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New Record of *Aiptasia couchii* (Actiniaria: Aiptasiidae) Reveals Undocumented Diversity in Lebanese Vermetid Reefs, eastern Levantine Mediterranean Sea

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Abstract

The trumpet sea anemone Aiptasia couchii (Cocks, 1851), widely distributed in the northeastern Atlantic and Mediterranean Sea, is here reported for the first time from the eastern Levantine Basin. This record, based on repeated field observations and morphological characterization of specimens from vermetid reef tidal pools in Saksakiyeh (southern Lebanon), represents the first confirmed occurrence of the species in Lebanese waters.

This finding highlights the ecological importance of vermetid reefs as biodiversity hotspots and emphasizes the role of targeted monitoring in revealing overlooked species. The previous absence of records is likely due to taxonomic difficulties, morphological similarities with related species, and limited biodiversity assessments in the region.

Overall, this study contributes to improving knowledge of Actiniaria diversity in the Levantine Sea and underscores the need for continued investigations, including molecular approaches, to refine species identification and support conservation of these vulnerable ecosystems.

Keywords: *Aiptasia couchii*, Vermetid reef, Lebanon, Eastern Mediterranean

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Introduction

The trumpet sea anemone *Aiptasia couchii* (Cocks, 1851) is an intertidal species belonging to the order Actiniaria Hertwig, 1882 and the family Aiptasiidae Carlgren, 1924. The family Aiptasiidae currently comprises seven accepted genera and approximately 18 valid species. The genus *Aiptasia* Gosse, 1858 includes three recognized species (Grajales and Rodríguez, 2014; Rodríguez et al., 2026).

Aiptasia couchii is primarily distributed along the northeastern Atlantic coasts, including England, Madeira, the Canary Islands, and parts of West Africa (Ocaña & den Hartog, 2002). It is also well documented in the Mediterranean Sea (Ocaña et al., 2015; Grajales and Rodríguez, 2016), with records extending from the northern Adriatic Sea (Arossa et al., 2021) to the western Mediterranean basin (Legain et al., 2026).

Despite its wide distribution, *A. couchii* has not previously been reported from the eastern Levantine Basin. In this region, records of the genus are limited to *Aiptasia mutabilis* (Gravenhorst, 1831) and *Exaiptasia diaphana* (Rapp, 1829) (formerly *Aiptasia diaphana*) (Chintiroglou et al., 1997; Vafidis et al., 1997; Coll et al., 2010; Çinar et al., 2014; Ammar, 2023).

Along the Lebanese coast, thirteen species of sea anemones belonging to six families within the order Actiniaria have been reported to date: *Actinia mediterranea* Schmidt, 1971; *Aiptasia mutabilis* (Gravenhorst, 1831); *Anemonia viridis* (Forsskål, 1775); *Anthopleura ballii* (Cocks, 1851); *Bunodactis rubripunctata* (Grube, 1840) [cited as *Aulactinia rubripunctata* (Grube, 1840)]; *Bunodactis verrucosa* (Pennant, 1777) [cited as *Aulactinia verrucosa* (Pennant, 1777)]; *Bunodeopsis strumosa* Andrès, 1881; *Calliactis palliata* (Müller, 1776) [cited as *Adamsia palliata* (Fabricius, 1779)]; *Calliactis parasitica* (Couch, 1842); *Cereus pedunculatus* (Pennant, 1777); *Condylactis aurantiaca* (Delle Chiaje, 1825); *Hormathia alba* (Andrès, 1880); and *Telmatactis cricoides* (Duchassaing, 1850) (see Badreddine et al., 2022).

In this context, the present study reports *Aiptasia couchii* for the first time from Lebanese coastal waters, representing the first confirmed record for the Levantine Sea. This identification is based on detailed morphological characterization of multiple specimens.

Material and Methods

Since 2020, one of the authors (A.B.) has conducted regular field surveys to assess marine biodiversity (fauna and flora) associated with vermetid reef formations along the coast of Saksakiyeh (southern Lebanon, eastern Levantine Mediterranean Sea).

The study site is characterized by extensive bioconstructions primarily formed by *Dendropoma anguliferum* (Monterosato, 1878) and *Vermetus triquetrus Bivona e Bernardi, 1832*, in association with the coralline alga *Neogoniolithon brassica-florida (Harvey)*. The surveyed vermetid reef extends approximately 120 m from the shoreline to the outer edge (33.439711° N; 35.274219° E; Fig. 1).

The reef exhibits a distinct geomorphology, with a wide and relatively flattened outer edge containing scattered crevices, and a more irregular inner zone characterized by numerous tidal pools. These pools form semi-confined microhabitats that support a diverse assemblage of organisms (Badreddine et al., 2019).

Field observations focused on the identification of sea anemone species inhabiting these tidal pools. Specimens were observed *in situ* and documented through high-resolution photography. Particular attention was given to key diagnostic morphological features, including tentacle number and arrangement, oral disc structure, and column characteristics.

For each observation, the date and number of individuals and life stage were recorded (see Table 1). Additional notes on systematics, morphological traits, and ecological observations were also compiled.

Specimens of *Aiptasia couchii* were observed repeatedly throughout the study period. Multiple individuals, ranging from juveniles to adults, were photographed to capture the full range of morphological variation. Detailed photographic documentation of the column, tentacles, and oral disc allowed for accurate identification and differentiation from morphologically similar species, particularly *Aiptasia mutabilis* and *Exaiptasia diaphana*.

The identification of *A. couchii* was based on external morphological characteristics following published taxonomic references, and was supported by consistent diagnostic features observed across multiple individuals.

Figure 1. The large vermetid reef of Saksakiyeh, south Lebanon, eastern Mediterranean Sea.

Table 1. Records of *Aiptasia couchii* observed in tidal pools of the vermetid reef at Saksakiyeh (southern Lebanon, eastern Levantine Mediterranean Sea) between 2024 and 2025. The table summarizes observation dates, number of individuals, life stage classification, and availability of photographic documentation. All records are based on in situ observations and high-resolution photographic evidence used for morphological identification.

Species	Date	Number of Individuals	Life Stage	Photographic Record
Aiptasia couchii (Cocks, 1851)	10 Aug 2024	1	Adult	Yes
	09 Sep 2024	3	Juveniles	Yes
	12 Sep 2024	2	Adults	Yes
	25 Dec 2025	Numerous	Juveniles	Yes

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Results and Discussion

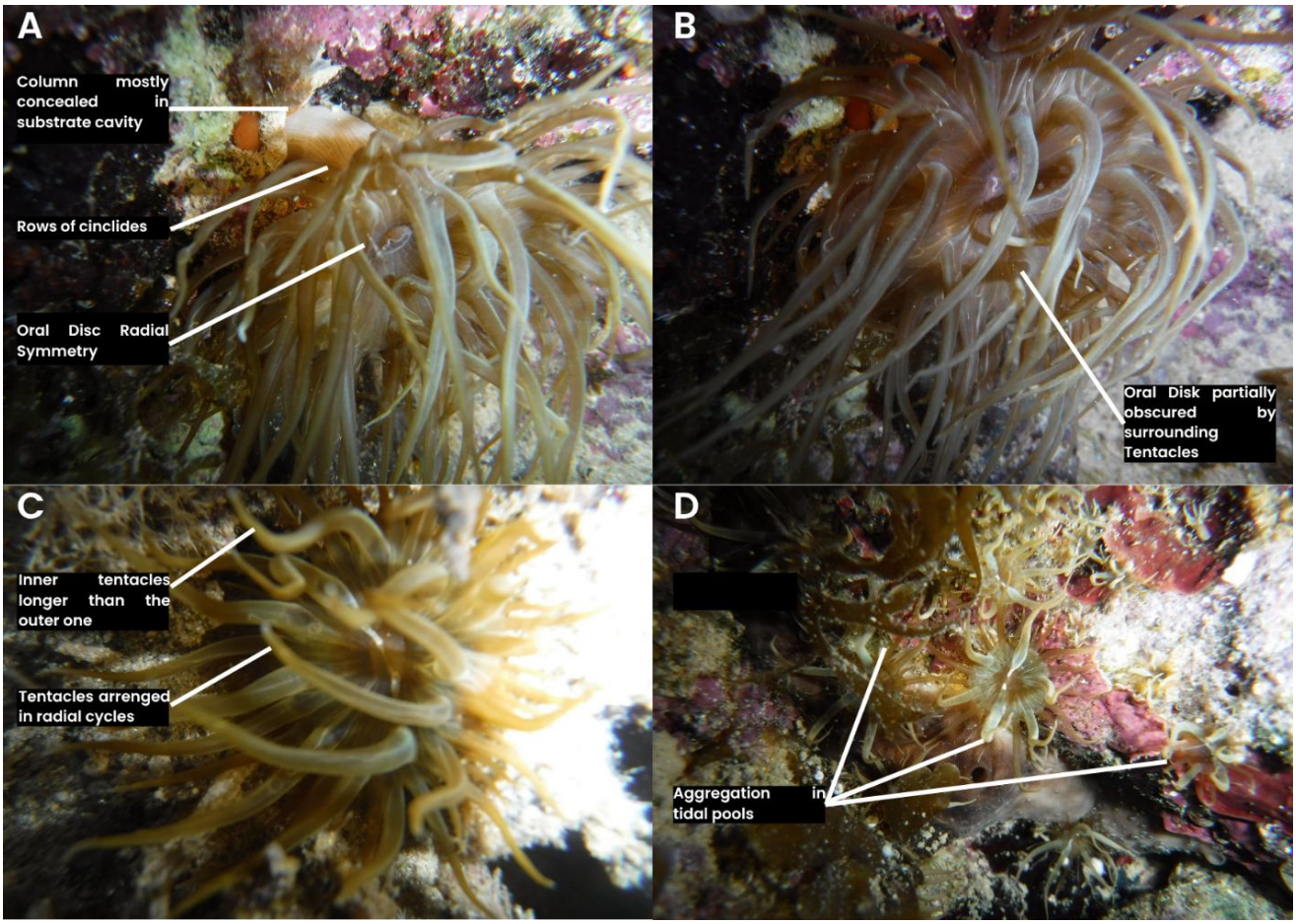

Figure 2. Distinctive morphological features and in situ observations of *Aiptasia couchii* from Lebanese vermetid reef tidal pools. (A) Lateral view of an extended specimen showing the elongated, translucent column, mostly concealed within a substrate cavity. The rows of cinclides (pores allowing the expulsion of acontia) are visible along the column, arranged in longitudinal series. The oral disc exhibits clear radial symmetry. (B) Close-up of the oral disc, which appears circular, translucent to greyish, with the central mouth partially obscured by surrounding tentacles, pale radial lines on the oral disc mark the insertions of the mesenteries, which is a characteristic feature of the species. (C) Detailed view of the tentacular arrangement, showing tentacles organized hexamerously in five cycles, with inner tentacles distinctly longer than outer ones, acontia are visible within the translucent tentacles. (D) General view of multiple individuals in situ within a tidal pool, illustrating gregarious behavior and aggregation patterns. (C)Ali BADREDDINE.

As a result, numerous specimens of *Aiptasia couchii* were observed and photographed in shallow tidal pools associated with extensive vermetid reef formations at Saksakiyeh (southern Lebanon). It is noteworthy that these vermetid reef tidal pools form semi-isolated microhabitats or "enclaves," which support a high diversity of sessile and cryptic organisms (Badreddine et al., 2019).

The species is characterized by a smooth, slender, and elongated column, which becomes markedly extended and assumes a trumpet-like shape. The column is translucent to brownish in coloration and widens distally toward the oral disc (Fig. 2A). It typically remains concealed within crevices or substrate cavities, with only the distal portion exposed. A distinctive feature is the presence of well-defined vertical rows of cinclides (pores used for the expulsion of acontia), with three cinclides in each row, which are clearly visible when the column is extended (Fig. 2A).

The oral disc is circular, translucent to greyish, and exhibits clear radial symmetry. The mouth is centrally positioned and is often partially obscured by the surrounding tentacles (Fig. 2A, B). The tentacles, numbering approximately 52 in juveniles and up to around 96 in adults, are arranged hexamerously in five cycles (Fig. 2A–D). They display a characteristic flame-shaped morphology, being broader at the base and tapering into elongated, sharply pointed tips (Fig. 2C, D).

Tentacles are translucent, often with acontia visible inside, and typically exhibit a brownish coloration due to the presence of symbiotic zooxanthellae. The tentacular crown is dense and shows irregular movements, with frequent partial contraction rather than complete synchronous retraction. A consistent diagnostic feature observed in all examined specimens is that the inner tentacles are distinctly longer than the outer ones (Fig. 2). Tentacle movements are irregular and dynamic, characterized by intermittent extension and contraction.

These morphological characteristics are consistent with previous descriptions of *Aiptasia couchii* (see Gosse, 1860; Grajales, 2014; Grajales & Rodríguez, 2014; Müller et al., 2025).

In comparison with *Aiptasia mutabilis*, *A. couchii* is generally smaller and exhibits a yellowish to brownish coloration, rather than the greener or whitish tones typically observed in *A. mutabilis* (Fig. 3). Furthermore, *A. mutabilis* possesses a greater number of tentacles arranged in more than six cycles around the oral disc, often showing noticeable compression and a more translucent

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appearance. It is also typically larger and may display whitish to greenish reticulated markings along the column (Grajales, 2014).

Figure 3. In situ observation of *Aiptasia mutabilis* in a tidal pool within the vermetid reef of Saksakiyeh (southern Lebanon), recorded in 2022. ©Ali BADREDDINE

In contrast, *Exaiptasia diaphana* is typically smaller (often <3 cm in diameter) and exhibits less pronounced differentiation between inner and outer tentacles. Its oral disc is usually yellowish to brownish, with tentacles restricted to the margin. These tentacles often display distinct whitish transverse bands near their base and are more slender, sometimes exhibiting a zigzag appearance. The column is generally white to brown with visible pale longitudinal lines (Grajales & Rodríguez, 2014; Wirtz, 2014; Acuña et al., 2020; Coudre et al., 2024).

In addition, *E. diaphana* commonly forms dense aggregations or "carpets," particularly in shallow or anthropogenically impacted environments. The study site, however, is characterized by a high ecological status, with the presence of key indicator species such as *Cystoseira* spp. and *Sargassum* spp. (Badreddine et al., 2018, 2019; Badreddine, pers. Obs.), which further supports the exclusion of *E. diaphana*, a species typically associated with disturbed habitats (Coudre et al., 2024).

The combination of morphological traits observed—particularly tentacle number, arrangement, coloration, and column structure—clearly distinguishes the examined specimens from both *Aiptasia mutabilis* and *Exaiptasia diaphana*. However, genetic analyses are recommended to further confirm species identification and to resolve potential cryptic diversity within the genus.

It is important to note that the apparent rarity of *Aiptasia couchii* in the Levantine Sea may be attributed to several factors, including limited taxonomic expertise in Actiniaria and the inherent difficulty in detecting and monitoring small, cryptic anemone species. In addition, the overall scarcity of comprehensive marine biodiversity assessments along the Lebanese coast has likely contributed to the underreporting of such taxa.

The absence of confirmed records of *A. couchii* in the Levantine Basin may also be linked to challenges in accurate species identification, as this taxon is frequently confused with morphologically similar species such as *Aiptasia mutabilis* and *Exaiptasia diaphana*. Misidentification is particularly likely in field-based observations where subtle diagnostic features are overlooked.

Furthermore, it is highly probable that *A. couchii* has been previously observed and even photographed in Lebanese waters but remained unreported due to the lack of confirmed identification. Similarly, *Exaiptasia diaphana*, although not formally reported from Lebanon to date, is very likely present in the region based on field observations; however, its occurrence still requires formal confirmation through detailed morphological examination and, ideally, molecular analyses.

Conclusion

This study highlights that sustained monitoring efforts significantly enhance our understanding of Levantine marine biodiversity, particularly along the Lebanese coast. The more systematically these ecosystems are surveyed, the greater the likelihood of detecting previously overlooked or unreported species.

Vermetid reefs represent one of the most important ecosystem-engineering habitats in Lebanese coastal waters. Despite being widely distributed, these biogenic formations are increasingly threatened and remain insufficiently studied. They provide structurally complex habitats that support a highly diverse and specialized assemblage of associated fauna and flora. Their ecological importance is further emphasized by recent findings: in 2022, four sea anemone species were newly recorded from the same vermetid reef of Saksakiyeh (Badreddine et al., 2022).

The present record of *Aiptasia couchii*, together with previous findings, contributes to filling gaps in the knowledge of Actiniaria diversity in the Levantine Sea (Chintiroglou et al., 1997; Vafidis et al., 1997; Coll et al., 2010; Çinar et al., 2014; Ammar, 2023). The occurrence of this species within tidal pools of a vermetid reef further confirms the ecological significance of these formations as biodiversity hotspots along the Lebanese coastline (Badreddine et al., 2019).

Given their ecological value, vermetid reefs should be considered a priority for conservation and management. Continued investigations targeting the fauna and flora associated with these habitats are essential to better understand species distributions, detect new records, and monitor ecosystem changes.

Finally, further research on sea anemone diversity across the Levantine Basin—including Lebanese waters—is needed to assess the current status of species and to identify potential new occurrences. In this context, citizen science initiatives, launched in Lebanon since 2022, represent a valuable tool for marine biodiversity monitoring. These programs support the documentation of native and non-indigenous species and actively engage the public through illustrated guides and thematic posters covering different ecological groups (Fig. 4), thereby enhancing large-scale observation and reporting efforts.

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Figure 4. Poster illustrating the diversity of sea anemones (Order Actiniaria) recorded along the Lebanese coast. ©Ali BADREDDINE.

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