Zootaxa 3755 (5): 491–495
www.mapress.com/zootaxa/

Article

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

http://dx.doi.org/10.11646/zootaxa.3755.5.9
http://zoobank.org/urn:lsid:zoobank.org:pub:96AA169A-0FB4-4475-BB99-559FC2EBA860

Gymnoxenisthmus tigrellus, new genus and species of gobioid fish from the Red Sea (Gobioidei: Xenisthmidae)

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Abstract

Gymnoxenisthmus tigrellus is described from the 15.2 mm SL holotype collected from the Farasan Archipelago, southern Red Sea. It is distinguished from other xenisthmid genera in having the following combination of characters: head pores absent; no scales; first dorsal fin with five spines; at least some dorsal-, anal- and pectoral-fin rays branched; pelvic fin with a spine and five unbranched rays. Evaluation of available (mostly external) characters suggests the new genus is the sister group of a clade consisting of *Rotuma*, *Tyson* and *Allomicrodesmus*.

Key words: Indo-Pacific, systematics, taxonomy, morphology

Introduction

The Xenisthmidae is a family of small (mostly less than 25 mm SL), very secretive fishes that live in sand patches adjacent to coral reefs or reef rubble throughout the Indo-Pacific. The family includes five genera: *Allomicrodesmus* Schultz in Schultz *et al.* 1966, *Paraxenisthmus* Gill & Hoese 1993, *Rotuma* Springer 1988, *Tyson* Springer 1983, and *Xenisthmus* Snyder 1908 (of which *Gignimentum* Whitley 1933, *Luzoneleotris* Herre 1938, *Platycephalops* Smith 1957, and *Kraemericus* Schultz in Schultz *et al.* 1966 are synonyms). Several synapomorphies distinguish xenisthmids from other gobioid fishes and support monophyly of the family (although only the first has been confirmed in the poorly known genus *Allomicrodesmus*): lower lip with uninterrupted, free ventral margin; basibranchial 2 absent; premaxillary ascending processes greatly reduced; rostral cartilage ossified; and hypobranchial 3 reduced to small cartilage nubbin or absent (Springer 1983, 1988; Gill & Hoese 1993). During fieldwork in February of 2012 in the Farasan Archipelago, Red Sea, a single gravid female of a distinctive, scaleless xenisthmid was collected by the second author from a reef slope at a depth of 8 m. The specimen could not be assigned to any known xenisthmid genus, and we therefore describe it herein as a new genus and species.

Material and methods

Methods of counting and measuring follow Winterbottom and Gill (2006). Where counts were recorded bilaterally from the holotype, both counts are given and separated from each other by a slash; the first count presented is the left count. Osteological details were determined from a radiograph. The holotype is deposited in Senckenberg Museum, Frankfurt (SMF). Comparisons with other xenisthmids are based on specimens amassed by the first author for an upcoming revision of the Xenisthmidae, and by details provided in the following publications: Springer (1983, 1988), Gill and Hoese (1993, 2004), Gill and Randall (1994) and Winterbottom and Gill (2006).

Accepted by W. Holleman: 12 Dec. 2013; published: 24 Jan. 2014

Gymnoxenisthmus, new genus

Type species. *Gymnoxenisthmus tigrellus*, new species.

Diagnosis. The following combination of characters distinguishes *Gymnoxenisthmus* from other xenisthmid genera: head pores absent; scales lacking; first dorsal fin with five spines; dorsal- and anal-fin rays branched; at least some pectoral-fin rays branched; pelvic fin with a spine and five unbranched rays.

Comparisons. Characters distinguishing xenisthmid genera are summarised in Table 1. The genus is most similar to *Paraxenisthmus* and *Xenisthmus* in general body form, in most meristic details, and in having dorsal-and anal-fin rays and at least some pectoral-fin rays branched. It differs from *Paraxenisthmus* in lacking laterosensory pores on the head, vomerine and palatine teeth, and scales, and in having only five (versus six) spines in the first dorsal fin and a relatively broad (versus narrow) proximal head on the third branchiostegal ray. It differs from *Xenisthmus* in lacking scales, laterosensory pores on the head, and developed gill rakers (though tiny rudiments are present), and in having only five (versus six) spines in the first dorsal fin, a narrower proximal head on the third branchiostegal ray (see Remarks below), and in having only unbranched rays in the pelvic fins (versus anterior four segmented rays branched in *Xenisthmus*). *Gymnoxenisthmus* might also be confused with *Rotuma*, with which it shares the following characters: first dorsal fin with five spines; pelvic fins with a spine and five unbranched segmented rays, the inner of which is vestigial; no head pores; and no scales. It is readily distinguished from *Rotuma* in having branched (versus unbranched) dorsal-, anal- and pectoral-fin rays, a relatively broad (versus narrow) proximal head on the third branchiostegal ray; autogenous anterior and posterior ceratohyals (versus a single ceratohyal ossification present); and more segmented rays in second dorsal and anal fins (13 and 12, respectively, versus 9 in both fins).

Remarks. Gill and Hoese (1993) hypothesised the following relationships among xenisthmid genera: (*Paraxenisthmus* (*Xenisthmus* (*Rotuma* + *Tyson* + *Allomicrodesmus*))). Character evidence for these relationships was in part from osteological characters, which have not yet been verified in *Allomicrodesmus*. We similarly lack detailed osteological information for *Gymnoxenisthmus*. Considering those characters that can be observed in the two genera, evidence supports placement of *Gymnoxenisthmus* in a clade that also includes *Rotuma*, *Tyson* and *Allomicrodesmus* (synapomorphies: five or fewer spines in first dorsal fin; sensory pores absent; scales absent; fifth segmented pelvic-fin ray vestigial or absent). Within this clade, *Rotuma*, *Tyson* and *Allomicrodesmus* in turn form a clade that excludes *Gymnoxenisthmus* (synapomorphies: all segmented second dorsal-fin rays unbranched; all segmented anal-fin rays unbranched; all pectoral-fin rays unbranched; ceratohyals represented by a single ossification). Contrary to these relationships, *Gymnoxenisthmus* shares a possible synapomorphy with *Xenisthmus*: enlarged proximal head on third branchiostegal ray. Gill and Hoese (1993) noted that *Xenisthmus* species differ from other xenisthmids in having a very broad proximal head on the third branchiostegal ray (see Springer 1983: fig. 9), which they interpreted as an autapomorphy of the genus. The proximal head of the third branchiostegal ray is also enlarged in *Gymnoxenisthmus*, but not to the same extent as in *Xenisthmus* species (slightly broader than the proximal head on the fourth ray in *Gymnoxenisthmus*, versus about twice the width of the fourth ray in *Xenisthmus* species). More detailed phylogenetic analysis must await more complete osteological studies of *Gymnoxenisthmus* and *Allomicrodesmus* (which in turn are dependent on the discovery of additional specimens of both genera for osteological preparation).

Etymology. The generic name is a combination of the Greek *gymnos*, meaning bare or naked, and the gobioid genus *Xenisthmus*, and alludes to the absence of scales on the body. Gender is masculine.

Gymnoxenisthmus tigrellus, new species

Figure 1, Table 1

Holotype. SMF 34903, 15.2 mm SL, gravid female, Red Sea, Saudi Arabia, Farasan Archipelago, unnamed island, 16°47.451'N 042°11.838'E, coll. S.V. Bogorodsky & T. Alpermann, 22 February 2012.

Diagnosis. As for genus.

Description. Dorsal-fin rays V + I,13, all segmented rays branched; first dorsal-fin pterygiophore formula 3-2210; anal-fin rays I,12, all segmented rays branched; pectoral-fin rays 15/15, upper 2/2 and lower 1/1 rays

unbranched; pelvic-fin rays I,5, all segmented rays unbranched, inner ray vestigial; segmented caudal-fin rays 9 + 8; branched caudal-fin rays 6 + 6; upper unsegmented caudal-fin rays 6; lower unsegmented caudal-fin rays 6; total caudal-fin rays 29; no developed gill rakers (about 6 tiny rudiments present on upper part of ceratobranchial 1); vertebrae 10 + 16; epurals 2.

TABLE 1. Comparison of selected characters of xenisthmid genera. * indicates where data are included from undescribed species.

	Paraxenisthmus	*Xenisthmus**	*Gymnoxenisthmus*	*Rotuma*	*Tyson*	*Allomicrodesmus**
Scales	present	present	absent	absent	absent	absent
D1	VI	VI	V	V	absent	II
D2	I,11–12	I,11–15	I,13	I,9	I,8–9	29–33
Segmented D2 rays branched	yes	yes	yes	no	no	no
A	I,10	I,10–14	I,12	I,9	I,8–9	23–26
A rays branched	yes	yes	yes	no	no	no
Pectoral	15–18	15–18	15	16	17–21	10–12
Pectoral rays branched	yes	yes	yes	no	no	no
Pelvic	I,5	I,5	I,5, inner ray vestigial	I,5, spine and inner ray vestigial	1	3 or absent
Pelvic rays branched	no	yes, outer 4	no	no	no	no
Segmented C rays	9 + 8	9 + 8	9 + 8	9 + 8	8 + 7	8 + 7
Upper unsegmented C rays	7–8	6–9	6	6	8–9	7
Lower unsegmented C rays	7–8	5–9	6	6	9	6–7
Vertebrae	10 + 16	10 + 16–17	10 + 16	11 + 15	13 + 13	17 + 26–28
Epurals	2	2	2	1	1	?
Head pores	present	present	absent	absent	absent	absent
Vomerine teeth	present	absent	absent	absent	present	absent
Palatine teeth	present	absent	absent	absent	absent	absent
Gill rakers	absent	at least some developed, 2–4 + 8–14 = 10–17	no developed rakers, about 6 tiny rudiments on upper part of ceratobranchial 1	absent, but tiny teeth present	absent	absent
Anterior and posterior ceratohyals	autogenous	autogenous	autogenous	undifferen-tiated	undifferen-tiated	undifferentiated
Proximal head on 3rd branchiostegal	narrow	very broad	broad	narrow	narrow	narrow

As percentage of SL: head length 28.3; predorsal length 39.5; prepelvic length 29.6; preanal length 60.5; first dorsal-fin origin to second dorsal-fin origin 17.1; second dorsal-fin base length 30.9; anal-fin base length 25.7; pectoral-fin base depth 6.6; first dorsal-fin origin to pelvic-fin origin 17.1; second dorsal-fin origin to anal-fin origin 13.2; snout length 5.9; orbit diameter 7.2; head width 14.5; body width 13.2; bony interorbital width 1.3;

snout tip to retroarticular tip 13.2; caudal-peduncle length 15.1; caudal-peduncle depth 9.2; length of first spine of first dorsal fin 12.5; length of third spine of first dorsal fin 14.5; length of spine of second dorsal fin 9.2; length of first segmented ray of second dorsal fin 10.5; length of last segmented ray of second dorsal fin 11.8; anal-fin spine length 7.2; length of first segmented anal-fin ray 8.6; length of last segmented anal-fin ray 13.2; pectoral-fin length 21.7; fourth segmented pelvic-fin ray length 23.0; caudal-fin length 18.4, ray possibly regrown (longest mid-ray on lower hypural 23.7).

Scales absent; laterosensory head pores absent; lower lip fleshy and protruding, with uninterrupted, free ventral margin; anterior naris in short tube (abnormally branched on left side); posterior naris without raised rim or membranous flap; tongue tip rounded; gill opening extending anteriorly to vertical through about midpoint between preopercle edge and eye.

FIGURE 1. *Gymnoxenisthmus tigrellus*, holotype, SMF 34903, 15.2 mm SL, gravid female, Farasan Archipelago, Red Sea. Photo by Sven Traenkner.

Upper jaw with 2 or 3 (anteriorly) to 2 (posteriorly) rows of slightly curved conical teeth; lower jaw with 2 or 3 (anteriorly) to 2 (posteriorly) rows of slightly curved conical teeth; vomer and palatine edentate.

Live coloration (based on colour photograph of holotype when freshly dead; Figure 1): head and body translucent bluish grey; body with fourteen equally spaced, mid-lateral orange markings (first a spot just anterior to pectoral-fin base; second a short bar just behind pectoral-fin base; third a chevron below anterior part of first dorsal fin; fourth a chevron below posterior edge of first dorsal fin; fifth a chevron through space between dorsal fins; sixth a chevron through first segmented ray of second dorsal fin; seventh a bar through third segmented ray of second dorsal fin; eighth a bar through fifth segmented ray of second dorsal fin; ninth a bar through seventh and eighth segmented rays of second dorsal; tenth a bar through tenth segmented ray of second dorsal fin; eleventh through base of last second dorsal-fin ray; twelfth and thirteenth bars slightly oblique and less distinct, through caudal peduncle; fourteenth a narrow, short bar along posterior edge of hypurals); small, indistinct pale orange or yellow spots present between most midlateral orange bars and spots; scattered melanophores present on head and body, mostly confined to orange areas; head with orange stripe extending from mid-upper part of upper lip to upper half of eye, then from behind eye to point above upper edge of preopercle, with large (almost pupil-sized) orange spot near edge of opercle; second, oblique orange stripe extending from just behind and below eye to middle of operculum; isolated orange spot on anterior part of operculum, between two orange stripes; lower lip orange; orange “L”-shaped marking on cheek extending from just below anterior margin of eye, with bottom of “L” extending along lower cheek edge; iris mostly orange on dorsal two-thirds, remainder pale yellow to pale gold; pectoral-fin base orange anteriorly and dorsally, with two pale orange spots, one on mid-upper and the other on mid-lower part of fin base; first dorsal fin with first spine base orange; remainder of fin translucent on outer third, followed proximally with silvery white stripe, orange stripe, and silvery white basal stripe; scattered melanophores on first dorsal, these densest over orange stripe; second dorsal fin orange (basally) to dusky orange (distally), with narrow (anteriorly) to broad (posteriorly) distal margin translucent; orange bars from body extending on to fin base; silvery white stripe through middle of fin, with a basal series of short, silvery white oblique bars that extend anterodorsally from between orange bars from body; a few scattered silvery white spots present on translucent part of fin; anal fin translucent with narrow indistinct dusky orange stripe through basal third to half of fin, indistinctly bordered basally with silvery white spots (anteriorly) and stripe (posteriorly); caudal fin mostly translucent, with

two large indistinct pale grey-orange spots on basal part of fin, one dorsal and the other ventral; pectoral and pelvic fins translucent.

Preserved coloration: head and body generally pale beige, greyish brown on lower abdomen; melanophores within orange bars on body remain, though indistinct and confined to midside and upper half of body; melanophores within orange areas on lips, upper stripe on head and upper half of pectoral-fin base remain; orange markings on first dorsal fin become dark grey; orange markings on second dorsal and anal fins remain, becoming dark grey-brown.

Etymology. The specific epithet is from the Latin, meaning a little tiger, alludes to the orange bars on the body. The name was selected by school children at the Australian Museum Science Festival Expo in August 2013.

Habitat. The holotype was collected from an unnamed rocky island with a narrow reef flat, and a slope with patches of corals and a rocky wall of about 3m with small caves and shelters. The sandy slope began at depths of 8–10 m; the holotype was collected on sand at the base of coral in 8 m.

Acknowledgements

This study was conducted as part of the scientific research cooperation between the Faculty of Marine Sciences (FMS), King Abdulaziz University (KAU), Jeddah, Saudi Arabia, and the Senckenberg Research Institute (SRI), Frankfurt, Germany, in the framework of the Red Sea Biodiversity Project, and was funded by KAU GRANT NO. "D/1/432-DSR". The authors acknowledge, with thanks, KAU and SRI for technical and financial support. The second author thanks Fareed Krupp (SMF) for facilitating the field work and T. Alpermann for his comprehensive help. The first author's studies on xenisthmids were initially supported by a Smithsonian Postdoctoral Fellowship under the supervision of V.G. Springer and G.D. Johnson. The first author is grateful to the 850 students that contributed to the naming of the new species at the Australian Museum Science Festival Expo, and to the organisers of the event. Also at the Australian Museum, we thank J. King for the radiograph of the holotype, and M. McGrouther for accommodating specimen loans.

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