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First confirmed report of *Cephalopholis cruentata* (Lacépède, 1802) (Perciformes: Epinephelidae) from Brazilian waters with notes about its occurrence in Venezuela

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Abstract. We report the first confirmed record of the Graysby, *Cephalopholis cruentata* (Lacépède, 1802), from Brazilian waters, based on specimens collected at the Great Amazon Mesophotic Reef System (GAMRS), a complex environment with a consolidated bottom formed by living organisms. The new finding solves the discussion about the presence of the species in Brazilian waters and extends its distribution for about 400 km eastwards to the north coast of Brazil. Morphometric and meristic data of the specimens are provided and compared to literature. New data about the occurrence of the species in Venezuelan waters are also presented.

Keywords: Graysby, range extension, taxonomy.

Resumo. Primeiro registro confirmado de *Cephalopholis cruentata* (Lacépède, 1802) (Perciformes: Epinephelidae) em águas brasileiras com notas sobre sua ocorrência na Venezuela. Registramos a primeira ocorrência confirmada da garoupa-sarampo, *Cephalopholis cruentata* (Lacépède, 1802) para águas brasileiras, baseada em exemplares coletados no Grande Sistema de Recifes Mesofóticos da Amazônia (GSRMA), ambiente complexo de fundo consolidado formado por organismos vivos. A descoberta resolve a discussão sobre a presença da espécie em águas brasileiras e estende sua distribuição por cerca de 400 km no sentido leste até a costa norte do Brasil. Dados merísticos e morfométricos são apresentados e comparados com a literatura. Dados inéditos sobre a presença da espécie em águas venezuelanas são também apresentados.

Palavras-chave: Garoupa-sarampo, extensão de distribuição, taxonomia.

Introduction

The genus *Cephalopholis,* family Epinephelidae, includes 25 extant species distributed circumglobally throughout the tropics and subtropics (Fricke *et al*., 2023), but might also include the two known species of the former genus *Paranthias*, based on morphological and DNA sequences analysis (Craig & Hastings, 2007, Ma & Craig, 2018). Several authors don't agree with Craig & Hastings (2007) conclusions concerning the genus, considering *Paranthias* as valid (Parenti & Randall, 2020, Fricke *et al*., 2023). Following these last authors, in the Atlantic Ocean four species are found: *Cephalopholis cruentata, C. fulva* (Linnaeus, 1758), *C. nigri* (Günther, 1859), and *C. taeniops* (Valenciennes, 1828), the first two occurring only in the Western Atlantic, the others in the eastern and central areas of this ocean (Parenti & Randall, 2020). A confirmed record of *C. taeniops* from Brazil is regarded as an incidental transport from the Eastern Atlantic, possibly through an oil platform (Garcia *et al*., 2018); this species was erroneously reported by Steindachner (in Jordan & Evermann, 1896) as a stray to Florida and the Bahamas but is otherwise considered to be restricted to West Africa (Heemstra, 1991, Rocha, 2018).

The north coast of Brazil is located between the Oiapoque River mouth and the Parnaíba River delta; its dominating environmental characters are determined by the influence of the Amazon-Orinoco Plume (Hu *et al*., 2004, Grodsky *et al*., 2014, Marceniuk *et al*., 2021). The Great Amazon Mesophotic Reef System (GAMRS) is a complex environment with substrate formed by living organisms (Cordeiro *et al*., 2015, Moura *et al*., 2016, Francini-Filho *et al*., 2018), delimited by the discharge of continental waters, sediments, and suspended material of the Amazon River, and strong marine currents (Francini-Filho *et al*., 2018). The available evidence indicates that the GAMRS covers a total area of 9,500 km² (Moura *et al*., 2016), and is made up of typical mesophotic coral reefs at depths between 70 m and 220 m, constructed primarily of calcareous algae, sponges, and scleractinian corals, which may potentially cover a total area of approximately 56,000 km² (Francini-Filho *et al*., 2018). Only very recently, the fish fauna of the area become better known with the publication of lists and a catalogue (Marceniuk *et al*., 2019, Klautau *et al*., 2020, Marceniuk *et al*., 2021).

Material & Methods

Two specimens of the Graysby were collected by professional fishermen with a trap designed to capture snappers (*Lutjanus* spp.) and were photographed on board of the fishing vessel. Both were frozen, taken to the laboratory, fixed in 10% formalin, transferred to 70% ethanol, and deposited in the collection of the Zoological Collection of the Santa Cecilia University (AZUSC). Measurements were taken with a digital caliper to tenths of millimeters (mm); measurements between 150 mm and 300 mm were taken with a manual caliper to

the nearest tenth of mm; over 300 mm with a ruler to the nearest tenth of mm. Proportions of specimens are given relative to standard length (SL). Digital pictures were taken of the fresh and preserved specimens; their identification and known distribution follows Jordan & Evermann (1896), Cervigón (1991), Carvalho-Filho (1999, 2023), Heemstra *et al.* (2003), McEachran & Fechhelm (2005), Robertson & Van Tassell (2015) and Fricke *et al.* (2021). Extensive research was also carried out in search of records of *Cephalopholis cruentata* specimens from Brazilian waters through online databases as GBIF, FishNet2, SiBBR and SpeciesLink.

Results

Cephalopholis cruentata (Lacépède, 1802)

(Figures 1, 2, 3 and Table 1)

Material - Brazil, Amapá: AZUSC 6920 (2, 298.2–305.4 mm SL), Great Amazon Mesophotic Reef System, 3º02'24"N, 48º27'36"W, about 90 m deep, reef bottom, 01 May 2022, trap.

Diagnosis - Selected morphometric and meristic data are given in Table 1. Both specimens were identified based on the diagnosis proposed by authors cited in Materials and Methods, as follows: Body robust, oblong; snout much longer than eye diameter; interorbital space flat to slightly convex; upper jaw with a distinct bony knob at lower rear corner; preopercle rounded, smooth, entire, spines and notch absent; dorsal-fin membrane deeply notched between spines; pectoral fin symmetrically rounded; caudal fin rounded; scales on body sides ctenoid, rough. Recently collected specimens with head, body and fins greyish brown (first specimen) or whitish grey (second specimen), paler on lower third of sides and head; small, rounded red dots covering head, body and fins; distal margin of soft dorsal, anal

Figure 1. The *Cephalopholis cruentata* specimens recently collected at the Great Amazon Mesophotic Reef System, north coast Brazil (AZUSC 6920, 298.2–305.4 mm SL).

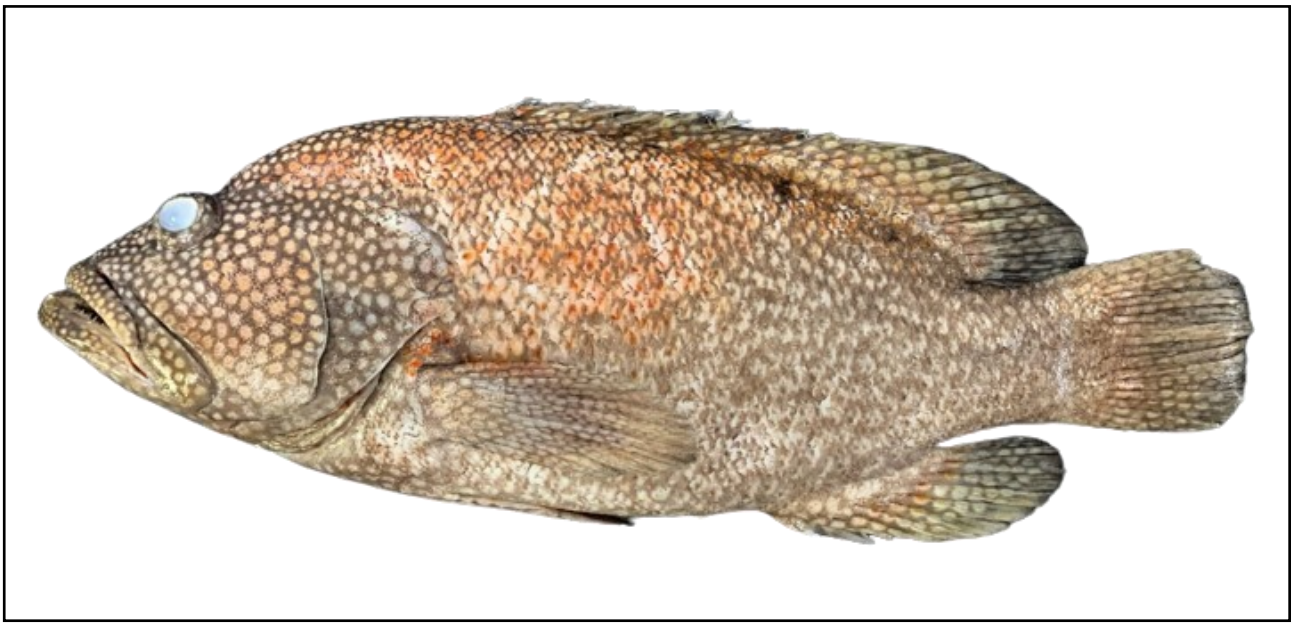

Figure 2. Preserved Brazilian *Cephalopholis cruentata* specimen, AZUSC 6920, 305.4 mm SL.

and caudal-fins dark, more pronounced in one specimen; four (one indistinct) black spots on back of one specimen, pale in the other; eyes red. After preservation, both specimens become brownish, the red dots pale yellow, the back-spots dark.

Discussion

The genus *Cephalopholis* is characterized by a combination of the following characters: supramaxilla present on upper rear border of maxilla; rayed sections of dorsal and anal fin mostly covered with thick skin and scales; cor-

Table 1. Morphometric (as SL%) and meristic characters of *Cephalopholis cruentata,* rounded. * Original data, based on examined specimens; @ calculated based in picture.

Meristics	AZUSC 6920, 1*	AZUSC 6920, 2*	Cervigón 1991*	Heemstra *et al.* 2003	Jordan & Evermann 1896*	Matsuura 1983*	Fricke *et al.* 2023 Neotype*	MHNLS Vouchers
Specimens number	01	01	15	None	No data	02	01	15
Dorsal-fin elements	IX,14	IX,14	IX,14	IX,13–15	IX,14–15	IX,14	IX,13–15	IX,14
Anal-fin elements	III,8	III,8	III,8	III,8	III,8	III,8	III,8	III,8
Pectoral-fin rays	15	15	15–16	16	No data	16	15	15–16
Lateral line scales	50	49	52–55	47–51	52–55	49	49	46–53
Lateral scales series	69	71	86–95	69 - 81	85–95	No data	69	82–96
Total gill rakers	26	27	24–27	18–21	No data	20	23	23–31
Developed	13	13	11-15	No data	9–11	No data	No data	11–20
Morphometrics								
Head length	39	40	37–40	No data	40	41–42	40	37–42
Body depth	37	37	34–40	34–40	34	34@	36	32–36
Upper jaw length	20	20	20–21	No data	20	20@	21	18–21
Pectoral fin length	25	26	25–28	No data	26	28@	23	23–30

ner of preopercle without a large antrorse spine; dorsal fin spines 9; caudal fin rounded or convex. *C. cruentata* differs from its Atlantic congeners by the combination of the following characters: 8 anal-fin rays, 15-16 pectoral-fin rays; color gray, brown or olive green with orange-brown to reddish spots on head, body and fins; four black to white spots on dorsum below dorsal fin.

This species was previously known from the Western Atlantic Ocean, occurring from North Carolina, Bermuda and the Gulf of Mexico through the Caribbean south to Colombia and Venezuela to Trinidad & Tobago and Suriname (McEachran & Fechhelm, 2005, Heemstra *et al.*, 2003, Matsuura, 1983, Fricke *et al.*, 2021, Figure 3), on seagrass beds and mainly rocky, coral and mesophotic reefs, between depths of 1 and 170 m.

For a hundred years, *Cephalopholis cruentata* has been cited from Brazil, probably due to misidentifications or incorrect interpretations as listed below:

A. Specimens housed in collections.

Specimens of *Petrometopon cruentatum* (= *Cephalopholis cruentata*) were collected by the Calypso from the Brazilian coast at Stations 15 (Fernando de Noronha Archipelago, Conceição Beach, 6–10 m, beach seine net, sandy bottom, 18 November 1961) and 25 (off Recife city, 8º22'S, 34º44'W, 52–88 m, dragging net, sandy and muddy bottom, 21 Novem-

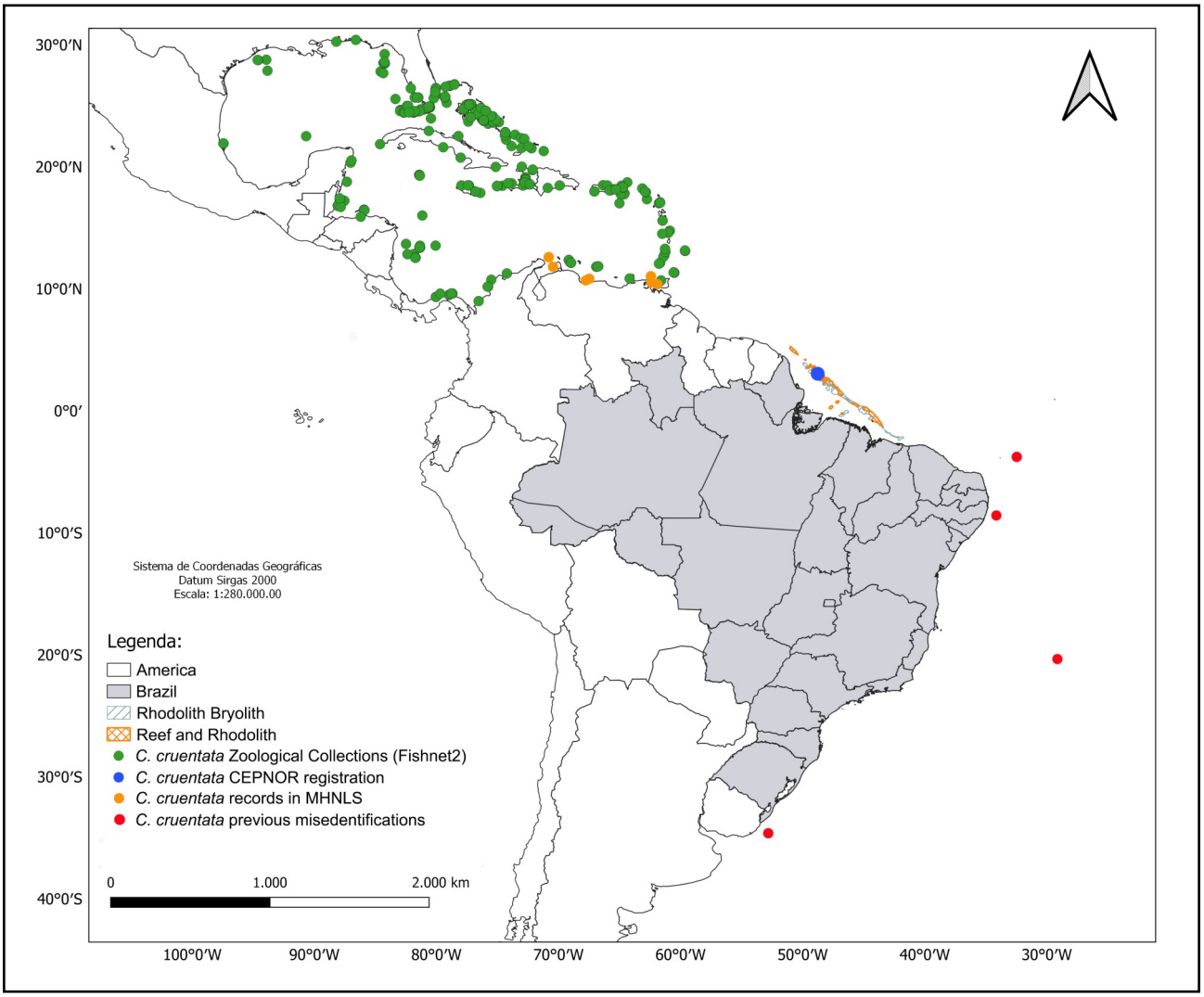

Figure 3. The blue circle location is that of AZUSC 6920 specimens, as reported by CEPNOR. The green dots presented refer only to records with georeferenced data, the red dots to misidentifications as cited in text and the orange dots to new records from Venezuela.

ber 1961) (Roux, 1973). Only two specimens (200 mm and 225 mm SL), both from Station 15, were preserved and deposited in the Museum National D'Histoire Naturelle, MNHN-IC-1975-0398 (Figure 4). The examination of the pictures of these specimens clearly shows that they belong to a different species, *Cephalopholis fulva*, having 17–19 pectoral-fin rays and tiny dark spots on the head and body in the preserved vouchers (vs. 15–16 pectoral-fin rays and much larger, pale spots on head, body and fins of the Graysby) (Figure 5, A, B, Table 1). No explanation is given concerning the missing MNHN specimen from Station 25; also, some data of this publication are not clear; for example, the only other specimen of *Cephalopholis fulva* captured by the Calypso was at Station 158, off Uruguay, which is almost impossible as this tropical species cannot live in temperate waters; this specimen is not deposited at MNHN.

Another specimen, housed in the Museu Nacional do Rio de Janeiro, MNRJ 16575, collected on October 10, 1997, at Praia dos Cabritos, Trindade Island, Espírito Santo, was examined by Lucas Canes Garcia when preparing the manuscript concerning *Cephalopholis taeniops* (Garcia *et al.*, 2018). It was reidentified as an immature specimen of *Epinephelus adscensionis* (Osbeck, 1765), a very common species on Trindade Island and that might resemble *Cephalopholis cruentata* due to the numerous dark dots of head and body (Figure 5, C, D).

B. Literature records.

Several literature sources reported *Cephalopholis cruentata* from Brazil, including Matsuura (1983), McEachran & Fechhelm (2005) and Cervigón (1991). These authors possibly followed Jordan & Evermann (1896) who stated that the species occurs from Brazil to Florida Keys; the only citation by Jordan & Evermann that includes Brazil is the one of Marcgrave (1648), with the word "doubtful" in brackets. We don't know the reason of the doubt, but the names used by Marcgrave that Jordan & Evermann attribute to *C. cruentata,*

Figure 4. Specimens of *Cephalopholis fulva* MNHN-IC-1975-0398, 225 mm SL and 200 mm SL.

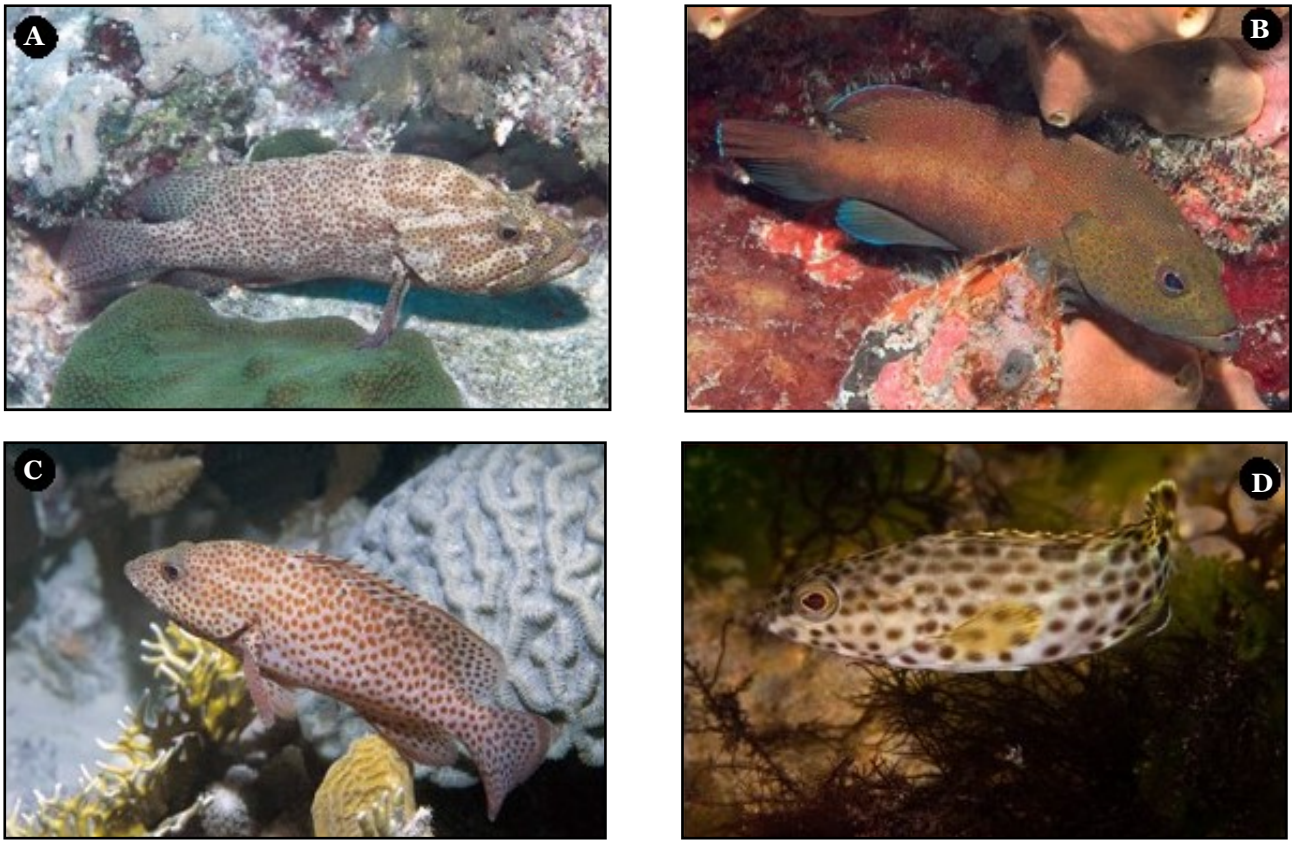

Figure 5. A - *Cephalopholis cruentata*, adult, Venezuela; **B -** *Cephalopholis fulva*, adult, Fernando de Noronha, Brasil; **C -** *C. cruentata*, immature, Venezuela; **D -** *Epinephelus adscensionis*, immature, Bahia, Brasil. Credits: A and C: H. Ramírez; B: J.P. Krajewski: D: A. Bertoncini.

Jurvucapeba and Itajara, are illustrated in Marcgrave work by a fish that resembles *Epinephelus adscensionis* (Osbeck, 1765). Accordingly, recently, Fricke *et al.* (2021) showed that previous records of the Graysby for Brazil were misidentifications with *Epinephelus adscensionis* (Osbeck, 1765). By the way, "Itajara" is an indigenous word for a fish – "Senhor das Pedras" in Portuguese or "Lord of the Rocks" in English, given to large costal fishes, usually of the family Epinephelidae, more often to the goliath grouper, *Epinephelus itajara* (Lichtenstein, 1822).

Lacépède, 1802, when describing *Cephalopholis cruentata*, in the text of the chapter "Le Spare Zonephore", pages 155–159, twice used the word Brazil, but regarding diverse fishes, the *Sparus nhuquunda* and the *Sparus acara*, both of the mainly freshwater-family Cichlidae. Thus, there is no reason to consider Brazil as an occurrence site to the Graysby.

Finally, there are some considerations about the synonymy given by Fricke *et al.* (2021):

The 'Gvarvgvarv' of Marcgrave (1648: 169, fig.) (= Guaruguaru) is the Brazilian indigenous and current popular name given to a tiny Poecilidae, usually *Poecilia vivipara*, and it is well illustrated as this; just below, the next fish of Marcgrave work, the Cugupu-guacu, clearly shows a *Epinephelus itajara*, by the illustration and description: "oculos mediocres" (very small eyes), and "maculae parvae nigrae" (small black dots), and this is probably the same fish of the 'Cugupuguacu cogener, corpore rotundiore' (robust, rounded body, as has *E. itajara* in a cross section) of Sloane (1725: 280, pl. 247, fig. 2), the 'Cugupu-guacu brasiliensibus' of Willughby (1686: 303), and the 'Cugupu guacu' of Ray (1713: 127), all of them based in Marcgrave.

As all previous reports were based on misidentifications, this is the first confirmed record with material deposited in collection of

Cephalopholis cruentata from Brazil.

Concerning the presence of the species in Venezuelan waters, only seven vouchers come from online databases: one from FMNH (Field Museum of Natural History, Chicago), five from UF (University of Florida, Museum of Natural History, Gainesville) and one from KU (University of Kansas Biodiversity Institute). In fact, the Graysby is abundant, very common in all Venezuelan coastline and islands, with 28 samples housed in the MHNLS, Museo de Historia Natural La Salle (Caracas), 15 of which were examined by us: MHNLS 3375, 15568, 25406, 25441, 25448, 25653, 25667, 26188, 26194, 26198, 26200, 26201, 26202, and 26203 (two specimens) (Table 1, Figure 6).

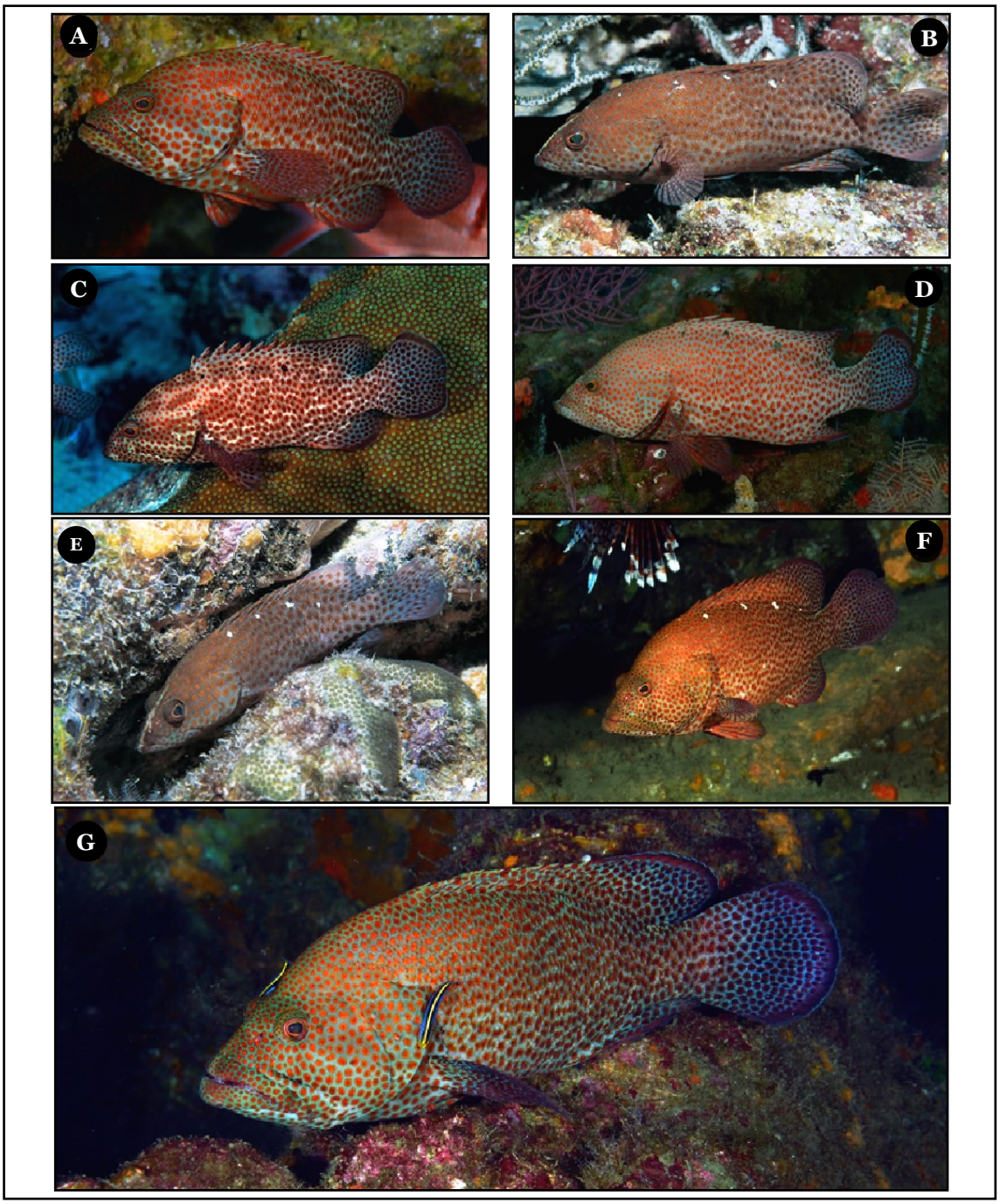

Figure 6. Venezuelan specimens of *Cephalophoplis cruentata*: **A -** Adult, Chichiriviche de La Costa, central continental coast. **B -** Juvenile, Archipiélago de Los Roques National Park. **C -** Adult, Aves de Sotavento, Archipiélago de Las Aves. **D -** Adult, Puerto Maya, Central continental coast. **E -** Juvenile, Archipiélago de Los Roques. **F -** Adult, Tuja, central continental coast. **G -** Adult, Mochima National Park, Eastern coast. Credits: Humberto Ramírez Nahín.

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