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First record of *Cylista ornata* (Holdsworth, 1855) and new records of *Cylista troglodytes* (Price, 1847) (Cnidaria, Actiniaria, Sagartiidae) on the Portuguese coast corroborated by genetic data

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Abstract. In 2023, *Cylista ornata* (Holdsworth, 1855) was documented for the first time along Portugal's west coast during a long-term monitoring program. *Cylista troglodytes* (Price in Johnston, 1847) was also found. These finds represent the southernmost confirmed records of both species on Europe's continental coast. Identifications were confirmed through morphological analysis and genetic barcoding, following initial sightings during a coastal survey initiated in 2021. These sightings highlight the importance of ongoing ecological monitoring and field surveys in understanding species distribution patterns and evaluating the effects of climate change on marine biodiversity.

Key words. Barcoding, cold-water species, distribution range, first occurrence, sea anemones

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Introduction

Sea anemones (Cnidaria, Actiniaria) are among the most species-rich clades of Hexacorallia (Rodríguez et al. 2014), yet the systematic within this group is heavily focused on the arrangement and morphology of soft tissues, like the column, mesenteries, and muscles (Rodríguez et al. 2014; Spano et al. 2018). However, it is unclear which of these characteristics are derived from shared ancestry and which ones are analogous responses from independent lineages (Rodríguez et al. 2014; Brugler et al. 2018; Spano et al. 2018). The simplicity of actinian body plan may be related to high levels of morphological convergence, and many of the relatively few morphological characters of the order have been repeatedly lost (Rodríguez et al. 2014). Fautin (2016) published a catalogue of families, genera, and species of Actiniaria, where several genera were considered invalid. One of these was the genus *Sagartia* Gosse, 1855, presently accepted as *Cylista* Wright, 1859, which has undergone repeated taxonomic revisions, with several species redescribed and reclassified in recent decades (Shaw et al. 1987; Acuña et al. 2004; Sanamyan and Sanamyan 2020). Despite these advances, uncertainties remain regarding the distribution and identification of *Cylista* species in European waters.

During samplings conducted across the central and south-western coasts of mainland Portugal, eight specimens of the family Sagartiidae, potentially representing the species *Cylista ornata* (Holdsworth, 1855) and *Cylista troglodytes* (Price in Johnston, 1847), were collected and brought to the laboratory for morphological identification and genetic barcoding. While this study focuses on the broad monitoring of intertidal flora and fauna rather than specifically targeting anemones, the

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collected samples provide valuable insight into the presence of *C. troglodytes* and *C. ornata* on the Portuguese continental coast.

Methods

This study is part of a long-term rocky coastal survey initiated in 2021 along the western Portuguese coast. The samples were collected in: Shell Beach, Oeiras, Portugal (38°40′40.87′N, 009°19′00.22″W); Cabo Raso, Cascais (38°42′32.14″N, 009°29′09.63″W), and Odeceixe (37°26′43.18″N, 008°48′01.38″W) (Figure 1). Vertebrates and invertebrates were surveyed monthly at each site using fixed 50 m^2 transects. To conduct research within the intertidal zone while optimizing sampling time despite tidal constraints, we developed a survey methodology based on the standardized search approach outlined by Totterman (2012). However, our technique does not impose time restrictions and is referred to as Free Roaming surveys. The starting and ending times of each sampling session were recorded, enabling the calculation of the total sampling duration. This method allows us to strategically focus our sampling efforts on the most suitable microhabitats of interest. The eight sea anemone individuals collected during these surveys were transported to our research unit for morphological confirmation using a Zeiss Stemi 2000 stereomicroscope. They were photographed in vivo using a Samsung S23, anesthetized with menthol crystals, and preserved in 96% ethanol for genetic reference or in a 3% formaldehyde solution in saltwater for anatomical and morphological studies. Given the taxonomic importance of cnidocyte types and sizes, acontia preparations were observed at 1000× magnification with a Zeiss Primostar 3 microscope and photographed with a Axiocam 208 color. The different cell types of two specimens were identified according to den Hartog and Ates (2011) and Acuña et al. (2004). Cnidae capsules were measured (width and length) with the software Zeiss ZEN v. 3.3.89.0000. Voucher specimens are stored at the Marine and Environmental Sciences Centre, University Institute of Psychological, Social and Life Sciences Lisbon, Portugal (MARE-ISPA) invertebrate collection.

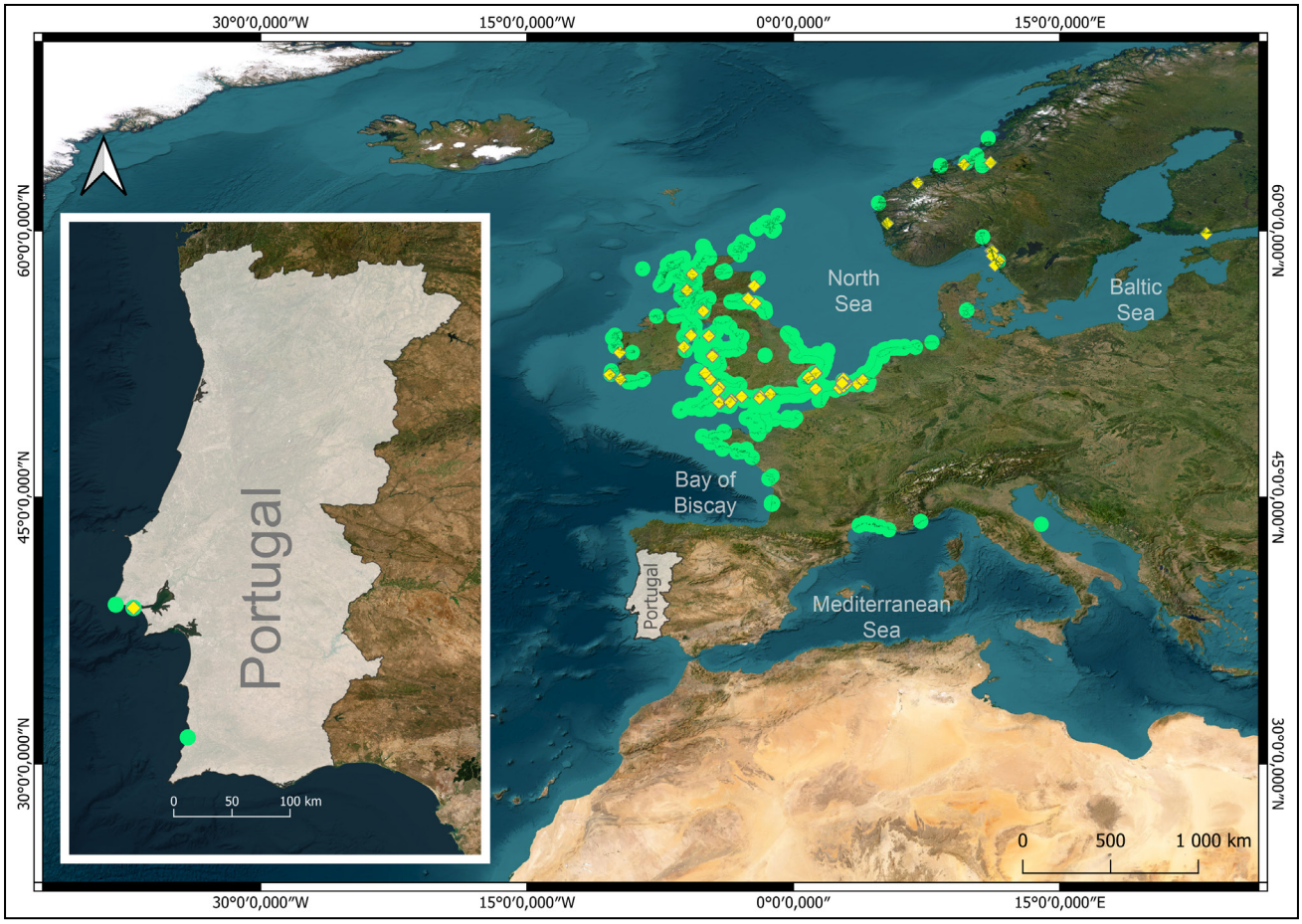

Figure 1. Map illustrating the occurrences recorded in GBIF (GBIF.org 2025a, 2025b) for *Cylista ornata* (represented by yellow diamonds) and *C. troglodytes* (green dots). The close-up section highlights the locations where both species were collected in Portugal.

The DNA extractions and amplifications were performed using the Sigma-Aldrich/Merck REDExtract-N-Amp Tissue PCR commercial kit following manufacturer's instructions. A total of 1051 bp of the nuclear DNA fragment coding for the ribosomal 28S subunit was amplified from seven individuals using the primers LSU D1D2 Fw1 (5′–AGCGGAGGAAAAGAAACTA–3′) and LSU D1D2 Rev1 (5′–TACTAGA AGGTTCGATTAGTC–3′) (Sonnenberg et al. 2007) and the following thermal cycling protocol: 94 °C for 2 min, 45 cycles of [94 °C 20 s, 52.5 °C 20 s, 72 °C 90 s], 72 °C for 8 min. A 655-bp fragment including the internal transcribed spacer (ITS) I and II partial sequences was also amplified from two individual using the primers 18SF (5′–TCATTTAGAGGAAGTAAAAGTCG–3′) and 28SR (5′–GTTAGTTTCTTTTCCTCCG CTT–3′) (Lôbo-Hajdu et al. 2004) and the following thermal cycling protocol: PCR thermal cycling protocol: 94 °C for 2 min, 40 cycles of [94 °C 30 s, 51.5 °C 45 s, 72 °C 1 min], 72 °C for 10 min. Amplification success was evaluated by electrophoresis in a 10% agarose gel and purified with magnetic beads. Sequencing was performed at Stabvida (https://www.stabvida.com).

Sequences were edited, assembled and aligned using CodonCode Aligner v. 11.0.2. The edited sequences were then compared sequences from known specimens available on the National Center for Biotechnology Information (NCBI) GenBank database using the Basic Local Alignment Search Tool (BLAST) on the NCBI website (http://blast.ncbi.nlm.nih.gov/Blast.cgi). Whenever there were available sequences with more than 90% similarity, they were downloaded and aligned with the ones obtained in this study, with MEGA v. 5.10 (Tamura et al. 2012). A maximum-likelihood phylogenetic tree was produced using default parameters for the 28S dataset. *Diadumene leucolena* (Verrill, 1866) (GenBank accession number KJ483123) served as the outgroup. Pairwise K2P distances between sequences were calculated when necessary.

Results

***Cylista troglodytes* (Price, 1847)**
Figures 2–4

New records. PORTUGAL — **Cascais** • Cabo Raso; 38°42′32.14″N, 009°29′09.63″W; intertidal free-roaming survey; 15.II.2024; Pereira leg.; 1, sex indet., preserved in formaldehyde, ID22 — **Odeceixe** • Praia de Odeceixe, 37°26′43.18″N, 008°48′01.38″W; intertidal free-roaming survey; 02.VI.2023; Duarte-Coelho, Miranda & Pereira leg; GenBank PV703787 (ITS), PV688315 (28S); 1, sex indet., preserved in ethanol, SP245 — **Oeiras** • Shell Beach; 38°40′40.87″N, 009°19′00.22″W; free-roaming survey; 13.VI.2022; Pereira leg.; GenBank PV688316 (28S); 1, sex indet., preserved in ethanol, SP100 • same locality; intertidal transect survey; 13.IX.2025; Duarte-Coelho & Miranda leg.; GenBank PX660031 (28S); 1, sex indet, preserved in formaldehyde, ID54.

Identification. The disc colouration is typically grey, brown, or black-and-white and variably patterned with magenta, crimson, orange, purple, or scarlet (notably excluding red), or with the colour pattern absent (Stephenson 1929; Manuel 1981; Wood 2013). Tentacles are arranged in multiples of six (Wood 2013), number up to 200, and have a distinctive B-shaped (Manuel 1981) or V-shaped (Wood

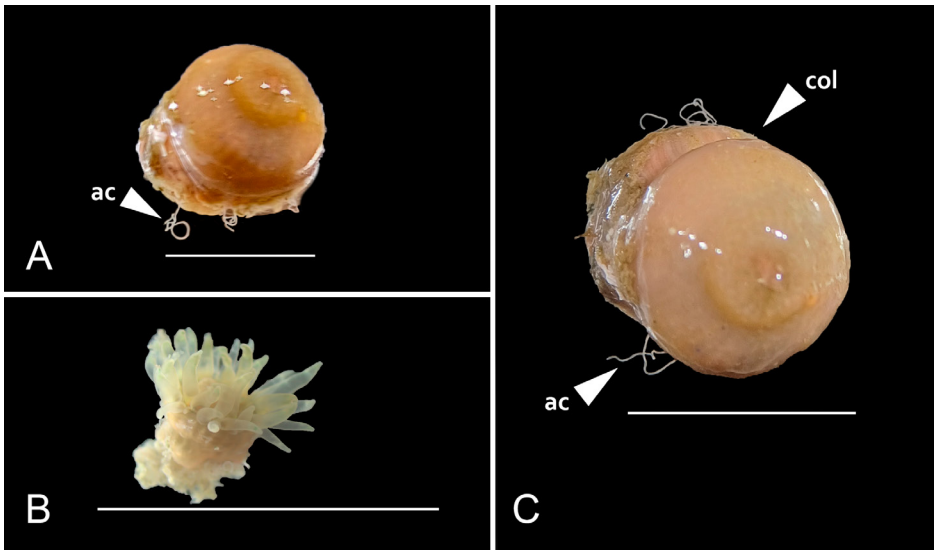

Figure 2. *Cylista troglodytes*. **A.** Top view showing its body significantly more rigid when retracted and the release of acontia (ac) (ID22). **B.** Young individual displaying the whitish tentacles (SP.100) **C.** Top side view of individual showing acontia (ac) and the distinctive goblet-like shape of the column (col.) (ID22). Scale bar = 10 mm.

2013) marking at their base. This marking is visible even when no colour pattern is present (Manuel 1981), and it is more pronounced on the innermost ring of six tentacles (Wood 2013). The column is dull-coloured (Figure 2B): greenish olive, yellowish grey, dirty flesh-tone, or light yellow-brown and exhibiting pale endocoelic stripes that extend upward from the limbus to the mid-column or beyond. It is normally short, but it fully elongates becoming tall and columnar in low-light or when buried. The base is broad, generally equal to or wider than the tentacle span (Manuel 1981), presenting relatively inconspicuous verrucae which are highly adhesive, so that coarse shell fragments, gravel, and similar sediments become attached (Ates et al. 1998). Acontia are very thin and not easily noticeable (Figure 2A, C). The cnidome of the acontia, according to Ates et al. (1998), is composed of the following: basitrich I (length 13.4–16.5 µm, width 2.4–2.7 µm), basitrichs II (length 13.4–16.0 µm, width 1.3–1.6 µm); pmastigophores (length 22.7–26.7 µm, width 3.6–4.0 µm). See Stephenson (1929), Manuel (1981), Ates et al. (1998), and Wood (2013) for further details. Acontia cnidae types and measurements from one of the collected individuals are presented in Table 1 and Figure 3.

Remarks. *Cylista troglodytes* adopts a distinctive goblet-like shape (Figure 2C) when dug-up from soft substrate (Manuel 1981), unlike *C. ornata*. Additionally, its body is notably more rigid when retracted, providing a further point of differentiation. Acontia are only released under significant stress or damage, unlike *C. ornata*.

Table 1. Acontia cnidae of *Cylista ornata* and *C. troglodytes*. Average sizes are presented followed by minimum and maximum sizes between brackets. *N*: number of cells observed. All measurements were performed in µm.

Species	Sample ID	Nematocyst type	Length (µm)	Width (µm)	*N*
C. troglodytes	ID54	p-mastigophores	20.96 [16.17–24.56]	4.12 [3.33–5.44]	19
		Basitrichs I	16.10 [13.37–20.57]	2.24 [1.77–2.67]	5
C. ornata	SP116	p-mastigophores	41.19 [37.77–44.73]	4.64 [3.78–5.17]	21
		Basitrichs I	14.29 [12.32–16.39]	2.24 [1.45–2.80]	11
		Basitrichs II	30.15 [26.43–33.30]	3.0 [2.31–3.49]	19
C. ornata	ID53	p-mastigophores	39.65 [36.9–43.49]	5.14 [4.14–6.18]	27
		Basitrichs II	29.3 [25.87–31.75]	2.99 [2.18–3.65]	14

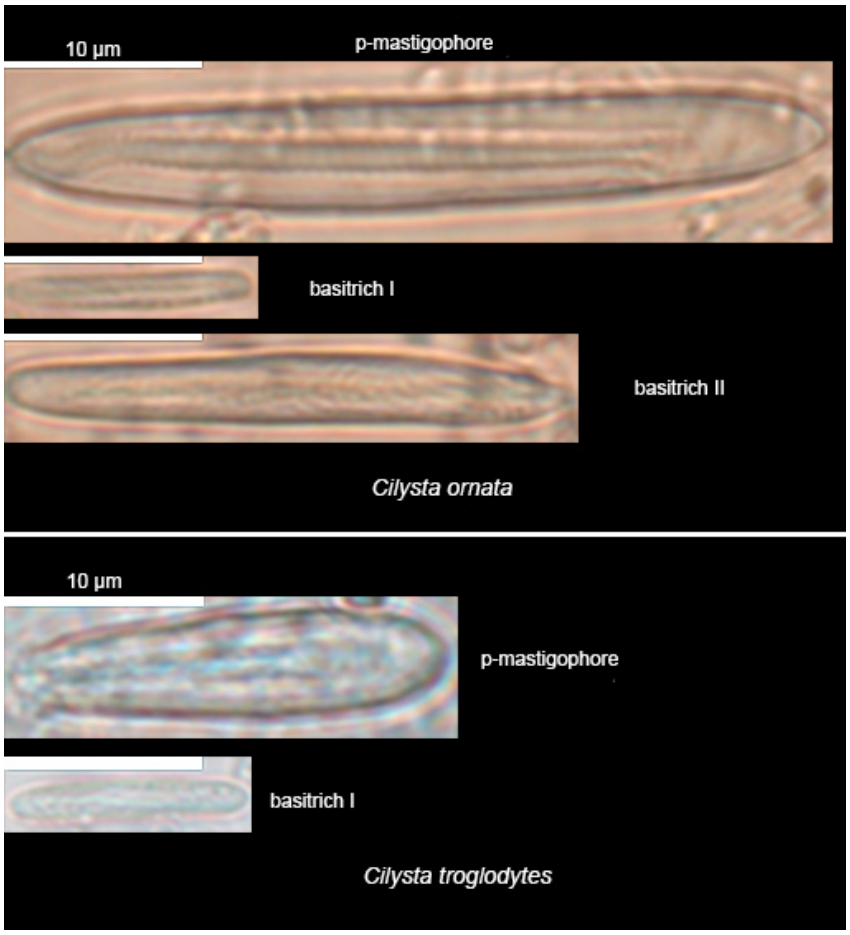

Figure 3. Nematocyst types observed in the *acontia* of *C. ornata* and *C. troglodytes* (see Table 1). Scale bar = 10 µm.

Natural history. This species is typically found in mud, sand, or gravel, with its base anchored to a buried stone or shell as much as 100–150 mm below the surface. *Cylista troglodytes* may be very abundant at low water in sheltered localities (Manuel 1981; den Hartog and Ates 2011; Wood 2013). Occasionally, this species may attach itself to rocks, particularly those with a thin layer of silt or sand along rocky shores (Wood 2013). In such habitats, it can be found in pools, holes, crevices, under stones, or within kelp holdfasts, where smaller, younger individuals are typically observed (Manuel 1981). It is commonly distributed across the lower shore and in shallow waters, and it also thrives in environments with reduced salinity, such as estuaries and harbours (Wood 2013).

Distribution. This is an eastern Atlantic species ranging from the North and Baltic seas to the Atlantic coasts of England and France and the Mediterranean (Shaw 1987; den Hartog and Ates 2011). Reliable records from the Iberian Peninsula are scarce (den Hartog and Ates 2011).

Genetics. The genetic analyses based on the 28S gene identified a single haplotype across the three *C. troglodytes* samples. Figure 4 presents a maximum-likelihood phylogenetic tree that incorporates our haplotypes together with all publicly available sequences of *C. ornata* and *C. troglodytes* (GenBank accession numbers EU190834, KJ483073, and KT852261 for *C. troglodytes* and KJ483069 and JF832997 for *C. ornata*). Regarding the partial fragment of the internal transcribed spacers I and II, we successfully sequenced a 655-bp fragment from sample SP245 identified as *C. troglodytes*. A BLAST search in NCBI revealed that the *C. troglodytes* sequence is identical (100% identity, 97% coverage) to a published *C. troglodytes* sequence (KT852235).

***Cylista ornata* (Holdsworth, 1855)**

Figures 3–5

New records. PORTUGAL — **Oeiras** • Shell Beach; 38°40′40.87″N, 009°19′00.22″W; free-roaming survey; 12.VI.2022; Pereira leg.; GenBank PV688314, PV688312 (28S); 2, sex indet., preserved in formaldehyde, SP116 & SP117 • same locality; intertidal transect survey; 04.IX.2023; Duarte-Coelho & Miranda leg.; GenBank PV703786 (ITS), PV688313 (28S);1, sex indet, preserved in ethanol, SP307 • same locality; intertidal transect survey; 13.IX.2025; Duarte-Coelho & Miranda leg.; GenBank PX660030 (28S); 1, sex indet, preserved in formaldehyde, ID53.

Identification. The mouth is creamy white, with a slit-like to ovoid form. The oral disc is typically flat, brownish internally, and greenish externally with creamy radial stripes. Tentacles number up to 200 and are arranged in four or five cycles, with the internal longer than the external and the last two considerably smaller than the others. The tentacles match the colour of the oral disc, with white spots, being some of the tentacles entirely white. The column may be translucent, coloured in various shades of reddish brown, pale pink to dark greenish towards the margins (Figure 5B, D). The column is 4.2–14.4 mm long, cylindrical in shape and presenting verrucae (sometimes with particles of surrounding substrate attached; Figure 5D) and cinclides, which are few in number but easily observed. The pedal disc is smaller than the oral disc and does not exceed 15 mm. The cnidome of the acontia, according to Acuña et al. (2004) is as follows: basitrichs I (length 8.0–15.0 µm, width 1.0–4.0 µm); basitrichs II (length 24.0–30.0 µm, width 2.0–4.0 µm); p-mastigophores (length 34.0–45.0 µm, width 3.0–6.0 µm). See Manuel (1981) and Acuña et al. (2004) for further details. Acontia cnidae type and measurements from one of the collected individuals are presented in Table 1 and Figure 3.

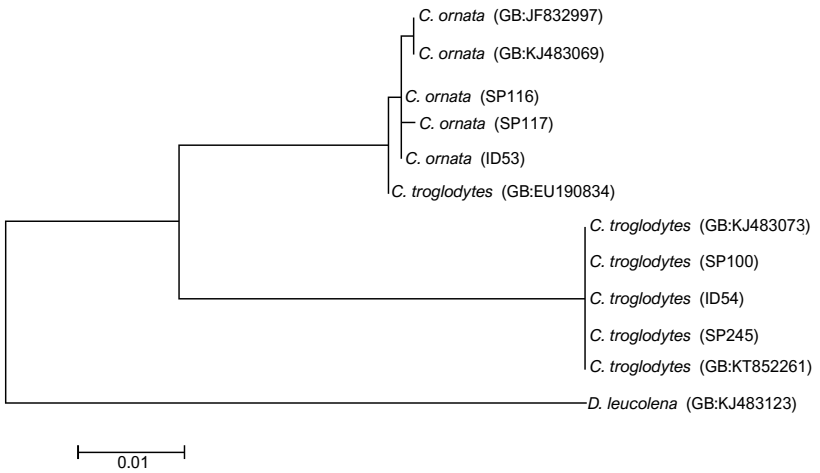

Figure 4. Maximum-likelihood phylogenetic tree based on the 28S dataset (1050 bp), incorporating both sequences generated in this study and publicly available data from GenBank. Sequences obtained in this study are labelled with their voucher IDs, while GenBank entries are indicated by their respective codes preceded by "GB:".

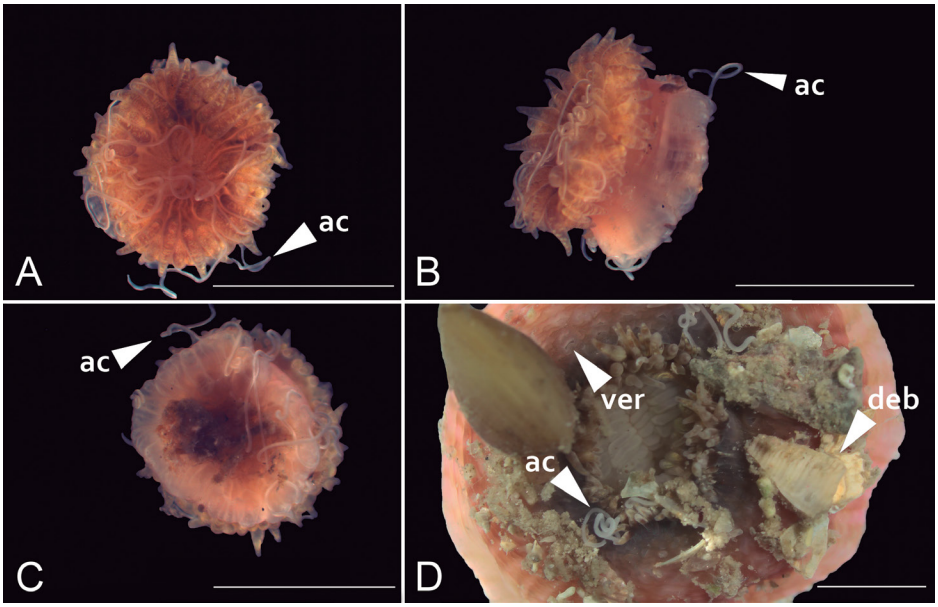

Figure 5. *Cylista ornata*. **A.** Top view displaying several acontia (ac) readily released from the mouth area (SP307). **B.** Side view showing the pink column with acontia (ac) (SP307). **C.** Bottom view showing several acontia (ac) (SP307). **D.** Top view of individual with acontia (ac) and verrucae (ver) with debris attached (deb) (SP116). Scale bar = 5 mm.

Remarks. *Cylista ornata* is very similar in form to *C. troglodytes* but rarely becoming very tall, and the base is not very wide and just slightly adherent (Manuel 1981). Compared to *C. troglodytes*, there is an immediate release of white acontia through cinclides or the mouth when disturbed (Figure 5) (Acuña et al 2004). Juveniles are commonly found within each brooding anemone, highlighting their distinctive reproductive strategy (Acuña et al. 2004). Specimens of *C. ornata* are generally smaller than those of *C. troglodytes* (Manuel 1981).

Natural history. *Cylista ornata* is commonly found on rocky shores, where it occupies microhabitats similar to those of *C. troglodytes* (Manuel 1981), although *C. ornata* extends further into marginal habitats, such as estuaries (Acuña et al. 2004). Additionally, it can be found among mussels and empty barnacle shells. Unlike *C. troglodytes*, however, it is rarely observed buried in sand or silt, favouring more exposed shores at relatively higher tidal levels (Manuel 1981; Wood 2013).

Distribution. The original native range of this species extends from Iceland and Scandinavia to the Mediterranean (Manuel 1981). A first record from South Africa was published by Acuña et al. (2004).

Genetics. The genetic analyses based on the 28S gene identified three distinct haplotypes among the four samples of *C. ornata*. Figure 4 presents a maximum-likelihood phylogenetic tree which incorporates our haplotypes together with all publicly available sequences (GenBank accession numbers EU190834, KJ483073, and KT852261 for *C. troglodytes* and KJ483069 and JF832997 for *C. ornata*). Regarding the partial fragment of the internal transcribed spacers I and II, we successfully sequenced a 655-bp fragment from sample SP307 identified as *C. ornata*. A BLAST search in NCBI revealed that the *C. ornata* sequence did not match any available sequence above 90% identity. The K2P distance between this sequence and the one from our *C. troglodytes* sample is 0.15.

Discussion

The presence of *Cylista ornata* is confirmed and validated with genetic analysis for the first time from along the Portuguese coast. Four specimens of *Cylista troglodytes* were also found along the western coast of Portugal. These findings provide important insights into the distribution of Sagartiidae species within the north-eastern Atlantic. Previous records have largely lacked concrete identification methods or have been misidentified, making accurate assessments of their presence in continental Portugal challenging (den Hartog and Ates 2011; Azeda et al. 2013; Piló et al. 2021).

Taxonomic uncertainties surrounding Sagartiidae have also contributed to discrepancies in reported distributions of their species. Numerous historical records identified *Sagartia troglodytes* as a single species, although it later became clear that *C. troglodytes* and *C. ornata* were included under this name. Thus, early reports likely misrepresented the geographical range of these species, as they blended to distinct ecological niches under a single taxon (den Hartog and Ates 2011; Wood 2013).

As stated in the Introduction, species and genera of Actinaria have been reviewed by Fautin (2016), who considered several genera invalid, including *Sagartia*, which is presently accepted as *Cylista*. This

genus has been revised several times over the years (Gosse 1860; Stephenson 1929, 1935; Sanamyan and Sanamyan 2020), and some species have been recently redescribed (Shaw et al. 1987; Acuña et al. 2004). Shaw et al. (1987) proposed that the two named varieties of *Sagartia troglodytes* (Price in Johnston, 1879)—var. *decorata* and var. *ornata*—should be recognized as two distinct new species. That is, *S. troglodytes* var. *decorata* should become *Sagartia troglodytes* and *S. troglodytes* var. *ornata* should be *Sagartia ornata* (Holdsworth, 1855) (Shaw et al. 1987). This change was based on a combination of electrophoretic, chromosomal, and reproductive information during the studies performed (Shaw et al. 1987).

Acuña et al. (2004) redescribed *S. ornata*, based on their morphological analysis of individuals of this species introduced to South Africa. Sanamyan and Sanamyan (2020) reviewed the validity and nomenclature of several families of Actiniaria and suggested the nomenclature accepted today, including *Cylista ornata* (Holsworth, 1855) (formerly *Sagartia ornata*) and *Cylista troglodytes* (Price in Johnston, 1847) (formerly *Sagartia troglodytes*).

The inconsistencies in nomenclature have rendered the distribution of these and related species highly ambiguous over the years. *Sagartia troglodytes*, in the former, broader sense—and now divided into two species—was often reported from locations where just one of these species might have been present. Thus, misidentifications have led to inaccurate geographical distribution ranges (den Hartog and Ates 2011; Wood 2013). Manuel (1981) described the geographical range of *S. troglodytes* as encompassing Western Europe, from Iceland and Scandinavia to the Mediterranean. This closely aligns with Shaw et al.'s (1987) understanding, who later described the distribution of *S. troglodytes* as extending from the northern Mediterranean along the north-east Atlantic coast of Europe and into the Baltic Sea. At that time, this geographical range encompassed what are now recognised as two distinct species.

By 2002, following the separation of the two species, Ocaña and den Hartog (2002) reported the presence of *S. troglodytes* in Gran Canaria and defined its general distribution as including Iceland, Ireland, the British Isles, France, and the North and Mediterranean seas. Acuña et al. (2004) confirmed the presence of *S. ornata* in South Africa and suggested that it may have been introduced accidentally. Acuña et al. noted that the previously recorded range of *S. ornata* had been restricted to European waters.

Den Hartog and Ates (2011) reported *S. troglodytes* from the Atlantic coast of Spain and referenced a sample from Portugal (Algarve); documented records from the Iberian Peninsula are sparse. They described *S. troglodytes* as an "eastern Atlantic species, commonly found in muddy or sandy habitats of the North Sea, Baltic, and Atlantic coasts of England and France" (den Hartog and Ates 2011: 22). Furthermore, den Hartog and Ates re-evaluated the 2002 record from Gran Canaria and concluded it belonged to *S. ornata*, not *S. troglodytes*. They also provided the first record of *S. ornata* from the coast of continental Spain and expanded this species' distribution to include "… the Faeroe Islands, western Scotland, southern England, and several localities along the Atlantic coast of Europe, from the north of the Netherlands southward to the Basque coast of France …" (den Hartog and Ates 2011: 24). Despite the presence of *C. ornata* in these regions, den Hartog and Ates did not confirm its occurrence in the Mediterranean. Two records of *S. troglodytes* were reported in Portugal in 2013, one from Madeira Island (Wirtz 2014) and another from Lisbon (Azeda et al. 2013). The Lisbon record, documented in a list of species, lacks critical details, such as sample preservation, photographic evidence, and identification methods, which raises the possibility of a misidentification. *Sagartia troglodytes* was again mentioned in a species list, this time for the southern coast of Portugal (Piló et al. 2021). However, no references have been found documenting the presence of *S. ornata* or *C. ornata* from continental Portugal, making our study the first confirmed report of this species to the continental Portuguese coast.

The identification of sagartiid species remains challenging, as their classification is complicated by both taxonomic uncertainty (den Hartog and Ates 2011) and the considerable morphological variability in *C. ornata* and *C. troglodytes*. Although their typical forms can often be distinguished, numerous intermediate morphotypes occur, obscuring species boundaries and complicating reliable identification. In general, specimens of *C. troglodytes* are larger than those of *C. ornata*. However, individuals inhabiting hard substrates on rocky shores (pools, crevices, holes, under stones, or kelp holdfasts) tend to be smaller than conspecifics found in softer burying habitats (Manuel 1981).

Habitat preferences further highlight the complexity of distinguishing these species. *Cylista ornata* typically occupies rocky shores, exploiting microhabitats similar to those of *C. troglodytes* (Manuel 1981). Yet, unlike its congeneric species, *C. ornata* also extends into marginal environments, including estuarine systems (Acuña et al. 2004). In contrast, *C. troglodytes* is more frequently encountered in

burying habitats of sand or silt, whereas *C. ornata* shows a marked preference for exposed shorelines at relatively higher tidal levels (Manuel 1981; Wood 2013).

Morphological analyses of the acontia cnidae provide further diagnostic support for species separation. In our samples, large p-mastigophores were consistently observed in *C. ornata*, while smaller ones characterized *C. troglodytes* (Table 1). The nematocyst types and dimensions matched those previously reported in the literature, although in *C. troglodytes* we detected only a single class of basitrichs, rather than the two classes described earlier (Table 1; Figure 3).

Genetic analyses corroborate these morphological distinctions. The maximum-likelihood phylogenetic tree (Figure 4) shows that our *C. troglodytes* samples, represented collectively as SP245 due to their shared haplotype, cluster with published sequences of this species. Similarly, the three *C. ornata* haplotypes (SP116, SP117, and ID54) group with published sequences of *C. ornata*. The only unexpected result is the relative position of sequence EU190834, which may reflect the recent taxonomic separation of *C. ornata* and *C. troglodytes* into distinct species.

By confirming the presence of these two species, we contribute new data that clarifies their regional occurrence and supports the hypothesis that *C. troglodytes* and *C. ornata* may be more widely distributed across the Iberian Peninsula than previously recognized; our records fill gaps in the known geographical distribution of these species and underscores the importance of reevaluating historical records that may have been misclassified or overlooked.

From a broader perspective, our study highlights the importance of continuing research on the distribution of Actiniaria along the European coasts. Given the historical inconsistencies in taxonomic classification within this order, and the misidentifications recorded in the past, future studies should integrate morphological and genetic approaches to refine species identification and strengthen biodiversity assessments. Expanding sampling efforts, reanalysing historical records, and applying molecular tools will be essential in establishing a more complete understanding of these species' presence throughout the North-eastern Atlantic. In particular, the confirmed presence in Portugal of another Sagartiidae species indicates that its geographical range is broader than previously recognised and raises doubts about the limits formerly attributed to its distribution. In recognizing the presence of *C. troglodytes* and *C. ornata* in Portugal, we not only contribute data on species' distributions but emphasize the broader significance of reassessing historical taxonomy to achieve more precise conservation fforts.

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Additional information

Conflict of interest

The authors declare that they have no competing interests.

Ethical statement

No ethical statement is reported.

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Author contributions

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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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