Callogorgia lucaya sp. nov., a new species of deep-sea Primnoidae (Anthozoa: Octocorallia) from the western Atlantic

RALF T. S. CORDEIRO¹, FREDERICK M. BAYER²,³ & STEPHEN D. CAIRNS²

¹Programa de Pós-Graduação em Biologia Animal, Universidade Federal de Pernambuco, Recife, PE, Brazil. E-mail: ralfts@gmail.com
²Department of Invertebrate Zoology, National Museum of Natural History, Smithsonian Institution, PO Box 37012, MRC 163, Washington, DC 20013-7012, USA. E-mail: cairnss@si.edu
³Deceased

Abstract

As part of an ongoing reassessment of the genus Callogorgia, we describe C. lucaya sp. nov. from the western Atlantic, with a distribution so far restricted to the Straits of Florida and northern Caribbean. The species was partially described in an unfinished manuscript of Dr. Frederick Bayer and differs from all other western Atlantic species by commonly lacking outer-lateral body wall scales, having a small number of abaxials, and having body wall sclerites that are externally almost smooth. (Species Zoobank LSID: urn:lsid:zoobank.org:act:CF8F92FC-8F8A-4A8C-AF4A-52E12B58F7B1)

Key words: Caribbean, Straits of Florida, Cold-water coral, Johnson Sea Link, Alcyonacea

Introduction

Species of the genus Callogorgia Gray, 1858 are among the octocorals that contribute to form deep-sea coral gardens in continental margins and seamounts around the world (Sampaio et al., 2012; Bullimore et al., 2013; Bo et al., 2015). A series of papers have addressed this genus in the two last decades, mainly comprehensive reviews: in the western Atlantic (Cairns & Bayer, 2002), Hawaii (Cairns, 2010), New Zealand (Cairns, 2016) and Galapagos (Cairns, 2018). The group is one of the most speciose (28 species) within the family Primnoidae Milne Edwards, 1857 (Cairns & Bayer, 2009), with at least five species described in the past three years (Bayer et al., 2015; Cairns, 2016; Cairns et al., 2018; Cairns, 2018). These corals are mostly reported in the Indo-Pacific and North Atlantic, only two records coming from south Atlantic waters (Bayer et al., 2015).

Five species of Callogorgia were described in western Atlantic waters, hitherto: C. gracilis (Milne-Edwards & Haime, 1857), C. americana Cairns & Bayer, 2002, C. delta Cairns & Bayer, 2002, C.iguimaris Cairns & Bayer, 2002 and C. arawak Bayer, Cairns, Cordeiro & Pérez, 2015. Those species share similar geographic ranges, but are often isolated by depth-related factors, such as water-masses and temperature. For this reason, differentiation by depth is the most accepted hypothesis to explain how several species of the genus may overlap in their distributions (Quattrini et al., 2015).

Recent molecular studies have shown the consistent reliability of morphological characters so far applied to distinguish between species of Callogorgia, even in situations of closely related morphologies (Quattrini et al., 2013). Starting from a series of unpublished notes and scanning electron micrographs left by Dr. Frederick Bayer (National Museum of Natural History, deceased), we examined specimens and describe herein a new western Atlantic species.

Materials and methods

Specimens were obtained during deep-sea surveys between 1880 and 1989, in depths from 183 to 522 m. After
collection, the samples were fixed in ethanol (70%) and deposited in the collections of the National Museum of Natural History (Washington, DC) and the Museum of Comparative Zoology (Cambridge, MA). Morphological terminology used herein follows Bayer et al. (1983). Arrangement and terminology of body wall sclerites are provided by Bayer (1982: p. 119, fig. 1), and additional terms are given by Cairns (2016).

Abbreviations: Car: R/V Caroline; Ger: R/V Gerda; JSL: submersible Johnson-Sea-Link (I and II); MCZ—Museum of Comparative Zoology, Harvard; NMNH—National Museum of Natural History, Smithsonian Institution, (USNM—United States National Museum, acronym still used for catalog numbers); Or: R/V Oregon; Pill: R/V Pillsbury.

**Taxonomy**

**Order Alcyonacea Lamouroux, 1812**

**Suborder Calcaxonia Grasshoff, 1999**

**Family Primnoidae Milne Edwards, 1857**

**Genus Callogorgia Gray, 1858**


**Diagnosis.** Colonies uniplanar, pinnately or dichotomously branched. Polyps cylindrical to clavate, arranged in whorls of up to 12, all polyps facing upward. Polyps covered with eight longitudinal rows of body wall scales, the number of scales per row decreasing from abaxial to adaxial polyp side. Body wall scales granular, smooth, pitted, or covered with tall ridges. Inner side of opercular scales covered with serrated multiple keels (from Cairns et al., 2018).

**Type species.** Gorgonia verticillata Pallas, 1766 (by monotypy)

**Remarks.** The genus was particularly well studied in the western Atlantic (Cairns & Bayer, 2002; Bayer et al., 2015) and in the Indo-Pacific (Bayer, 1982; Cairns, 2010, 2016, 2018; Cairns et al., 2018), but examinations of specimens from other areas are rare in the literature. Therefore, the group is in need of a worldwide revision. Recent molecular analyses also show that Callogorgia and Fanellia Gray, 1870 are paraphyletic genera (Taylor & Rogers, 2017) and should be treated as synonyms (Cairns & Wirshing, 2018).

**Callogorgia lucaya** sp. nov.

Figs. 1–3

Callogorgia gracilis.—Deichmann, 1936: 158–159 (in part: MCZ 4798), pl. 26, fig. 7.

**Material examined (Types).** Holotype and Type-locality: Car-104: 18°13′10″N, 66°13′50″W (San Juan, west end of Salinas Island, Puerto Rico), 146–219 m, USNM 50193 (one dry specimen), 8 March 1933. Paratypes: Blake expeditions (John R. Bartlett coll.), Jamaica, Entrance to Pt. Royal, 183 m, (MCZ 4798), year 1880; Or-5415, 20°43′48″N, 73°36′00″W, 395–410 m, one fragment, USNM 52927, 24 May 1965; JSL-I-1502, 25°06′37″N, 77°24′48″W, 456–476, one fragment, USNM 1122908, 20 October 1987; JSL-I-2262, 23°50′48″N, 75°08′30″W, 472–508, three fragments, USNM 1123273, 12 September 1988; Pill-1231, 17°56′06″N, 77°59′00″W, 252–265, one fragment, USNM 52929, 7 July 1970; JSL-I-2266, 23°56′30″N, 74°30′45″W, 238–336, one fragment, USNM 1123213, 14 September 1988; JSL-I-1495, 23°59′47″N, 74°33′12″W, 225–312, one fragment, USNM 1123271, 20 October 1983; JSL-I-2262, 23°50′48″N, 75°08′30″W, 472–508, three fragments, USNM 1123224, 12 September 1988; Ger-503, 26°31′00″N, 78°51′00″W, 366 m, USNM 58424 (one fragment), USNM 52942 (three fragments)
and USNM 52944 (three fragments), 4 February 1965; Ger-706, 26°27′00″N, 78°43′00″W, 489–522, one fragment, USNM 52947, 22 July 1965; Ger-533, 26°27′00″N, 78°43′00″, 384–403, one fragment, USNM 52916, 4 March 1965; JSL-II-1845, 16°10′00″N, 61°49′08″S, 306, two fragments, USNM 86803, 10 June 1989; Or-2655, 18°25′48″N, 67°10′48″W, 183 m, one fragment, USNM 1017252, 6 October 1959.

**Diagnosis.** Alternately pinnate *Callogorgia* usually lacking outer-lateral (OL) scales, sides of polyp covered by lateral expansion of the abaxial-1, sometimes abaxial-2; inner laterals (IL) also always absent; adaxials completely absent or represented by one pair of small scales; body wall scales nearly smooth externally, sometimes with weak wrinkles and scattered granules but never anastomosing ridges. Body wall scale formula: 4–7: 0–2:0:0–1.

**Description of the holotype.** Colony alternately pinnate, with the major axis practically straight (Fig. 1B); fully developed undivided branchlets usually less than 80 mm in length, mostly 60–70 and occasionally as little as 40 mm. Axis heavily calcified, irregularly grooved longitudinally, with distinct metallic iridescence, brownish or bronze in the trunk and large branches, becoming paler distally until it is cream white or faintly yellowish, with pearly luster, in the distal branchlets. Contracted polyps about 1 mm tall (0.9–1.13 mm), arranged in whorls of three or four, occasionally paired, especially near the branch tips (Figs. 1A, 3A); usually six or seven whorls per centimeter of branchlet; polyps rare on main stem.

Abaxial scale-rows with four to seven scales, commonly four to five. Marginals large and conspicuous, extending around the sides of the polyp that otherwise would be covered by outer-lateral scales, which are absent from one or both sides of most polyps. More proximally situated abaxials wide and bent around the body of the polyp, either the lowest scale or the one immediately above it wider than the following scales (Figs. 1C, 3D). Outer surface of body scales nearly smooth, marked at most by some faint wrinkles radiating outward from the nucleus, and sometimes some marginal granulations (Fig. 2B). Free distal edge conspicuously serrated by flattened, comb-like teeth and overlaps the base of the next scale above. Basal scale edge sculptured by lateral expansion of the abaxial-1, sometimes abaxial-2; inner laterals (IL) also always absent; adaxials and sometimes some marginal granulations (Fig. 2B). Fully developed body wall scales 0.47 mm x 0.20 mm to 0.5 mm x 0.29 mm. Adaxials completely absent or represented by one pair of small scales. The body wall scale formula is thus: 4–7: 0–2:0:0–1.

Opercular scales lanceolate, distally prolonged as a prominent, blunt tooth; dominant abaxial scale nearly symmetrical and pyriform in outline (0.47 mm x 0.26 mm to 0.28 mm x 0.58 mm); the others (except the adaxials) roughly triangular but with the adaxial basal angle prominently rounded and overlapping the base of the adjacent opercular (Figs. 2A, 3C). Opercular scales from 0.2 mm x 0.10 mm (length x width), in the adaxial lines, to 0.57 mm x 0.30 mm, in the abaxial pairs. Outer lateral opercular basally expanded toward the adaxial side. Adaxial operculars conspicuously smaller than the others, lancet-shaped but blunt-tipped and strongly bent inward toward the mouth of the polyp (Fig. 2A). Outer surface of opercular scales covered by simple granules aligned in rows radiating from the center (Fig. 2A). Usually, the abaxial, OL and IL operculars all communicate basally with the abaxial marginal (abaxial-1) (Fig. 3B,C). In some specimens, the abaxial-2 extends into the OL marginal position, in which case the abaxial-0 and OL-0 articulate with abaxial-1 and the inner lateral opercular with the inner margin of abaxial-2. Coenenchymal sclerites elongate polygonal scales with rounded angles, marginally pectinate and sculptured outside by granules radiating outward from the nucleus, inner surface with complex tubercles (Fig. 2C).

**Variability.** Length of the fully developed simple lateral branchlets may vary widely in a single locality. For example, from Ger-503, one colony has branchlets about 80 mm long, whereas in another they are about 40 mm long; in the former, the abaxial rows generally have five scales, and in the latter usually six (USNM 58424). The number of polyps comprising a whorl varies from two to four. In some specimens, whorls of two (i.e., pairs) are common, especially near the tips of branchlets (USNM 52929), but in others whorls of three and four predominate with pairs occurring rarely or never.

**Comparison.** Colonies of *Callogorgia lucaya* have the general appearance of *C. gracilis*, but differs from all western Atlantic species of the genus in the very common lack of OL scales together with a low number of abaxials scales (usually four or five, but up to seven), its unique body wall sclerite formula, and sclerites that are almost smooth externally. Whereas OL scales are usually absent in *C. lucaya*, there are often 1–2 in *C. linguimarisis* and *C. gracilis*, and 2–4 in *C. americana* and *C. delta* (Cairns & Bayer, 2002). Other species recently described, i.e., *C. arawak*, may lack the OLs in one or both sides of some polyps, but also differ from *C. lucaya* by having 8–11 abaxial pairs of body wall scales and body scales externally sculptured by radial wrinkles. Some colonies of *C. gracilis* have a few polyps that lack OL scales on one or both sides, but in this case the absence is compensated by a broad basal lobe of the OL opercular scale, which also occupies at least part of the space otherwise covered by the
inner-lateral marginal. The number of abaxials is typically four or five, in some colonies six to seven, and the sclerites maybe slightly sculptured externally with anastomosing ridges.

**Etymology.** Lucaya, an old name for Grand Bahama Island.

**FIGURE 1.** Colony and details of *Callogorgia lucaya* sp. nov. (USNM 50193, holotype). A: branch showing four whorls of polyps; B: entire specimen showing alternate pinnate branching; C: stereo view of a whorl of polyps.
FIGURE 2. Sclerites of *Callogorgia lucaya* sp. nov. (USNM 50193, holotype). A: opercular scales; A₁: abaxials; A₂: outer laterals; A₃: inner lateral; A₄: adaxial; B: body wall scales; C: coenenchymal scales. All scales but those marked with * are in outer face view.
FIGURE 3. Branch-tip and polyp view of Callogorgia lucaya sp. nov. A: Branch and whorls; B,D: stereo view of the abaxial side (USNM 52927 and USNM 58424, respectively); C: stereo view of the adaxial side (USNM 52942). Abax: abaxial scales; IL: inner-lateral scales; OL: outer-lateral scales.

Remarks. Five species of the genus were so far described in the western Atlantic. The new species overlaps in geographic distribution with C. gracilis and C. americana, and is a component of diverse communities formed by
several coral species. For example, in one station (Ger-503), at least 15 other octocoral species were collected, mostly calcaxonians. Additionally, as in other primnoids, colonies of *C. lucaya* may be infested with ophiuroids, which tightly entwine their arms around the gorgonian branches but seem to do no harm.

**Distribution.** Northern Straits of Florida southward to the Windward Passage and north coast of Puerto Rico; southwest coast of Jamaica. Only one record from the Lesser Antilles (USNM 86803), but no records in Central and South America. Records from 55 to 522 m depths, most 150–395 m.

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**References**


