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ORIGINAL ARTICLE

On the record of *Coronula diadema* (Cirripedia: Coronulidae) in Chilean waters

Sobre el registro de *Coronula diadema* (Cirripedia: Coronulidae) en aguas chilenas

Valentina Olave[1], Daniel Caniullan[2], Juan Antonio Aliaga[3], Luis Ballesteros[4] & Juan Francisco Araya[5,*]

[1]Veterinaria Libre (VetLibre), Colo Colo 222, Concepción, Chile.
[2]Comunidad Lafkenche Puwapi, Melinka, Islas Guaitecas, Región de Aysén, Chile.
[3]Departamento de Química, Universidad Tecnológica Metropolitana, José Pedro Alessandri 1242, Ñuñoa, Santiago, Chile.
[4]Instituto de Ciencias Químicas Aplicadas, Facultad de Ingeniería, Universidad Autónoma de Chile, El Llano Subercaseaux 2801, San Miguel, Santiago, Chile.
[5]Programa de Doctorado en Sistemática y Biodiversidad, Departamento de Zoología, Facultad de Ciencias Naturales y Oceanográficas, Universidad de Concepción, Concepción, Chile.
*Corresponding author: jfaraya@u.uchile.cl

ABSTRACT

The barnacle genus *Coronula* Lamarck, 1802 (Cirripedia: Coronulidae) includes two extant species: *Coronula diadema* (Linnaeus, 1767), and *Coronula reginae* Darwin, 1854. These rather large, and highly specialized barnacles, live exclusively attached to the skin of whales, particularly of the humpback whale *Megaptera novaeangliae*, and thus they are widely distributed in marine waters from the equator to the poles. *Coronula* species have few records in the Southeast Pacific, with a single previous record in Chilean waters (although during the XIX century). In this article we present the second documented record of *Coronula diadema* in Chilean waters, based on two specimens found in deep waters off Caldera, northern Chile, extending its distribution in the southeastern Pacific. We also illustrate for the first time the only previous record of *C. diadema* in Chile by Weltner (1895). The presence of detached extant *C. diadema* shells in northern Chile agrees with the migratory routes of humpback and baleen whales along the South American coasts. Considering the previous absence of *Coronula* specimens in Chilean institutions, it is necessary to actively record this species in living whales, and to collect specimens in those stranded, which constitute the only opportunity to recover live specimens of *Coronula* and associated fauna.

Keywords: barnacles, Cetacea, new records, southeastern Pacific, whales.

RESUMEN

El género de percebes *Coronula* Lamarck, 1802 (Cirripedia: Coronulidae) incluye dos especies vivientes: *Coronula diadema* (Linnaeus, 1767), y *Coronula reginae* Darwin, 1854. Estos percebes bastante grandes y altamente especializados viven exclusivamente adheridos a la piel de las ballenas, particularmente de la ballena jorobada *Megaptera novaeangliae*, y por lo tanto están ampliamente distribuidos en el medio marino desde el ecuador hasta los polos. Las especies de *Coronula* tienen pocos registros en el Pacífico Sudeste, con un solo registro previo en aguas chilenas (aunque durante el siglo XIX). En este artículo presentamos el segundo registro documentado de *Coronula diadema* en aguas chilenas, basado en dos especímenes encontrados en aguas profundas frente a Caldera, norte de Chile, extendiendo su distribución en el Pacifico suroriental. También ilustramos por primera vez el único registro previo de *C. diadema* en Chile realizado por Weltner (1895). La presencia de conchas desprendidas de *C. diadema* en el norte de Chile concuerda con las rutas migratorias de ballenas jorobadas y barbadas a lo largo de las costas

sudamericanas. Considerando la ausencia previa de ejemplares de *Coronula* en instituciones chilenas, es necesario registrar activamente esta especie en ballenas vivas, y recolectar ejemplares en aquellas varadas, que constituye la única oportunidad para recuperar ejemplares vivos de *Coronula* y fauna asociada.

Palabras clave: ballenas, Cetacea, nuevos registros, Pacífico Suroriental, percebes.

INTRODUCTION

The family Coronulidae Leach, 1817 includes ten genera of thoracic barnacles which are usually found as obligate epibionts of other living organisms, including marine mammals, sea reptiles, crustaceans, and on floating inanimate objects (Ross & Frick 2011). Among them, the genus *Coronula* Lamarck, 1802 (Cirripedia: Coronulidae) is represented by two extant species: *Coronula diadema* (Linnaeus, 1767) and *Coronula reginae* Darwin, 1842, two barnacle species characteristic by their large size (13-85 mm in diameter), and the more or less radially symmetrical shells and yellow opercular membranes (Scarff 1989). These highly specialized barnacles live exclusively attached to the skin of whales, particularly of the humpback whale *Megaptera novaeangliae*, where they are found in almost all specimens (Ten *et al*. 2022b), and thus they are epipelagic species widely distributed in marine waters from the equator to the poles. They are usually distributed on the rostrum and part of the flukes, flippers, ventral grooves, and genital slit of whales, often in very large numbers. Both species can be distinguished by their shells, as *C. diadema* has larger and more prominent barrel-shaped shells, about 30-59 mm width in the North Pacific (Scarff 1986), and about 25-50 mm width for specimens recovered from minke whales in the Southern Ocean (Ten *et al*. 2022a), while *C. reginae* has smaller and more depressed shells (13-19 mm), barely surfacing the skin of the whales where they are found (Scarff 1986).

Coronula diadema has been cited in the Atlantic, Pacific, Indian Oceans, and in the Antarctica, while *C. reginae* has a geographic range which includes only the north Pacific and the Gulf of Mexico (North Atlantic) (Ten *et al*. 2022b). Due to the host-specific relationship between *Coronula* and humpback whales, they provide an indirect method to study the migratory routes of whales, particularly in fossil settings (Bianucci *et al*. 2006a; Collareta *et al*. 208; Taylor *et al*. 2019). *Coronula* species have only three previous documented records in the southeastern Pacific, at Ecuador (Bianucci *et al*. 2006b) and (as a fossil) in Perú (Pilsbry & Olsson 1951), and a single record in Chilean waters more than a hundred years ago (Weltner 1895). In the other hand, there are plenty of records of whale species, and many of them are present in northern Chile during austral summer months. In this work we present the first documented record of *C. diadema* in Chilean waters in the last hundred years, and the first record of this species in northern Chile, based on two detached specimens collected as bycatch from shrimp trawlers in deep waters off Caldera, northern Chile.

MATERIAL AND METHODS

The present records are based on two complete and articulated shells collected by fishermen as bycatch in shrimp trawls off El Morro, south of Caldera (27°07'12" S; 70°57'17" W), northern Chile. These shells do not preserve the membranous base nor the opercular shells. We have also examined high resolution photographs of the first and only previous record for this species in Chile, from specimens deposited at the Museum für Naturkunde at Berlin, Germany (ZMB 8989). We illustrate these specimens for the first time since its description by Weltner (1895). Abbreviations include MNHN: Museo Nacional de Historia Natural, Santiago, Chile; ZMB: Zoologisches Museum der Humboldt-Universität zu Berlin, Berlin, Germany. Measurements abbreviations are: Maximum shell diameter (MaxSD), minimum shell diameter (MinSD), maximum height (MaxH), minimum height (MinH), width at base (WB), maximum operculum diameter (MaxOD), minimum operculum diameter (MaxOD).

RESULTS

Systematics

Subclass Cirripedia Burmeister, 1834
Infraclass Thoracica Darwin, 1854
Superorder Thoracicalcarea Gale, 2015
Order Balanomorpha Pilsbry, 1916
Family Coronulidae Leach, 1817
Genus *Coronula* Lamarck, 1802
***Coronula diadema* (Linnaeus, 1767)**
(Figs. 1A-H)
Darwin, 1854: 417, Pl. 15, fig. 3, 3a, 3b; Pl. 16, fig. 1, 2, 7. Beu, 1971: 902, Fig. 1, 2, 5, 7, 8. Hayashi, 2012: 110, Figs. 3, 15C, plate 2A. Ten *et al*. 2022b: 23.

Figure 1. *Coronula diadema* (Linnaeus, 1767). (a-c) specimen collected trawled off Caldera (27°S), northern Chile (MNHN unnumbered). (a) aboral view; (b) lateral view; (c) basal view; (d-h) specimens collected from a spermwhale stranded at Tumbes, Talcahuano, central Chile in 1895 (ZMB 8989); (d) original label for specimens; (e, f) aboral views; (g) lateral view; (h) basal view. (Figures d-h courtesy of Fiona Lorenz and Kristina von Rintelen, MfN Berlin, Germany). Scale bar is 10 mm for all figures. / *Coronula diadema* (Linnaeus, 1767). (a-c) espécimen colectado en pesca de arrastre fuera de Caldera (27°S), norte de Chile (MNHN sin código de deposito). (a) vista aboral; (b) vista lateral; (c) vista basal; (d-h) especímenes colectados de un cachalote varado en Tumbes, Talcahuano, Chile central en 1895 (ZMB 8989); (d) etiqueta original para los especímenes; (e, f) vistas aborales; (g) vista lateral; (h) vista basal. (Figuras d-h cortesía de Fiona Lorenz y Kristina von Rintelen, MfN Berlin, Alemania). Barra de escala es 10 mm para todas las figuras.

Diagnosis: Large globose, barrel-shaped and rounded to slightly hexagonal shells with six plates; aperture ovate-hexagonal, slightly larger than diameter of shell. Shells with six groups of four to five longitudinal ribs, base of shell slighlty curved inside, with ribs wrinkled toward the base. Internally, parietes with three compartments and one additional at intersection of parietes.

Description of examined specimens: Shells of large size (about 54 mm in diameter), slightly globose, rounded to slightly hexagonal, white and sculptured, thick (about 17 mm at basis) and porous, formed by six plates firmly interlocking and calcified together. The body chamber is about half the size of basal diameter. Aperture ovate-hexagonal, more than half the diameter of shell (about 30 mm). All the parietes thick but porous, internally with two internal vertical plates and three elongated compartments which reach the top of the shell; the intersection of the parietes at the base of the shell having an additional small compartment. Externally, the parietes have four to five longitudinal ribs (reflecting the internal compartments) separated by smooth horizontal growth lines; the parietes at the base of shell show horizontal ribbing giving a wrinkled appearance. The border at the base of the shell sharp, crenulated and inflected toward the inside the shell.
Measurement of examined specimens: Specimen 1: MaxSD: 53.5 mm, MinSD: 43.6 mm, MaxH: 35 mm, MinH: 31 mm, WB: 39.5, MaxOD: 30.5 mm, MinOD: 22.8 mm. Specimen 2: MaxSD: 47.6 mm, MinSD: 44.5 mm, MaxH: 38 mm, MinH: 24.4 mm, WB: 35 mm, MaxOD: 33 mm, MinOD: 22.7 mm (MNHN, unnumbered).

Distribution: *Coronula diadema* is found in most seas, from the Arctic to the Southern Ocean (Hayashi 2013). In the southeastern Pacific it has been recorded at Ecuador (Bianucci *et al*. 2006b) and as a fossil in Perú (Pilsbry & Olsson 1951). In Chile, the only previous record of this species is from the carcass of a stranded sperm whale washed ashore at Tumbes, Talcahuano in 1892 (Weltner 1895). These Tumbes specimens are illustrated here for the first time (Figs. 1D-H).

Remarks: The good condition of the examined specimens indicate that they must have been recently detached from the whale, as they had dried soft parts in some of the hollow coring tubes at the periphery. The difference between the upper and the lower part of the shell is a character typical of *Coronula* diadema (Bianucci *et al*. 2006a). *Coronula diadema* is also the host of the barnacle *Conchoderma auritum* (Fertl & Newman 2018), however as this latter species is a mostly soft-bodied barnacle, no evidence of them are found in the present shells of *Coronula*.

DISCUSSION

Coronula barnacles are easily identified by their large, rounded, and buttressed shells, a unique morphology easily differentiated from all other barnacles found in the southeastern Pacific, with the exception of sea turtle barnacles which are stouter and have even flatter shells (Zambrano *et al*. 2022). The paucity of records and specimens of *Coronula* barnacles in local Chilean institutions is not surprising, as this species is sparsely collected, perhaps due to its very special habitat, as they can only be obtained from dead, stranded whales (or from whales caught by whaling).

Whales are quite abundant along the shores of the southeastern Pacific (Aguayo-Lobo *et al*. 1998; Papastavrou & Van Waerebeek 1997), so these barnacles must be plentiful in the area. A more detailed geographic distribution for *C. diadema* can thus be explored through whale-monitoring, with photo-identification surveys, as similar coronulid barnacle species have already been recorded by sightings in the area (Díaz-Aguirre *et al*. 2012). Stranded marine mammals should also be analyzed regarding their epibiotic fauna, as similar barnacles (*e.g*., *Cetopirus*) may be present in the area, even when there are no records of them in the current inventories for this group of invertebrates (Pitombo & Ross 2002; Hayashi 2013).

The discovery of large, well-preserved, detached specimens of the whale barnacle *C. diadema* in northern Chile confirms the distribution of this species in the southeastern Pacific (Pitombo & Ross 2002), and agrees with known migratory routes of humpback and other baleen whales along the South American coast (Aguayo-Lobo *et al*. 1998). Considering the extensive geographic distribution for this species and the current absence of records and specimens in local institutions, it is thus necessary active monitoring of living whales and systematic examination of stranded carcasses. The recovery of fresh specimens of *Coronula* and associated barnacles would allow further research, for example accurate species identification, population genetics, or to research the unique associated fauna, as already described for other locations in the Pacific or Southern Ocean waters (Holthuis & Fransen 2004).

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REFERENCES

Aguayo-Lobo, A., Torres, D., Acevedo, J. 1998. Los mamíferos marinos de Chile: I. Cetacea. Serie Científica INACH 48: 19-159.

Beu, A.G. 1971. Further fossil whale barnacles from New Zealand. New Zealand Journal of Geology and Geophysics 14(4): 898-904.

Bianucci, G., Landini, W., Buckeridge, J. 2006a. Whale barnacles and Neogene cetacean migration routes. New Zealand Journal of Geology and Geophysics 49(1): 115-120.

Bianucci, G., Di Celma, C., Landini, W., Buckeridge, J. 2006b. Palaeoecology and taphonomy of an extraordinary whale barnacle accumulation from the Plio-Pleistocene of Ecuador. Palaeogeography, Palaeoclimatology, Palaeoecology 242(3-4): 326-342.

Darwin, C. 1854. A Monograph of the Sub-class Cirripedia, with Figures of all the Species. The Balanidae (or Sessile Cirripedes); the Verrucidae, etc. London: Ray Society, London. 684 pp.

Díaz-Aguirre, F., Salinas, C., Navarrete, S., Castillo, V., Castilla, C. 2012. First record of the commensal barnacle (*Xenobalanus globicipitis*) on common bottlenose dolphins (*Tursiops truncatus*) in Chile. Aquatic Mammals 38(1): 76-80.

Fertl, D., Newman, W.A. 2018. Barnacles. In: Würsig, B., Thewissen, J.G.M., Kovacs, K.M. pp. 75-78. Encyclopedia of Marine Mammals. Third edition. Academic Press, USA.

Hayashi, R. 2012. Atlas of the barnacles on marine vertebrates in Japanese waters including taxonomic review of superfamily Coronuloidea (Cirripedia: Thoracica). Journal of the Marine Biological Association of the United Kingdom 92(1): 107-127.

Hayashi, R. 2013. A checklist of turtle and whale barnacles (Cirripedia: Thoracica: Coronuloidea). Journal of the Marine Biological Association of the United Kingdom 93(1): 143-182.

Holthuis, L. B., Fransen, C. H. 2004. Interesting records of whale epizoic crustaceans from the Dutch North Sea coast (Cirripedia, Amphipoda). Nederlandse Faunistische Mededelingen 21: 11-16.

Papastavrou, V., Van Waerebeek, K. 1997. A note on the occurrence of humpback whales (*Megaptera novaeangliae*) in tropical and subtropical areas: the upwelling link. Reports of the International Whaling Commission 47: 945-947.

Pilsbry, H.A., Olsson, A.A. 1951. Tertiary and Cretaceous cirripedia from northwestern South America. Proceedings of the Academy of Natural Sciences of Philadelphia 103: 197-210.

Pitombo, F.B., Ross, A. 2002. A checklist of the intertidal and shallow-water sessile barnacles of the Eastern Pacific, Alaska to Chile. Contributions to the study of East Pacific Crustaceans 1: 97-107.

Ross, A., Frick, M.G. 2011. Nomenclatural emendations of the family-group names Cylindrolepadinae, Stomatolepadinae, Chelolepadinae, Cryptolepadinae, and Tubicinellinae of Ross & Frick, 2007—including current definitions of family-groups within the Coronuloidea (Cirripedia: Balanomorpha). Zootaxa 3106: 60-66.

Taylor, L., Abella, J., Morales-Saldaña, J.M. 2022. New fossil remains of the commensal barnacle *Cryptolepas rhachianecti* provide evidence of gray whales in the prehistoric South Pacific. Journal of Paleontology 96(3): 583-590.

Ten, S., Konishi, K., Raga, J.A., Pastene, L.A., Aznar, F.J. 2022a. Epibiotic fauna of the Antarctic minke whale as a reliable indicator of seasonal movements. Scientific Reports 12(1): 22214. https://doi.org/10.1038/s41598-022-25929-1.

Ten, S., Raga, J.A., Aznar, F.J. 2022b. Epibiotic fauna on cetaceans worldwide: A systematic review of records and indicator potential. Frontiers in Marine Science 9: 846558. https://doi.org/10.3389/fmars.2022.846558

Weltner, W. 1895. Die Cirripedien von Patagonien, Chile und Juan Fernandez. Archiv Für Naturgeschichte 61(1): 288-292.

Zambrano, N., Ahumada, A., Aliaga, J.A., Araya, J.F. 2022. First record of *Chelonibia testudinaria* (Linnaeus, 1758) (Cirripedia: Chelonibiidae) in northern Chile. Gayana 86: 8-12.

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