

Natural history collections and overlooked fauna: *Pinctada longisquamosa* (Bivalvia) in the Colombian Caribbean

Colecciones de historia natural y fauna poco estudiada: *Pinctada longisquamosa* (Bivalvia) en el Caribe colombiano

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Abstract

The scaly pearl oyster, *Pinctada longisquamosa* (Margaritidae), is a resident of shallow marine habitats within the western Atlantic tropical region from Florida to Venezuela. This species remained unrecognized for an extended period due to frequent misidentification with other western Atlantic oysters such as *Pinctada imbricata* and the Pteriidae species *Pteria colymbus*. In this study, we confirm its presence in the Colombian Caribbean based on stored and uncatalogued specimens from the molluscan collection of the Museo de Historia Natural Marina – Makuriwa – in Santa Marta, Colombia. All specimens were collected on mangrove roots. This discovery underscores the invaluable role of natural history museums in documenting biogeographic distribution patterns and contributes to a voucher record of Colombia's marine malacological fauna.

Key words: Mollusca; Margaritidae; Scaly pearl oyster; *Rhizophora mangle* roots; Colombia

Resumen

La ostra perlera escamosa, *Pinctada longisquamosa* (Margaritidae), reside en hábitats marinos poco profundos dentro de la región del Atlántico occidental tropical desde Florida hasta Venezuela. Esta especie permaneció sin ser reconocida durante un período prolongado debido a la frecuente identificación errónea con otras especies de ostras del Atlántico occidental como *Pinctada imbricata*, o la especie de Pteriidae, *Pteria colymbus*. En este estudio, establecemos su presencia confirmada en el Caribe colombiano con base en especímenes almacenados y sin catalogar en la colección de moluscos del Museo de Historia Natural Marina – Makuriwa – en Santa Marta, Colombia. Todos los ejemplares fueron recolectados de raíces de manglar. Este descubrimiento subraya el papel invaluable de los museos de historia natural en la documentación de patrones de distribución biogeográfica y aporta un registro comprobado a la fauna malacológica marina de Colombia.

Palabras clave: Mollusca; Margaritidae; ostra perlera escamosa; raíces de *Rhizophora mangle*; Colombia

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More than 1,500 species of marine mollusks are currently known from the Colombian Caribbean (Díaz and Puyana, 1994; Yidi and Sarmiento, 2011). However, for some species no specific location or reference material is known that ensures that they inhabit Colombian waters. Therefore, prioritizing the documentation of species, local distributions, ecological characteristics and traditional uses, among other information, are important for scientific research in the country.

National scientific collections serve as crucial repositories for firsthand information on numerous species, contributing to the understanding of biodiversity. The preservation and safeguarding of specimens in collections are the foundation for a wide range of scientific investigations, encompassing taxonomic, systematic, ecological, biogeographic, phylogenetic, environmental impact, and conservation studies, among others.

Mikkelsen and Bieler (2008) listed five species of Pteriidae living in the western Atlantic Ocean: the scaly pearl oyster *Pinctada longisquamosa* (Dunker, 1852), the Atlantic pearl oyster *Pinctada imbricata* Röding, 1798, the black-lipped pearl oyster *Pinctada margaritifera* (Linnaeus, 1758) (non-native), the Atlantic wing oyster *Pteria colymbus* (Röding, 1798), and the European wing oyster *Pteria hirundo* (Linnaeus, 1758) [as *Pteria vitrea* (Reeve, 1857)]. Currently, these species are classified in two families: Pteriidae, which groups the genera *Pterelectroma* Iredale, 1939 and *Pteria* Scopoli, 1777, and Margaritidae, having the genus *Pinctada* Röding, 1798. The last genus includes 21 recognized species worldwide (MolluscaBase, 2023), one of them being *P. longisquamosa*, that is native to the western Atlantic. Mikkelsen *et al.* (2004) re-described this species and conducted an additional comparative analysis based on the morphology and ecological characteristics of two co-occurring species, *P. imbricata* and *P. colymbus*, which are often confused with *P. longisquamosa*. The scaly pearl oyster is recorded in more than ten countries based on GBIF records (accessed 2023/10/31), from the USA to Brazil. In some sources this

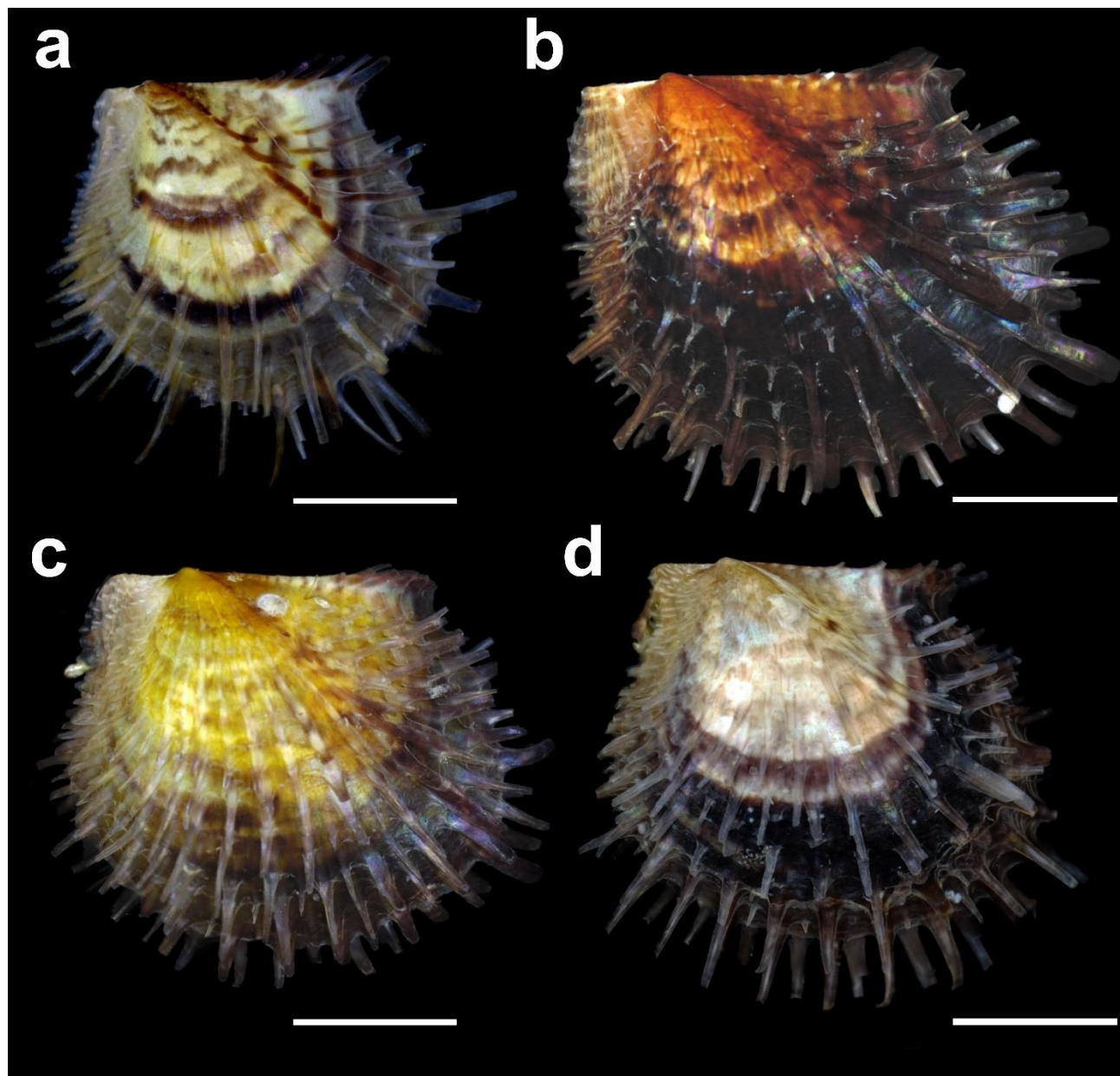
species has been mentioned as distributed in Colombia, however, no reference material or specific locations for the Colombian Caribbean coast were found.

Pinctada longisquamosa is a relatively small pearl oyster, with the largest recorded specimen reaching 39.3 mm in length and 28.7 mm in height (Mikkelsen *et al.*, 2004). *Pinctada* life history traits include protandry, or alternating hermaphroditism (Cole *et al.*, 2011; Halvorson *et al.*, 2011), however sex determination in *P. longisquamosa* seems to follow three different patterns: from pure protandry to a pattern of alternating sex reversal, and also a pattern resembling gonochorism (Cole *et al.*, 2011), which have been documented for different populations in different anchialine ponds in the Bahamas. This species is distinguished by its radial rows of narrow shell lamellae and a predominantly bright green to yellow coloration; those colors suggest a camouflage strategy (Mikkelsen *et al.*, 2004). Juveniles exhibit irregular, randomly distributed opaque white blotches and the conspicuous lamellae characteristic of adult specimens are absent (Mikkelsen *et al.*, 2004). It inhabits shallow waters, typically ranging from 2 to 10 m depths, based on records from Florida (Mikkelsen *et al.*, 2004). In the Bahamas, a particular recorded characteristic of this species is that a "suicide spawning" event will occur when there is a strong storm such as a hurricane; older *P. longisquamosa* spawn successfully and then die in the subsequent year (Cole *et al.*, 2011).

Oyster species of the families Margaritidae and Pteriidae are represented in the Colombian Caribbean by *P. imbricata* and *P. colymbus*, respectively. A key distinguishing characteristic of *P. longisquamosa* from these species is its extremely thin interior nacreous layer, which is translucent (Mikkelsen and Bieler, 2008).

The subsequent section will provide a detailed description of the material found in the Museo de Historia Natural Marina de Colombia (MHNMC for its acronym in Spanish) mollusk collection.

Family Margaritidae Blainville, 1824
Genus *Pinctada* Röding, 1798
Pinctada longisquamosa (Dunker, 1852)



Figures 1 a-d. Different color patterns of *Pinctada longisquamosa* collected on Tintipán Island (Colombia). INV MOL11589. All viewed from the left side. Scale bars: 1 cm.

This species is primarily distinguished by densely packed, long, and recurved commarginal rows of thin, flattened scales or spines (Mikkelsen and Bieler, 2008), as observed in Figures 1a-d.

Colombian material examined: 23 specimens INV MOL11587 (St. CIS097), Tintipán Island, north lagoon; collected

13/November/1999. 3 specimens INV MOL11588 (St. CIS109), Tintipán Island, west lagoon; collected 14/August/2000. 131 specimens INV MOL11589 (St. CIS115), Tintipán Island, north lagoon; collected 15/March/2000. 2 specimens INV MOL11590 (St. CIS120), Tintipán Island, west lagoon; collected 11/April/2000. 32 specimens INV MOL11591 (St. CIS131), Tintipán Island, north lagoon; collected 12/April/2000. All

specimens were collected on mangrove roots. In the collection of the MHNMC all the specimens are preserved with the soft parts in an ethanol solution of 70 %.

Geographic distribution: Bermuda, Florida, Texas, Bahamas, Cuba, Jamaica, Puerto Rico, Virgin Islands, Netherlands Antilles, Mexico and Venezuela (Mikkelsen *et al.*, 2004); according to these same authors, other unverified localities include Grand Cayman Island, Guadeloupe, Dominica and Colombia. GBIF (2023a) datasets showed 233 records for Antigua and Barbuda (1), Aruba (1), Bermuda (2), Brazil (1), Bahamas (18), Belize (9), Cuba (12), Curaçao (1), Dominican Republic (1), Honduras (2), Italy (1), Jamaica (1), Cayman Island (1), Mexico (7), Panama (14), Trinidad and Tobago (1), USA (156, mainly from Florida), Venezuela (1), and three without location. The associated collections include 241 occurrences from 17 datasets. 12 datasets are from USA museums, and the remaining are from Europe, Japan, and iNaturalist institutions. 30 % of the occurrences correspond to the Field Museum of Natural History, 23 % to the Florida Museum of Natural History, and 13 % to the National Museum of Natural History, Smithsonian Institution, among others.

In Colombia, *P. longisquamosa* is recorded in this study for Tintipán Island (Morrosquillo Gulf), a continental island located in the central Colombian Caribbean. The specimens were found in two localities of the island: North lagoon (9° 47' 44.92" N, 75° 50' 58.10" W) and West lagoon (9° 47' 26.17" N, 75° 51' 19.03" W).

Substrate: Colombian specimens of *P. longisquamosa* were collected from larger stilt-like roots of *Rhizophora mangle* that were not secured to the soil (Báez, 2001). It is worth noting that *P. longisquamosa* has been documented on a broad range of biogenic substrates. These oysters attach themselves to marine vegetation using byssal threads (Mikkelsen *et al.*, 2004). This species is most frequently associated with shallow seagrass beds dominated by *Thalassia testudinum* K.D.Koenig, typically at depths of 1 to 2 m; recorded occurrences also include habitats such as "*Halimeda* clumps, in mixed algae communities on mangrove roots and rocks, associated with sponges and gorgonian stalks, an artificial reef, and attached to floating *Sargassum* that has washed ashore" (Mikkelsen *et al.*, 2004).

Remarks: The mollusk collection at MHNMC currently comprises 11,746 cataloged lots (SIBM, 2023), with a

substantial amount of material in the process of being documented. Future endeavors aim to continue cataloging new species records, thus enhancing our understanding of marine Colombian malacofauna. *Pteria hirundo* is noteworthy, as it is distributed on both coasts of the Atlantic Ocean, although with more records towards the eastern Atlantic (659 occurrences) (GBIF, 2023b). Mikkelsen and Bieler (2008) recorded *P. vitrea* (a synonym of *P. hirundo*) from Massachusetts to the Gulf of Mexico. However, WoRMS (2023) documented *P. hirundo* along the tropical western Atlantic, also including Colombia. As Mikkelsen *et al.* (2004) noted, both *P. hirundo* and *P. longisquamosa* are considerably underrepresented in the existing literature and collections. Furthermore, no records, material, or locations of *P. hirundo* have been previously recorded in the Colombian Caribbean.

Exploration of new localities along our coastline and population studies of *P. longisquamosa* are essential, as its conservation status remains undocumented in the Colombian Caribbean. The information presented here introduces a novel location for *P. longisquamosa*, contributing with valuable data to our understanding of its geographic distribution within the Colombian Caribbean region.

Conflicts of interests

The authors declare no conflict of interest related to this manuscript.

Authors Contributions

All authors were equally involved in obtaining, writing, and analyzing the information.

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