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REDESCRIPTION OF *Gobulus myersi* (Pisces: Gobiidae)

Isaac Ginsburg described *Gobulus myersi* from a single specimen collected in 1885 at F/V ALBATROSS station 2374 (Ginsburg, 1939). He correctly listed the station location as 29°11'30"N, 85°29'W, but erroneously interpreted these coordinates as "Gulf of Mexico, off Cape Sable." These coordinates in fact lie 47 km SSW of Cape San Blas, Gulf County, Florida and are 530 km NW of Cape Sable, Monroe County, Florida. Thus the type locality of this species is the extreme northeastern Gulf of Mexico.

Subsequently, only three western Atlantic specimens referable to *G. myersi* have been reported: two specimens from off Venezuela (Cervigon, 1966) and one from the Bahamas (Böhlke and Chaplin, 1968). Recent dredge, trawl, and SCUBA efforts in the northeastern Gulf of Mexico have provided several specimens of *G. myersi* from near the type locality. As Ginsburg provided only a cursory description of the holotype, this study was undertaken to provide a more detailed description of this poorly known goby and to evaluate variation of this species in the western Atlantic.

Gobulus Ginsburg, 1933 can be distinguished from other western Atlantic gobiid genera by the presence of seven spines in the first dorsal fin, an indented pelvic fin, reverse countershading of the head and body (i.e., dark ventrally and light dorsally), and the absence of head pores and scales (Böhlke and Robins, 1968). A complete diagnosis of the genus is deferred to Hoese and Birdsong (in prep.).

METHODS AND MATERIALS

Measurements were made with dial

calipers according to standard methods for gobies (Böhlke and Robins, 1968) as emended by Hastings and Bortone (1981). Abbreviations of institutions cited are as follows: ANSP-Academy of Natural Sciences, Philadelphia; UA-University of Arizona, Tucson; UMML-University of Miami, Rosensteel School of Marine and Atmospheric Sciences; USAIC-University of South Alabama, Mobile; USNM-National Museum of Natural History, Washington, D.C.; UWF-University of West Florida, Pensacola.

The following description is based primarily on 24 recently collected specimens from the northeastern Gulf of Mexico (see Material Examined). The holotype agrees with this description in all essential aspects.

Gobulus myersi Ginsburg, 1939
Paleback goby
Figs. 1-2

Description

First dorsal fin with seven spines (Table 1), none filamentous. Second dorsal fin separated from first by about one-half to three-fourths diameter of eye. Second dorsal fin I, 9-10, last ray branched to its base (10-11 total elements). Anal fin I, 7-9, last ray branched to its base (8-10 total elements). Pectoral fins rounded, longest ray extends posteriorly to level of mid- or posterior spinous dorsal fin. Pectoral fins with 14-16 branched rays. Caudal fin rounded, with 7-9 upper and 6-8 lower branched rays (13-17 total branched rays). Pelvic fins I, 5; fifth ray well-developed, but shorter than fourth ray (Table 2). Fourth ray extends posteriorly to a vertical under anterior to mid-spinous dorsal fin. No interspinal frenum. Membrane connecting inner pelvic rays well-developed, typically about one-third to rarely one-half length of fifth pelvic ray.

Figure 1. *Gobulus myersi*. USAIC 02802, 20.9 mm SL male.

Body laterally compressed in caudal region, somewhat rounded in trunk region. Head dorsoventrally flattened and broad from orbits posteriad. Lower jaw inclined upward at about a 30 degree angle from the horizontal and projecting anteriorly just beyond upper jaw. Posterior margin of upper jaw extends to a vertical through mid-pupil. Rostral frenum absent. Eyes dorsally oriented; interorbit slightly wider than one-half eye diameter. Anterior nostril with a short tube (length equal to about one-third pupil diameter); posterior nostril with a raised rim. Pseudobranchiae in four tufts (5 specimens). Gill rakers on first arch short: 3 upper and 8-9 lower (5 specimens). Gill opening restricted to a vertical slit which extends from slightly above to slightly below pectoral-fin base. Genital papilla of males very short (length equal to about one-half pupil diameter) and slender; papilla of females low and globose. Cephalic sensory pores absent. Sensory papillae (epipores) numerous and well-developed (Fig. 2). Scales absent. Head and body with a thick mucous layer in some specimens.

Upper jaw with an outer row of evenly-spaced recurved canine teeth (6-14 per side) which diminish in size laterally. Medial to this outer row are two

to three rows of low pointed teeth anteriorly which taper to one or two rows laterally. Lower jaw with four rows of teeth anteriorly which taper to one or two rows laterally. Most teeth in lower jaw are pointed and low to moderate in size. Eight to ten teeth in outer row are slightly enlarged recurved canines. No teeth on vomer or palatines. Tongue tip rounded.

Head and body of preserved specimens (45 percent isopropanol) reverse countershaded. Entire head and body densely covered with chromatophores; most dorsal chromatophores contracted, ventral chromatophores expanded. Dark ventral coloration uniform and uninterrupted except at genital region; genital papilla and anus immaculate. Line demarcating light and dark regions extends from snout (just below anterior nostril) through middle of eye (iris uniformly black in preserved specimens but countershaded in life), across cheek, operculum, pectoral-fin base, and midline of body. Anterior pectoral-fin axil typically bicolored, but entirely dark in some specimens. This appears to be under individual control as one specimen with entire left pectoral axil dark (chromatophores on upper axil expanded) has a bicolored right axil

Table 1. Frequency distribution of total fin ray elements of *Gobulus myersi*. Pectoral fin ray counts are the total for both fins.

	Dorsal fin			Anal fin			Pectoral fin				
	First	Second		8	9	10	28	29	30	31	32
	VII	10	11								
Holotype (USNM 107283)	1		1			1			1		
NE Gulf of Mexico	24	10	14	2	10	12	3	1	15	4	1
Bahamas	1	1				1			1		
Puerto Rico*						1			1		
Lesser Antilles	3	1	2		1	2			3		
Venezuela	2		2			2			1		1

*Dorsal fin abnormal, see text.

(chromatophores on upper axil contracted). Reverse countershading, though consistently present, variable in intensity. Several specimens with a broad dark saddle at spinous dorsal-fin base. Some specimens with eight nearly equally-spaced dark dots on dorsal midline from nape to caudal-fin base. A row of ten dots extending from head to caudal-fin base evident on flank of some specimens. Proximal half of first and second dorsal and anal fins scattered with brown chromatophores; pigment absent from distal half of these fins. A dark-brown vertical crescent (broadened ventrally, tapered dorsally) at caudal-fin base. This crescent set off proximally by a light band which may extend across entire fin base but more often falls short of lower fin margin. Distally caudal fin with few or no chromatophores. Pectoral fin of most specimens similarly colored: a dark-brown crescent extending from lower fin margin and tapering to upper fin

margin. Some specimens lack this crescent but have an ill-defined blotch on central pectoral-fin rays. Distally pectoral fin with no pigment. Proximal portion of pelvic fins and median frenum scattered with chromatophores; distal portions with no pigment.

Living specimens and kodachromes of live and freshly killed individuals exhibit no bright coloration. The live color pattern is essentially as described above for preserved material except that the lower portion of the head and body is a darker brown, the upper portion is tan with a rust cast, the iris is bicolored, and the line demarcating the upper and lower pigmented regions is more distinct.

Variation

The northeastern Gulf of Mexico material encompasses the range of variation seen in meristic characters for other known western Atlantic specimens of *Gobulus* (Table 1), except for one specimen from Puerto Rico (ANSP 144500). This specimen has the first and second dorsal fins fused. It possesses VIII spines followed by 11 segmented rays (this exceeds the range for total dorsal elements of other western Atlantic *Gobulus* by one), but its condition appears abnormal.

The significance of morphometric variation in small fishes is clouded by problems of specimen preservation and

Figure 2. Diagrams of sensory papillae distribution in *Gobulus myersi* (USAIC 02802). Papillae are enlarged slightly. A) lateral view; B) dorsal view of head; C) ventral view of head.

Table 2. Morphometric data from 23 northeastern Gulf of Mexico specimens of *Gobulus myersi* expressed as thousandths of the standard length. SD = standard deviation.

	Mean	Range	SD
Standard length	22.4 mm	15.4-29.3 mm	4.6
Head length	299	284-315	9.7
Eye diameter	67	57- 82	7.2
Snout length	58	52- 65	3.6
Upper jaw length	108	97-119	5.5
Width between mandible tips	100	87-120	9.9
Head width	185	140-208	16.2
Head depth at occiput	109	100-127	8.0
Head depth at preoperculum	149	127-170	12.6
Body depth at first dorsal fin origin	155	132-203	18.2
Body depth at anal fin origin	132	123-143	5.4
Caudal peduncle depth	96	90-108	7.9
Predorsal length	397	381-412	9.2
Preanal length	638	619-655	9.9
Caudal fin length	253	236-274	9.1
Pectoral fin length	221	189-253	15.2
Pelvic fin:			
Length of spine	70	62- 78	5.2
Length of first ray	99	90-111	5.8
Length of second ray	129	115-152	10.3
Length of third ray	154	138-177	10.8
Length of fourth ray	176	154-202	14.8
Length of fifth ray	124	112-138	8.6

data collection (Stephens, 1963). The northeastern Gulf of Mexico material of *G. myersi* varies greatly in some characters (Table 2). This variation may be attributable to either poor preservation or difficulty in taking measurements for a number of characters (e.g., head width, head and body depth). However, variation in some characters is attributable to negative allometry. These characters include head length (correlation coefficient, r , for SL versus head length in thousandths of SL = -0.83 ; critical value of r at 0.01 level = 0.53 with 21 degrees of freedom), predorsal length ($r = -0.66$), eye diameter ($r = -0.68$), pectoral-fin length ($r = -0.69$), and pelvic-fin length (r for fourth ray = -0.93).

The non-Gulf material of *Gobulus* falls within the range of morphometric variation of Gulf specimens except that the Bahama specimen (ANSP 98572) has a notably longer pelvic fin (fourth ray 229 thousandths of SL) and the Puerto Rico

specimen (ANSP 144500) has a shorter predorsal (335, possibly associated with the abnormal dorsal-fin configuration of this specimen). The non-Gulf specimens are similar in coloration to that described above. In summary the absence of significant variation in the available material indicates that a single widespread species of *Gobulus* is present in the western Atlantic. This stands in contrast to the presence of three species in the eastern Pacific (Hoese and Birdsong, in prep.).

Relationships

Gobulus myersi appears to be most closely related to the eastern Pacific *Gobulus crescentalis* as both species possess a robust body, large eye, and similar coloration, and lack an interspinal pelvic frenalum. *Gobulus hancocki* differs from these two species in that it has a more elongate body, a smaller eye, and a weakly developed interspinal frenalum. A third but as yet un-

named eastern Pacific species (Hoes and Birdsong, in prep.) was not examined in the present study.

Distribution and ecology.— Though poorly known, *G. myersi* is widespread in the tropical and subtropical western Atlantic. It is not uncommon at appropriate localities in the northeastern Gulf of Mexico and has been taken at the Bahamas, the Greater and Lesser Antilles, and the islands off Venezuela.

A number of specimens have been collected from the shell rubble regions (described by Hastings and Shipp, 1981) east of the Desoto Canyon in the northeastern Gulf of Mexico. Additional Gulf specimens have been collected on artificial reefs erected in the Florida Middle Grounds (D. Clarke, pers. comm.). Within the Gulf of Mexico, the species is known only from relatively deep water (27.5–47.6 m). Outside the Gulf it has been taken mainly from coral reefs at depths ranging from 4.6 to 27.4 m.

Observations of an aquarium-held individual from a shell rubble area of the northeastern Gulf (USAIC 02802) indicate that the light dorsal coloration of *G. myersi* closely approximates the color and pattern of the rubble and associated encrusting fauna. As this individual rested within rubble placed in the aquarium, its ventral outline was obscured by the resemblance of the dark ventral portion of its head and body to shadows within the rubble. This species' striking reverse countershading apparently serves a cryptic function.

MATERIAL EXAMINED

Gobulus myersi. Northeastern Gulf of Mexico: USNM 107283, 27 mm SL male, holotype, 47 km SSW Cape San Blas, Gulf Co., Florida, 29°11'30"N, 85°29'W, F/V ALBATROSS sta. 2374, 7 Feb. 1885, 47.6 m; UWF 3473, 7(15.9–19.7),

29°84'N, 86°03'30"W, 4 June 1974, 39.6 m; UWF 1470, 1(17.3), 29°49'54"N, 86°05'06"W, 19 Oct. 1975, 36.6 m; USAIC 02802, 2(20.9–20.9), 29°50'N, 86°05'30"W, 8 Feb. 1976, 36.6 m; USAIC 05023, 1(24.5), 28°34'N, 84°20'W, 30 Aug. 1977, 36.6 m. Uncat. 13(15.4–29.3) 28°32'15"N, 84°18'38"W, Florida Middle Grounds, between 19 Oct. 1978 and 3 July 1979, 27.5 m. Bahamas: ANSP 98572, 1(15.3), Grand Bahama Island, 10 July 1959, 21.3 m. Puerto Rico: ANSP 144500, 1(28.2), La Parguera, 8 Feb. 1977, 7.6 m. Lesser Antilles: ANSP 112758, 1(16.5), Anguilla Island, 17 July 1965, 16.8–18.3 m; ANSP 126181, 1(17.9), St. Barthelemy, 13 July 1965, 4.6 m; ANSP 108752, 1(16.5), St. Barthelemy, 14 July 1965, 25.9–27.4 m. Venezuela: UMML 24462, 2(24.9–26.9), Los Testigos Island, 10 July 1961, 6.1–9.2 m. *Gobulus crescentalis*: UA 70-44-1, 1(36.5), Gulf of California, Bahía San Augustin; UA 71-23-6, 1(33.2), Gulf of California, Puerto Peñasco. *Gobulus hancocki*: UA 70-51-2, 1(24.5), Gulf of California, Cabo San Lucas.

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