

# First record and geographic range extension of the brittle star *Ophionephthys limicola* Lütken, 1869 (Amphilepidida, Amphiuridae) from the Caribbean coast of continental Colombia

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**Abstract.** *Ophionephthys limicola* Lütken, 1869 (Amphiuridae) is recorded for the first time from the mainland Caribbean coast of Colombia. Although its presence was already known from the island of San Andrés, Colombia, we extend this species' geographic range south to the Gulf of Morrosquillo. Based on 10 specimens collected between 2023 and 2024, its external diagnostic characteristics and, for the first time, its microstructures are documented. Finally, we provide an ontogenetic characterisation, focusing on external morphological traits that show significant variation.

**Key words.** Biodiversity, microstructures, morphology, Ophiuroidea

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## Introduction

The family Amphiuridae Ljungman, 1867, is the most diverse in the class Ophiuroidea, with approximately 477 species distributed across 28 genera (Stöhr et al. 2026). These organisms have a cosmopolitan distribution and a wide bathymetric range, inhabiting shallow waters to abyssal zones (Borges 2006; Stöhr et al. 2012; Alitto et al. 2018). The family is morphologically distinguished by its fragile structures, such as the disc, and its long, slender arms (Hendler et al. 1995; Borges 2006; Alitto et al. 2018). Ecologically, they represent a dominant component of the infauna of soft substrates, where they often reach high population densities (Hendler et al. 1995).

The genus *Ophionephthys* Lütken, 1869 was established based on *O. limicola* Lütken, 1869 as the type species, which was originally described from specimens collected from Saint Thomas, in the Antilles. Lütken (1869) chose this genus to distinguish those forms of Amphiuridae that exhibit a peculiar disc morphology, characterised by thin skin devoid of scales over most of its surface, except near the radial shields. Over the years, the taxonomic treatment of the genus has been complex, and the delimitation of its species has undergone constant revision. Many species originally described as *Ophionephthys* were subsequently transferred to other taxa, mainly to genera of *Amphiura* Forbes, 1843, due to similarities in the structure of the oral papillae and the arm armour (Lütken 1869; Thomas 1962).

The genus *Ophionephthys* comprises three species worldwide (Stöhr et al. 2026). It differs from other amphiurids in having between three and five papillae along each half of the jaw, remarkably long arms with 3–5 spines on each lateral plate, and a single pair of tiny tentacular scales. Its dorsal surface is bare, except for a scaly area at the apex of each radial shield and a group of flat scales at the edge of the disc (Thomas 1962; Clark 1974).

*Ophionephthys limicola* is distributed in the western tropical Atlantic, including the Dry Tortugas, the Florida Keys, the Virgin Islands, Belize, Panama, and Colombia (Thomas 1962; Vélez 2003; Borrero-Pérez et al. 2019). In Colombian waters, its presence had only previously been documented around the island of San Andrés (Vélez 2003; Borrero-Pérez et al. 2019) (Figure 1). According to Thomas (1962), *O. limicola* is found on muddy bottoms at a depth of not more than 1 m. It is a very active species and difficult to capture intact, as it frequently sheds its disc during capture or shortly thereafter, making



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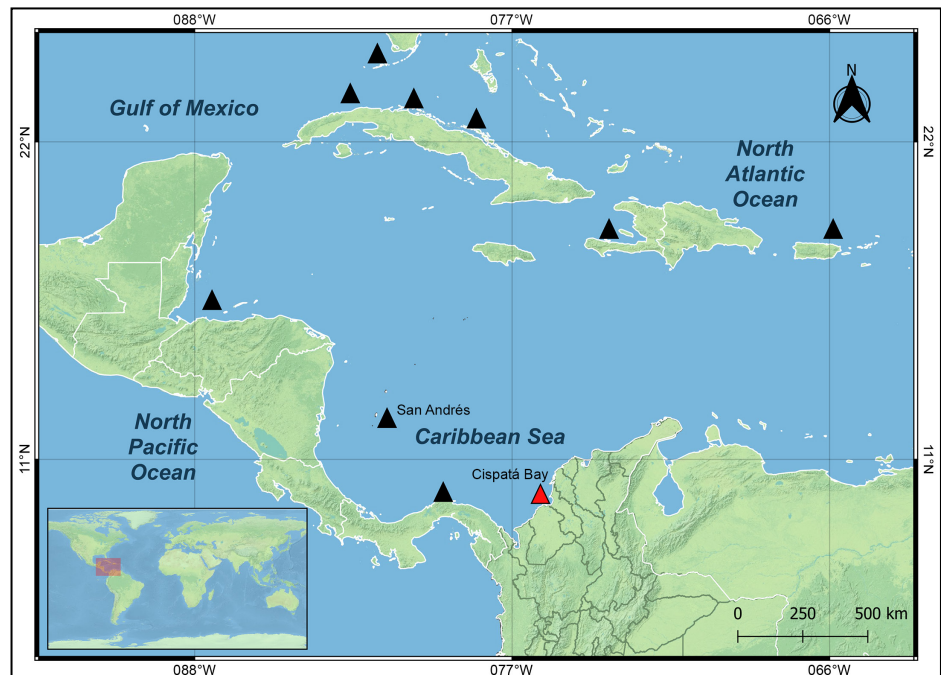
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**Figure 1.** Distribution of the ophiuroid *Ophionephthys limicola* Lütken, 1869; black triangles = previous records; red triangle = extension of its range to the Caribbean coast of continental Colombia.



identification difficult. Therefore, our purpose here is to report the first record of this species from the mainland coast of Colombia. Our new record extends this species' geographic range southward to the Gulf of Morrosquillo.

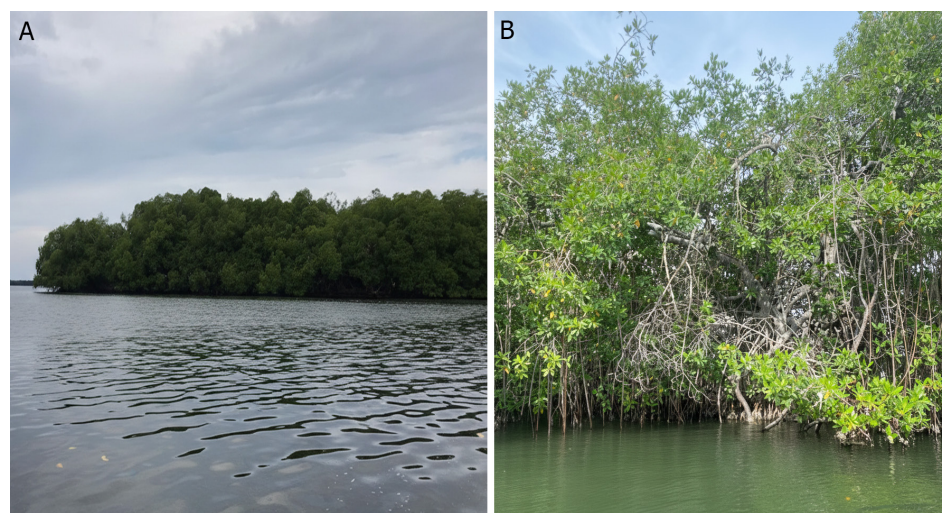
## Methods

Ten specimens of *Ophionephthys limicola* were collected in Cispata Bay near Punta Nisperal and Ahumadera, Department of Córdoba, Colombia (Figure 2) in 2023 and 2024. To collect the specimens, a corer was used to extract sediment samples from depths ranging from 0.5–1.5 m. The specimens were anesthetised with magnesium sulfate, then fixed and preserved in 75% ethanol following the protocols of Martínez-Melo et al. (2018).

Photographic records were made using Pixel Pro v. 3.1, and observations were made using a Luxeo 6Z stereoscope with an integrated camera. The identification was validated by comparison with the syntype material (MCZ: IZ: OPH-1571) and the published descriptions by Thomas (1962), Hendler et al. (1995), and Vélez (2003). The reference material was deposited at the Makuriwa Natural History Museum (INVEQU5240) and the Zoology Laboratory of the University of Córdoba (LZUC).

To study the microstructures of the ossicles, fragments between the second and tenth segments

**Figure 2.** Sampling sites of *Ophionephthys limicola* in Cispata Bay, Córdoba, Colombia. **A.** General view of the Ahumadera. **B.** General view of Punta Nisperal.



of an arm were selected. The samples were immersed in sodium hypochlorite (NaClO) to remove soft tissue. After disarticulation, the plates were washed off with water and dehydrated in a 95% ethanol solution (Chagas et al. 2020). The samples were coated with gold and prepared for subsequent observation using a JEOL JSM-7100F scanning electron microscope (SEM). Finally, 10 specimens were analysed to carry out an ontogenetic characterisation focused on morphological features that showed significant variation.

## Results

Phylum Echinodermata Klein, 1778

Class Ophiuroidea Gray, 1840

Order Amphilepidida O'Hara, Hugall, Thuy, Stöhr & Martynov, 2017

Family Amphiuridae Ljungman, 1867

Genus *Ophionephthys* Lütken, 1869

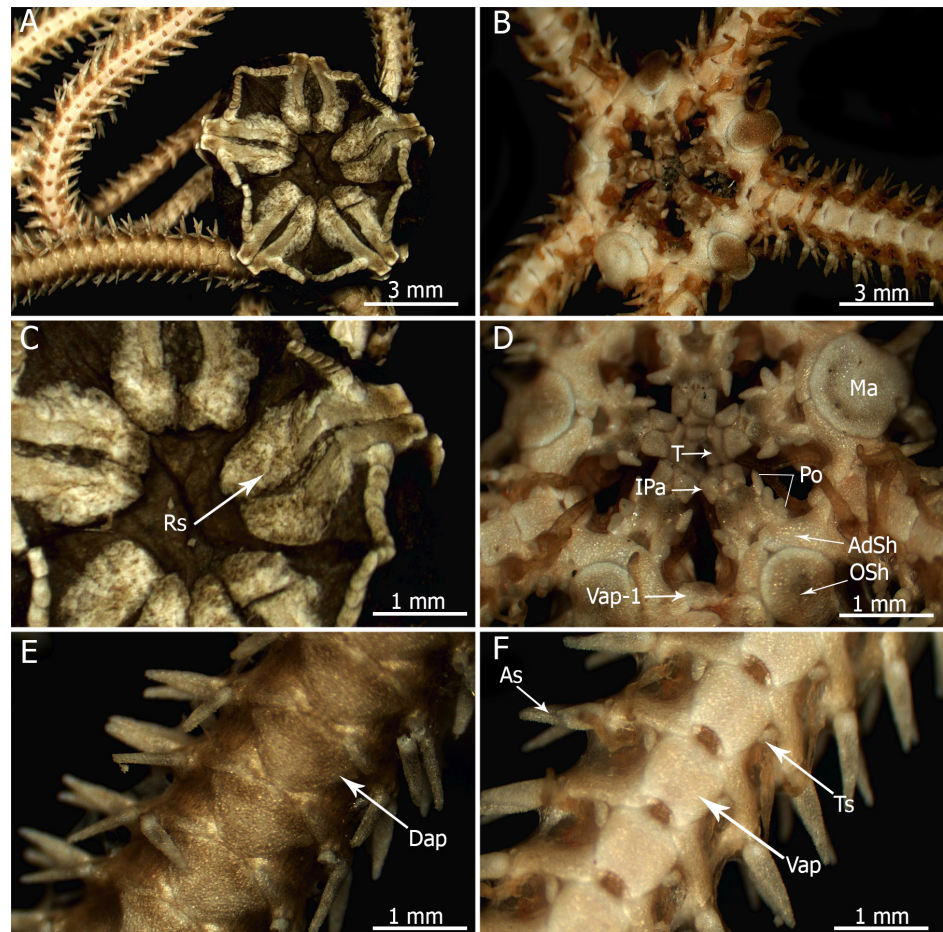
### *Ophionephthys limicola* Lütken, 1869

Figures 3–5

**New record:** COLOMBIA — CÓRDOBA • San Antero, Cispatá Bay, Ahumadera sector; 09°24'34"N, 075°47'34"W, 1 m depth; 03.VI.2024; J. Sierra Gómez & C. Nisperuza Pérez leg.; 8 specimens, INV EQU5240 & LZUC-ECH 037 to LZUC-ECH 043 • Bay Punta Nisperal sector; 09°23'42"N, 075°47'27"W; 1 m depth; 06.II.2023; J. Sierra Gómez & C. Nisperuza Pérez leg.; 2 specimens, LZUC-ECH 044 & LZUC-ECH 045.

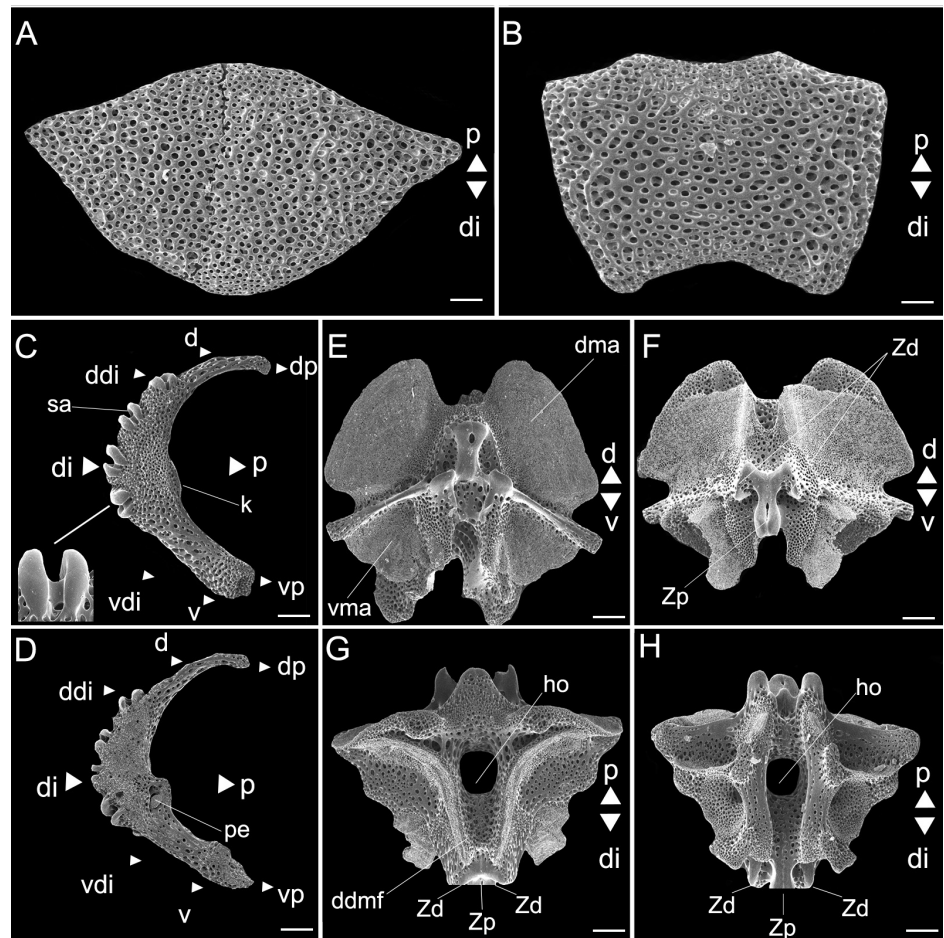
**Identification.** According to the descriptions by Thomas (1962), Hendler et al. (1995), and Vélez (2003), *O. limicola* is brown and has a bare surface disc with elongated, narrow radial shields (Figure 3A). These shields are distally widened and covered by scales; in addition, a belt of small marginal scales completely surrounds the disc at the distal end of each pair of radial shields (Figure 3C). As

**Figure 3.** External morphological characters of *Ophionephthys limicola* (disc diameter: 7.1 mm LZUC-ECH 043). **A.** Dorsal side of the complete specimen, **B.** Ventral side of complete specimen. **C.** Radial shields. **D.** Mandible. **E.** Dorsal side of arm. **F.** Ventral side of the arm. Abbreviations: Rs = radial shields, Vap-1 = first ventral plate, Ma = madreporite, OSh = oral shields, AdSh = adoral shield, Po = Oral papillae, IPa = infradental papillae, T = teeth, Dap = dorsal plates of the arm, Vap = ventral plates, Ts = tentacular scales, As = spines of the arm.





**Figure 4.** Microstructures of the arm of *Ophionephthys limicola* observed under a scanning electron microscope (disc diameter: 7.1 mm LZUC-ECH 043) **A.** Dorsal arm plate. **B.** Ventral arm plate. **C, D.** Lateral arm plate. **E.** Vertebra, proximal surface. **F.** Vertebra, distal surface. **G.** Vertebra, dorsal surface. **H.** Vertebra, ventral surface. Abbreviations: d = dorsal, di = distal, dap = dorsal plate, ddi = dorsodistal, ddmf = dorsodistal muscle fossa, dp = dorsoproximal, dma = vma = dorsal muscle area, p = proximal, pe = perforation, v = ventral, vdi = ventro-distal, vp = ventro-proximal, vma = ventral muscle area, sa = spine articular tubercle, ho = hole, Zd = zygocondyles, Zp = zygospheno. Scale bars: A–B = 150 µm; C–H = 100 µm.



for the mouthparts, the mandibular structure consists of large, triangular oral and adoral shields, a prominent madreporite, two or three lateral oral papillae, and a pair of robust infradental papillae (Figure 3B, D). The arms bear semi-rhomboidal to rhomboidal dorsal plates, which are characterised by convex proximal and distal margins and pointed lateral margins (Figures 3E, 4A), and square ventral plates with a bipointed proximal margin and a concave distal margin (Figures 3F, 4B), which do not contact each other. A single tentacle scale and tetragonal spines are present (Figure 3F).

The lateral plates of the arm (Figure 4C, D) exhibit a ventral portion that protrudes in a ventro-proximal direction, while the ventro-distal region has no protuberances; likewise, the absence of spurs and horizontal striations is noteworthy. The spine joint consists of four insertion points, whose interspinal distance increases dorsally. The articular lobes are parallel, straight, and almost horizontally oriented, and the dorsal lobe is larger than the ventral lobe. The stereom is dense and lacks a sigmoid fold, while the inner side shows two central protuberances and a perforation (Figure 4D).

The vertebrae are zygospondylous and lack a keel. The proximal vertebral surface exhibits a prominent groove in the dorso-distal muscular fossa (Figure 4E). The zygocondyles dorsally converge, and the zygosphene is fused to the pair of zygocondyles (Figure 4F). Dorso-distal muscle fossae are located anterior to the distal edge of the zygocondyles, accompanied by a vertical hole traversing the vertebra (Figure 4G). Finally, the ventral surface has a deep, circular depression, with a zygosphene that projects beyond the ventral edge of the zygocondyles (Figure 4H).

**Ontogenetic changes in morphological traits.** Among the 10 specimens analysed, the ornamentation of the disc, radial shields, and jaw structures (oral and adoral shields) were the morphological features that exhibited significant changes during development. The dorsal and ventral plates did not show significant variation. To document the progression of these changes, four representative individuals with disc diameters (dd) of 6.5 mm, 6.9 mm, 7.2 mm, and 8.0 mm were selected (Figure 5).

In the specimens analysed, the primary scales are not visible (Figure 5A–D). A marked morphological transition was observed in the radial shields in relation to the size of the individual: in the smallest specimen, the shields have a dense covering of scales on their proximal part, covering a large portion of these shields (Figure 5E). On the other hand, the medium-sized specimen (Figure 5F) has radial



**Figure 5.** Growth series of *Ophionephthys limicola*. **A–D.** Dorsal view of the disc. **E–H.** Detail of the radial shields. **I, J.** Detail of the mandibles. Abbreviations: Rs = radial shields; AdSh = adoral shields; OSh = oral shields. Scale bars: A–D = 2 mm; E–H = 3 mm.

shields that are 1.0–1.5 times longer than wide; they are fused and with fewer scales at their proximal end. In contrast, in the two larger specimens, the shields narrow significantly, 2–3 times longer than wide, and they are fused only at the distal end and show reduced scale coverage at the proximal end (Figure 5G, H).

Finally, the structure of the mandible varies with growth: the specimen with the smallest diameter exhibits an oval oral shield, longer than it is wide, with contiguous adoral shields (Figure 5I). In the three larger individuals, the morphology of the oral shield transitions to an arrow shape, with a pointed proximal apex and a rounded distal base, becoming longer than wide (Figure 5J–L). During this process, the adoral shields maintain their contiguous arrangement along the internal midline of the mandible (Figure 5J–L).

## Discussion

Clark (1974) remarked that the mouthparts of *Ophionephthys* are similar to those of *Amphiura*. However, in *Ophionephthys* the oral papillae are not located at the distal angle of the jaw as in *Amphiura* but laterally arranged in a manner very similar to that observed in *Amphioplus* Verrill, 1899. Due to these morphological affinities, Thomas (1962) suggested that some species more similar to *Amphiura* should probably be removed from *Ophionephthys*.

The genus *Ophionephthys*, which currently comprises three globally recognised species (Stöhr et al. 2026), is distinguished from other amphiurid genera of by a set of diagnostic features, among which the disc ornamentation is the most prominent. While *O. limicola* has a circular disc up to 7.1 mm in diameter that is almost completely bare, except for a belt of marginal scales and a small group of scales at the base of the radial shields (Thomas 1962; Hendler et al. 1995; Vélez 2003), the other two species exhibit completely covered with scales. In contrast, *O. lowelli* A.M. Clark, 1974 is recognised by its round disc, up to 8 mm in diameter, with fine, overlapping scales (Clark 1974), and *O. difficilis* (Duncan, 1887), by a smaller, pentagonal disc covered with granular scales (Duncan 1887).

The combination of traditional external morphological characterisation with high-resolution imaging, such as scanning electron microscopy, has proven to be highly effective for the systematic study and differentiation of ophiuroidean species (Thuy and Stöhr 2011; Alitto et al. 2018; Chagas et al. 2020). Here, we provide the first photographic record of the arm microstructures of *O. limicola*.

*Ophionephthys limicola* represents a morphological transition between naked and scaly taxa within

the Amphiridae (Thomas 1962). The specimens we analyzed show notable ontogenetic changes: as the organism grows, the radial shields become thinner and separate proximally, the scales at the base of these shields disappear, and the oral shields tend to acquire an arrowhead shape. The ontogenetic differences observed are fundamental for the accurate identification and delimitation of diagnostic characters in the family (Borges et al. 2014). According to Borges et al. (2014) and Goharimanesh et al. (2022), this morphological transition can be interpreted as a response to selective pressures that have favoured specific developmental strategies at different stages of the life cycle, and distinguishing between congeneric taxa.

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## Additional information

### Conflict of interest

The authors declare that no competing interests exist.

### Ethical statement

No ethical statement is reported.

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### Author contributions

Conceptualization: JDSG, CANP, JAQR. Data curation: JDSG. Formal analysis: JDSG, CANP, JAQR. Funding acquisition: JAQR. Investigation: JDSG, CANP, JAQR. Methodology: JDSG, CANP. Resources: JDSG, CANP, JAQR. Software: JAQR. Validation: CANP, JAQR. Original draft writing: JDSG. Writing, review, and editing: JDSG, CANP, JAQR.

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### Data availability

All data that support the findings of this study are available in the main text.

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