



First reliable records of *Cryptodendrum adhaesivum* (Anthozoa: Actiniaria: Thalassianthidae) for the coastal waters of Vietnam and the Spratly Islands

Первые достоверные находки *Cryptodendrum adhaesivum* (Anthozoa: Actiniaria: Thalassianthidae) для прибрежных вод Вьетнама и островов Спратли

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Abstract. The tropical sea anemone *Cryptodendrum adhaesivum* Klunzinger, 1877 is reliably recorded from the coastal waters of Vietnam and the Spratly Islands for the first time. Its presence there is documented by collected specimens, in situ observations during scuba diving, as well as numerous photographs taken during the expeditions of the Vietnam-Russian Tropical Research and Technological Centre, carried out from 2007 to 2021. The main morphological characters for the identification of the species are given and illustrated.

Резюме. Тропическая актиния *Cryptodendrum adhaesivum* Klunzinger, 1877 впервые достоверно зарегистрирована в прибрежных водах Вьетнама и архипелага Спратли. Ее присутствие задокументировано коллекционными материалами, наблюдениями in situ во время водолазных погружений, а также многочисленными фотографиями, сделанными во время экспедиций Совместного российско-вьетнамского тропического научно-исследовательского и технологического центра, проводившихся с 2007 по 2021 гг. Приведены и проиллюстрированы основные морфологические признаки для идентификации вида.

Key words: Vietnam, Spratly Islands, new records, distribution, identification, Cnidaria, Anthozoa, Actiniaria, Thalassianthidae, *Cryptodendrum adhaesivum*

Ключевые слова: Вьетнам, архипелаг Спратли, новые находки, распространение, идентификация, Cnidaria, Anthozoa, Actiniaria, Thalassianthidae, *Cryptodendrum adhaesivum*

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Introduction

The heated discussion on the problems associated with climate change revived interest in the problems of marine biogeography, which was and

to a large extent remains the study of the latitudinal zonation of the shelf (from Ekman, 1953 up to Spalding et al., 2007). Close attention to the tropical fauna and the adjustment of the boundaries of biogeographic provinces (Hoeksema, 2007;

Toonen et al., 2016) makes it possible to link the formation of regional faunas with the effect of biogeographic barriers. Their appearance, on the one hand, contributed to the enrichment of species diversity due to allopatric speciation, and on the other hand, the destruction of barriers allowed reciprocal, not always equally strong, enrichment of faunas as a result of the exchange of species (Veron et al., 2009; Dautova, 2011; Briggs & Bowen, 2012, 2013). The main subject of discussion in this field is the extraordinary faunal richness of the Coral Triangle (including the Philippines, Indonesia and New Guinea). Therefore, the set of species inhabiting the coastal waters of Vietnam and the Spratly Islands belonging to the Triangle is of primary interest.

Cryptodendrum adhaesivum Klunzinger, 1877 was one of the first sea anemones to be described in reports of tropical expeditions. Despite the long history of the study of this species, its biology, symbiotic relationships, and even geographical distribution are still little known. The explanation for this, apparently, could be the very unusual structure of this animal. Unlike most large sea anemones, it does not have a clearly distinguishable ring of long tentacles on the oral disc, and most specialists not especially involved in the taxonomy of cnidarians cannot recognise it as a representative of Actiniaria when collecting material. The wide and flat oral disc of *C. adhaesivum* is covered with a continuous carpet of very small, fluffy tentacles and does not look like the disc of the well-known predatory northern sea anemones.

The general appearance of this species is so unusual that at the first attempt to compile a taxonomic monograph of the world fauna of sea anemones (Andres, 1883a, b), *Cryptodendrum* Klunzinger, 1877 was placed in the separated subfamily Cryptodendridae Andres, 1883*. Later, it

was assigned to the previously described subfamily (now the family) Thalassianthidae Milne Edwards et Haime, 1851, which is also characterised by small, branched tentacles and special stinging formations located at the edge of the oral disc.

Cryptodendrum adhaesivum is widespread in the Indo-Pacific region and is represented by numerous images on many popular websites and by unconfirmed records in the literature, but not all of them actually belong to this species. The present article takes into account only those records that are accompanied by a morphological description or based on museum specimens.

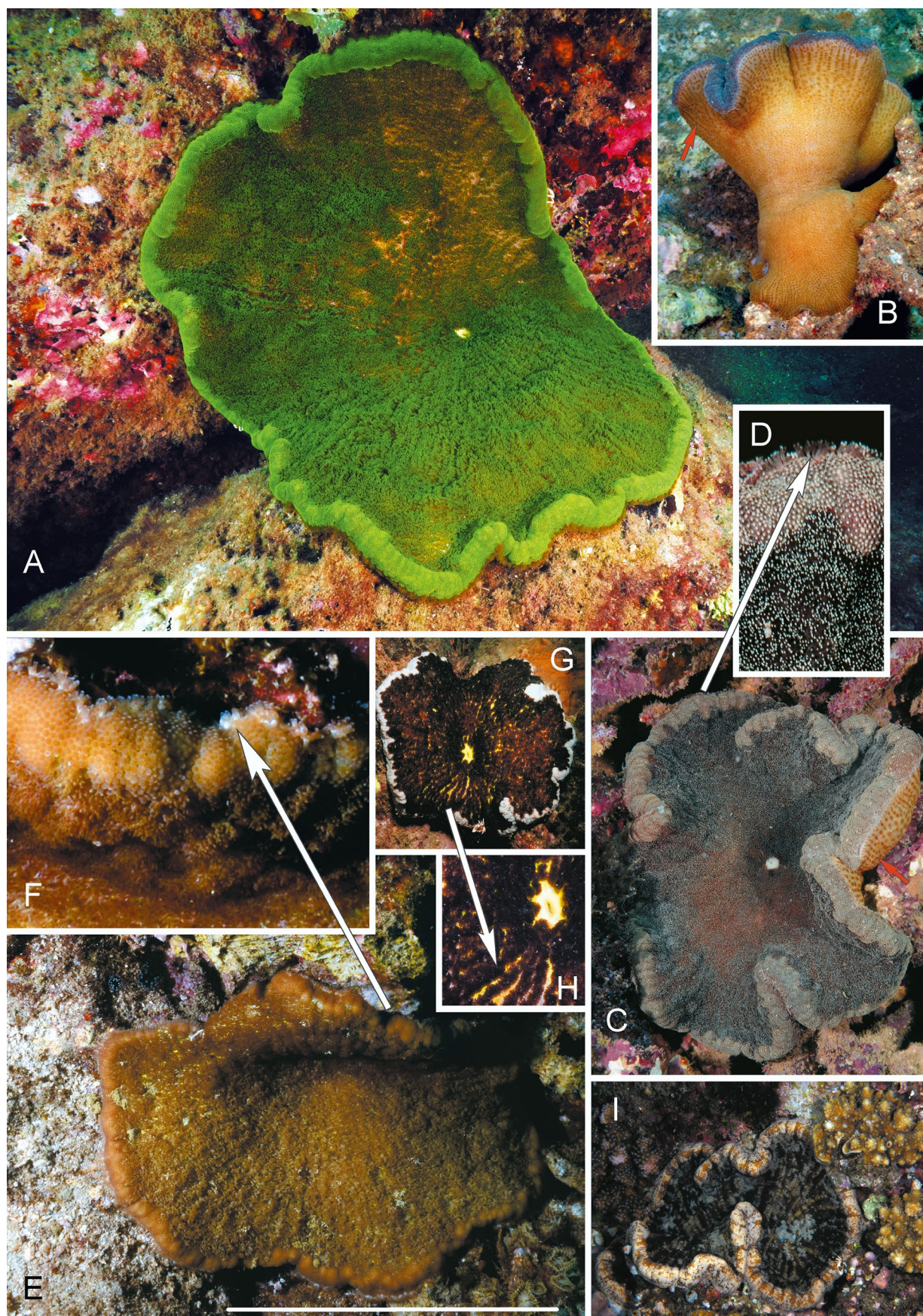
Material and methods

Specimens of *C. adhaesivum* were collected by scuba diving during the expeditions of the Vietnam-Russian Tropical Research and Technological Centre, carried out in 2014 and 2021. In addition, during the expeditions in 2007, 2008, 2009, 2012, 2018, 2021 and during the personal trip of a diver and photographer O.V. Savinkin (A.N. Severtsov Institute of Ecology and Evolution RAS) to the Similan Islands in January 2020, a number of high-resolution photographs were obtained, which confirm the presence of this species and make it possible to identify it with confidence. We had at our disposal five well-preserved specimens and several photographs taken in situ, accompanied by precise information about the place and time of the finds of this species.

The collected specimens were placed in 4–10% formalin and after one or two months they were transferred to 75% alcohol. To study the internal structure, the usual methods of manual dissection were used. All the specimens examined are stored in the collection of the Zoological Institute, Russian Academy of Sciences, St Petersburg, Russia (ZIN). The collection catalogue numbers are indicated in the “Material examined” section. Photographs, unless otherwise indicated, taken by O.V. Savinkin.

* Incorrect spellings: Criptodendridae (Andres, 1883a: 480, 510, 511, 1883b: 272, 302, 1884: 265, 296), Cryptodendridae (Andres, 1883b: 432, 1884: 429), *Criptodendrum* (Andres, 1883b: 302, 303, 1884: 265, 296, 297).

Fig. 1. *Cryptodendrum adhaesivum*, general appearance and details of structure of living actinians. **A**, Dao Be I., 20°45'N 107°07'E; **B**, Hon Tre I., 12°13'N 109°19'E, polyp taken out of reef; **C**, **D**, Hon Tre I., 12°11'N 109°19'E; **E**, **F**, Hon Cau I., 11°13'N 108°49'E, No. 2/12190; **G**, **H**, Hon Tre I., 12°11'N 109°20'E; **I**, Hon Tre I., 12°11'N 109°20'E. Habitus (A, B, C, E, G, I); margin with exocoelic tentacles at large magnification (D); band of small globular nematospheres (F); radial rows of dendritic tentacles (H). Red arrows indicate rows of verrucae in upper part of column (B, C). Scale bar: 10 cm (E).



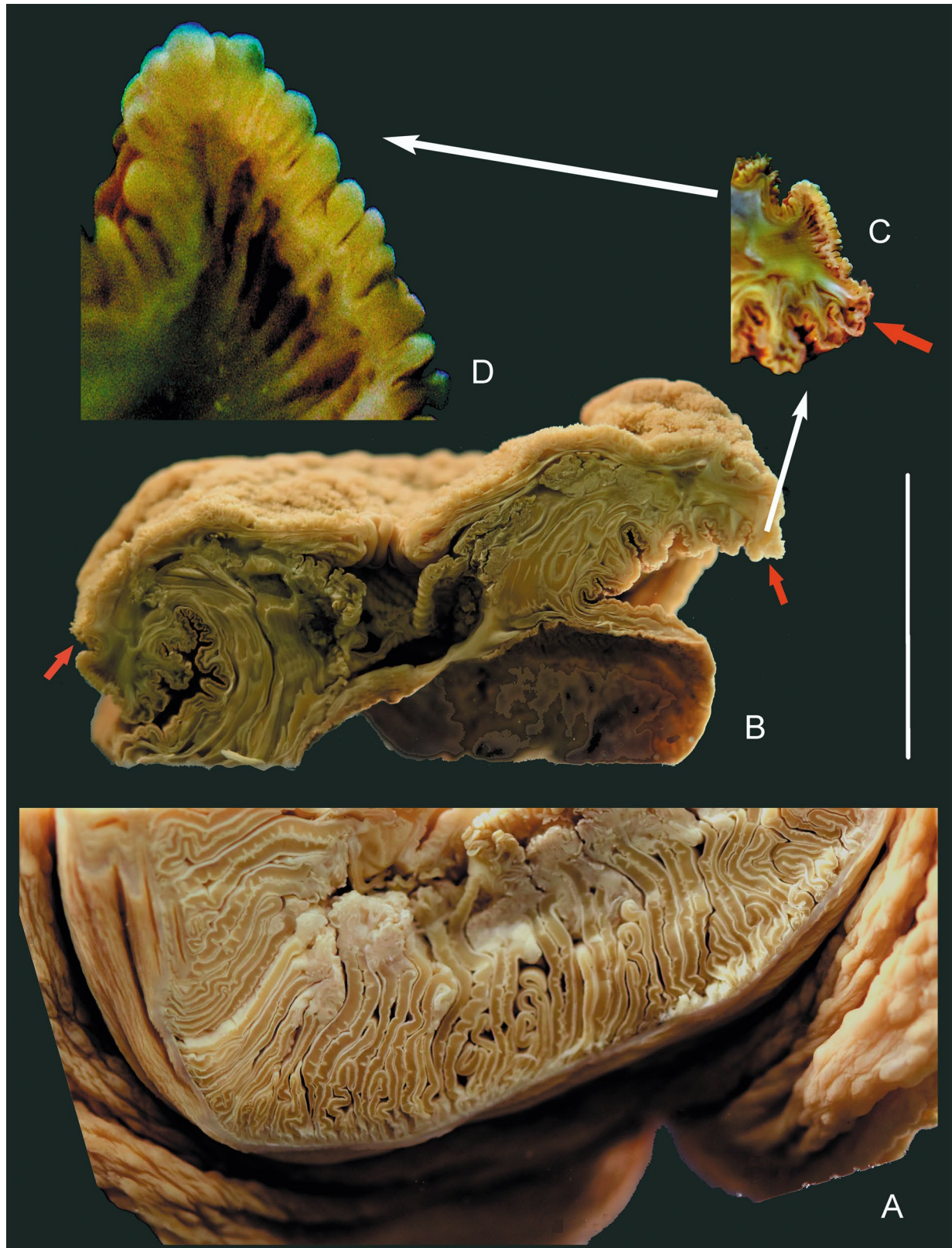


Fig. 2. *Cryptodendrum adhaesivum*, preserved specimen No. 2/12190. **A**, transversal section in middle part of column; **B**, vertical section of body; **C**, enlarged part of section; **D**, structure of globular nematospheres. Red arrows denote sphincter. Scale bar: 3 cm (B). Photos by S.D. Grebelnyi.

Results

Class **Anthozoa** Ehrenberg, 1834

Order **Actiniaria** Hertwig, 1882

Infraorder **Thenaria** Carlgren, 1899

Family **Thalassianthidae** Milne Edwards et Haime, 1851

Genus ***Cryptodendrum*** Klunzinger, 1877

Cryptodendrum Klunzinger, 1877: 86.

Stoichactis Doumenc, 1973: 175, 194–198.

Cryptodendrum adhaesivum Klunzinger, 1877 (Figs 1, 2)

Cryptodendrum adhaesivum [sic!] Klunzinger, 1877: 86, pl. VI, figs 4, 4a, 4b.

Cryptodendrum adhaesivum: Studer, 1879: 545; Haddon, 1898: 399, 483–484, pl. XXV, figs 4–6, XXXII, figs 5, 6; Dunn, 1981: 7–13, figs. 1–4; Fautin, 1988: 27; Fautin & Allen, 1997: figs at p. 25; Fautin, 2016: 78, 147.

Cryptodendrum [sic!] *adhaesivum* [sic!]: Andres, 1883: 302–303.

Cryptodendrum adhaesivum [sic!]: Kwietniewski, 1896: 583–603, pl. XXVI, fig. 15; Carlgren, 1940: 7, 32–34, fig. IX, fig. 13; Fishelson, 1970, p. 111, fig. 15.

Cryptodendron [sic!] *adhaesivum*: Carlgren, 1950: 427, 442–443, fig. 16.

Stoichactis digitata Doumenc, 1973: 175, 194–198, fig. 4, pl. V, figs A–B.

Material examined. **South China Sea:** *Vietnam:* *Hon Tre I.*: 12°13'30"N 109°18'45"E, depth 5–14 m, bottom: rock, large stones, dead branches of corals, 27 May 2014, coll. S.D. Grebelnyi & O.V. Savinkin, 1 specimen (No. 1/12191) [photos in sea]; 12°11'N 109°19'E, depth 6 m, bottom: large stones and dead corals, 17 May 2014, coll. S.D. Grebelnyi & O.V. Savinkin, 1 specimen (No. 3/12192) [photos in sea]; *Hon Cau I.*, 11°13'N 108°49'E, depth 9–12 m, bottom: large stones, dead branches of *Acropora* Oken, 1815 between them, 10 May 2014, coll. S.D. Grebelnyi & O.V. Savinkin, 1 specimen (No. 2/12190) [photos in preserved state, by S.D. Grebelnyi; photos in sea, by O.V. Savinkin]; *Spratly Is.: Namyt I.*, 10°10'28.6"N 114°22'02.7"E, depth 4 m, bottom: limestone with dead colonies of stony corals, 15 Apr. 2021, coll. S.D. Grebelnyi, 1 specimen (No. 4/12364) [photos in aquarium on board of ship]; *Barque Canada Reef*, 08°16'32.6"N 113°21'10.6"E, depth 6 m, bottom: limestone with dead colonies of stony corals, 1 May 2021, coll. S.D. Grebelnyi & O.V. Savinkin, 1 specimen (No. 5/12365) [photos in sea and in aquarium on board of ship].

Photos in sea. **Andaman Sea, Thailand, Similan Is.**, 08°28'N 97°38'E, depth 8–10 m, bottom: dead corals, 31 Jan. 2020. **South China Sea: Vietnam: Dao Be I.**, "Island Hon Nut Dat": 20°45'N 107°07'E, depth unknown, bottom: large stones, 29 May 2012; same coordinates, depth 6–10 m, bottom: rock, large stones, 30 May 2012; *Hon Tre I.*: 12°11'N 109°20'E, depth 7–8 m, bottom: rock, large stones, 11 Apr. 2009; same coordinates, depth 6–10 m, bottom: rock, 2 May 2007; 12°11'N 109° 22'E, depth 12–14 m, bottom: large stones, 27 May 2008; same coordinates, depth 11–14 m, bottom: large stones, 19 May 2021; *Hon Mun I.*, 12°10'08"N 109°17'46"E, depth 5 m, bottom: dead coral branches, 16 Jun. 2021; *Spratly Is.: Discovery Great Reef*, 10°10'N 113°50'E, depth 7–10 m, bottom: large stones, 5 Dec. 2018; *Ladd Reef*, 08°48'N 111°33'E, depth 5–7 m, bottom: coral rubble, 12 Dec. 2018 [photos by O.V. Savinkin]; *North Danger Reef*, Southwest Cay, 11°25'43.1"N 114°19'32.7"E, depth unknown, bottom: limestone with dead coral branches, 30 March 2021 [photos by Yu.V. Deart].

Morphology. Body of polyp more or less cylindrical, column not divided into regions. Pedal disc well developed, attached to stones or dead corals in deep rock cavities into which animal can completely withdraw. Middle part of column much narrower than base and upper part (Fig. 2B) that being covered with verrucae (Fig. 1B, C). Oral disc wide and sometimes folded (Fig. 1C, G, I), especially after fixation, with diameter reaching 30 cm, according to Dunn (1981), or even 40 cm in our Vietnamese specimens. When expanded, it commonly lying flat on substrate (Fig. 1A, E). Endocoelic tentacles dense, extremely short, branched, organised in not always very distinct radial rows (Fig. 1G, H) and occupying almost entire disc. Fairly wide band of small spherical tentacles or globular nematospheres is located close to margin (Figs 1F, 2D) and usually differing in colour from most dendritic tentacles. Extreme margin outside of this stinging zone with a single ring of less branched exocoelic tentacles (Fig. 1D). Small, so slight that nearly indistinguishable, circumscribed sphincter is situated just at margin (Fig. 2B, C). Strong mesenteries numerous, at least two complete cycles. Their retractors diffuse, but very thick, bandlike; parietobasilar muscles rather weak (Fig. 2A). Mesenterial arrangement not very regular since largest mesenterial pairs sometimes disposed next to each other being not separated by weaker mesenteries. All or nearly all of them with filaments and fertile.

Variability. As noted by early observers and according to our data on Vietnamese specimens, the

species demonstrates uniformity of morphological characters, but wide variability in colouration.

Bionomics. The species is inclined to symbiosis and complex biotic relationships with different animals. Although the species has a very wide range, unlike other anemones, as far as is known (Astakhov, 2002, 2016; Ollerton et al., 2006), it enters into symbiosis with only one species of fish, *Amphiprion clarkii* (Bennett, 1830), and only a few of the polyps found were inhabited by fish. However, two shrimps and a small porcelain crab can often be seen on its oral disc. From numerous photographs, they were identified as *Ancylocaris brevicarpalis* Schenkel, 1902 [formerly in *Periclimenes* Costa, 1844 or in *Periclimenaeus* Borradaile, 1915] (Palaemonidae), *Neopetrolisthes maculatus* (H. Milne Edwards, 1837) (Porcellanidae), and *Thor amboinensis* (de Man, 1888) (Thoridae).

Our skilled and sharp-eyed photographer has observed that some pale, non-coloured individuals of *Cryptodendrum* can be detected by the presence of symbiotic crabs or brightly coloured small shrimps, as happened with specimen No. 2/12190.

Distribution. The species is widespread in the tropical Indo-West Pacific region. Data on reliable findings of it, based on museum collections and accompanied by morphological descriptions, are listed below.

Egypt [type locality of *C. adhaesivum*: Koseir; Museum für Naturkunde der Humboldt Universität, Berlin, Germany, No. 1877, two syntypes; Naturhistoriska Riksmuseet, Stockholm, Sweden, No.1159, part of syntype (Dunn, 1981; Fautin, 2016)]; **Seychelles** (Crowther, 2013); **Maldives** (Dunn, 1981); **Thailand** (Fautin & Allen, 1997); **Singapore** (Fautin et al., 2009); **Philippines**: “Mendanao” [Mindanao Island?] (Carlgren, 1940; Crowther, 2013); **Indonesia**: “Billeton” [most likely Billiton Island located between Sumatra, Borneo and Java] (Carlgren, 1940), Northwest New Guinea, “Galero-Strasse” [Straits of Galewo between Salwatti Island and New Guinea] (Studer, 1879; Kwietniewski, 1896); **Papua New Guinea**: Madang (Fautin, 1988); **Australia**: Torres Straits, Murray Island (Haddon, 1898), Northern Territory (Crowther, 2013), Great Barrier Reef, Low Isles (Carlgren, 1950); **Micronesia**: Yap Islands (Crowther, 2013); **Marshall Islands** [type locality of *Stoichactis digitata*; Muséum national d’Histoire naturelle, Paris, France, 1 syntype, No. 2540]

(Doumenc, 1973; Dunn, 1981); **New Caledonia** (Dunn, 1981); **Polynesia**: Line Islands (Crowther, 2013); **French Polynesia**: Tuamotu Archipelago, Gambier Islands [type locality of *S. digitata*; Muséum National d’Histoire Naturelle, Paris, France, 1 syntype, No. 2038] (Doumenc, 1973).

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