

12-1990

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DOI: 10.18785/negs.1102.02

Recommended Citation

Garzón-Ferreira, J. and A. Acero P.. 1990. Redescription of *Coryphopterus tortugae* (Jordan) (Osteichthyes: Gobiidae), A Valid Species of Goby from the Western Atlantic. *Northeast Gulf Science* 11 (2).

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REDESCRIPTION OF *Coryphopterus tortugae* (JORDAN) (Osteichthyes: Gobiidae), A VALID SPECIES OF GOBY FROM THE WESTERN ATLANTIC

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ABSTRACT: New descriptive and ecological information obtained from western Atlantic (mainly Colombian Caribbean) material has led to the recognition of *Coryphopterus tortugae* (Jordan) as a valid species of gobiid fish. It is distinguished from *Coryphopterus glaucofraenum* Gill, the species with which it was previously confused, by its more elongated shape, its pigmentation characteristics, and its more restricted habitats.

[Keywords: *Coryphopterus*; redescription; goby]

The American gobiid fish genus *Coryphopterus* Gill was revised by Böhlke and Robins (1960); they recognized six Atlantic and two Pacific species. Later they included other three Atlantic species (Böhlke and Robins, 1962). *Ctenogobius tortugae* Jordan was considered a junior synonym of *Coryphopterus glaucofraenum* Gill, but the existence of two forms within the species was admitted. Nothing has been written about this problem since, but several authors have mentioned, described or illustrated the two forms of *C. glaucofraenum* without resolving their status (Böhlke and Chaplin, 1968; Randall, 1983; Robins, Ray and Douglass, 1986).

Recent collections of reef fishes in the Colombian Caribbean have produced abundant material of 46 species of the family Gobiidae (Garzón and Acero, 1988). Among the material of *Coryphopterus* characterized by having a dark blotch above the opercle, first assigned by us to *C. glaucofraenum*, we recognized the presence of two forms clearly distinct and separable. Later this finding was corroborated examining and comparing specimens from other localities

between Bermuda and Brasil. In this paper we present new descriptive and ecological information supporting the resurrection of *C. tortugae* as a valid species.

METHODS

A detailed description of the collecting methods and the studied areas in the Colombian Caribbean is found in Garzón and Acero (1988). Methods of measuring and counting basically follow those of Böhlke and Robins (1968). The first element of the second dorsal and anal fins is included with the segmented rays of these fins in the counts. Measuring was done with an ocular micrometer, except if the length exceeded 25 mm, when a dial calliper (to within 0.1 mm) was used.

Materials collected by us were fixed with formalin, kept in ethanol and deposited in the fish collections of the Instituto de Investigaciones Marinas de Punta de Betín, Santa Marta, Colombia (INVEMAR-P) and the Museo de Historia Natural, Instituto de Ciencias Naturales, Universidad Nacional de Colombia, Bogotá, Colombia (ICNMHN). Fishes deposited at the Florida Museum of

Natural History, University of Florida, Gainesville, U.S.A. (UF), the University of Puerto Rico at Mayagüez, Puerto Rico (UPRM), and the teaching collection of the Bermuda Biological Station for Research, Bermuda (BBSR) were also studied. In the material examined section the number of specimens followed by their size range (mm SL) appears in parentheses after the catalogue number.

Coryphopterus tortugae (Jordan)

Ctenogobius tortugae Jordan, 1904, Bull. U.S. Fish. Comm., 22 for 1902: 541-542, pl. 1 (Garden Key, Dry Tortugas, Florida). Longley and Hildebrand (1941): 232; and Böhlke and Robins (1960): 107 (placed in the synonymy of *Coryphopterus glaucofraenum* (Gill)).

Coryphopterus glaucofraenum (not of Gill, in part), Longley and Hildebrand (1941): 232-233; Böhlke and Robins (1960): 106-112, pl. 1; Böhlke and Chaplin (1968): 595; Randall (1983): 249-250; Robins, Ray and Douglass (1986): 244.

Ctenogobius transparentus Klauswitz, 1958, Senckenbergiana Biol., 39 (1/2): 78-80 (Bonaire).

Diagnosis. — A species close to *C. glaucofraenum*, with the dark spot above

the opercle relatively small but well contrasted, approximately triangular in shape and with an angle dorsad. Basicaudal blotch formed as a short vertical bar. Body depth equal to 17.2-23.6% SL. Fleshy predorsal ridge low, generally evident only in large specimens.

Description. — The morphology of *C. tortugae* agrees well with all the characters described by Böhlke and Robins (1960) in the diagnosis of the genus *Coryphopterus* (we did not study the vertebrae). Therefore most of the descriptive information is not repeated here.

Frequency distributions of fin-ray counts and measurements of body parts of Colombian specimens are given in Table 1. The meristic formula of *C. tortugae* is: D VI, 10 or 11 (normally 10); A 9-11 (normally 10); P 18-20 (normally 19); lateral scale rows 26 or 27; gill rakers on first gill arch 2 + 1 + 7 in three specimens.

Coloration. — Coloration of *C. tortugae* in alcohol was detailed and illustrated by Böhlke and Robins (1960) as their "pallid white-sand form ("*tortugae*")" of *C. glaucofraenum*. Figures 1 and 2 illustrate the more noticeable marks observed in the Colombian material, the darkest and more conspicuous one being the black

Table 1. Summary of meristic and morphometric data for *Coryphopterus tortugae* of the Colombian Caribbean. For meristic data, the number within parentheses after each count indicates the number of specimens. Ranges and averages (the latter in parentheses) of measurements are expressed as percentages of standard length.

Meristic characters	
Dorsal fin rays	VI - 10(33), 11(2)
Anal fin rays	10(32), 11(1)
Pectoral fin rays	18(5), 19(22), 20(3)
Lateral scale rows	26(3), 27(3)
Morphometric characters	
	N = 6
Standard length	27.1 - 43.8 mm
Upper jaw length	10.0 - 11.2 (10.6)
Head length	29.5 - 32.3 (31.0)
Snout length	6.1 - 7.6 (7.0)
Pectoral fin length	30.3 - 32.3 (31.3)
Pelvic fin length	24.2 - 25.8 (25.2)
Body depth	19.5 - 22.5 (21.3)*
Caudal peduncle depth	12.2 - 13.7 (13.0)
Eye diameter	9.1 - 10.2 (9.5)

*Based on 35 specimens (15.4 - 43.8 mm SL)

spot located above the opercle. This spot is approximately triangular in shape, with an angle dorsad, and it is always darker than the postocular band where it is placed; in young specimens (usually smaller than 30 mm total length) it is not differentiated. The stripes on the head are darker and more defined in small specimens. The roundish spot in the ventral portion of pectoral-fin base was present in all the specimens from the Santa Marta region, but in none from Providencia; this spot is tenuous but often well-defined and sometimes tends to appear as a ring due to the higher concentration of melanophores toward the borders. Basicaudal bar tenuous, some-

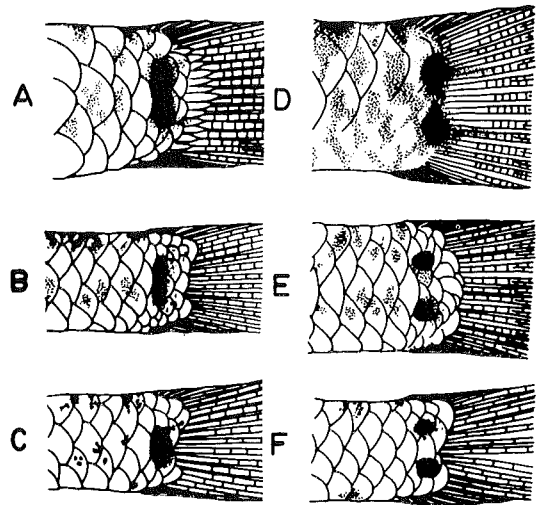


Figure 2. Comparison of the basicaudal marks of *Coryphopterus tortugae* (A-C, Santa Marta region) and *Coryphopterus glaucofraenum* (D-F, Islas del Rosario) from the Colombian Caribbean. A: 42.0 mm SL, INVEMAR-P 0981. B: 25.6 mm SL, INVEMAR-P 0983. C: 17.0 mm SL, INVEMAR-P 0983. D: 44.8 mm SL, INVEMAR-P 0987. E: 34.6 mm SL, INVEMAR-P 0988. F: 12.0 mm SL, INVEMAR-P 0992.

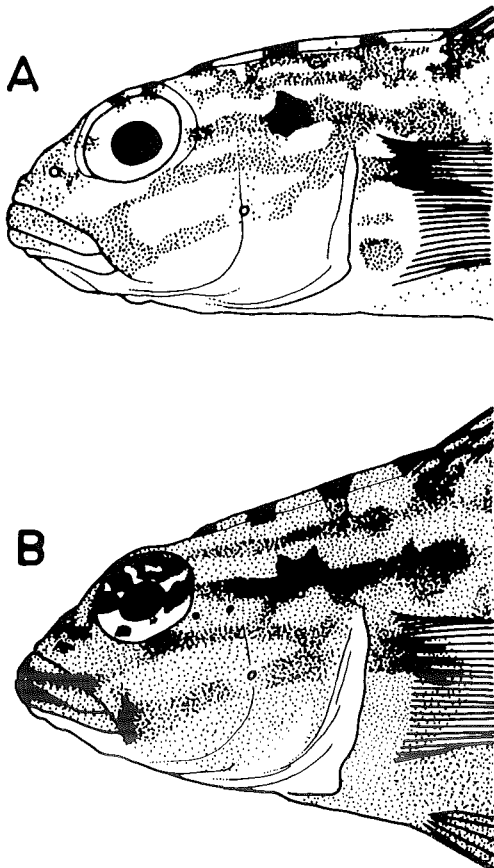


Figure 1. Head pigmentation patterns of *Coryphopterus tortugae* (A: 39 mm SL, Santa Marta region, INVEMAR-P 0981) and *Coryphopterus glaucofraenum* (B: 44.8 mm SL, Islas del Rosario, INVEMAR-P 0987) from the Colombian Caribbean.

times inconspicuous in juveniles of pale populations, but it is the second darkest mark on the fish. In specimens from Isla de Providencia pigmentation is highly reduced; most are pale yellow, with the opercular blotch and the basicaudal bar the only conspicuous marks. The individuals from Santa Marta are generally more heavily pigmented.

In fresh specimens the body is translucent, with abundant internal pigmentation. Surface marks vary from yellow-orange to brown, depending on melanophore concentration. Between body markings and on the fins there are many iridescent white spots and a white band crosses the cheek, opercle and pectoral base longitudinally. Four 15.4-27.2 mm specimens from Santa Marta region also show yellowish dorsal fins, with a white band on the basal and distal portions; blackish anal fin, with two longitudinal rows of yellow spots and a white band near basal and distal margins; caudal fin with yellow spots; iris silvery white and pupil iridescent green; peri-

toneum silvery white with dark and orange blotches; immediately over and below the vertebral column there is a yellowish stripe with melanophores; dorsal surface of vertebral column silvery white with black blotches.

Size and sexual dimorphism. — The largest examined specimen, 48.6 mm SL and 61.5 mm in total length, was collected from Looe Key, Florida. Due to the confusion in the literature with *C. glaucofraenum*, it is not possible to know whether *C. tortugae* grows larger than this. It has been said that *C. glaucofraenum*, including both forms, reaches a size of 75 mm in total length (Robins, Ray and Douglass, 1986).

Sexual dimorphism is only slightly developed since the only marked external difference between sexes is the genital papilla. It is elongated and pointed in males; shorter, truncate and with a conspicuous opening at its tip in females. Sexual identification using the papillae was possible in specimens larger than 27 mm. Also, as in other species of the genus, the last dorsal and anal fin rays are somewhat larger in males than in females at similar sizes.

Habits. — In the Colombian Caribbean *C. tortugae* was collected only in coral-line areas with clear to slightly turbid waters, between 5 and 32 m depth. It appeared in rotenone sample on isolated coral heads and patch reefs in lagunar zones; on mixed bottoms with small corals, octocorals, sponges and sand patches; at the deeper part of coral cliffs, and in mainly rocky bottoms. In Puerto Rico and Bermuda it was collected at 3 and 4 m depth, but at a white-sand cay and at a patch reef, in very clear waters several kilometers offshore. In Bermuda it was observed alive during active hours, living on the sediment nearby corals and algae-covered rocks, as other species of the genus.

The digestive tracts of two specimens 32.7 and 41.0 mm from the Santa Marta region contained mainly detritus, some sand, filamentous algae, foraminiferans, one nematode and one unidentified egg.

Distribution. — The authors have examined material of *C. tortugae* from the following localities: Bermuda, Florida Keys, Bahamas, Puerto Rico, Grand Cayman, Honduras, Isla de Providencia (Colombia), Antigua, Santa Marta region (Colombia) and Atol das Rocas (Brasil). It occurs with certainty also at the Dry Tortugas (type locality of the species) and Bonaire (type locality of *C. transparentus*). Therefore it seems that the species is widely distributed in the western Atlantic, mainly at insular localities.

Comparisons. — Within the species of *Coryphopterus* from the western Atlantic, *C. tortugae* is grouped with *C. punctipectophorus*, *C. thrix*, *C. eidolon* and *C. glaucofraenum* as all have united pelvic fins with developed frenum between the two spines (Smith and Tyler, 1977). Of this group only *C. tortugae* and *C. glaucofraenum* have a prominent dark spot above the opercle. *C. thrix* is also distinguished from *C. tortugae* by having the second dorsal spine prolonged as a filament and a prominent black spot on the upper part of the pectoral base; *C. punctipectophorus* is distinguished by having 11 rays in the second dorsal fin, and *C. eidolon* for having usually 25 lateral scale rows. Juveniles of *C. tortugae* which lack the blotch above the opercle are very difficult to identify, and are easily confused with young *C. eidolon* and *C. thrix*, which have a similar basicaudal mark; the produced dorsal spine present in young specimens of these species may be useful in such cases.

Coryphopterus glaucofraenum is separated from *C. tortugae* because it is

a more robust fish and for clearcut differences in pigmentation and habits. Several series of both species from western Atlantic localities were compared, and *C. glaucofraenum* always shows a higher body depth than *C. tortugae* (Table 2): 20.5-26.2% SL. In Figure 3 the neat distinction in body depth between the two species is observed; body depth in Colombian material of *C. glaucofraenum* is 22.5-25.9% (n = 39, \bar{x} = 23.9, SD = 0.84) SL and in Colombian material of *C. tortugae* is 19.5-22.5% (n = 35, \bar{x} = 21.3, SD = 0.86) SL. The basicaudal mark also differ in the two (Figure 2). In *C. glaucofraenum* two very conspicuous spots, sometimes joined by a tenuous blotch of melanophores (in large and well pigmented specimens), are present. The spot above the opercle is somewhat larger than in *C. tortugae*, is usually rectangular in shape, with two pointed projections dorsad, and is frequently masked by the adjacent pigmentation. It was also observed that the fleshy predorsal ridge is comparatively better developed in *C. glaucofraenum*, and is evident even in young individuals.

Coryphopterus glaucofraenum, in contrast to *C. tortugae*, is one of the most eurytopic reef goby. It has been found in all the explored regions of the Colombian Caribbean, from tidepools to 16 m depth. It appears in a great diversity of environments, from clear waters in coralline regions to turbid waters in muddy bottom bays that are strongly influenced by rivers; in rocky or coralline reefs, in seagrass beds, in mangrove lagoons and in wrecks and artificial tire reefs. The two species may live together; nevertheless, they tend to segregate spatially: *C. tortugae* seems to favor clear and deeper waters and *C. glaucofraenum* abounds close to shore, where sedimentation is high. Collections were made in the southern Puerto Rican shelf at four stations, going from a mangrove

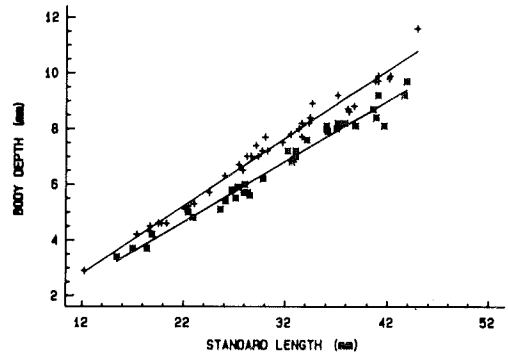


Figure 3. Comparison of body depth vs. standard length for *Coryphopterus tortugae* (asterisks; $y = 0.2173x - 0.126211$) and *Coryphopterus glaucofraenum* (plus signs; $y = 0.24319x - 0.117725$) from the Colombian Caribbean.

shore-line to a cay several kilometers offshore; *C. glaucofraenum* appeared everywhere but *C. tortugae* was collected solely at the two last locations, being the most abundant form only at the cay.

Longley and Hildebrand (1941) placed *C. tortugae* in the synonymy of *C. glaucofraenum*, without any explanation. Böhlke and Robins (1960) kept that decision in their revision of the genus, but recognized and described two clearly distinct forms based on pigmentation: "the pallid form ("*tortugae*")" typical of white sand areas in clearer and deeper water, and the "dark, inshore form (typical *glaucofraenum*)" from murky and shallow waters. They indicated that between these two extremes, the full range of intermediates occur and apparently because of this they did not accept *C. tortugae* as a valid species. Nevertheless, they did not describe the presumed intergradation between those two forms, and did not mention if such intergradation occurred at the basicaudal mark, which is the most important diagnostic pigmentary character separating the two species.

In the material studied we observed that both *C. tortugae* and *C. glaucofraenum* show wide variation in the inten-

sity of pigmentation, presenting pallid and dark forms. In any case, the basicaudal mark (Figure 2) did not show intergradation between the typical form of each species. *C. tortugae* is in general more pale, perhaps because it prefers insular areas with white sand. The palest specimens of both species were collected in Isla de Providencia, and where they co-occurred the intensity of pigmentation was similar. The darkest individuals of *C. tortugae* were found in the Santa Marta region, and when they were collected together with *C. glaucofraenum*, the degree of pigmentation was also similar in both species. This darker pigmentation in Santa Marta, which was also observed in most Colombian Caribbean reef gobies (Garzón, 1987), is possibly due to the influence of dark sediments of continental origin. The absence of well pigmented specimens of *C. tortugae* in older studies did not allow variational study, and may have precluded its recognition as a valid species.

The name *Ctenogobius transparentus*, created by Klausewitz (1958), falls without any doubt in synonymy with *C. tortugae*. Based on the original description the only specimen showed the blotch above the opercle small and intense, a transverse dark band on the caudal fin base and a body depth of 20.9% in SL.

Common name. — We propose the use of “whitesand goby” as the common name of this species.

Material examined. — All the Colombian specimens were collected by the authors. The Isla de Providencia is located off Nicaragua in the western Caribbean, but it is part of the island territories of Colombia. Colombian regions and localities of collections are presented in Garzón and Acero (1988).

— *C. tortugae*. Colombian material (15 females, 10 males, 15 undetermined).

Santa Marta region: INVEMAR-P 0981 (13, 23.0-41.0), Bahía de Nenguange, southeast side, 5-9 m depth; INVEMAR-P 0982 (1, 43.6), Bahía de Gayraca, west side, 12 m depth; INVEMAR-P 0983 (4, 15.4-27.1), Ensenada de Granate, southwest point, 6 m depth; INVEMAR-P 0984 (1, 26.1), Bahía de Nenguange, northeast sector, 11 m depth. Isla de Providencia: INVEMAR-P 0999 (12, 22.4-43.8), ca. 1 km east of Crab Cay, 4-6 m depth; INVEMAR-P 1000 (3, 32.2-37.1), ca. 0.3 km northwest of Crab Cay, 7-8 m depth; INVEMAR-P 1002 (3, 18.4-21.8), ca. 0.1 km south of Basalt Cay, 6 m depth; INVEMAR-P 1580 (1, 36.0), ca. 2.5 km northwest of Isla de Santa Catalina, 32 m depth; ICNMHN 1059 (2), ca. 2.5 km west of Freshwater Bay, 11 m depth.

Other material. — Bermuda, Three Hill Shoals: BBSR uncatalogued (6) and INVEMAR-P 1712 (4). Florida, Monroe County, Looe Key: UF 16166 (5). Bahamas, New Providence, North Island: UF 9208 (6). Puerto Rico, La Parguera: UPRM uncatalogued (6), (2), (2), (3). Grand Cayman, Paradise Rocks: UF 32588 (6). Antigua, Bird Island: UF 79871 (5); Mary Galante Bay: UF 79872 (3). Honduras, Pond Cay: UF 79873 (2). Brasil, Atol das Rocas: UF 19249 (5).

— *C. glaucofraenum*. Colombian material (13 females, 19 males, 46 undetermined). Santa Marta region: INVEMAR-P 0985 (1) and 1231 (32). Bahía de Cartagena: INVEMAR-P 0997 (7). Islas del Rosario: INVEMAR-P 0986 (2), 0987 (1), 0988 (2), 0989 (2), 0990 (1), 0991 (1), 0992 (2) and 0993 (3). Islas de San Bernardo: INVEMAR-P 0994 (1), 0995 (2) and 0996 (2); ICNMHN 1060 (3). Ensenada Pinorroa, Golfo de Urabá: INVEMAR-P 0998 (2). Isla de Providencia: INVEMAR-P 1001 (9). Bahía de Portete: INVEMAR-P 1581 (5).

Other material. — Bermuda, Whalebone Bay: INVEMAR-P 1709 (1); Harrington Sound: INVEMAR-P 1710 (1); Three Hill

Shoals: INVEMAR-P 1711 (2). Florida, Palm Beach County, Intracoastal Waterway: UF 46389 (1); Monroe County, Crawl Key: UF 10971 (6); Dry Tortugas, Loggerhead Key: UF 36442 (1). Bahamas, San Salvador Island: UF 18774 (6). Puerto Rico, La Parguera: UPRM uncatalogued (1). Antigua, Bird Island: UF 11519 (4); Mary Galante Bay: UF 12756 (3). Panamá, Zona del Canal, Bahía Las Minas: UF 75445 (4). Brasil, Alagoas, Ponta Verde: UF 19904 (2).

ACKNOWLEDGMENTS

The Fondo Colombiano de Investigaciones Científicas y Proyectos Especiales "Francisco José de Caldas" (COL-CIENCIAS) has supported the main portion of our studies on the Colombian coral reef fishes (30003-1-24-80, 30003-1-30-81 and 30003-1-55-83). The Instituto de Investigaciones Marinas de Punta de Betín (INVEMAR) has provided the required infrastructure. The first author thanks K.S. Cole, D. Hensley, G. Dennis and L. Sang for their collaboration at the Magueyez Field Station (UPRM). The second author thanks the great help and friendship received from G.H. Burgess and Dr. C.R. Gilbert during his visit to Gainesville and from Dr. B.B. Collette in Bermuda; his travel was made possible by the patronage of the Universidad Nacional de Colombia and the Fondo "José Celestino Mutis" of the Financiera Eléctrica Nacional. S. Zea corrected the English text.

RESUMEN

Con base en material del Atlántico occidental (colectado principalmente en el Caribe colombiano) se obtuvo nueva información descriptiva y ecológica que nos ha llevado a reconocer a *Coryphopterus tortugae* (Jordan) como una especie válida de pez gobiido. Ella se diferencia

de *Coryphopterus glaucofraenum* Gill, las especie con la que era confundida, por ser un pez más alargado, por características de la pigmentación y por sus hábitos más restringidos.

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