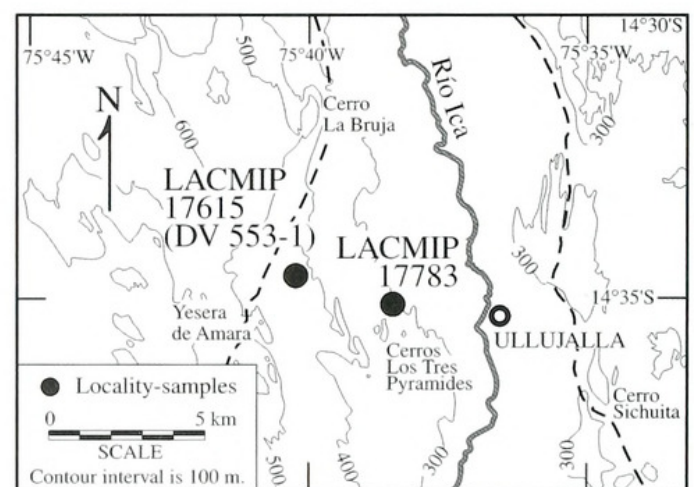


Figure 2. Index map showing the type locality of *Muracypraea ormenoï* new species at Ullujalla West (LACMIP loc. 17783), and locality DV 553-1 (LACMIP loc. 17615). Dashed lines indicate roads.

Geographic Range: Miocene: Dominican Republic, Haiti, Trinidad, Cuba, Jamaica, Venezuela, Colombia, Panama, Brazil, Ecuador, Peru, Costa Rica, Michoacán, Mexico, and Baja California Sur, Mexico; Miocene/Pliocene: Imperial County, California, USA; Pliocene: Venezuela, Panama, Ecuador; Pleistocene: Venezuela; Recent: Venezuela and Colombia.

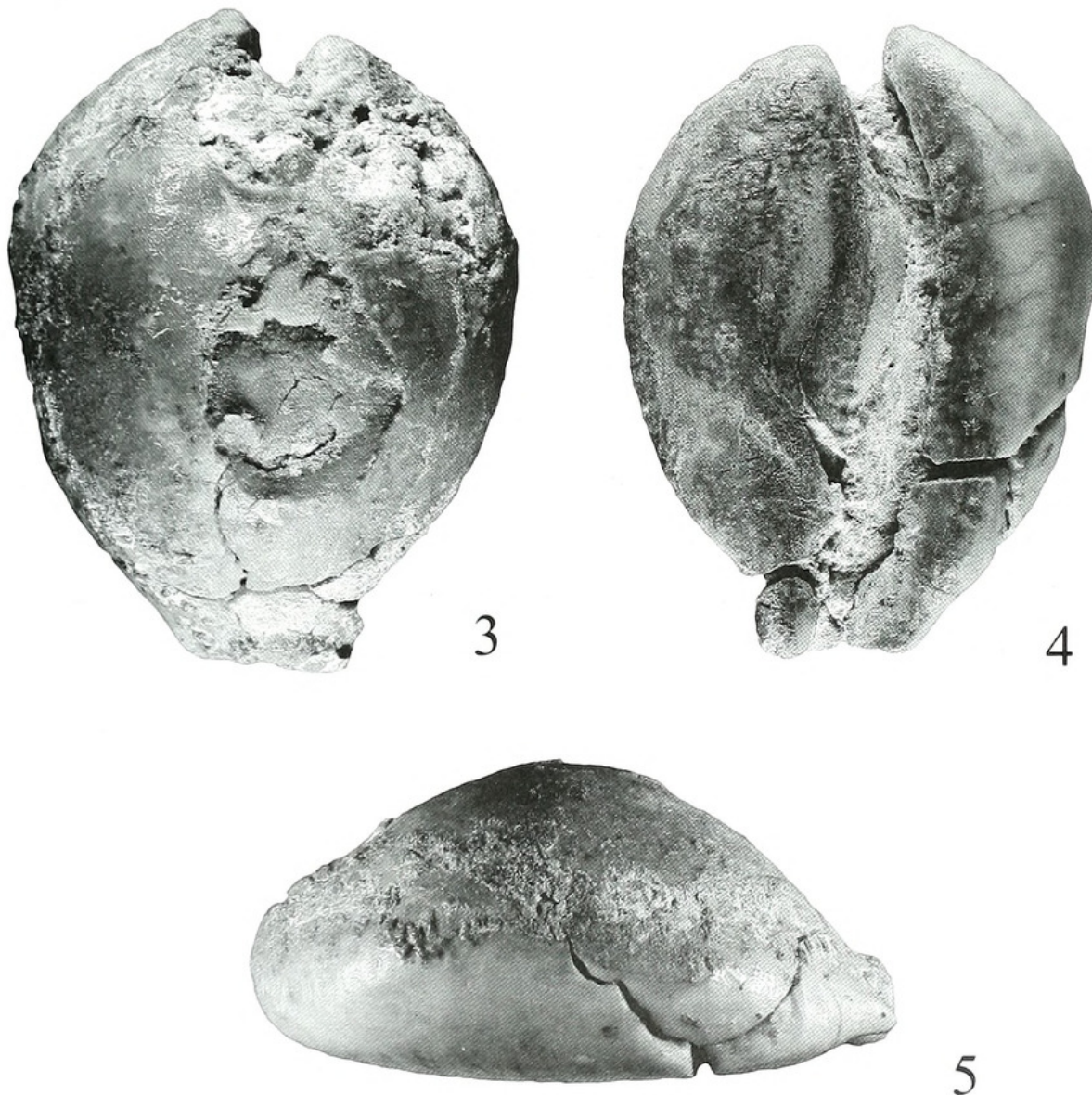
Remarks: In a monograph of the Miocene Gatun Formation of Panama, Woodring (1959) acknowledged the variability of *Muracypraea henekeni* (Sowerby, 1850) and the excess of names applied to this species. He stated that "some of the names in the synonymy may prove to be useful for local populations when adequate samples are available." Groves (1997) reviewed the cypraeiform gastropods of northwestern Ecuador and discussed the stratigraphic and geographic distribution of the *M. henekeni* group in Panama, Ecuador, and Colombia.

Groves (1997, 1998) proposed that a distinctly rhomboidal, bituberculate lineage be recognized in the western Caribbean and tropical eastern Pacific that included specimens previously assigned to *M. henekeni* (Marks, 1951; Olsson, 1964), as well as the Pliocene Ecuadorian species, *M. cayapa* (Pilsbry and Olsson, 1941).

Muracypraea ormenoi new species
(Figures 3–5)

Diagnosis: A medium-sized *Muracypraea* of weakly rhomboidal shape; outer lip extended posteriorly well beyond inner lip; dorsum bituberculate with posteromedial depression.

Description: Shell medium in size; slightly rhomboidal shape; dorsum moderately arched, maximum height (apex) slightly posterior to midpoint; base slightly flattened; surface generally smooth; lateral margin of right



Figures 3–5. *Muracypraea ormenoi* new species, holotype LACMIP no. 8197, length = 64.9 mm. 3. Dorsal view. 4. Apertural view. 5. Labral lateral view.

side weakly corrugated ventrally; dorsum with broad, low tubercles; tubercle on labral side situated axially between apex and periphery; tubercle on columellar side smaller and situated slightly more posteriorly and closer to axial median; medial tubercle at apex absent or broken; medial posterior depression present between tubercles; aperture moderately wide, curved strongly posteriorly toward columella; outer lip extending posteriorly beyond inner lip; outer lip with 17 short simple teeth; columella with about 13 short weak simple teeth, fading posteriorly; denticular interstices smooth; terminal ridge not visible; fossula narrow, mostly covered; siphonal canal long, bordered by spatulate extensions of columella and outer lip; terminal canals moderately extended, very weakly rimmed.

Comparison: The new species is most similar to Woodring's (1959) hypotype of *Cypraea* (*Muracypraea*) *henekeni* [= *Muracypraea mus isthmica* (Schilder, 1927)], USNM 562603 (pl. 31, figs. 6–7) from the upper Miocene Gatun Formation of Panama. *Muracypraea ormeno*i has fewer columellar teeth, a less inflated columella, deeper terminal canals, and is not as highly arched as *M. mus isthmica*. Color pattern aside, when compared to several specimens of the Recent *M. mus bicornis* (Sowerby, 1870) [LACM 90–47.1 (LACM Malacology collection); see also Lorenz and Hubert, 2000, pl. 1, figs. 11, 16, 19], we note a striking similarity in overall morphology between *M. mus bicornis* and the new species. However, the new species has a more inflated columella, fewer columellar teeth, and deeper terminal canals than *M. mus bicornis*. *Muracypraea angustirima* (Spieker, 1922), the other Peruvian muracypraeid species, from the early to middle Miocene Zorritos Formation of Tumbés Department, northern Peru, lacks the dorsal tubercles, has a straighter aperture, has more columellar teeth, and has a more inflated columella than the new species.

Discussion: *Muracypraea ormeno*i is the first cypraeid reported from the Pisco Basin. Although post-burial processes have damaged the mid-dorsal and the posterior dorsal surfaces and the anterior columellar terminal ridge of the holotype of the new species, preservation is adequate for unequivocal generic assignment. The non-type specimen is a poorly preserved specimen consisting of three fragments, including labral and columellar lips and several internal whorls within matrix. Some mollusks associated with *M. ormeno*i in Peru range southward to the Miocene Navidad Basin of central Chile (Table 1; DeVries and Frassinetti, 2003). Other species associated with *M. ormeno*i range northward to the Talara Basin of northern Peru, situated at the same low latitudes where warm sea surface temperatures help define the modern Panamic Faunal Province. Despite the warm-water environment indicated by the southern Peruvian Miocene faunas, sedimentological indicators including diatomaceous siltstone, synsedimentary horizons of remobilized dolomite, and phosphatic concretions (Dunbar et al., 1990) point to the existence of high primary productivity along the southern Peruvian margin during the early and middle Miocene. Then, as now, the impetus for high primary production and would have been coastal upwelling. Upwelled waters were probably cooler than surface waters, but temperatures may still have been more elevated at present, since the world's oceans were warmer during the early Miocene, as well (Savin et al., 1985; Lourens et al., 2004).

Material: *Muracypraea ormeno*i new species is represented by the moderately well-preserved holotype from the upper Oligocene to lower Miocene Chilcatay Formation and an incomplete specimen from the overlying lower middle Miocene to upper Pliocene Pisco Formation. The non-type specimen (LACMIP no. 13070) was collected by the senior author in June, 1987, near Cerro Submarino, east of Yesera de Amara, Ica Department,

Table 1. Mollusks from the Chilcatay and lowermost Pisco formations of southern Peru associated with *Muracypraea ormeno*i new species and their occurrence in depositional basins to the north and south.

Species	Talara Basin Northern Peru	Navidad Basin Central Chile
<i>Acanthina katzi</i> (Fleming, 1972)		x
<i>Eucrassatella ponderosa</i> (Philippi, 1987)		x
<i>Ficus distans</i> (Sowerby, 1846)		x
<i>Glycymeris colchaguensis</i> (Hupé, 1954)		x
<i>Glycymeris ibariformis</i> (Frassinetti and Covacevich, 1984)		x
<i>Miltha vidali</i> (Philippi, 1887)		x
<i>Olivancellaria claneophila</i> (Duclos, 1835)		x
<i>Testallium cepa</i> (Sowerby, 1846)		x
<i>Architectonica karsteni</i> (Rutsch, 1934)	x	
<i>Chionopsis</i> sp.	x	
<i>Conus</i> spp.	x	x
<i>Dosinia</i> sp.	x	
<i>Gonyscyon</i> sp.	x	
<i>Phyllonotus</i> sp.	x	
<i>Terebra</i> sp.	x	x
<i>Turritella woodsi</i> (Lisson, 1925)	x	
<i>Turritella infracarinata</i> (Gryzbowski, 1899)	x	

Peru (14°34'26"S, 75°40'30"W) [DV 553-1, = LACMIP loc. 17615]

Type Material: Holotype LACMIP no. 8197, 64.9 mm in length, 48.3 mm in width, 31.9 mm in height. Collected in October 2004 by Manuel Ormeño, Ocucaje, Peru.

Type Locality: LACMIP loc. 17783, between Yesera de Amara and the Rio Ica, less than one km north of Cerros Las Tres Piramides [herein designated Ullujalla West] (about 14°34'50" S, 75°38'40" W; Lomitas 1: 100,000 quadrangle), Ica Department, southern Peru, upper Oligocene to lower Miocene Chilcatay Formation (Figure 2).

Etymology: Named after Manuel Ormeño who collected the holotype and was one of the principal field workers employed by Mario Urbina.

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