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First record of *Babka gymnotrachelus* (Kessler, 1857) from Germany

(Teleostei, Gobiidae, Benthophilinae)

Michael Haertl, Alexander F. Cerwenka, Joerg Brandner, Jost Borcherding, Juergen Geist & Ulrich K. Schliewen

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The Ponto-Caspian racer goby *Babka gymnotrachelus* (Kessler, 1857) is recorded for the first time in Germany from a Danube backwater close to the city of Regensburg, and from the Danube main channel close to the village of Mariaposching. Several specimens were collected and photographed in May and September 2011, and one kept until April 2012 in captivity. Previously reported records of this species from the German River Rhine are male *Neogobius fluviatilis* (Pallas, 1841), or possibly hybrids between different benthophiline goby species.

Michael Haertl, Regensburger Str. 14, 93173 Wenzenbach, Germany;
e-mail: fischmich@online.de

Alexander F. Cerwenka and Ulrich K. Schliewen (corresponding author), Zoologische Staatssammlung München (Bavarian State Collection of Zoology), Department of Ichthyology, Münchhausenstr. 21, 81247 München, Germany;
e-mail: cerwenka@zsm.mwn.de, schliewen@zsm.mwn.de

Jost Borcherding, General Ecology and Limnology, Zoological Institute, University of Cologne, Ecological Research Station Grietherbusch, Cologne, Germany;
e-mail: Jost.Bocherding@uni-koeln.de

Joerg Brandner and Juergen Geist, Aquatic Systems Biology Unit, Department of Ecology and Ecosystem Management, Technische Universität München, Germany; e-mail: brandner@tum.de, geist@wzw.tum.de

Introduction

Ponto-Caspian gobies of the subfamily Benthophilinae Beling & Iljin, 1927 (Teleostei, Gobiidae) are globally invasive and pose serious ecological threats to invaded waters (e. g. Neilson & Stepien 2009). In Germany, the Rhine system and the Danube were connected by the Main-Danube junction (MD canal) in 1992, and since then have become one of the main dispersal routes for invasive Ponto-Caspian species in Central Europe (Leuven et al. 2009). Until recently four invasive benthophiline freshwater gobies had been reported from the Lower Rhine and/or the Upper Danube in Germany and Austria, i. e. *Proterorhinus semilunaris* (Heckel, 1837), *Ponticola kessleri* (Günther, 1861), *Neogobius melanostomus* (Pallas, 1814) and *Neogobius fluviatilis* (Pallas, 1814) (Copp et al. 2005). A fifth species, the racer goby *Babka gymnotrachelus* (Kessler, 1857), may have been discovered outside of its native range in the middle section of the Danube before 1991 (Hegedis et al. 1991, but see Jurajda et al. 2005), and reached Vienna (Austria) in 1999 (Zweimüller et al. 2000, Ahnelt et al. 2001). Eleven years later it was reported from Germany in the River Rhine (Borcherding et al. 2011). Racer gobies were now discovered and photographed from

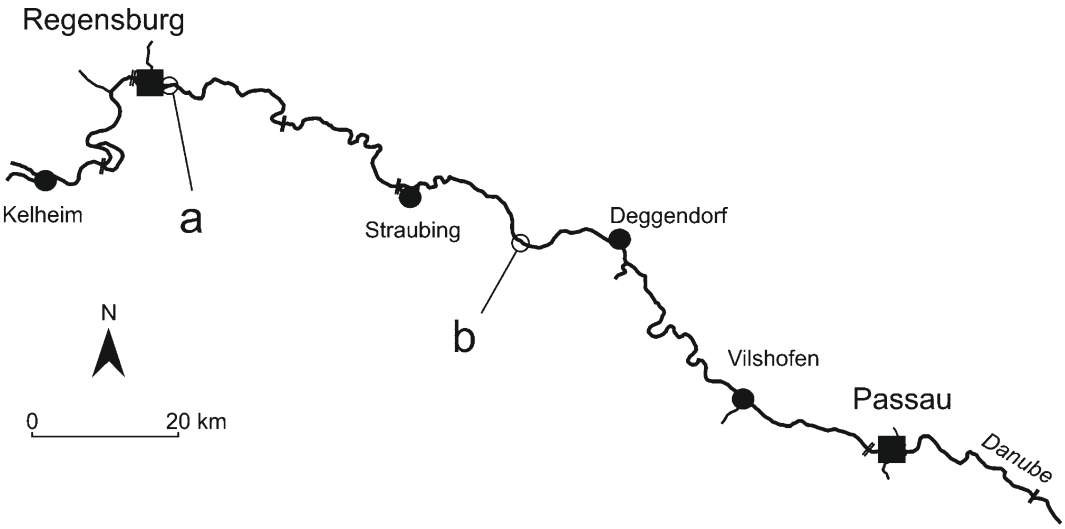

Fig. 1. Collection points of *Babka gymnotrachelus* in the Upper Danube (Germany). **a,** Danube backwater "Almer Grube" opposite the east harbour of Regensburg; **b,** Danube main channel at Mariaposching.

a backwater of the Upper Danube River at Regensburg, and from a groyne head habitat in the Danube main channel at Mariaposching, Germany (Fig. 1). A closer examination confirmed their preliminary identification and prompted a re-examination of the specimen that was reported as the first record of *B. gymnotrachelus* in Germany (see Borcherding et al. 2011).

Material and methods

Several specimens identified as *B. gymnotrachelus* were collected from below stones in shallow waters (<1 m) from a backwater in the River Danube in May 2011 and a single one by electrofishing at a groyne head near Mariaposching in September 2011. One male specimen from Regensburg was kept in an aquarium until April 2012, upon it was anaesthetized, preserved and deposited at ZSM. This and the Mariaposching specimen, as well as the one collected and previously identified as *B. gymnotrachelus* in the River Rhine (Borcherding et al. 2011) were (re-)identified using published keys (Miller & Vasil'eva 2003, Kottelat & Freyhof 2007). If not otherwise mentioned, measurements, counts and other characters are taken as described in Schliewen & Kovačić (2008) and compared with literature data (Ahnelt et al. 2001, Pinchuk et al. 2003a,b, Kottelat & Freyhof 2007) and with comparative material from the native range of *B. gymnotrachelus* and *N. fluviatilis*, as well as with additional *N. fluviatilis* material from the River Rhine.

Babka gymnotrachelus (Kessler, 1857): ZSM 41739 (1 male, 92.2 mm SL), Germany, backwater "Almer Grube" of River Danube close to Regensburg close to an artificial rocky outcrop (49.0127° N, 12.1802° E), M. Haertl, collected May 2011, preserved 19 April 2012. ZSM 41336 (1 female, 78.5 mm SL), Germany, River Danube downriver of Mariaposching at a groyne head (48.8255° N, 12.8194° E), J. Brandner, G. Nassel, D. Koeck, 30 September 2011; partly dissected. ZSM 26420 (2 specimens, 53.9–62.0 mm SL), Turkey, Lake Sapanca, M. Winter, 4 June 1984. ZSM 23288 (2 specimens, 52.7–56.8 mm SL), Romania, Lake Crapina, floodplain of the River Danube near Macin, P. Banarescu, 16 November 1964.

Neogobius fluviatilis (Günther, 1861): ZSM 41740 (1 male, 95.8 mm SL), Germany, River Rhine near city of Rees (Rhine-km 843), J. Borcherding, S. Gertzen, S. Staas, 21 September 2010. ZSM 23289 (6 specimens, 83.4–88.0 mm SL), Romania, Lake Crapina, floodplain of River Danube near Macin, P. Banarescu, 24–25 August 1966. ZSM 23863 (12 specimens, 52.6–92.5 mm SL), Romania, Danube estuary at Sulina, P. Banarescu, 15 September 1968. ZSM 41579 (4 specimens, 73.9–80.5 mm SL), Germany, River Rhine near city of Rees (51.7621° N, 6.3408° E), A. Cerwenka, S. Gertzen, J. Brandner et al., 8 August 2011.

Fig. 2. *Babka gymnotrachelus* (ZSM 41739), photographed shortly after collection (Photo M. Haertl).

Fig. 3. *Neogobius fluviatilis* (ZSM 41740), photographed shortly after collection (Photo J. Borcherding).

Results and conclusions

Measurements and counts of the three benthophiline specimens are reported in Table 1. The two Danube specimens ZSM 41739 (Fig. 2) and ZSM 41336 key out as *B. gymnotrachelus* in keys provided by Kottelat & Freyhof (2007) and Miller & Vasil'eva (2003), and exhibit almost all applicable diagnostic character states of *B. gymnotrachelus* as reported in the most thorough recent review of the species (Pinchuk et al. 2003a: 266): midline of nape naked in front of preoperculum, otherwise scales cycloid or ctenoid; interorbit one third eye diameter (0.33/0.31); upper lip of rather uniform width and 0.68 and 0.61 times in lateral preorbital area as measured between lip and eye; anterior membrane of pelvic disc without lateral lobes; D_1 moderately high, rounded in profile; coloration with oblique dark bands across body; lateral line scales count 59 and 65. The pelvic disc does not reach the anus in specimen ZSM 41739 and is slightly smaller than the diagnostic value given by Pinchuk et al. (2003a), i.e. 0.9 or more than the abdomen length (0.84); in specimen ZSM 41336 it does reach the anus and therefore fits the diagnostic value (0.96); further, the caudal peduncle depth is slightly larger than 0.5–0.6 of its own length (0.76 and 0.71). We conclude, that both specimens are conspecific with *B. gymnotrachelus*, however, with a slightly smaller pelvic disc in one specimen as compared to the character state reported by Pinchuk et al. (2003a).

Using the same keys, the Rhine specimen ZSM 41740 (Fig. 3) keys out as *N. fluviatilis*, except that it does not conform to the character state of Kottelat & Freyhof (2007) "first branched ray of second dorsal fin about twice as long as penultimate ray: no, but a bit shorter than first", because the first branched ray is only about 1.5× as long as the penultimate ray (14.2/11.2 mm). Nevertheless, it exhibits all applicable diagnostic characters of *N. fluviatilis* as reported in the most thorough recent review of the species (Pinchuk et al. 2003b): Nape scaled

completely, scales ctenoid; head depth at eyes about equal to width as measured between upper origin of opercles (12.9/13.2 mm); interorbit no more than 0.75 of eye diameter (0.72: 3.8/5.3 mm); angle of jaw below snout between eye and posterior nostril; snout 1.47 times larger than eye (7.8/5.3 mm); upper lip not swollen at angle, 0.4 times in lateral preorbital area as measured between lip and eye (1.8/4.5 mm); pelvic disc 0.94 of abdomen length (18.7/19.8 mm); anterior membrane of pelvic disc with small rounded, lateral lobes, less than 0.2 width of rear edge; D_1 high, with acute anterior profile; median fins edged yellowish in breeding males. Lateral line scales count 55. We conclude that specimen ZSM 41740 is a male of *N. fluviatilis* in pre- or postbreeding coloration. We conclude so despite

Table 1. Measurements (mm) and meristic counts of *B. gymnotrachelus* specimens (ZSM 41739, ZSM 41336) and the *N. fluviatilis* specimen previously misidentified as *B. gymnotrachelus* (ZSM 41740).

	Babka gymnotrachelus		*Neogobius fluviatilis*
	ZSM 41739	ZSM 41336	ZSM 41266
Distance measurements			
Sl, standard length	92.2	78.5	95.8
Tl, total length	114.1	98.4	120.1
Ab, anal fin base	31.2	24.6	31.5
Ad, body depth at anal fin origin	15.4	13.1	14.5
Aw, body width at anal fin origin	10.2	8.8	n/a
Bd, body depth	18.6	14.1	16.0
Cl, caudal fin length	21.9	19.9	24.3
CP, caudal peduncle length	12.4	10.6	12.2
CPd, caudal peduncle depth	9.5	7.6	7.6
D1b, first dorsal fin base	11.5	11.8	14.9
D2b, second dorsal fin base	36.1	31.5	39.1
Hl, head length	26.1	23.2	28.4
HwO, head width betw. opercles	19.2	13.6	13.2
Hd, head depth	13.4	9.5	12.9
E, eye diameter	5.6	5.2	5.2
SN, snout length	7.5	6.3	8.4
ULl, upper lip length	10.6	8.3	10.6
AULw, anterior upper lip width	2.4	1.9	1.8
LPd, lateral preorbital depth	3.9	3.3	5.0
Chd, cheek depth	8.0	5.2	8.0
PO, postorbital head length	15.3	11.7	16.2
I, interoribital width	2.0	1.6	3.8
IDs, interdorsal space	4.7	3.4	1.0
Pl, pectoral fin length	21.1	16.9	23.9
SN/A, snout to A	51.5	45.1	55.8
SN/AN, snout to anus	46.2	39.0	46.0
SN/D1, snout to D1	28.0	24.8	32.9
SN/D2, snout to D2	46.0	38.6	47.5
SN/V, snout to V	26.9	23.6	31.2
V/AN, pelvic to anus	19.8	17.0	16.5
Vd, body depth at pelvic fin origin	18.6	13.9	14.8
Vl, pelvic fin length	16.6	16.4	18.7
Vw, body width at pelvic fin origin	18.2	13.5	14.0
Counts			
LL, lateral line scale count	59+3	65+4	55+4
D1, spines in the first dorsal fin	VI	VI	VII
D2, spines and branched rays in the in the second dorsal fin	I/17	I/17	II/17
A, spines and branched rays in the anal fin	I/15	I/14	I/14

the missing character state in the key of Kottelat & Freyhof (2007), because this character state is not even evident from the photograph of a large *N. fluviatilis* male (page 579). We hypothesize that adult *B. gymnotrachelus* males develop enlarged median fins as a secondary sexual character, as fin shape differences are a kind of sexual dimorphism typical for many adult gobiid species (Horsthemke 1995).

Remarks

In its native range *B. gymnotrachelus* is a typical inhabitant of mud, sand, gravel or muddy-sandy bottoms (Pinchuk et al. 2003b), and it is abundant in backwaters (Kottelat & Freyhof 2007). Two of the upper Danube records, the one from Austria (Ahnelt et al. 2001) and the one from Regensburg, Germany, are from large backwaters. The specimen from Mariaposching was collected near a groyne head, which is adjacent to a soft bottom area with comparatively calm water, and this is the single specimen that has been recorded from main channel habitats despite intensive shallow water electrofishing efforts along the Danube in Germany in 2010 and 2011, which yielded thousands of benthophiline goby specimens (pers. obs. A. Cerwenka and J. Brandner). This preliminary result suggests that monitoring of invasive freshwater fishes should target soft-bottom backwaters and soft bottom main river habitats more intensively, and that the invasive range of *B. gymnotrachelus* may already be larger than previously assumed.

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