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Geographic and bathymetric distribution of *Americominella duartei* (Neogastropoda: Buccinidae), a bathyal species from the Southwestern Atlantic

ALVAR CARRANZA[1,2], FABRIZIO SCARABINO[4], LEONARDO ORTEGA[5] & SEBASTIÁN SAUCO[1,3]

[1]UNDECIMAR, Facultad de Ciencias, Iguá 4225, C.P. 11400, Montevideo, Uruguay. e-mails: [2]alvardoc@fcien.edu.uy; [3]sebas@montevideo.com.uy
[4]Museo Nacional de Historia Natural y Antropología, C.C. 399, C.P. 11000, Montevideo, Uruguay and Dirección Nacional de Recursos Acuáticos, Constituyente 1497, CP 11200, Montevideo, Uruguay. e-mail: fscara@gmail.com
[5]Dirección Nacional de Recursos Acuáticos, Constituyente 1497, CP 11200, Montevideo, Uruguay. e-mail: lortega@dinara.gub.uy.

Abstract. The accurate description of the geographic and bathymetric ranges of benthic species is a key issue for macroecological and biogeographical studies. However, it is usual to assume that a species bathymetric range does not vary with latitude. Besides, accurate information on bathymetric and latitudinal ranges is not the rule for South American benthic gastropods, due to several factors. We illustrated this issue by reviewing the existent data and reporting new information on the gastropod *Americominella duartei* Klappenbach & Ureta, 1972 in the Southwestern Atlantic shelf and slope, also providing precise references for its northernmost distribution limit. *A. duartei* is widely distributed along the Southern Atlantic shelf, from 36°51'00" to 54°51'00"S. It is a bathyal species, commonly found at depths between 300 and 400 m, although it can be found in depths ranging from 100 to 1250 m. The bathymetric range of the species increases with latitude, due to a shift of the species to deeper waters tracking the distribution of Subantarctic Waters over the northern portion of the area. Our results shows that the bathymetric ranges of benthic animals should be used with caution when searching for macroecological patterns.

Key words: Gastropoda, Buccinoidea, bathymetric range, macroecology.

Resumen. Distribución geográfica y batimétrica de Americominella duartei (Neogastropoda: Buccinidae), una especie batial del Atlántico Sudoccidental. La descripción precisa de los rangos geográficos y batimétricos de las especies bentónicas es un punto clave para estudios macroecológicos y biogeográficos. Sin embargo, es usual asumir que el rango batimétrico de una especie no varía con la latitud. Además, la existencia de información precisa sobre los rangos batimétricos y latitudinales no es la regla para los gasterópodos bentónicos de Sudamérica, debido a múltiples factores. Se ilustra esta cuestión revisándose los datos existentes y reportando nueva información sobre el gasterópodo *Americominella duartei* Klappenbach & Ureta, 1972 en la plataforma continental y borde de talud del Atlántico Sudoccidental, proveyendo registros precisos para el límite norte de distribución de la especie. *A. duartei* se encuentra ampliamente distribuida a lo largo de la plataforma continental y borde de talud del Atlántico Sudoccidental, desde 36°51'00" a 54°51'00"S. Es una especie batial, comúnmente encontrada en profundidades entre 300 y 400 m, aunque puede ser encontrada en profundidades desde 100 a 1250 m. El rango batimétrico se incrementa con la latitud, debido a un desplazamiento de la especie hacia aguas más profundas siguiendo la distribución de las Aguas Subantárticas en el norte del área. Nuestros resultados muestran que los rangos batimétricos de los animales bentónicos deben ser usados con cautela cuando se utilicen para detectar patrones macroecológicos.

Palabras clave: Gastropoda, Buccinoidea, rangos batimétricos, macroecología.

Introduction

The accurate description of the geographic and bathymetric ranges of benthic species is a key issue for macroecological and biogeographical studies. However, it is usual to assume that a species bathymetric range is geographically fixed, i.e. it does not vary with latitude (e.g. Fortes & Absalão 2004). In addition, precise distributional data are often unavailable for the southwestern Atlantic, due to poor taxonomic expertise and lack of reliable records based of material deposited in zoological collections, as well as the cryptic nature of some information sources (Carranza *et al*. in press; Scarabino 2006). This is often aggravated in molluscan species, where the records based on shells may lead to incorrect distribution and bathymetric ranges (Cantera & Arnaud 1984; Scarabino *et al*. 2006).

To illustrate this issue we reviewed the existent data on the southwestern Atlantic buccinoidean gastropod *Americominella duartei* Klappenbach & Ureta, 1972 (Figure 1). This species has a relatively complex nomenclatural and taxonomical history (see Bouchet & Warén 1986; Dell 1990; Scarabino 2004; see synonymy here presented), being described simultaneously by Castellanos & Fernández (1972a) as *Bathydomus longisetosus*. Later, Kaiser (1977) described the same species again, creating the new genus *Echinosipho*, further contributing to the dispersion of the available information.

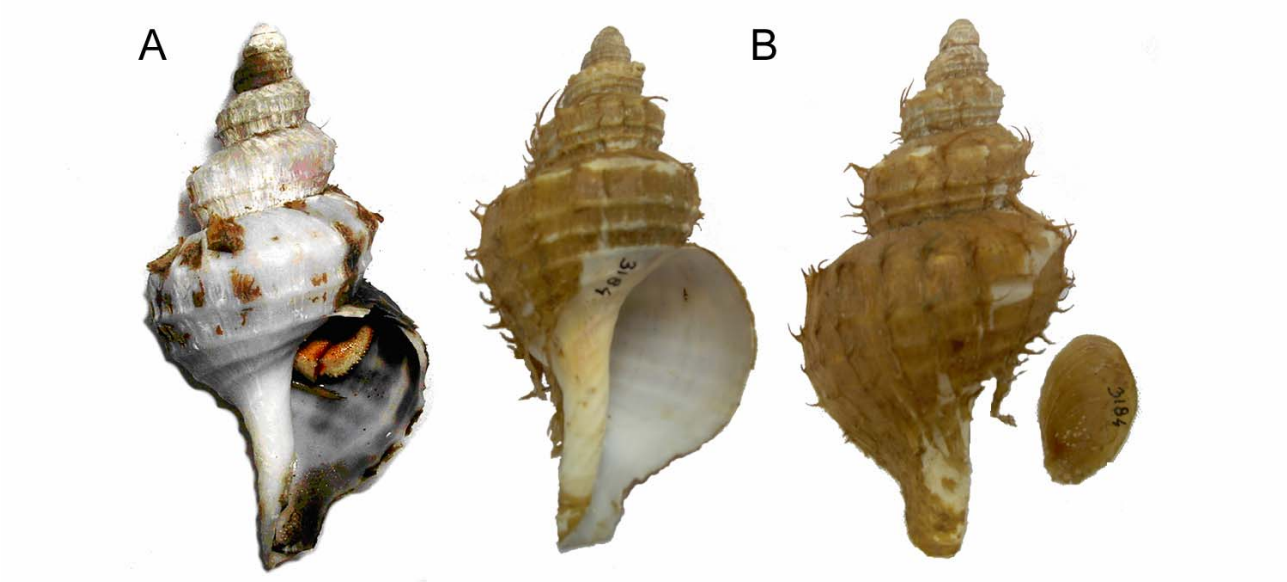

Figure 1. A. *Americominella duartei*, MNHNM 15542, continental slope off Río de la Plata, 610 m, (64 mm length). B. *Americominella duartei*, dorsal and ventral view of the holotype, including the operculum, MNHNM 3184 (78 mm length).

This species was originally described based on material provided by two different sources: Uruguayan fishermen collected the holotype (F/V "Cecilia"; Fig 1B) and one paratype (F/V "Florida"), while the remaining paratypes were obtained by the German research vessel "Walther Herwig" (Klappenbach & Ureta 1972). Castellanos & Fernández (1972a) and Kaiser (1977) based the description of *B. longisetosus* and *E. longisetosus* on material collected by the Walther Herwig campaigns. Part of the type material of *A. duartei* could be suspected as collected at the species northern distribution limit, constituting the only known records from Uruguayan waters, but lacked precise geographic and bathymetric references. This is the case for several species (see the discussion about *Adelomelon barattinii* Klappenbach & Ureta, 1966 in Scarabino 2004, a similar situation), since the bathyal malacofauna off Uruguayan continental shelf has been only scarcely studied. Considering the doubtful status of the northern distribution limit of *A. duartei*, as well as the imprecise shallower record and the dispersion of the existent information, here we reviewed data on the species, summarizing the available information and reporting an accurate distributional range.

Material and Methods

Study area

The geographic area covered in this study corresponds to the continental shelf and slope of the southern portion of South America (36ºS to 55ºS) (Figure 2). Between these latitudes, the wide of the shelf increases from ~200 km at the north to

~600 km at 50ºS. The shelf presents an uneventful topography, gently sloping toward the shelf edge without steep macro-gradients in substrate texture (Bogazzi *et al*. 2005). Most of the area is under the influence of the Malvinas Current (MC) which is part of the northern branch of the Antarctic Circumpolar Current (ACC) (Piola & Gordon, 1989) and Subantartic Waters (SAW). MC flows equatorward along the western edge of the Argentine Basin advecting SAW in the upper 500m (Bianchi *et al*. 1993). The shelf waters result from the mixing of ACC, MC and Patagonian Current (PC) waters and continental runoff, and are modified by water and energy exchange with the atmosphere (Guerrero & Piola 1997). The PC is characterized by low salinity contributed by Southeast Pacific watersand continental waters from Magellan Strait and Fueguian Channels moving northward along the coast (Guerrero & Piola 1997). In addition this area presents steep frontal systems, characterized by pronounced horizontal gradients e.g Argentine shelf-break front, Atlantic Patagonia cold estuarine front (Acha *et al*. 2004).

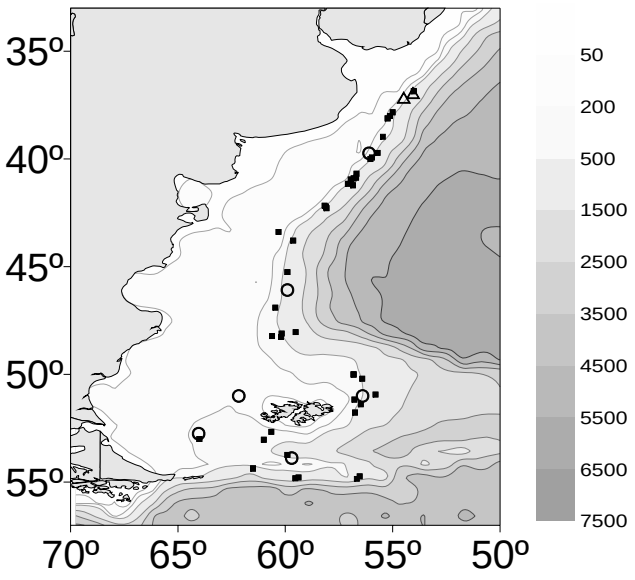

Figure 2. Records of *Americominella duartei.* Material trawled by R/V "Walther Herwig" (■), type specimens of *Bathydomus longisetosus* reported by Castellanos & Fernández (ʘ) and pagurized shells reported in this paper (△) are indicated.

Analyzed material

We examined the holotype and five paratypes of *A. duartei* deposited at Museo Nacional de Historia Natural y Antropología (Montevideo, Uruguay, MNHNM) and checked for additional localities from the type series of *B. longisetosus* and *A. duartei* (Castellanos & Fernández 1972a, Klappenbach & Ureta 1972). In addition, information was gathered from the material deposited at the Zoologisches Museum der Universitaet Hamburg (Germany, ZMUH). This material includes 52 specimens (including holotype and paratypes for *E. aculeatum*), from 44 stations performed during the research surveys conducted in 1966, 1971 and 1978 by the R/V "Walther Herwig" along the Southwestern Atlantic. Additional uncatalogued material was collected during 1975 (one station, RV "Waser") and 1978 (33 stations, RV "Walther Herwig") added to a total of 121 specimens, all with precise bathymetric and geographical data. With these data, the geographical and bathymetric ranges of the species were determined.

Data analysis

Further, we analyzed a) trends associated with the maximum and minimum depth of occurrence along the latitudinal gradient and b) the modal depth for this species. To this end, the observations were grouped in 100 m depth bins and looked at the frequency distribution, in order to determine the depth category that comprised the higher number of observations. Depth distribution of the species in relation with latitude was assessed in terms of the minimum and maximum depth from which the species has been reported, with data grouped in 1º latitude bins. Relationships between maximum and minimum depth of occurrence within each category (dependent variable) and latitude bins (independent variable) were assessed by means of simple linear regression.

Results

Systematics

Class Gastropoda Cuvier, 1791
Subclass Ortogastropoda Ponder & Lindberg, 1996
Superorder Caenogastropoda Cox, 1959
Order Sorbeoconcha Ponder and Lindberg, 1996
Infraorder Neogastropoda Wenz, 1938
Family Buccinidae Rafinesque, 1815[1]
Genus *Americominella* Klappenbach & Ureta, 1972

Americominella duartei Klappenbach & Ureta, 1972

Americominella duartei Klappenbach & Ureta, 1972: 2, figs. 1-2; pl. 1, figs. 1-2, Castellanos & Fernández 1972b: 111, Testud 1973: 222, Figueiras & Sicardi 1973: 178, pl. 12, fig. 175; 1980: 214, Bouchet & Warén 1986, Dell 1990: 199, Scarabino 2004: 318.

[1] We follow Bouchet & Rocroi (2005); Harasewych & Kantor (2004) placed most Subantarctic buccinodeans in Buccinulidae Finlay, 1926.

Bathydomus longisetosus Castellanos & Fernández 1972a, b: 111, figs. 1-3, Figueiras & Sicardi 1973: 178, 1980: 214, Dell 1990: 199, Scarabino 2004: 318.

Echinosipho aculeatum Kaiser 1977: 28, figs. 1-2, pl. 4, Figueiras & Sicardi 1980: 214, Bouchet & Warén 1986; 481-482, pl. 2, fig. 10; pl. 5, fig. 27; pl. 15, fig. 97-99, Dell 1990: 199, Scarabino 2004: 318.

Distribution

The holotype (live collected) and one paratype (pagurized shell) were referred as collected off Río de la Plata, SE of Isla de Lobos. The geographic distribution of the specimens collected by the R/V "Walther Herwig" and "Waser" ranged from 36°51'00"S, 54°01'00"W to 54°51'00"S, 56°40'00"W. One additional reference (Testud 1973: 222) reported the species for the "Calypso" station 171: 37º36'S-54º46'W in 740 m.

Concerning the bathymetric distribution, it ranged from 100 to 1250 m depth. The modal depth was detected in the 300-400 m depth interval (Figure 3). Maximum depth of occurrence was not correlated with latitude (R^2 = 0.01; p> 0.05), but a latitudinal effect on minimum depth was detected (R^2 = 0.35; p< 0.05). Shallower occurrences of this species are noticed as latitude increased (Figure 3).

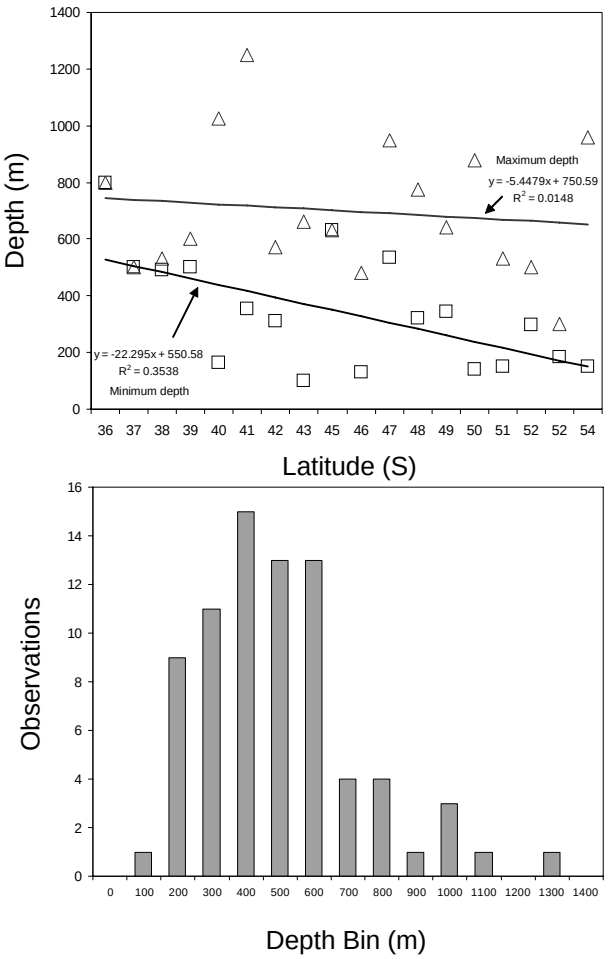

Figure 3. Relationships between minimum (open squares) and maximum (open triangles) observed depth in relation with latitude one-degree bins (a regression for each line is shown) and number of observations within 100m depth bins all along the latitudinal gradient.

Discussion

Americominella duartei is widely distributed along the Southern Atlantic shelf and slope, from 36°51'00" to 54°51'00"S. It is a bathyal species, commonly found at depths between 300 and 400m, although it can be found in depths ranging from 100 to 1250m. We considered the location reported for the holotype an imprecise geographic reference. The shallower record of the species mentioned in the original description (100m) seems to be assumed by the authors, since this datum is absent from the list of examined material. Considering that this material was collected by fishermen and that all the information compiled from literature and collections indicates that *A. duartei* occupies only the bathyal zone in its northern limit, we consider this depth as incorrect. This is at least the case for the living specimen (holotype). One additional pagurized shell measuring 64 mm shell length and collected at 36º 56'S, 54º 03'W in 610 m deep (MNHNM 15542), during a trap survey onboard a fishing vessel, Fig. 1A targeting the deep-sea red crab *Chaceon notialis* during 2006 conserved portions of its periostracum, providing some confidence about the presence of the species at the zone.

However, two pagurized shells were collected in November 2004, during an onboard research in a 70 m length commercial fishing vessel targeting hake (*Merluccius hubbsi)* at 37º09'S, 54º09'W, in a depth between 145 and 148 m (MNHNM 15543). This indicates that some shells may be present at or transported to shallower waters. In conclusion, and based in data from Kaiser (1977), the northern limit of its distribution should correspond to 36°51'00"S (paratypes for *E. aculeatum*, ZMUH 1051).

The bathymetric range of the species increased with latitude, due to a positive correlation between minimum depth of occurrence and latitude. The prevalence of SAW over the shelf south of 37ºS at depths greater than 200 m, supports the idea that *A. duartei* may be considered a typical member of the SAW fauna. In addition, the progressively narrowing of it occurrence northward along the outer margin of the shelf reinforces that hypothesis. Since the Subantarctic benthic fauna is strongly associated

with SAW, there is a negative correlation between the minimum depth of occurrence and latitude, with the shallower records of this species (i. e < 200 m) occurring below 39ºS. Thus, the bathymetric range of the species increased with latitude, due to a positive correlation between minimum depth of occurrence and latitude. Most likely, this may be due to a distributional response to water temperature (i.e. submergence, see Weinberg 2005), as already reported by Carcelles (1944) and discussed by Olivier & Scarabino (1972) and Schrödl (1999) for inner shelf benthic invertebrates of Patagonia that occupies much deeper zones off the Río de la Plata.

The extension and placement of the bathymetric range of *A. duartei* is similar to related species such as *Chlanidota, Pfefferia, Parabuccinum* and *Neobuccinum* (Harasewych & Kantor 2004). This generic diversity is closely related to species richness, since the monotypic condition of *Americominella* seems to be common in Antarctic and Magellanic buccinoidean gastropods, for which a high proportion (48.3%) of monotypic genera was reported (Harasewych & Kantor 2004). These findings remark the need for the performance of exploratory studies with adequate sampling methods in the continental slope and abyssal plain off South America, to increase the knowledge on deep sea biodiversity at the region.

In summary, we showed that the bathymetric and latitudinal range of a bathyal, previously poorly known, and taxonomically complex species can be reconstructed with certain accuracy using data stored in museum specimens. Further, our results suggest that the bathymetric ranges of benthic animals should be used with caution in macroecological studies, because they may lead to a blurred picture of bathymetric patterns in species richness.

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