

MARINE RECORD

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New record of the red prickly sea star *Paulia horrida* (Gray, 1840), Asterodiscididae, in the north of Chile

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Abstract

We report the capture of a single specimen of the species *Paulia horrida* Gray, 1840, off the coast of Arica, in the Arica and Parinacota Region, Northern Chile. This finding extends the currently known distributional range of the species by 2,434 km towards the south, since the southernmost known area for this species corresponds to Punta Sal, Peru. We discuss the importance of finding this relatively unknown species in Chile and the need to continue sampling to confirm the continuous distributional range of the species between the south of Peru and the north of Chile.

Keywords: Arica, Distribution, Northern Chile, Pacific coast, Peru, Starfish, *Paulia horrida*.

Introduction

Echinodermata is a phylum of coelomate marine animals, mostly benthic and with a wide bathymetric distributional range (Caso 1961); (Harrison 1994), ranging from 0 to more than 1500 m as the case of, for instance, Antarctic echinoderms (Moles et al. 2015). The class Asterozoa includes 1890 currently described species (Mah and Blake 2012), commonly known as ‘starfish’ or ‘sea stars’ due to their body shape, as it resembles the shape of a star (Hyman 1955).

The family Asterodiscididae comprises three genera: *Amphiaster* Verrill 1868, *Asterodiscides* A. M. Clark 1974 and *Paulia* Gray 1840. *Asterodiscides* inhabits shallow to deep waters, and the genera *Amphiaster* and *Paulia* occur mainly in shallow coastal waters (Rowe 1985); (Oguro 1991). Within this family, *Paulia horrida* has a wide geographic distributional range, occurring from the Baja California Peninsula, in Mexico, to the locality of Punta Sal, in Peru (Clark 1910); (Rowe 1977); (Hooker and Solís–Marín 2011) (Fig.1). Morphologically, *P.*

horrida is basically characterised by its thick conical spines covering the aboral area and its intense vermilion-red colour in living specimens (Hooker and Solís–Marín 2011).

In this report, we expand the currently known distribution of *Paulia horrida* to a new southernmost locality. We then discuss the importance of finding this species in Chile and the need to continue sampling to document the distributional range of this species more thoroughly, particularly focusing on the gap between the north of Peru and north of Chile.

Materials and methods

The specimen was collected, by autonomous diving, off the coast of Arica (18.4746° S; 070.2894° W), Parinacota Region, Northern Chile. The specimen was collected alive, measured with callipers, then submerged in fresh water following the method of (Quijada 1911) for two hours to anaesthetise it; and fixed in 95 % alcohol in a closed plastic tray to induce dehydration. The specimen was taken to the laboratory and dried in a taxidermy oven at 80°C for 2 h. Finally, the specimen was photographed using a Canon PowerShot® SX60 HS camera and incorporated to the collection of marine

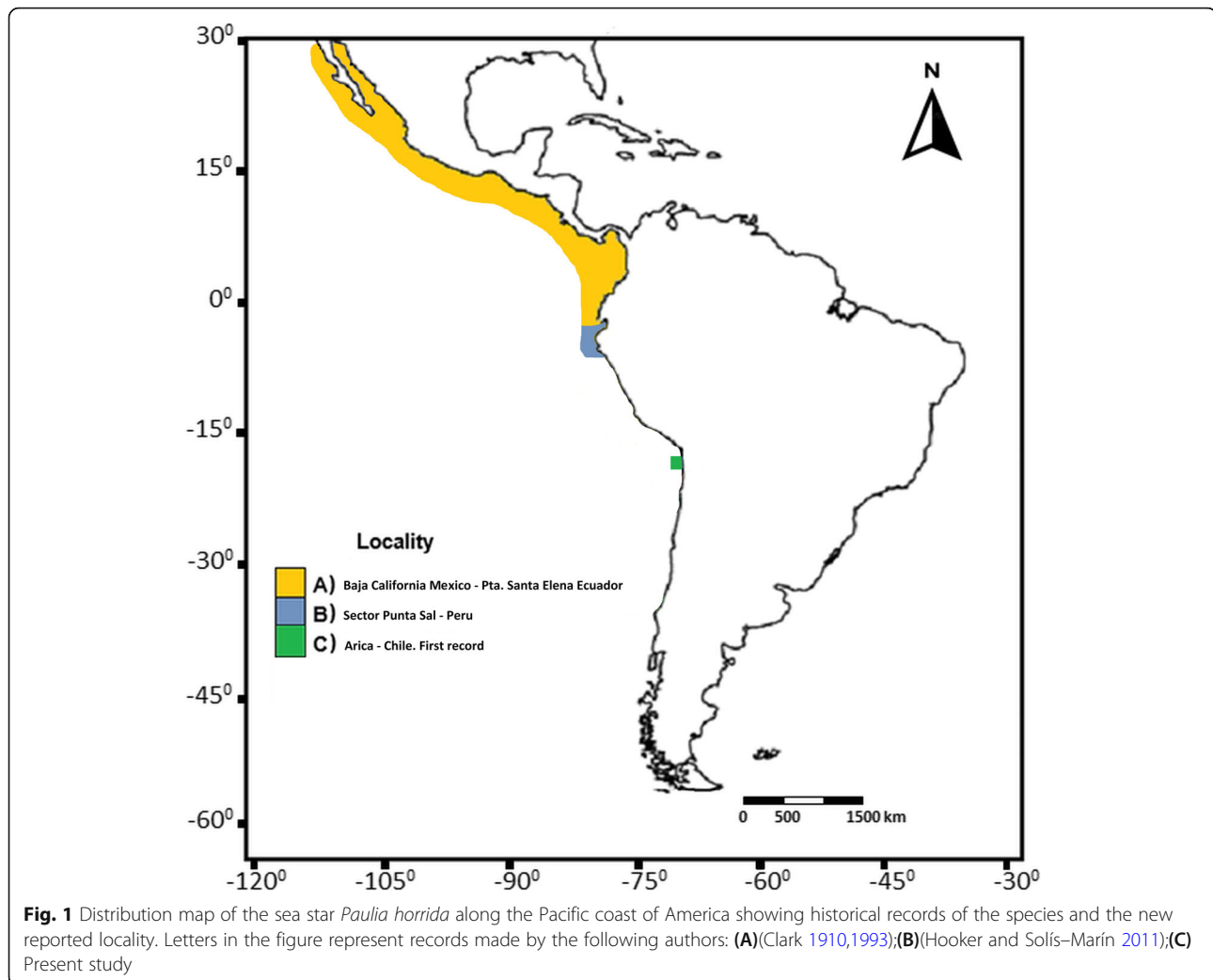
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invertebrates of the museum ‘Vida Salvaje-Museo Vivo’, of the Animal Kingdom Foundation (Fundación Reino Animal), in Arica, Chile. A label was applied to the specimen (COLEQUISIL088FRA acronym of “Collection of equinoderms: Number 088: Animal Kingdom Foundation”).

Results

New record for Chile of the species *P. horrida*. The specimen was collected at a depth of 13 m, on a rocky substrate isolated by sand. One adult specimen, sex undetermined; radius length $R = 65\text{mm}$ (we used the major radius length R measured as the distance from the centre of the oral disk to the tip of the arm); Arica, Arica province, Region of Arica and Parinacota; 12 January 2018; specimen collected alive at 13 m deep on a rocky substrate, surrounded by a sandy bottom, offshore of the Alacran peninsula area (18.4802°S ; 070.3319°W). Figure 2 A-B.

The identification of the specimen was based on the taxonomic characters described by (Hooker and Solís-Marín 2011). Disc well developed, slightly elevated. Ventral region flattened; with five wide triangular arms, strong, conical, with spines covering the abactinal (aboral) surface. Abactinal plates with numerous pores through which the papulae emerge. Actinal surface with tessellated actinal plates, each with a bulge surrounded by small granules. Supramarginal plates with large spherical spines distinctive of the species. Narrow ambulacral groove. Interambulacral plates with a row of small, finger-like, internal spines and an outer series of two larger spines on each plate. Actinal surface with tessellated actinal plates, each with a bulge surrounded by small granules. The specimen exhibited an intense red-vermilion colouration while alive, becoming pale orange after being fixed and dried.

Discussion

In general, *Paulia horrida* is a poorly known species, with no records of its life cycle and ecology.

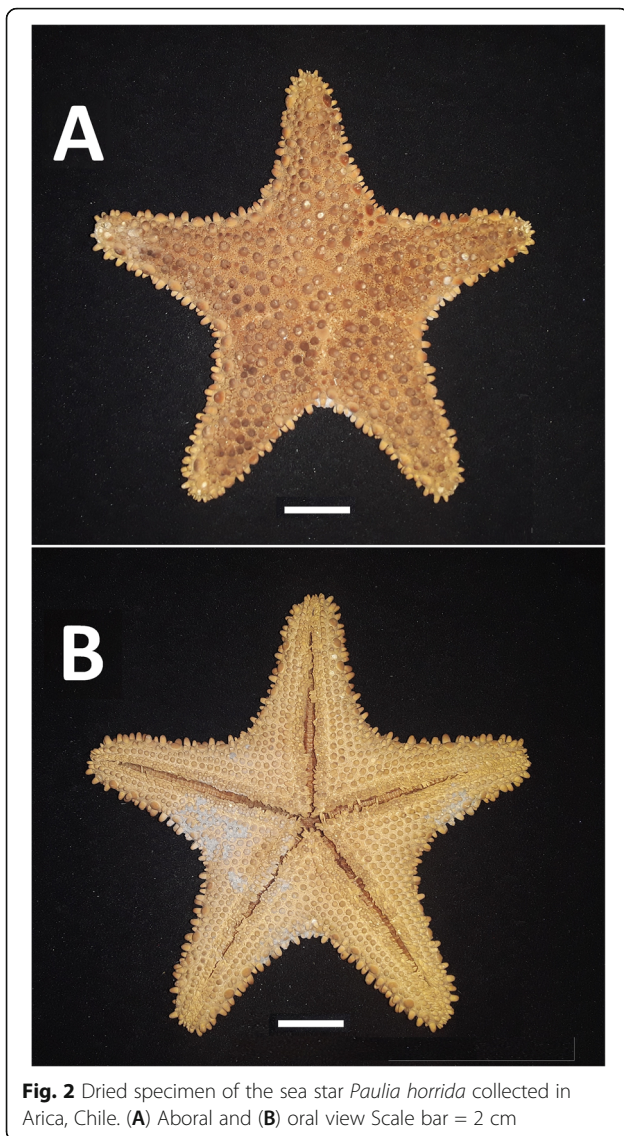


Fig. 2 Dried specimen of the sea star *Paulia horrida* collected in Arica, Chile. (A) Aboral and (B) oral view Scale bar = 2 cm

The first record of *P. horrida* was described by H.L. (Clark 1910) comprised the area of Punta Santa Elena, in Ecuador, extending towards the Galapagos Islands. Subsequently, (Rowe 1977) hypothesised that *P. horrida* was potentially present in the Peruvian coast, which was later confirmed by Hooker and Solís-Marín (2011), who collected an $R = 84$ mm specimen at a depth of 33 m on a rocky reef in Punta Sal, northern Peru. Furthermore, A.M. (Clark 1993) incorporated some localities in his checklist suggesting Baja California, Mexico, as the northernmost distributional limit of the species, also including the localities of Isla Clarión and Isla del Coco, both located in Costa Rica. Finally, (Maluf 1987) broadened the distribution of the species confirming the Galapagos Islands as part of the distributional range of *P. horrida*.

In this report, a single specimen of *P. horrida* was collected off the coast of northern Chile, expanding the already known geographical distribution of the species by approximately 2,434 km towards the South. The specimen had an $R = 65$ mm, which provides some insights of the size variation of the species when comparing it with other records such as, for example, Hooker and Solís-Marín (2011) who reported a larger, $R = 84$ mm radius, specimen.

The discovery of *P. horrida* in Chilean waters allows us to incorporate it to the Chilean asteroid fauna, opening the possibility of its presence at even southern latitudes along the Chilean coasts. This needs to be confirmed through further sampling of the species in such latitudes. Moreover, in light of the current scenario of global biodiversity loss and the necessity to carry out effective conservation measures, this expansion of the distributional range of this species represents an invaluable opportunity to gain further knowledge of this species.

Conclusions

A specimen of *P. horrida* was collected in waters of northern Chile, off the coast of the city of Arica. This capture corresponds to the first record of this species in this area of the Pacific. The single specimen does not necessarily indicate a population settled in this area, although future collection days could corroborate or discard this hypothesis.

Acknowledgements

We thank the reviewers and editor for their comments and suggestions that allowed us to improve the quality of this paper. We would also like to thank to the Programa de Magíster en Acuicultura, Mención Recursos Hidrobiológicos y Mención Acuiponía, Universidad Arturo Prat, Chile; to Lorena Avilés-Arredondo for reviewing the structure of the manuscript and to Dr. Mariana Lazzaro-Salazar for proofreading the manuscript.

Authors' contributions

FM-A performed field samplings, taxonomical identifications and paper writing; EAM performed scientific review, contributed to paper writing and translated it into English; RP-V assisted the paper writing and review. The author(s) read and approved the final manuscript.

Funding

Not applicable.

Availability of data and materials

The sample is available at the equinoderms collection belonging to the "Animal Kingdom Foundation (specimen record: COLEQUISIL088FRA)".

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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Received: 19 June 2021 Accepted: 7 October 2021

Published online: 29 October 2021

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