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First record and range extension of the Cocos batfish, *Ogocephalus porrectus* Garman 1899 (Lophiiformes: Ogocephalidae), off the continental Pacific coast of Costa Rica

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ABSTRACT

Introduction: To date, two species of batfishes of the genus *Ogocephalus* have been documented in the Eastern Pacific Ocean. *Ogocephalus porrectus*, originally described from Isla del Coco, Costa Rica, has been regarded as restricted to waters around Isla del Coco and Isla de Malpelo (Colombia).

Objectives: To report and describe the first record of *O. porrectus* from the Pacific coast of continental Costa Rica, thereby extending its known distribution range.

Methods: The specimen supporting this new record was collected with a bottom trawl net off the north Pacific coast of Costa Rica, at 67 m depth. It was deposited in the Ichthyological Collection of the Museo de Zoología, Universidad de Costa Rica, under the catalog number UCR 3368-001. Morphometric and meristic data of the specimen were recorded following standard procedures. Additional material of *O. porrectus* and *O. darwini* was examined for comparison.

Results: Morphological and coloration traits of the specimen were consistent with previous descriptions of *O. porrectus*, confirming its identification.

Conclusions: This record parallels the recent continental occurrence of *O. darwini* in Ecuador, since both species were previously considered insular. Such a finding highlights the role of larval dispersal and sampling gaps on perceived distribution patterns of batfishes. It also underscores the need for continued ichthyological surveys to document faunal linkages and to anticipate potential responses of marine biodiversity to environmental change in the Eastern Pacific.

Keywords: Eastern Tropical Pacific; insular–continental connectivity; biogeography; larval dispersal; ichthyofaunal inventories.

RESUMEN

Primer registro y extensión geográfica del pez murciélago de la Isla del Coco, *Ogocephalus porrectus* Garman 1899 (Lophiiformes: Ogocephalidae), en aguas costeras del Pacífico de Costa Rica

Introducción: Hasta la fecha se han documentado dos especies de peces murciélago del género *Ogocephalus* en el Océano Pacífico Oriental. *Ogocephalus porrectus*, descrita originalmente para la Isla del Coco, Costa Rica, se consideraba restringida a las aguas de esta isla y de la Isla de Malpelo, Colombia.



Objetivos: Reportar y describir el primer registro de *O. porrectus* en la costa pacífica continental de Costa Rica, ampliando así su distribución conocida.

Métodos: El ejemplar que respalda este nuevo registro fue recolectado con una red de arrastre de fondo, a 64 m de profundidad, en la costa Pacífico norte de Costa Rica. El espécimen fue depositado en la Colección Ictiológica del Museo de Zoología, Universidad de Costa Rica, bajo el número de catálogo UCR 3368-001. Se registraron datos morfométricos y merísticos del ejemplar siguiendo procedimientos estándar, y se examinó, a efectos comparativos, material adicional de *O. porrectus* y *O. darwini*.

Resultados: Los rasgos morfológicos y de coloración del ejemplar coincidieron con descripciones previas de *O. porrectus*, confirmando su identificación.

Conclusiones: Este registro es paralelo a la ocurrencia reciente de *O. darwini* en aguas costeras de Ecuador continental, ambas especies previamente consideradas como insulares. Tal hallazgo resalta la influencia de la dispersión larval y de los vacíos de muestreo en los patrones de distribución percibidos de los peces murciélagos en la región. Asimismo, enfatiza la necesidad de continuar con inventarios ictiológicos que documenten los vínculos faunísticos y permitan anticipar posibles respuestas de la biodiversidad marina frente al cambio ambiental en el Pacífico Oriental.

Palabras clave: Pacífico Tropical Oriental; conectividad insular–continental; biogeografía; dispersión larval; inventarios ictiofaunísticos.

INTRODUCTION

The family Ogcocephalidae currently comprises 98 valid species distributed across ten genera (Fricke et al., 2025). Ogcocephalids, commonly known as batfishes, are characterized by their distinctive morphology, including a dorsoventrally depressed body, a pointed or rounded head (in dorsal view), and large and lateral arm-like pectoral fins; a combination of characters that justify their vernacular designation (Nelson et al., 2016; Robertson & Allen, 2024). Batfishes are benthic organisms inhabiting tropical and subtropical waters worldwide, where they move in a waddling manner or by “walking” slowly, supported by their modified pectoral and pelvic fins (Nelson et al., 2016; Robertson & Allen, 2024). Batfishes are carnivorous, feeding primarily on crustaceans and small fishes, which they capture using specialized lures and aided by their cryptic appearance (Nelson et al., 2016; Robertson & Allen, 2024).

The genus *Ogcocephalus* Fischer 1813 is the most diverse and taxonomically complex group within the Ogcocephalidae, with 13 species currently recognized as valid (Robertson & Allen, 2024; Froese & Pauly, 2025). These fishes are widely distributed in the Western Atlantic and Eastern Pacific (EP) oceans, in shallow to

moderately deep waters, inhabiting continental shelves, insular slopes, and rarely estuarine environments (Nelson et al., 2016; Robertson & Allen, 2024; Froese & Pauly, 2025). Members of the genus are distinguished from other ogcocephalids by their relatively elongate body form, their oval and plate-like gill rakers, the presence and arrangement of dermal tubercles, and characteristic modifications of the illicium and esca (Bradbury, 1967, Bradbury, 1980; Robertson & Allen, 2024).

Two species of *Ogcocephalus* have been documented in the EP; *Ogcocephalus porrectus* Garman 1899 and *Ogcocephalus darwini* Hubbs 1958 (Robertson & Allen, 2024; Froese & Pauly, 2025). The first species was originally described from specimens collected at the vicinity of Isla del Coco (also known as Cocos Island), Costa Rica (5°32'45.0'' N, 86°54'30.0'' W) (Bradbury, 1980). Since then, its confirmed distribution has been limited to insular environments in the Eastern Tropical Pacific region (ETP), specifically the Coco and the Malpelo (Colombia) islands, at depths ranging from 35 to 150 m (Bradbury, 1980; Robertson & Allen, 2024). *Ogcocephalus porrectus* can be distinguished from its congeners by its markedly elongated body, a slender rostrum, and the presence of small but well-defined dermal tubercles over

the disk, among other characters (Bradbury, 1980; Robertson & Allen, 2024). Despite being recognized as a distinctive species, information on its ecology, abundance, and precise distribution remains relatively scarce (Bradbury, 1980; Robertson & Allen, 2024).

Herein, we report the first record of occurrence of *O. porrectus* from the Pacific coast of continental Costa Rica, extending its known distribution range. This finding contributes to the understanding of the diversity and biogeography of the Ogocephalidae in the region and underscores the importance of continued ichthyological surveys along the ETP, particularly in areas and ecosystems where the fish fauna remains incompletely documented.

MATERIALS AND METHODS

The specimen supporting this new record was obtained using a bottom trawl net (12 m total length, with a 9 m length cone, plus a 3 m long tube bag; mouth 7 m wide and 2 m high; and mesh size 2.54 cm), operated by a local longline vessel off the northern Pacific coast of Costa Rica. Four trawls, each lasting approximately 30 minutes and covering an estimated distance of 1.85 km at a speed of 3.7 km/h, were conducted within the Gulf of Santa Elena,

Guanacaste. The collection of the specimen took place on March 6, 2023, at the locality of Palo Blanco (about 10°57'57.3" N, 85°47'51.9" W; Fig. 1), at an average depth of 67 m, over a muddy-sandy substrate. This sampling was part of the BioMar-ACG project, which aims to inventory and characterize the marine biodiversity of the Área de Conservación Guanacaste (ACG) [see Cortés & Joyce (2020) for additional details].

Immediately after capture, the specimen was frozen and transported to the laboratory, where tissue samples (preserved in 96% ethanol) were taken prior to fixation in 10% formalin. The specimen was subsequently preserved in 70% ethanol and deposited in the Ichthyological Collection of the Museo de Zoología of the Universidad de Costa Rica (UCR), under catalog number UCR 3368-001. Identification was based on Hubbs (1958), Bradbury (1980) and Robertson & Allen (2024).

Morphometric measurements (12 in total; Table 1) were recorded as follows: orbital diameter (OD), greatest diameter of the bony orbit; interorbital width (IO), narrowest distance between lateral frontal bones of either side; rostral length (RL) (measured on ventral side), distance between upper extent of illicial cavity and anterior tip of rostrum; mouth width

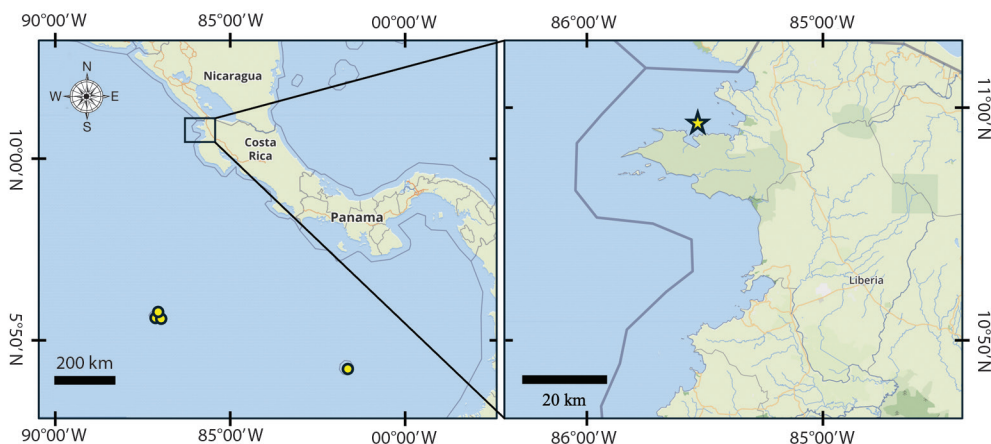


Fig. 1. Map of the capture site of *Ogocephalus porrectus* (UCR 3368-001; yellow star) on the Pacific coast of Costa Rica, along with previously known records (yellow circles) in Coco and Malpelo islands. Occurrence data, based on museum material, were obtained from Bradbury (1980) and Robertson & Allen (2024). A single point may represent more than one lot or specimen. The gray line indicates national boundaries, including the twelve nautical mile territorial limit.



(MW), measured as greatest overall width; illicial cavity width (IW), greatest width of illicial cavity opening; predorsal length (PD), distance from center of upper lips to base of first dorsal fin ray; disk margin length (DM) (measured on ventral side), distance from posterior swelling of mandible to posterior base of subopercular buckler; pectoral fin length (PF), distance from base to distalmost tip of longest fin ray; anal fin length (AF), distance from origin of anal fin to distalmost tip of longest fin ray; dorsal fin length (DF), distance from origin of dorsal fin to distalmost tip of longest fin ray; caudal fin length (CF), distance from base of caudal fin to distalmost tip. Meristic data (Table 1) were taken following Bradbury (1980); these include pectoral (P1), pelvic (P2), dorsal (D), anal (A), and caudal (C) fin rays counts. Additional material of *O. porrectus* and *O. darwinii*, deposited in the UCR, as well as published data (Briones-Mendoza et al., 2022), were also examined and tabulated for comparative purposes.

RESULTS AND DISCUSSION

Morphometric and meristic data of the examined specimen (Fig. 2), along with additional comparative material, are provided in Table 1. Other morphological characteristics of the specimen include: head depressed, but elevated above disk; disk triangular; snout pointed, with a horn-like rostrum projecting well forward before eyes, and with a mass of relatively long “hairs” on tip of horn; fish-lure with three fleshy points, in a small cavity under horn; spine at lower rear corner of operculum blunt; eyes on sides of head; gill opening high, above pectoral fin base; gill rakers as oval plates covered with small teeth; pectoral and pelvic fins limb-like; pectoral fins completely separated from body; skin covered dorsal fin on tail; small fleshy anal fin under tail; skin with many large protruding, bony spines; fringe of hairs along lower side, from mouth to base of caudal fin; ventral portion of body completely covered

Table 1

Morphometric and meristic data of *Ogcocephalus porrectus* from coastal waters of Costa Rica (UCR 3368-001), with comparative material of *O. porrectus* and *O. darwinii*. Morphometric values are expressed as percentages of standard length (SL).

Measurement / Count	<i>Ogcocephalus porrectus</i>			<i>Ogcocephalus darwini</i>	
	UCR 3368-001	UCR 0737-0007, n = 9		UCR 0788-001	Briones-Mendoza et al. (2023); n = 1
		Min	Max	n = 1	
SL (mm)	78.55	75.13	105.85	102.62	215
OD	7.12	5.51	7.28	6.49	5.12
IO	8.42	7.83	11.62	8.01	8.79
RL	11.29	9.22	14.21	13.2	12.28
MW	11.05	9.47	12.54	8.92	-
IW	4.35	3.31	4.7	4.45	-
PD	65.82	60.44	69.96	62.37	-
DM	45.44	45.38	53.09	51.45	50.6
PF	19.94	18.46	23.38	22.27	15.16
AF	13.05	12.93	16.7	16.22	11.3
DF	8.47	6.77	8.75	8.99	2.7
CF	22.92	19.79	24.73	25.35	14.88
P1	14	12	13	15	14
P2	6	6	6	5	5
D	4	4	4	4	3
A	4	4	4	4	3
C	9	8	8	9	9

with pointed, bony scales; and ventral portion of tail densely covered with small prickles, sometimes with a few conical spines along the midline.

Morphometric, meristic, and other anatomical traits (as described above), together with the live coloration of the specimen (i.e., dorsum pale brown; two large dark blotches on the nape and several smaller ones along mid-side; a pale bar beneath the eye; ventral surface ranging from orange-red to creamy white; mouth reddish), agree closely with previous descriptions of *O. porrectus* (Hubbs, 1958; Bradbury, 1967, Bradbury, 1980; Robertson & Allen, 2024). This species can be readily distinguished from its closest congener in the ETP, *O. darwini*, by the following combination of characters: horn-like rostrum with a mass of long hairs on tip (vs. few short hairs); flanks with fringe of hairs (vs. without fringe of hairs); skin with many large spiny knobs (vs. few small to medium spiny knobs); and coloration [with a pair of large dark blotches on nape plus several smaller blotches on mid-side vs. two dark brown stripes (sometimes broken) from top of head to caudal fin] (Bradbury, 1980; Robertson & Allen, 2024). These consistent morphological traits, supported by multiple diagnostic characters, provide robust evidence for species identification even in the absence of molecular confirmation, especially given that no COI sequences for *O. porrectus* are currently available in public genetic databases (e.g., GenBank or BOLD).

The detection of *O. porrectus* in continental waters of Costa Rica parallels the record of *O. darwini* in mainland Ecuador (Briones-Mendoza et al., 2022), a species previously considered endemic to the Galápagos region. These findings highlight recurring patterns in ogocephalid biogeography (Bradbury, 1967; Bradbury, 1980; Briones-Mendoza et al., 2022), suggesting that oceanographic processes such as eddy-driven larval transport, episodic current-mediated dispersal, and/or relaxation of upwelling fronts may intermittently connect insular and continental habitats in the ETP (Briones-Mendoza et al., 2022). Given the limited dispersal

capacity of adult batfishes, such events likely occur during the planktonic larval stage (Bradbury, 1967, Bradbury, 1980; Briones-Mendoza et al., 2022). The apparent absence of *O. porrectus* from continental records until now may reflect insufficient sampling, as its cryptic nature and benthic habits make detection challenging without dedicated surveys (Bradbury, 1967; Bradbury, 1980; Bussing & López, 2009; Briones-Mendoza et al., 2022; Robertson & Allen, 2024).

Biogeographically, this continental record of *O. porrectus* advances our understanding of faunal linkages across the ETP and challenges assumptions of strict insular endemism in ogocephalids. The finding suggests that Central America's continental margins may serve as under-explored refuges or transient habitat for insular species. Documenting these occurrences is fundamental not only to fill knowledge gaps in Costa Rica's marine biodiversity (Bussing & López, 2009), but also to inform broader conservation and management efforts. Strengthening ichthyological surveys, particularly of cryptic benthic taxa, is therefore critical to capture the true extent of species distributions and to anticipate future ecological responses to environmental and climatic shifts (Bussing & López, 2009; Briones-Mendoza et al., 2022).

Future studies should aim to better elucidate the oceanographic mechanisms facilitating larval dispersal and potential colonization by *O. porrectus*. Approaches integrating hydrodynamic and larval drift modeling, combined with field sampling of early life stages, could help test whether mesoscale eddies, coastal upwelling relaxation, or current reversals promote cross-shelf connectivity between insular and continental habitats (Ospina-Alvarez et al., 2020). Additionally, targeted surveys along the continental shelf, especially in areas influenced by upwelling or strong eddy activity, would help assess the spatial extent of the species' distribution (Abernathey & Haller, 2018; Briones-Mendoza et al., 2022). Given that this record is based on a single specimen and the identification relies exclusively on morphological evidence,

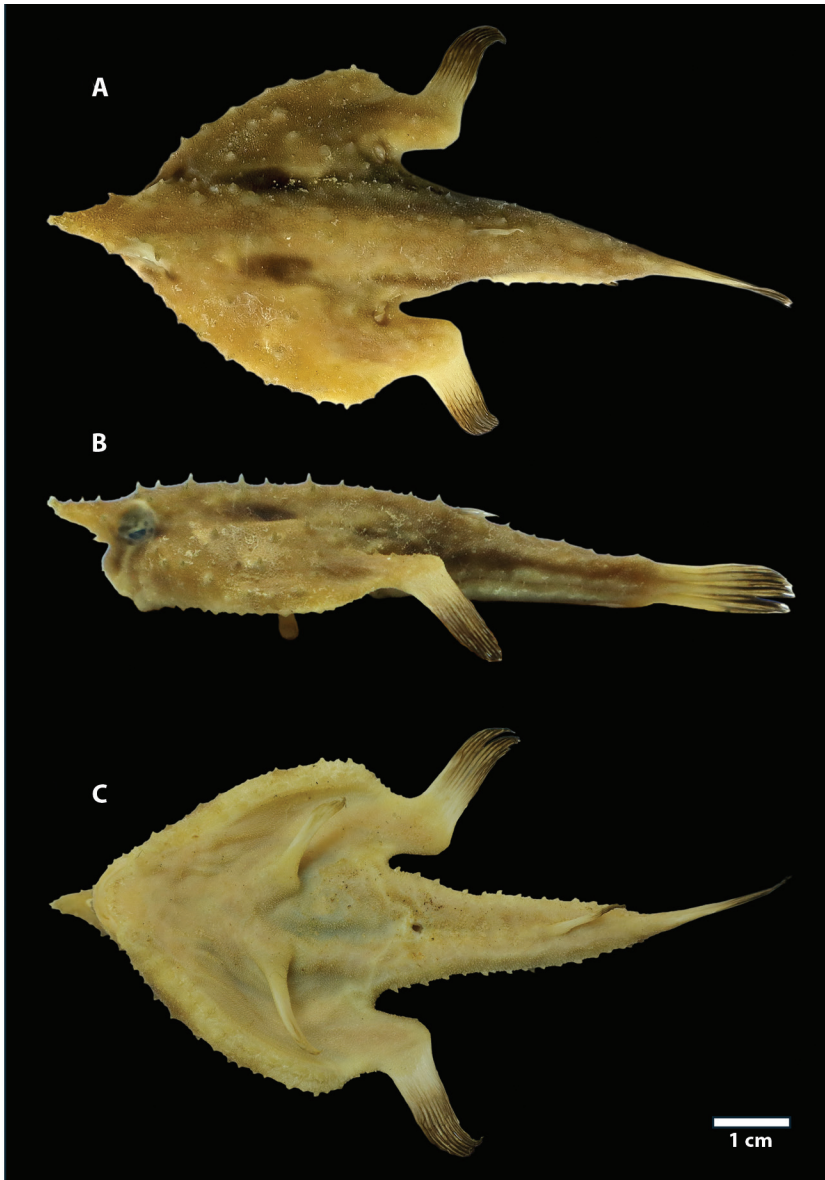


Fig. 2. Preserved specimen of *Ogcocephalus porrectus* from coastal waters of Costa Rica (UCR 3368-001), showing dorsal (A), lateral (B), and ventral (C) views.

future efforts should prioritize the acquisition and publication of molecular data to generate reference sequences, thereby promoting, facilitating, and strengthening phylogeographic assessments within the genus *Ogcocephalus* and the Ogcocephalidae. Addressing sampling biases using standardized trawls, baited remote

underwater video systems, and fine-mesh benthic sleds will also be essential to detect cryptic taxa and improve inventory completeness. Finally, species distribution models incorporating environmental and oceanographic variables could be used to predict potential ranges under present and future climatic scenarios, offering

valuable insights into the resilience and dispersal dynamics of benthic fishes in the ETP (Ospina-Alvarez et al., 2020).

Author contribution statement: AA and NVV-Q conceived, designed, and proposed the study, and participated in the collection of the specimen. AJD-M recorded the data from the preserved specimen and comparative material. All authors (AA, AJD-M, and NVV-Q) contributed to the analysis and interpretation of the data, and to the preparation of the manuscript.

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