

Exilia alanbeui, a new species from the Neogene of central Chile: the first record of *Exilia* (Gastropoda: Ptychatractidae) from South America

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ABSTRACT

A new species of the ptychatractid genus *Exilia*, *E. alanbeui* new species, is described from late Neogene sediments of the Navidad Formation, central Chile. This new species represents the first record, fossil or Recent, of the genus *Exilia* from the South American continent. Given that Recent species of *Exilia* are restricted to bathyal depths, the presence of representatives of the genus in fine siltstones of the Navidad and Ranquil formations lend support to a previous interpretation of bathyal depths for these deposits.

INTRODUCTION

The genus *Exilia* Conrad, 1860, has been placed in the family Turbinellidae by Maxwell (1988) and in the subfamily Ptychatractinae within the Turbinellidae by Kantor et al. (2001). The subfamily Ptychatractinae was removed from the Turbinellidae and raised to family level by Riedel (2000), as was suggested previously by Kantor and Bouchet (1997). Riedel (2000) placed the Turbinellidae together with other columellar plait-bearing groups in his suborder Volutina while the Ptychatractidae were placed in the suborder Muricina based mainly on radula type and absence of columellar plaits. The most recent classification is that presented by Bouchet and Rocroi (2005), placing Ptychatractidae within Pseudolivoidea. The genus *Exilia* has been revised by Bentson (1940) and more recently by Kantor et al. (2001). The latter authors synonymized nine nominal genera, i.e., *Mitraefusus* Bellardi, 1873, *Mesorhytis* Meek, 1876, *Surculina* Dall, 1908, *Phenacoptygma* Dall, 1918, *Palaeorhaphis* Stewart, 1927, *Zexilia* Finlay, 1926, *Graphidula* Stephenson, 1941, *Benthovoluta* Kuroda and Habe, 1950, and *Chathamidia* Dell, 1956, containing fossil and Recent species with *Exilia* and recognized a total of nine living species. Fossil species were not formally treated by them but a number of

species were figured for comparison. Previously, the Recent species of the synonymized genus *Benthovoluta* had been reviewed by Cernohorsky (1973) and Harasewych (1987). Species of *Exilia* are known from the Late Cretaceous (Coniacian) onward and fossil species are known from all continents except Africa and South America, “probably a reflection of insufficient studies of Cretaceous and Tertiary mollusks in these regions” (Kantor et al., 2001, p. 92). Some Cretaceous through Miocene species come from shallow-water deposits while deep-water occurrences are known since the late Eocene (Kantor et al., 2001). Recent species of *Exilia* are restricted to bathyal depths at tropical latitudes and in the New Zealand region (Kantor et al., 2001).

GEOLOGY OF THE FOSSIL-BEARING LOCALITIES

The Navidad Formation (Darwin, 1846) and its equivalents have recently been re-interpreted as late Miocene bathyal basin deposits containing displaced intertidal to outer shelf sediments (Finger et al., 2003; Nielsen et al., 2003). Several fossiliferous sites have been sampled for micro- and macrofossils. Of these, two localities from the Navidad Formation (Figure 1B) and two from the Ranquil Formation (Figure 1C) yielded specimens of *Exilia* described here.

Locality PPP (Figure 1B) is a grey deep-water siltstone that today forms the intertidal platform at Punta Perro. Based on planktonic foraminifera this locality has been dated as late Miocene (Tortonian) by Tsuchi et al. (1990) and Ibaraki (1992), while new dating by Finger et al. (2003) suggests an even younger age. The fauna is of an unusual composition for the Navidad Formation, containing otherwise unknown species of *Struthiochenopus* (Zinsmeister and Griffin, 1995) and *Xenophora* (Nielsen and DeVries, 2002). The specimens coming from Pupuya (Figure 1B) were collected by

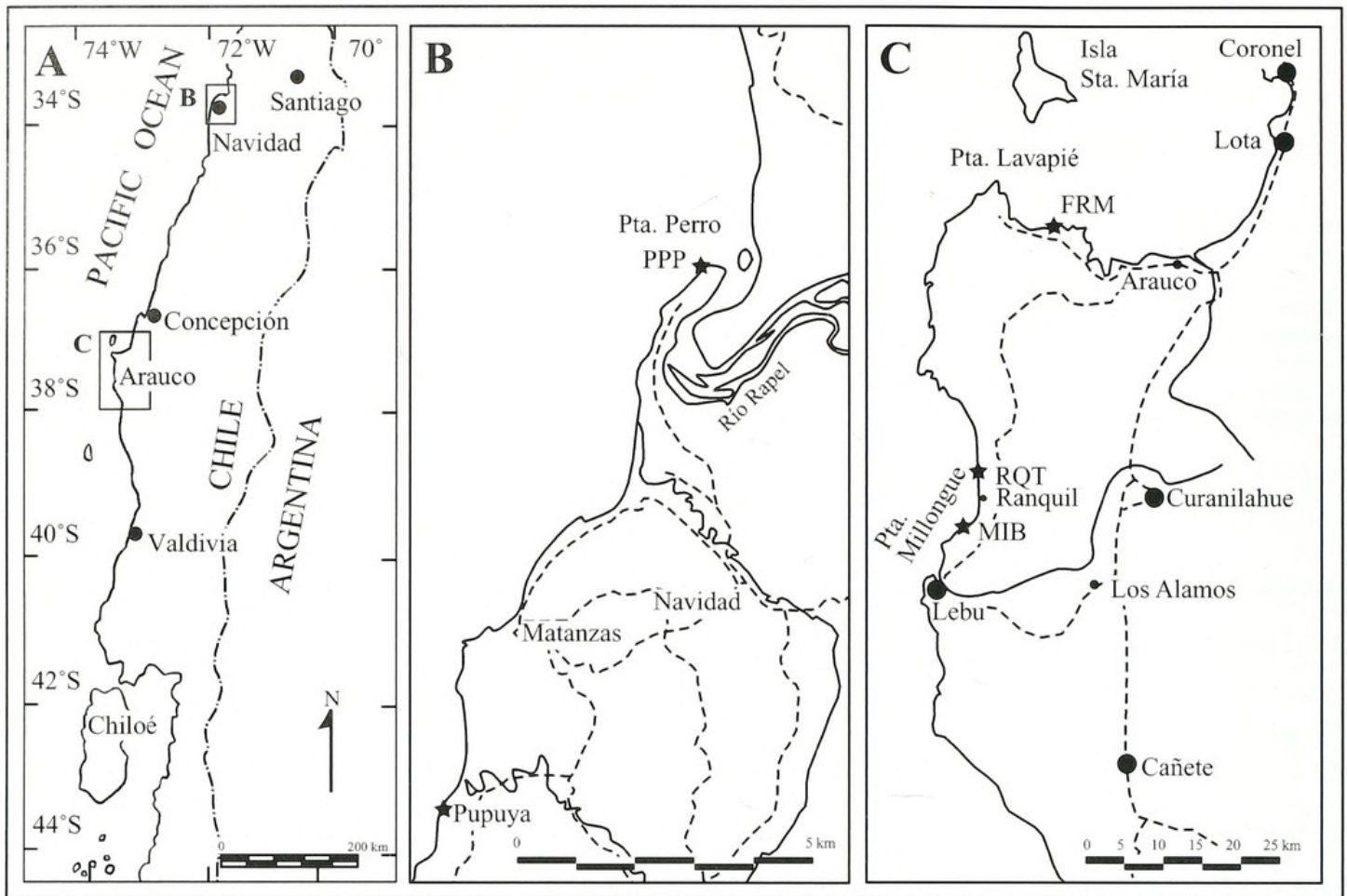


Figure 1. Fossil localities for *Exilia alanbeui* new species, in central Chile. **A.** Location of working areas. **B.** Localities of the Navidad Formation, Platform Punta Perro (PPP), Pupuya. **C.** Localities of the Ranquil Formation, Punta El Fraile (FRM), northern end of Caleta Ranquil (RQT), southwestern end of Caleta Ranquil.

V. Covacevich and D. Frassinetti a little south of the village Pupuya and come from a grey siltstone for which no ages are available. However, the faunal content (e.g., Nielsen et al., 2004) justifies correlation with PPP. The sediment at the type locality Punta El Fraile (FRM, Figure 1C) consists of grey siltstone and underlies a yellowish sandstone typical for the Ranquil Formation. The limit between these two lithological units has been observed to be a sharp, concordant one including some pebbles at the boundary. The sediments at Caleta Ranquil (RQT and MIB, Figure 1C) consist of a grey siltstone similar to that present at Punta El Fraile. The geological relation with other lithologies present at this locality, like reddish sandstone with beds of glauconitic sandstone and coarse light-grey sandstone, are not yet clear. However, both localities of the Ranquil Formation are similar to those of the Navidad Formation in lithology, and faunal content and were also dated as late Miocene by Finger et al. (2003).

MATERIALS AND METHODS

Specimens described in this study are deposited in the collections of the Departamento de Paleontología de

Invertebrados Museo Nacional de Historia Natural, Santiago de Chile (SGO.PI) and Senckenberg Museum, Frankfurt, Germany (SMF). Photographs were taken using a Leicaflex SL2 or Olympus Camedia c730 camera. Images taken with the former camera were scanned from Ilford FP4 125 black and white 35 mm negatives using an Acer ScanWit 2720S film scanner. All images were processed with Adobe Photoshop 7.0.

SYSTEMATIC PALEONTOLOGY

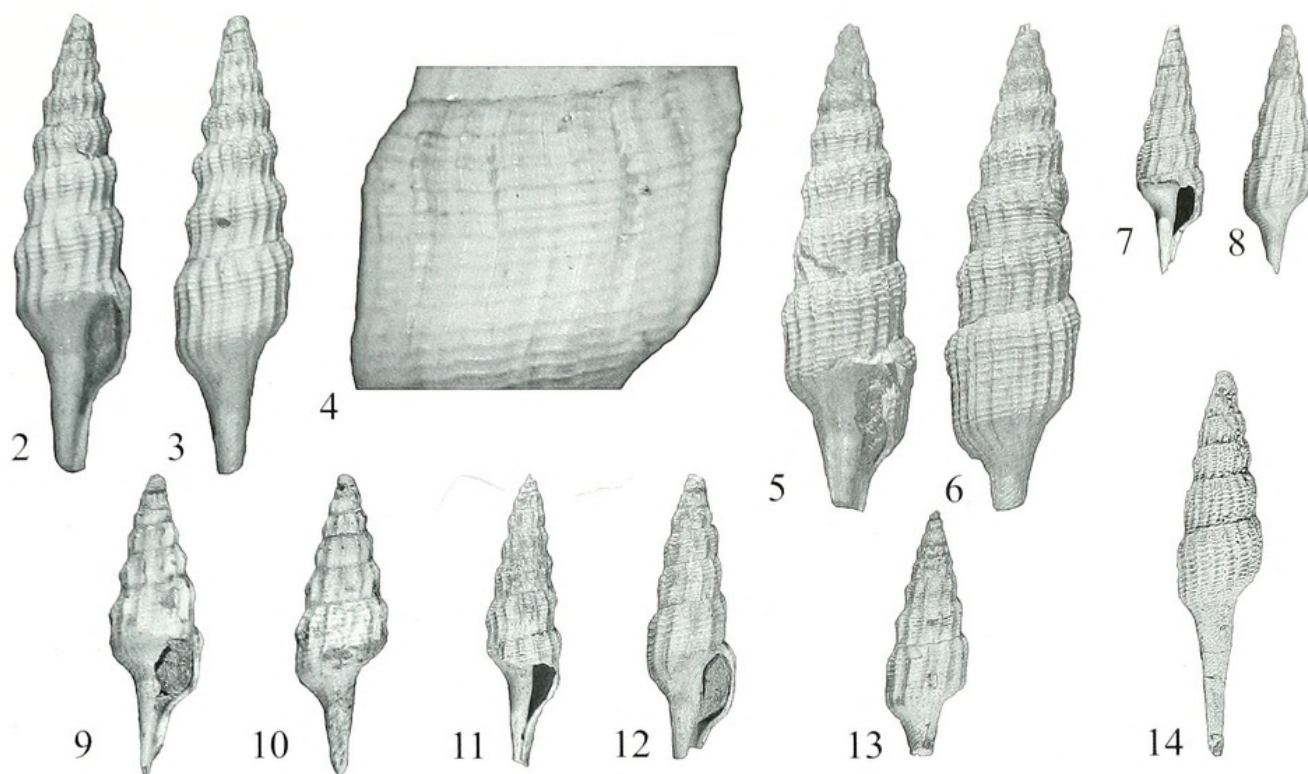
Family Ptychatractidae Stimpson, 1865

Genus *Exilia* Conrad, 1860

Type Species: *Exilia pergracilis* Conrad, 1860, by monotypy; Midway Group, lower Eocene, Alabama, USA.

Exilia alanbeui new species
(Figures 2–14)

Description: Shell narrow-fusiform, with spire occupying only little more than half of total height. Protoconch unknown. Teleoconch of about seven straight to slightly convex whorls, lacking pronounced shoulder. Axial sculpture consists of rounded, slightly



Figures 2–14. *Exilia alanbeui* new species. **2–4.** Holotype FRM 019 (height 28.35 mm). **5–6.** Paratype FRM 012-3 (height 30.2 mm). **7–8.** Paratype FRM 012-2 (height 15.46 mm). **9–10.** Paratype FRM 012-1 (height 9.3 mm). **11.** Paratype FRM 012-4 (height 18.03 mm). **12.** Paratype FRM 012-5 (height 17.62 mm). **13.** Paratype FRM 012-6 (height 15.2 mm). **14.** PPP 017 (PPP, height 23.9 mm).

backwards bent, collabral ribs. Penultimate whorl bears about 16 ribs, which become obsolete on base of whorl. Spiral sculpture well and equally defined, consisting of narrow, low, rounded, subequal cords, crossing axial elements unchanged, separated by interspaces of about equal width. Fine secondary spiral threads present in some interspaces. On penultimate whorl 10–14 spiral cords present, 8–9 further cords present on base of last whorl and about 30 weaker, closely spaced cords on siphonal canal. Aperture narrow-elongate. Outer lip thin. Siphonal canal narrow, long, straight. Inner lip smooth. Columella smooth and almost straight, with weak swelling at entrance of siphonal canal.

Etymology: This species is named in honour of Alan G. Beu (Institute of Geological and Nuclear Sciences, New Zealand), who always helps when needed.

Type Material: Holotype SGO.PI.6371 (FRM, height 28.35 mm), paratypes SGO.PI.6372 (FRM, one specimen, height 10.5 mm), SGO.PI.6373 (FRM, 21 specimens), SMF 327749 (FRM, 19 specimens).

Other Material Examined: SGO.PI.6374 (PPP, height 23.9 mm), SGO.PI.6375 (PPP, one specimen), SGO.PI.5303 (Pupuya, four specimens), SGO.PI.6376 (RQT, one specimen, height 9.25 mm), SGO.PI.6377 (MIB, one specimen, height 29.91 mm).

Type Locality: The grey siltstone at Punta El Fraile (FRM), Arauco, southern central Chile.

Occurrence: PPP, Pupuya, FRM, MIB, RQT; Navidad and Ranquil formations, Late Miocene or Early Pliocene, central Chile.

Discussion: *Exilia alanbeui* resembles the type species, *E. pergracilis* (see Bentson, 1940, pl. 2, fig. 25; Kantor et al., 2001, figs. 1 A–D), and *E. lincolnensis* Weaver, 1916, but differs from those North American Eocene species in having a less convex whorl profile, almost straight instead of sinusoidal axial sculpture and a more angulated whorl base. It differs from the New Zealand Miocene species *E. nodulifera* (Marwick, 1931), *E. leachi* (Marwick, 1931) and *E. wellmanni* Maxwell, 1988 (see Maxwell 1988) in having stronger axial sculpture. Most species of *Exilia* have more convex whorls and especially the Recent species have weaker axial sculpture (see Harasewych, 1987 and Kantor et al., 2001). The geographically closest species, *E. cortezi*, has wider whorls and different axial sculpture and is therefore not considered to be closely related to *E. alanbeui*. *Exilia alanbeui* is known only from localities consisting of deep water siltstones which have been dated as probably Messinian in age based on foraminifera (Finger et al., 2003). Therefore, this species is younger than the above mentioned Miocene species from New Zealand. Regarding the similarity of the two species, *E. alanbeui* may prove to be closely related to the New Zealand species *E. wellmanni*.

CONCLUSIONS

The occurrence of *Exilia alanbeui* in central Chile is the first record of the genus from the South American continent (except the Recent *E. cortezi* (Dall, 1908) from the Galápagos Islands) and therefore closes a considerable biogeographic gap. Although shallow water species of *Exilia* are known from Miocene deposits of Europe, the occurrence of *Exilia* in siltstones of the Navidad and Ranquil formations is here interpreted to support microfossil data placing these deposits in a bathyal environment (Finger et al., 2003).

Exilia alanbeui is another Chilean Miocene gastropod species that shows many similarities to New Zealand taxa. Trans-Pacific biogeographic connections between Chile and New Zealand during the Miocene have already been shown for some vetigastropods (Nielsen et al., 2004) and xenophorids (Nielsen and DeVries, 2002).

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