MEDITERRANEAN FISH—*GAMMOGOBIUS STEINITZI* BATH, 1971 (ACTINOPTERYGII: PERCIFORMES: GOBIIDAE)—A NEW REPRESENTATIVE OF THE BLACK SEA ICHTHYOFAUNA

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Abstract. *Gammogobius steinitzi* Bath, 1971, a goby species endemic to the Mediterranean Sea, was observed for the first time in the Black Sea in marine caves of western Crimea (Tarkhankut, Ukraine). A description of the morphological and ecological characteristics is given on the basis of the analyses of 5 specimens. The morphological and ecological characteristics of the Black Sea specimens do not differ from the Mediterranean ones.

Keywords: Tarkhankut, marine caves, Gobiidae, Steinitz's goby, new record, morphological characteristics

Gobiidae is one of the most numerous families of the order Perciformes. It has at least 1950 valid species, representing 210 genera. Gobiids are distributed in tropical and temperate latitudes of the northern and southern hemispheres from the intertidal zone to a depth of 200 m (Nelson 2006). In terms of the number of species, gobies represent 10%–12% of the Mediterranean ichthyofauna (Quignard and Tomasini 2000, Manilo 2011). Over the last decade, as a result of comprehensive research in all regions of the oceans, the number of representatives of this family has greatly increased.

In the Black Sea, there are 30 species and sub-species of gobies, comprising about 17% of the marine ichthyofauna (Manilo 2011). A number of representatives of Mediterranean ichthyofauna have appeared in the coastal zone of the Crimea during the last ten years, which has led to an increase in the specific diversity of the Gobiidae family in the Black Sea (Boltachev and Yurahno 2002, Boltachev et al. 2009, Boltačёv et al. 2010, Boltačёv and Karpova 2010).

All gobies in the Black Sea, that have been studied, are inhabitants of open coastal waters. The composition of underwater caves and grotto ichthyocenoses—an element of the shelf zone along the coast of the Crimea—have been poorly studied to date. The presently reported study has been encouraged by:

Recent discoveries of small, rare goby fish in underwater caves previously not recorded from Ukraine and the Black Sea (Kovtun and Pronin 2011, Kovtun 2012) and

Discoveries of rare species, which were described for the Black Sea but their presence was considered doubtful (Manilo 2008–2009, Kovtun 2013). Morphological and ecological characteristics of these fish have not yet been described in the scientific literature.

The main purpose of this paper is to describe external morphological features of the Steinitz's goby, *Gammogobius steinitzi* Bath, 1971—newly identified by the present authors in the Black Sea, inhabiting marine caves of Cape Tarkhankut (the Black Sea, western Crimea, Ukraine).

Fish sampling from marine caves of the western Crimea was performed within June and August of three consecutive years (2010, 2011, and 2012). During the study period five specimens of *Gammogobius steinitzi* were captured.

The fish were caught with a small landing net, while diving in the caves and were fixed in 10% formalin solution. Due to the small size of the specimens, all measurements were performed using an electronic callipers (to the nearest 0.1 mm) under a binocular dissecting microscope (MBS-9). Additionally, meristic counts were performed.

For a clearer display of genipore rows, the front part of the goby body was first thoroughly washed to remove the fixing liquid; it was then immersed into 50% solution of azure-eosin and dried gently. The usage of this dye greatly facilitated genipore counting.

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The location and proper labelling of the cephalic lateral line canals with pores of small and large, transverse and longitudinal genipore rows, were presented in accordance with the work of Sanzo (1911) and Miller (1986).

We filmed our underwater explorations with a 3CCD video camera Sony TRV900e, after which colour photo-images and data on the behaviour and ecology of the species were analysed. To define and clarify identification of the fish to species level, we used a number of taxonomic keys and other published sources. The principal ones were Bath (1971), Miller (1986), Kovačić (1999, 2008), Scsepka and Ahnelt (1999).

The following symbols and abbreviations were used: TL = total body length, SL = standard body length, *H* = height of the body to the base of the first dorsal fin, *h* = height of the caudal peduncle, *hA* = height of the body at the beginning of anal fin, aD_1 = distance from the beginning of the upper lip to the base of the first dorsal fin, aD_2 = distance from the upper lip to the base of the second dorsal fin, *aP* = distance from the upper lip to the beginning of the pectoral fin, *aV* = distance from the upper lip to the base of the ventral sucker, *aA* = distance from the upper lip to the beginning of anal fin, *aa* = distance from the beginning of the upper lip to the anus; *pD* = distance from the base of the second dorsal fin to the base of the middle caudal fin rays, lD_1 = length of the base of the first dorsal fin, hD_1 = height of the first dorsal fin, lD_2 = length of the base of the second dorsal fin, hD_2 = height of the second dorsal fin, *lA* = length of the base of the anal fin, *hA* = height of the anal fin, *lP* = length of the pectoral fin, *lpc* = length of the caudal peduncle from the vertical end of the anal fin to the base of the middle caudal fin rays, *lV* = length of the ventral sucker, *V-an* = length of the belly from the base of the ventral sucker to the anus, *c* = length of the head from the start of the upper lip to the upper corner of the vertical gill operculum, *wc* = head width on the spin between the beginning of the gill slits, *hc* = height of the head through the centre of the eye, *Hc* = height of the head at the end of the gill operculum, *r* = length of the snout from the beginning of the upper lip to the front edge of the eye, *lmx* = length of the branch of the upper jaw, *o* = horizontal diameter of the eye, *po* = postorbital distance from the rear edge of the eye to the upper corner of the gill operculum, *pro* = preorbital distance (the shortest distance on the side of the head between the upper lip and the eye), *io* = interorbital distance.

The following meristic characters were also calculated: D_1 = the number of rays in the first dorsal fin, D_2 = the number of rays in the second dorsal fin, *A* = the number of rays in the anal fin, *P* = the number of rays in the pectoral fin, *V* = the number of rays in the ventral fin; *Squ* = the number of longitudinal rows of scales, *TR* = the number of transverse rows of scales.

GOBIIDAE

Gammogobius steinitzi Bath, 1971

Material examined. Ichthyological collection of the Zoological Museum of the National Museum of Natural History of the National Academy of Sciences of Ukraine, No. 9261, 5 specimens. (♀ 2, ♂ 3), Ukraine, Crimea, Chernomorsky district, Cape Tarkhankut, “Maly Atlesh”, marine karst caves, Black Sea, 08.2012, landing net , collector O.A. Kovtun.

Description. Body elongate and slightly compressed laterally (Fig. 1). Anterior part of body (including all head) mostly scaleless. Small part of middle and posterior body covered with ctenoid scales. Several rows of cycloid scales located at base of pectoral fin and on ventral side towards anus. Head large, somewhat pointed, constituting ≤32.6% SL. Anterior end of head compressed in dorso-ventral plane. Head width (from beginning of gill operculum along dorsal side) approximately equal to its height. Back muscles extending to posterior edge of eye. Lower jaw protruding; eyes large, oval, shifted to upper profile of head, and positioned close to each other (Fig. 2a). Front Nostrils short, tubular, not reaching upper lip in pressed position and without outgrowths from rear edge. Rear nostrils rounded, larger than front ones. Interorbital distance very narrow, constituting 3.3%–4.4% of head length or 11.4%–15.6% of eye diameter (Fig. 2a). Corners of mouth ending under front part of eye. Snout length smaller than eye diameter and constituting 23.7%–27.0% of head length. Eye diameter slightly larger then snout

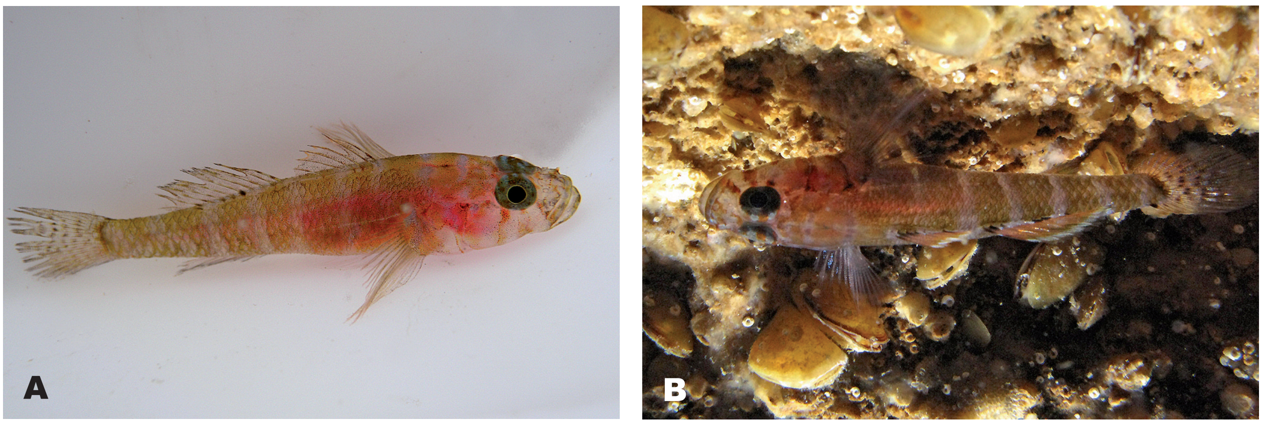

Fig. 1. *Gammogobius steinitzi* from a marine cave in western Crimea, Cape Tarkhankut, Ukraine; underwater photograph in a cave (depth of 5 m); **A** ♀, **B** ♂ (please note that the fish lives on the ceiling of the caves, in an up-side-down position with its belly facing the ceiling)

length, representing 27.1%–29.5% of head length. Mouth large, sloping upwards. Upper lip not extended laterally reaching behind anterior edge of eye. Ventral sucker oval, with well developed membrane, extending behind anus and beyond genital papillae (Fig. 2b). Anterior part of membrane usually with some slightly pointed lateral lobes. Ray tips of abdominal sucker protruding slightly beyond membrane (Fig. 2b). Pectoral fins large and oval, with their ends reaching vertical of beginning of second dorsal fin. Upper rays linked by membrane, with their tips slightly elongate and protruding. Two dorsal fins separate (Fig. 2c). First ray of first dorsal fin short. Base of second dorsal fin longer than that of anal fin. Beginning of anal fin behind anterior edge of second dorsal fin (in vertical projection). Caudal peduncle not flattened, with its height approximating 10.4%–11.8% of standard body length and its length constituting 22.9%–25.4% of standard body length. Caudal fin rounded (Fig. 2d).

The morphological characteristics of *Gammogobius steinitzi* are given in Table 1.

Seismosensory system. The terminology used was based on that proposed by Sanzo (1911) and Miller (1986). The frontal part of the oculoscapular canal (AOS) with all the large pores were well distinguished under a binocular microscope. The back part of the oculoscapular canal (POS), preopercular canal (POC), and infraorbital longitudinal row of papillae *a* are missing. There are seven transverse suborbital rows of papillae: four rows in front of-, two above-, and one below the longitudinal row of papillae *b*. The papillae rows 1, 2, 3, and 4 are placed in front of longitudinal papillae row *b*, rows 5*s* and *6s* are short, situated on the longitudinal papillae row *b*. The papillae row *6i* is above the longitudinal papillae row *b* and decreases behind longitudinal papillae row *d2*. The seventh row is represented by one papillae before the oculoscapular front pore α. The longitudinal papillae row *d* is intermittent, its anterior part d_1 is located along the rear edge of the upper lip, the posterior part of d_2 ends before the lateral infraorbital row *6i*. It should be noted that papillae rows can be divided into large, easily visible under a binocular microscope, and small ones, difficult to see. The first category includes, for example, lateral infraorbital rows, the second—rows: *g*, *o*, *m*, and *h* of the predorsal part and *e1, e2, f* of preopercular-mandibular part. The number of papillae in rows of the seismosensory system of *G. steinitzi* from different habitats is shown in Table 2.

Comparative notes. The Black Sea specimens have a bigger overall size, which distinguishes them from the fish from the northern part of the Mediterranean Sea and the Adriatic (TL, SL). The base of their first dorsal fin lD_1 is considerably longer. We found that antedorsal distance aD_1 and anteanal distance *aA* are slightly smaller than in specimens from the Mediterranean Sea and the Adriatic.

Our results confirm the data of Scsepka et al. (1999) on sexual dimorphism, which is manifested in the length of the belly *V-an* and the length of the upper jaw *lmx*. However, the length of the latter is somewhat longer than in specimens from the Mediterranean. This fact draws attention to the relative width of the head *wc* of the Black Sea fish

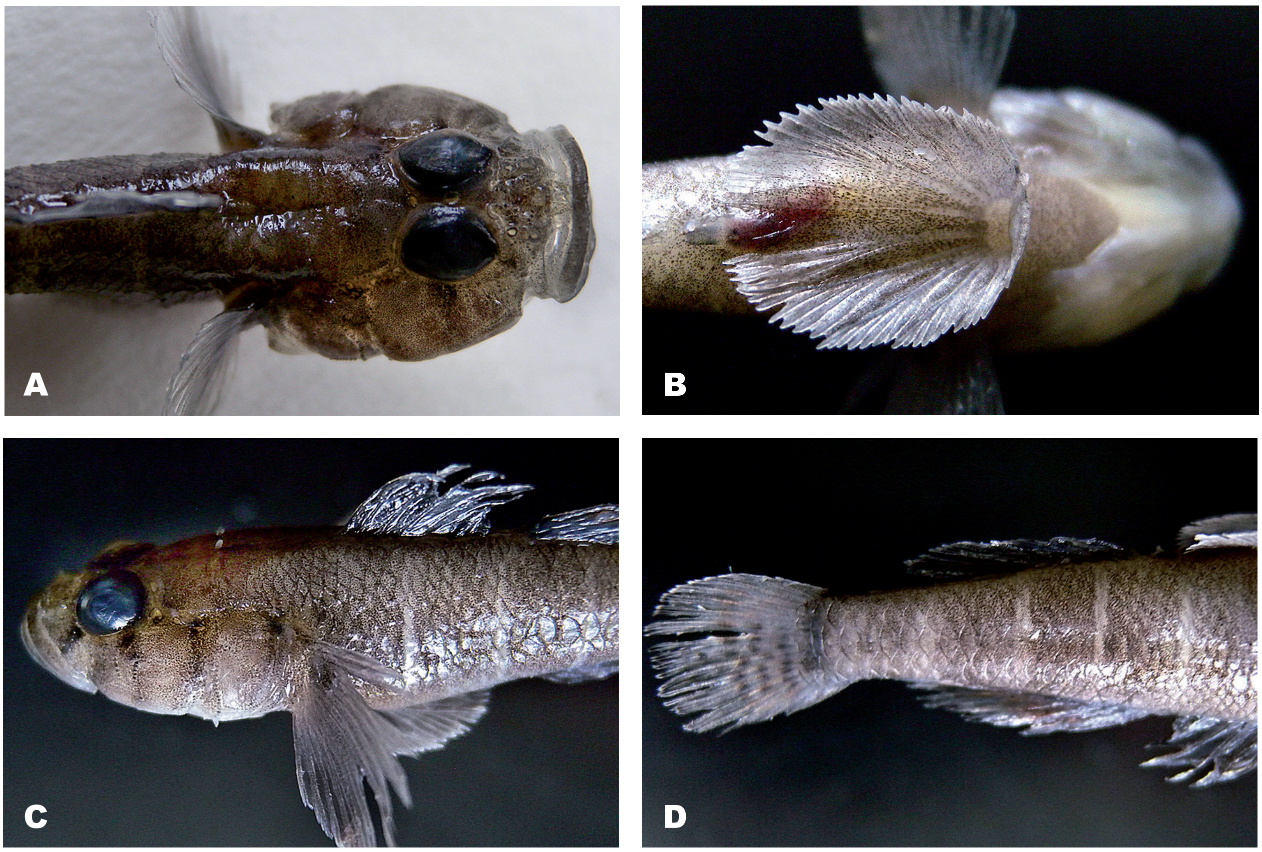

Fig. 2. Morphological details of *Gammogobius steinitzi* recovered from a marine cave in western Crimea, Cape Tarkhankut, Ukraine; **A** dorsal view, **B** ventral view (sucker), **C** lateral view, **D** posterior part of the body

Table 1

Body proportions and meristic characters of *Gammogobius steinitzi* from different habitats in the Mediterranean-, Adriatic-, and Black Seas

	Feature	Tarkhankut (this study)		Marseille	Ibiza				Giglio	Krk
		Males (*N* = 3)	Females (*N* = 2)	Males (*N* = 1)	Females (*N* = 4)		Females (*N* = 9)		Females (*N* = 1)	Females (*N* = 2)
					Range	M ± m	Range	M ± m		
[mm]	TL	44.9–53.2	45.5–46.4	—	—	—	—	—	—	—
	SL	37.1–43.3	36.5–37.4	26.5	25.1–36.3	—	21.7–30.9	—	33.9	24.8–26.2
[% SL]	*H*	20.1–22.6	19.2–21.4	—	—	—	—	—	—	—
	H	10.4–11.3	11.5–11.8	9.9	9.6–10.5	10.1 ± 0.4	8.9–10.2	9.5 ± 0.5	10.1	10.1–9.5
	hA	19.0–20.5	19.2–20.6	—	—	—	—	—	—	17.3–16.0
	aD_1	36.7–38.5	38.2–38.6	39.5	39.2–42.1	40.4 ± 1.1	40.1–42.7	41.4 ± 0.8	39.7	39.1–38.9
	aD_2	55.2–57.7	56.4–58.3	58	57.4–59.5	58.4 ± 0.8	57.7–60.9	59.1 ± 0.9	58.5	57.3–57.6
	aP	32.9–34.0	33.2–33.7	—	—	—	—	—	—	—
	aV	31.0–36.7	27.7–30.5	30.5	31.5–34.3	33.1 ± 1.1	31.9–33.5	32.7 ± 0.5	31.3	31.5–32.1
	aA	56.9–59.4	58.6–60.8	58.2	59.0–60.2	59.6 ± 0.5	59.5–62.2	60.7 ± 0.9	60.9	58.1–57.6
	aa	53.9–55.3	54.8–51.9	52.8	53.1–55.1	54.3 ± 0.7	54.1–56.9	55.7 ± 1.0	56.2	54.4–53.8
	pD	20.9–22.6	23.6–23.8	—	—	—	—	—	—	—
	lD1	17.8–19.4	15.9–19.8	13.1	11.3–11.9	11.6 ± 0.3	11.0–11.8	11.4 ± 0.3	11.8	14.9–15.7
	hD1	11.6–12.8	12.3–15.5	—	—	—	—	—	—	—
	lD2	21.7–22.4	21.1–23.5	21.1	18.0–20.8	19.8 ± 1.1	19.1–21.3	20.0 ± 0.6	19.8	23.4–23.3
	hD2	15.1–19.4	15.3–17.6	—	—	—	—	—	—	—
	lA	16.6–19.4	17.3–16.8	16.9	15,7–16.4	16.1 ± 0.3	14.6–15.6	15.4 ± 0.6	15.5	16.9–17.6
	hA	15.0–16.2	15.0–15.3	17.9	15.7–17.5	16.6 ± 0.7	15.2–16.6	15.8 ± 0.4	17.0	—
	lP	25.9–28.6	22.2–24.3	—	23.8–25.2	24.4 ± 0.6	24.9–27.6	26.7 ± 0.8	25.3	22.3–21.8
	lpc	22.9–25.4	24.6	—	—	—	—	—	—	25.0–24.8
	lV	24.3–26.3	26.5–27.4	23.6	23.1–25.4	24.4 ± 0.9	23.2–27.0	25.0 ± 1.1	25.9	23.0–22.9
	V-an	22.4–23.8	23.8–26.0	22.5	20.5–23.4	22.2 ± 1.1	21.9–25.1	23.7 ± 1.0	25.6	22.6–21.8
	C	31.4–32.6	31.2–31.6	30.8	30.2–33.7	32.6 ± 1.6	31.0–33.6	32.3 ± 0.7	33.5	31.9–32.1
	wc	14.3–15.9	15.3–14.7	13.9	12.4–14.4	13.3 ± 0.8	11.8–14.7	13.0 ± 0.8	13.8	21.0–22.1
[% *c*]	*wc*	44.3–48.8	46.6–49.1	45.0	38.2–45.4	41.0 ± 3.0	36.7–43.7	40.1 ± 2.3	41.1	65.8–69.1
	hc	43.8–47.8	43.9–43.2	—	—	—	—	—	—	—
	Hc	61.5–68.4	56.1–61.0	—	—	—	—	—	—	—
	R	25.6–27.0	23.7–24.6	30.4	27.7–31.3	29.1 ± 1.3	28.5–31.0	29.8 ± 0.8	30.6	31.7–31.0
	lmx	39.7–40.4	40.4–40.7	36.8	34.0–39.7	37.1 ± 2.0	33.1–36.6	35.2 ± 1.1	36.6	–
	O	28.9–29.5	28.1–27.1	29.1	27.4–30.8	28.7 ± 1.3	27.7–32.1	29.7 ± 1.4	27.3	24.1–25.0
	po	44.6–48.4	49.1–45.8	42.5	40.9–45.9	43.9 ± 2.0	41.1–46.3	42.8 ± 1.9	46.2	44.3–44.1
	pro	10,7–14.0	10.7–12.7	—	—	—	—	—	—	—
	Io	3.3–4.4	4.3–3.4	—	—	—	—	—	—	—
[% *o*]	*Io*	11.4–15.0	15.6–12.5	15.1	11.1–15.9	13.0 (1.8)	9.1–14.4	11.7 (2.0)	14.8	14.3–15.0
Meristic characteristics	*D1*	VI	VI	VI	VI				VI	VI
	D2	I/8–I/9	I/9	—	I / 8–9				I / 8	I / 8
	A	I/8–I/9	I/7–I/8	—	I / 8				I / 8	I / 8
	P	15–16	16–17	—	15–17				16	15
	V	I / 5	I / 5	I / 5	I / 5				I / 5	I / 5
	Squ	31–32	31–32	—	31–37				34	30 / 32
	TR	10–11	10–11	—	9–11				9–11	10–11

Data for Marseille from Bath 1971; Data for Ibiza and Giglio from Scsepka and Ahnelt (1999); Data for Krk from Kovačić (1999); M ± m = mean value ± standard error of the mean.

Table 2

The number of papillae in the rows of the seismosensory system for *Gammogobius steinitzi* from different habitats in the Mediterranean-, Adriatic-, and Black Seas

Feature		Tarkhankut (this study)				Ibiza				Giglio		Krk	
		Males (*N* = 3)		Females (*N* = 2)		Males (*N* = 2)		Females (*N* = 8)		Females (*N* = 1)		Females (*N* = 2)	
SL [mm]		37.1–43.3		36.5–37.4		28.0–35.8		21.7–25.8		33.9		24.8–26.2	
		L	R	L	R	L	R	L	R	L	R	L	R
PO	*r*	4–3	3–4	4–5	4	3–5	3–5	3–4	4–5	5	6	3	4
	s^1	4–3	4–3	4–3	4	4–5	3–5	3–5	3–5	4	4	3–4	3–4
	s^2	4–3	3–5	3	4	4–5	4–6	4–6	3–5	5	6	3	3
	s^3	4	3–4	3	3	5	4–5	3–4	3–5	4	6	3	3
	c^2	5–4	5–4	6–5	6	6–7	5–10	6–8	6–8	11	9	2–3	3
	c^1	3–4	3–5	3	3–4	4	4	3–4	2–4	3	4	3	3
	c_2	6–7	6–5	7–6	7–8	7	6	5–7	5–7	7	7	X	X
	c_1	3–2	2–3	2	2	2	3	2–3	2–3	3	3	5	6–5
SO	*1*	5–6	6–5	7–6	6–5	7–9	7–9	6–8	5–9	11	10	6	6
	2	9–6	8	9–8	8–7	8	8	5–10	5–9	9	9	7–6	6–8
	3	8–5	9–5	8	8–7	7–9	7–9	5–9	4–9	9	8	7	6–7
	4	9–7	10–7	8–5	7–6	9	8–9	5–10	6–10	9	10	8	8
	5s	5–4	4–3	4–5	5–4	4–6	4–5	3–7	3–5	7	7	4	4
	6s	7–5	7–5	6–5	5–4	5–6	4–6	5–8	4–7	7	8	5–4	5–7
	6i	12–10	12–11	11–10	10–9	10–12	10–11	4–15	8–13	10	11	10	11–10
	7	1	1	1	1	1	1	1	1	1	1	1	1
	b	9–10	11–9	10–9	9	9–11	8–10	6–11	6–9	11	10	10–8	9
	d1	11–9	13–11	11–12	13–11	9–12	9–11	8–12	7–13	12	13	X	X
	d2	11–9	12	12–11	12–11	11–12	10–11	8–14	9–13	13	12	X	X
PM	*e1*	20–25	25–23	18–19	20–19	19–20	19–20	16–26	15–25	27	25	X	X
	e2	23–24	24–26	22–24	23–24	22–23	20–22	18–23	19–24	24	24	X	X
	i1	8	7–6	8–7	7–8	9–10	9–11	9–12	7–11	10	9	X	X
	i2	7–8	8–7	8–9	8	9	9	8–10	8–10	9	9	X	X
	f	8–12	12–10	10–9	9–10	10	9–10	9–14	8–15	10	11	8–13	8–12
OS	*x1*	12–9	12–10	8	8–10	9–11	10–12	9–10	8–11	11	11	9–7	10–7
	x2	5–6	6–5	5–4	4	3–5	3–5	3–5	3–5	5	6	4	4–5
	z	9–7	8–9	7–8	6–8	8–10	8	7–10	6–10	7	10	5–7	5–6
	q	3–4	4–3	3	3–4	3–4	4–5	3–5	3–5	4	5	3	3–5
	y	2	1–3	2	2–3	1	1	1–2	1–2	3	0	2	3–2
	tr	6–4	5–4	4	3–4	5	5	3–6	3–6	7	7	3	3–4
	u	—	—	—	—	1–2	1–2	1–2	1–3	1	1	—	—
	as1	4–5	5–6	6–5	5	7	7	5–8	6–8	8	6	5	5–6
	as2	5–6	5–7	7–6	5–6	5–7	4–6	4–7	5–7	8	8	6–5	7–6
	as3	6–5	6–7	7–6	6–7	6–7	6–7	7–10	7–12	8	10	6–5	7–6
	la2	3–4	3–5	3–4	4	4–5	4	3–5	2–5	4	4	4–5	6–3
	la3	—	—	—	—	3–4	4	3–4	3–4	5	5	—	—
OP	*ot*	15–16	15–16	16–14	16–14	16–23	16–20	15–20	15–21	20	23	14–16	14–16
	os	8	7–8	8–9	8–9	7–12	7–10	8–12	7–11	10	11	7–8	6–8
	oi	6–7	5	4	5–6	3–7	6–7	5–6	5–6	7	7	7–6	6
AD	*n*	7–10	8–9	8–7	7	9	9–10	8–10	7–10	10	3	6–7	6–7
	g	4–5	4–5	5–4	4–5	7	7	5–7	4–7	6	4	4–5	4–5
	o	4–3	4–5	5–4	5–4	4–5	4–5	4–5	4–5	4	2	4–3	4–3
	m	3	2–3	2	3–2	2–4	3	2–4	2–4	3	4	2	2
	h	10–8	9	9–8	9–8	10	14	7–13	6–10	10	10	7–8	7–10

Data for Ibiza and Giglio from Scsepka and Ahnelt (1999); Data for Krk from Kovačić (1999); Features of the seismosensory system labelled based on Sanzo (1911) and Miller (1986); L = left part of the body, R = right part of the body, X = genipores were counted by the author using a different method; Series of sensory papillae: PO = postorbital length, SO = suborbital, PM = preopercular-mandibular, OS = oculoscapular, OP = opercular, AD = anterior dorsal.

(44.3%–48.8% of head length for males and 46.6%–49.1% for females) which is bigger than in the Mediterranean specimens (38.2%–45.4% of head length for males and 36.7%–43.7% for females), but significantly smaller than those from the Adriatic (65.8%–69.1% for females), which is likely due to differences in the method used for measurement by different investigators (Table 1). In our opinion, other variations in the Black Sea *G. steinitzi* characteristics from the Mediterranean basin specimens, can be attributed to individual and geographic variability.

The Black Sea specimens, as well as the Mediterranean ones, have differences in topography of some papillae rows. Some specimens have the rear end of the longitudinal infraorbital row *b* slightly bent back and down, while others have it more direct. There are also variations in the location of vertical suborbital *6i*, in some cases it is straight, but the majority of fish have the bottom end facing forward. We believe that the slight variations in the number of papillae in the rows of the Black Sea specimens, compared with those known from the Mediterranean region (Table 2), refer to the individual variability.

Thus, it should be noted that the narrow ecological specialization of species in similar environmental conditions in the marine cave ecosystem has an effect on the morphology of the species. We confirmed through our research that variations in characteristics, even in specimens from edge parts of the area may be small.

Coloration. Based on the analysis of colour photographs taken in the marine caves of the peninsula Tarkhankut (Fig. 1), 6 broad greenish-brown and 6 narrow vertical light alternate stripes cross the goby's body. There is a dark vertical patch at the base of the caudal fin. There are three dark brown vertical stripes on the gill operculum and preoperculum. The ventral sucker and pectoral fins are greyish-white in colour. There is a diffuse dark spot under the 4th pectoral fin ray. Dark brown stripes stretch from the eyes forward and down. Four or 5 rows of vertical dark spots on the caudal fin form narrow strips. There are black spots at the base of the dorsal fin rays. Having been fixed in formaldehyde solution, the colours fade, but alternating greyish-brown and dark spots on the body and black spots at the base of the dorsal fin rays are well preserved. Overall, body and fin colour coincides with earlier descriptions of this type of colouring (Kovačić 1999, Scsepka and Ahnelt 1999, Scsepka et al. 1999). Sexual dimorphism in colour has not been observed.

Distribution. *Gammogobius steinitzi* belongs to a group of extremely rare fish, which lead a cryptic life, occurring only in marine caves and grottoes of the Mediterranean Sea. They have been identified in several points of the northern part of the Mediterranean Sea: by the coast of France near Marseille (original description by G. Bath 1971), Ibiza and other Balearic Islands, Spain (Ahnelt and Patzner 1996, Patzner 1999, Scsepka and Ahnelt 1999), in the north of the Tyrrhenian Sea near Giglio, to the south of Elba, Italy (Ahnelt et al. 1998), and in the northern Adriatic Sea near Krk Island, Croatia (Kovačić 1999, Kovačić and Miller 2000, Arko-Pijevac et al. 2001). Later, Kovačić (2005, 2008) included it in the list of fish of the Adriatic Sea. Subsequently, this species was observed during underwater research in the marine national park of Port-Cros Island, France (Dufour et al. 2007), but no specimens were caught there. The latest information on the presence of this species outside the northern part of the Mediterranean Sea and the Adriatic are off the island of Crete, Greece (Kovačić et al. 2011), but this was confirmed only by photographs.

Gammogobius steinitzi had not been previously described from the Black Sea (Svetovidov 1964, Bilecenoglu et al. 2002, Fricke et al. 2007, Vasil′eva 2007). The credit for the first record of this goby species should be given to Kovtun and Pronin (2011), who video filmed an unknown striped goby on the vertical walls of a submarine cave in the western Crimea in August 2010. This species of goby was also mentioned in a short note (Kovtun, 2012), in which the features of colouring and ecology of this species from marine caves of the Tarkhankut peninsula (Western Crimea, Ukraine) were described for the first time.

Ecology. *Gammogobius steinitzi* were accidentally found in the Black Sea in July 2009, when fouling in a marine cave was studied. Our video camera photographed a strange striped goby, whose behaviour was not characteristic for a goby. Gobies were found in completely dark or twilight parts of the cave, solely on the side walls or the ceiling vaults. The fish were moving in an inverted or lateral position. The number of fish in the cave was small, from 2 to 4 (probably some fish were hiding in crevices and cracks of the caves), but in the first year of observation we were able to see about a dozen of them. The gobies were initially mistaken for juveniles of other species in the adjacent ecosystem. Further analysis of the literature and photographs allowed us to consider it may be a very rare, and according to some specialists (Kovačić 1999), an enigmatic species found exclusively in the crevices of caves of the Mediterranean. Among several of the currently known species of cave species such as—*Speleogobius trigloides* Zander et Jelinek, 1976; *Thorogobius ephippiatus* (Lowe, 1839); *Corcyrogobius liechtensteini* (Kolombatovic, 1891) —*G. steinitzi* is the least numerous and least extensively studied.

As the species is poorly studied, there is very little data on their ecology. All available data are generally reduced to the description of their behaviour in caves. Arko-Pijevac et al. (2001), while studying a 30-m long marine cave (the island of Krk, Croatia, North Adriatic Sea) indicated that there was a clear pattern of distribution of gobies in the cave on vertical surfaces and vault of the cave. The distribution of the earlier mentioned "cave" goby species is very interesting. *T. ephippiatus* and *C. liechtensteini* are also found outside caves, whereas *G. steinitzi* exclusively in deep caves. *T. ephippiatus* prefers shallow cavities at the bottom, some 17–20 m from the entrance, and *C. liechtensteini*—cracked walls near the entrance to the cave and deeper. *G. steinitzi* has the most distinct preferences and lives exclusively in the dark part of the cave on side walls and on the ceiling. Its behaviour, described in the work of Arko-Pijevac et al. (2001), and association with specific microenvironment for *G. steinitzi* fully coincides with our observational data from the Tarkhankut caves.

Origin. As hypothesized by Ahnelt et al. (1998), *Gammogobius steinitzi* descended from an ancestor that had evolved in the Mediterranean basin in the early Pliocene (2–3 million years ago). Later, as a result of transgressions and regressions, the Black Sea basin permanently separated from the Mediterranean and was in desalination condition. Such a long period contributed to the development and establishment of this species in the Mediterranean basin.

During Riss–Wurm interglacial period (100–150 thousand years ago) during the formation of the Karangatsk Sea, the link between the Black Sea and the Mediterranean was reinstated, which resulted in a considerable increase of its salinity and penetration of Mediterranean species started (Zajcev 1998). A period of another flourishing of Ponto-Caspian allochthonous fauna and extinction of halophilic Mediterranean hydrobionts is linked to subsequent isolation of the Mediterranean basin and formation of the desalinated Novoevksinsky Sea-Lake (18–20 thousand years ago).

The link between the Mediterranean and the Black Sea has been finally established in the form, in which it exists today, relatively recently, about 5–7 thousand years ago, after breaking through the Dardanelles and the Bosphorus; and the Black Sea salinity, suitable for penetration of Mediterranean species, was being established in the course of about 1.5 thousand years.

Since *Gammogobius steinitzi* leads an enigmatic cave way of life, it is impossible to define exactly the time of settlement of this species in the Black Sea. It could have settled in the caves of the Black Sea during the formation of the Karangatsk Sea, but this is questionable, as it is unclear if they would have survived under the conditions of the most desalinated Novoevksinsky Sea-Lake. In our opinion, the species could have moved into the Black Sea basin during or after the formation of its last link with the Mediterranean Sea. There is no reason to believe that it is a recent Mediterranean immigrant species, as its habitat is poorly studied. However, recent findings of other Mediterranean gobies, new for the Black Sea species, in the Crimea suggest that such an opportunity cannot be excluded.

Conservation status. This species has previously been considered endemic of the Mediterranean Sea, included in the list of the International Union for Conservation of Nature and Natural Resources, the data on which is insufficient (Abdul Malak et al. 2011). The data on the number and the distribution of this species gives us a reason to include this goby in the list of rare species of the Black Sea and the Red Book of Ukraine in the future, with the marine caves of Tarkhankut peninsula (Western Crimea) listed as the only known habitat in the Black Sea.

Conclusion. The findings of the rare Mediterranean goby—*Gammogobius steinitzi* Bath, 1971—in the marine cave ecosystems of Tarkhankut Peninsula (the Black Sea, Ukraine) significantly changes the distribution range of this species. The limits of its area expand eastward to the western coast of the Crimea, and therefore, it is not only endemic to the Mediterranean, as has been stated earlier. The minor morphological differences between the Black sea specimens and the Mediterranean specimens indicate high specialization of this species in the habitat, which may be necessary for the inconspicuous behaviour of the cavernous communities which play a key role in the structure and functioning of such communities.

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