Vestnik zoologii, **47**(4): 335–341, 2013
DOI 10.2478/vzoo-2013-0035

UDC 597.556.333.1(282.247.326.4)

A RECORD OF THE RATAN GOBY, PONTICOLA RATAN (GOBIIDAE, PERCIFORMES), IN THE DNEPRODZERZHINSK RESERVOIR (DNIEPER RIVER)

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A Record of the Ratan Goby, *Ponticola ratan* (Gobiidae, Perciformes), in the Dneprodzerzhinsk Reservoir (Dnieper River). Manilo L. G., Didenko A. V. — The paper contains new data, which confirms distribition of the ratan goby, *Ponticola ratan* (Nordmann, 1840), in fresh waters, as well as its diagnosis, description, and brief information on its biology.

Key words: ratan goby, Dneprodzerzhinsk reservoir, biological characteristics, morphology, distribution.

Находка бычка-ратана, *Ponticola ratan* (Gobiidae, Perciformes), в Днепродзержинском водохранилище (р. Днепр). Манило Л. Г., Диденко А. В. — Приведены новые данные, подтверждающие распространение бычка-ратана, *Ponticola ratan* (Nordmann, 1840), в пресных водах, а также его диагноз, описание, краткие сведения по биологии.

Ключевые слова: бычок-ратан, Днепродзержинское водохранилище, биологическая характеристика, морфология, распространение.

The ratan goby, *Ponticola ratan* (Nordmann, 1840) sensu Neilson, Stepien (2009), is a representative of the Ponto-Caspian faunistic complex. Its biology has not been sufficiently studied yet. According to literature data (Georghiev, 1966; Vasil'eva, 2007), it belongs to mesohaline species, which inhabits water with salinity from 6 to 16 ‰, and as a rule does not enter fresh waters. In the "Handbook of European freshwater fishes" by M. Kottelat and J. Freyhof (2007), this species is not mentioned among other freshwater fishes. It is also absent in the waters of the Dnepropetrovsk region (Bulakhov et al., 2008). Based on known literature sources, records of ratan goby in fresh waters are dated back to the beginning of the last century in the South Bug River (87 km above Nikolaev near Belousovka village) (Beling, 1927) and later in the lower part of the Kakhovka reservoir near Berislav, where an isolated dwarf population of this goby was observed (Pinchuk et al., 1985). This species is included in the list of freshwater fishes of Europe (Pinchuk et al., 2003), but in this work its records in fresh waters werebased on two findings mentioned above. Up to now, when describing the distribution of this species, all researchers stressed that records about finding of this fish in fresh waters had to be revised. This works contains new materials on ratan goby distribution in fresh waters (Dnieper River, Dneprodzerzhinsk reservoir, Dnepr-Donbass canal inlet) as well as its morphology in comparison with specimens of the same species from sea and brackish waters of the Northwestern part of the Black Sea.

Material and methods

The material was collected in August 2011 and 2012 during annual fish juvenile surveys on the Dneprodzerzhinsk reservoir conducted by the Institute of Fisheries of the National Academy of Agrarian Sciences of Ukraine and thereafter it was left for storage at the Zoological Museum of the National Museum of Natural History of the NAS of Ukraine (the inventory numbers are provided below).

Material. N 9353, 7 specimens, Ukraine, Dnepropetrovsk region, Petrikovskiy district, near Shulgivka village, Dnieper River, Dneprodzerzhinsk reservoir, Dnepr-Donbass canal inlet, depth up to 2 m, 2011–2012, A. V. Didenko.

Comparative material. N 2467, 3 specimens, Ukraine, Odessa region, Ovidiopol district, near Sanzheika village, Black Sea, 14.08.1969, V. I. Pinchuk; N 5202, 4 specimens, Ukraine, Nikolaev region,

Ochakov district, near Luparevo village, Bug lagoon, Black Sea, 25.10.1984, V. I. Pinchuk; N 5339, 1 specimen, Ukraine, Odessa region, Ovidiopol district, near Sanzheika village, Black Sea, 14.08.1965; N 8733, 1 specimen, Ukraine Odessa region, Belgorod-Dnestrovskiy district, Dniester bank, Black Sea, 1–12.10.1961, V. I. Pinchuk.

Fish were caught at shoreline control sampling sites using a beach seine (10 m length × 1 m height, mill gauze N 7). The area of seine hauls depended on the water depth and bank steepness and ranged from approximately 40 to 60 m^2. Following abiotic and biotic features were recorded at sampling sites within beach seine hauls: hauled area, maximum depth, substrate type, vegetation density, aquatic plant composition, and accompanying fish fauna. In addition, fish were also caught at some sites using angling gears. Substrate type at angling sites was determined using an Eckman's dredge. Such abiotic indices as mineralization (‰) and pH were determined at laboratory conditions from samples taken near the sampling sites. Fish after being caught were preserved in a 4 % formalin solution.

Fish relative density for every beach seine sampling site was calculated as the catch-per-unit-effort (CPUE) — the number of fish caught per 100 m^2 of a seine haul.

In other to avoid the effect of size variability, the smallest ratan goby specimens from the Northwestern part of the Black Sea were taken for comparison.

Measurements were carried out according to the method used for Gobiidae species with the aid of an electronic vernier caliper with a precision of up to 0.1 mm: *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, *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 center of the eye, *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, *GR* — the number of gill rakers on the first gill arch.

Calculations were performed using MS Excel 2007.

Results and discussion

Three specimens of the ratan goby (*P. ratan*) were caught near the Dnepr-Donbass canal inlet in the Dneprodzerzhinsk reservoir (48°43'58.87" N; 34°18'54.88" E and 48°43'58.98" N; 34°18'58.53" E) using beach seine in 2012. The hauling depth in these sites did not exceed 1.0 m. The bottom substrate at these sites was represented by sand with gravel with dense aquatic vegetation, which was represented by watermilfoil, *Myriophyllum spicatum* Linnaeus, 1753. Accompanying fish fauna included rudd, *Scardinus erythrophtalmus* (Linnaeus, 1758) — 10.9–23.3 ind./100 m^2; bleak, *Alburnus alburnus* (Linnaeus, 1758) — 20.0 ind./100 m^2; monkey goby, *Neogobius fluviatilis* (Pallas, 1814) — 18.3–121.8 ind./100 m^2; round goby, *Neogobius melanostomus* (Pallas, 1814) — 3.3–9.1 ind. /100 m^2; western tubenose goby, *Proterorhinus semilunaris* (Pallas, 1814) — 1.7–9.1 ind./100 m^2; black-striped pipefish, *Syngnathus nigrolineatus*, Eichwald, 1831 — 1.7 ind./100 m^2. Relative density of ratan goby calculated as a CPUE value was 1.7–1.8 ind./100 m^2.

In addition, 4 specimens (1 female with *SL* 35 mm was not measured) of the ratan goby were caught at a depth of about 2.0 m by an angling gear in 2011–2012 from an abandoned berth located near the Dnepr-Donbass canal inlet (48°44'07.23" N; 34°18'51.55" E). The substrate at this site was represented by gravel with dense population of the river snail, *Viviparus viviparus* (Linnaeus, 1758), and zebra mussel, *Dreissena*

polymorpha (Pallas, 1771). Accompanying fish were round goby (85.7 %) and knout goby, *Mesogobius batrachocephalus* (Pallas, 1814), (3.6 %). The ratan goby composed 10.7 % of the catch.

Mineralization of water in sampling sites was 0.32 ‰, pH was 8.3.

Taking into account that this species is very rare in fresh waters, we considered worthwhile to present the data on its morphometric features and as far as possible to perform a comparative morphometric analysis with specimens from sea and brackish waters of the Northwestern part of the Black Sea as well as its picture (fig. 1).

Brief diagnosis. $\boldsymbol{D_1}$ VI, $\boldsymbol{D_2}$ I (15) 16–17, ***A*** I 13–14, ***P*** 18–19, ***Squ*** 50–54, ***GR*** 9–11 (n = 6) (Dneprodzerzhinsk reservoir, our data).

$\boldsymbol{D_1}$ VI, $\boldsymbol{D_2}$ I 16–17, ***A*** I (12–13) 14–16, ***P*** 18–20, ***Squ*** 50–52; ***GR*** 11–12 (n = 9) (Northwestern part of the Black Sea, our data).

$\boldsymbol{D_1}$ (V) VI (VII), $\boldsymbol{D_2}$ I (15) 16–18 (19), ***A*** I (12) 13–14 (15), ***P*** (18) 19–20 (21), ***Squ*** (52, 53) 54–59 (60, 61), ***Vert.*** 32–34 (Bulgarian coast, Black Sea, Georghiev, 1966).

Description. Body is short, laterally flattened, covered with ctenoid scales. Top of the head, back of the head, the back ahead of the dorsal fin, and part of the breast and the base of the pectoral fins are covered with cycloid scales. Head is laterally compressed, its height is not less than 90 % of its width, equal to it or somewhat larger. Cheeks are not swollen. Snout length is about equal to orbit diameter. Mouth is large, slightly oblique, its angles extend to the middle of the pupil. Lower jaw is slightly protruding. Upper lip is narrow, long, does not expand on sides. Eyes are large, interorbital distance is 40–60 % of the eye diameter. Anterior nostrils are not extended in form of long tubes. Pelvic disk usually reaches the anal opening or extends beyond it; its length is not less than 90 % of the abdomen length. The pelvic disk fraenum has lateral angular or rounded lobes. Pectoral fins extend beyond the vertical of the beginning of the first dorsal fin and reach the vertical of the beginning of the anal fin. All pectoral fin rays are connected with a membrane. Dorsal fins are not separated by a gap. The second dorsal fin height slightly increases in its posterior part. Caudal peduncle is very compressed laterally, short, its height is not less than 75 % of its length. Large specimens from some populations have distinctly larger scales on the caudal peduncle than on other parts of the body (Pinchuk et al., 2003); the specimens from the Dneprodzerzhinsk reservoirs have scales of the same size on all parts of the body. Swimbladder is absent. Caudal fin is rounded. General coloration in life of the body is brownish-brown, lighter on sides. Abdomen is light grey. There are lighter vertical bands ahead of the first dorsal fin, under the second dorsal fin and on the caudal peduncle. Fins are greyish with blue-gray hue. There is a yellow or orange band along the upper margin of the first dorsal fin, below which there is a small black spot in specimens of some populations, while others have several almost parallel darkish bands. The specimens from the Dneprodzerzhinsk reservoirs have the first dorsal fin coloration corresponding to the second variant. The second dorsal fin is unicolored grey with narrow light margin and three or four rows of darkish bands near its base, more visible in young specimens. Ventral disk and anal fin are greyish-cream with wide light margin. During spawning period males become completely black with grey-blue hue, however some females from the Dneprodzerzhinsk reservoir also had dark coloration of the body (fig. 1). There are records on finding a solitary specimen of the flavist ratan goby in the Odessa bay (Kovtun, 2010).

Comparative analysis. Small number of available fish does not give opportunity for full analysis of morphometric data. Age-size variability of the ratan goby has not been studied. According to literature data, sexual dimorphism in meristic features is absent, while in plastic features it is marked extremely slightly (Pinchuk et al., 2003). Based on our data (table 1), the ratan goby from the Dneprodzerzhinsk reservoir does not practically differ from specimens from sea and brackish waters of the Northwestern part of the

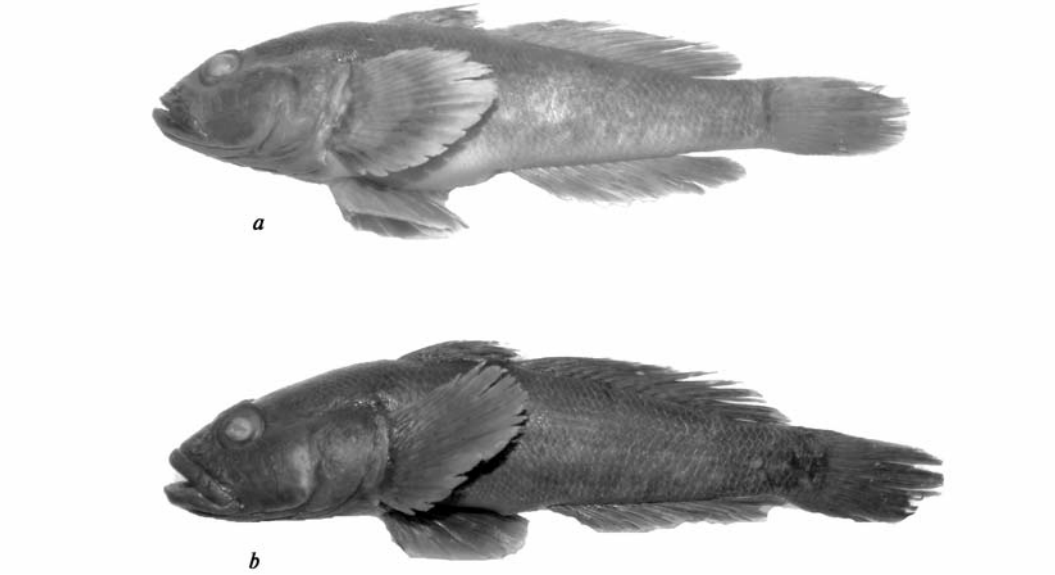

Fig. 1. Ratan goby, *P. ratan*, from the Dneprodzerzhinsk reservoir: *a* — male *SL* 77 mm; *b* — female *SL* 80 mm.

Рис. 1. Бычок-ратан, *P. ratan*, из Днепродзержинского водохранилища: *a* — самец *SL* 77 мм; *b* — самка *SL* 80 мм.

Black Sea. The only feature which is different is the number of gill rakers on the first gill arch (*GR*), the reservoir fish have one — two fewer.

Biological characteristics. The ratan goby in the Black Sea prefers bottom covered with gravel and pebble, but in the Azov Sea it occurs on soft bottom. The ratan goby is characterized by marked seasonal migrations related to spawning. In spring, it goes to shallow coastal warm waters, where it spawns at water temperature from 8 to 10°C, which occurs on the Odessa coast in May (Khutornoy, 2010), while in Bulgarian waters from the end of March to the beginning of May (Georghiev, 1966). Eggs are laid under stones in the littoral zone, fecundity of 97–103 mm females varied from 222 to 360 eggs (Pinchuk et al., 2003). Sexual maturation occurs at the age of 2 years after reaching the body length of about 70 mm (Vasil'eva, 2007; Pinchuk et al., 2003). Taking into account the size of the ratan gobies from the Dneprodzerzhinsk reservoir, they can belong to two age groups — yearlings (35 mm) and age − 1 + (77–80 mm) indicating that they can spawn in the reservoir. However, they can be a dwarf form similar to that observed by Pinchuk et al. (1985) in the Kakhovka reservoir and therefore these sampled fish can be older. Juveniles of the ratan goby prey on small crustaceans and polychaetes. Diet of adult fish in the Northwestern part of the Black Sea was dominated by crustaceans (73.2 %), among which the most abundant were shrimps *Palaemon* (45.5 %) and gammarids (9.4 %), polychaetes *Nereis* (15.8 %), fish juveniles (6.6 %) and mollusks. It is known about changes in ratan goby diet from spring to autumn as well as with its age (Strautman, 1973). Food competitor of the ratan goby in Northwestern part of the Black Sea is the grass goby, *Z. ophiocephalus* (diet overlap is 42.4 %) (Strautman, 1972). Longevity is up to 4–5 years. Maximum body length of males from the Odessa coast is up to 183 mm, females are up to 153 mm long (Pinchuk et al., 2003). In Bulgarian waters it can reach 230 mm (Georghiev, 1966).

Distribution. Black Sea basin (from Bulgarian coast to Crimea in the western part and from the Kerch Strait to Novorossiysk), Azov and Caspian Seas (Vasil'eva, 2007). In Ukrainian waters, it was recorded in littoral waters of Zmeiny Island (Snigirev, 2008), is known from sea coast of the Danube-Dniester interstream area to Tendrovsky

Table 1. Morphometric features of the ratan goby from fresh and sea waters
Таблица 1. Морфометрические признаки бычка-ратана из пресных и морских вод

Features	Dneprodzerzhinsk reservoir		Northwestern part of the Black Sea	
	males (n = 3)	females (n = 3)	males (n = 4)	females (n = 5)
SL, mm	52.0–77.0 66.0	40.5–80.0 53.8	80.0–87.0 83.5	66.0–74.0 70.0
		in % *SL*		
H	20.8–25.1 23.0	19.5–22.0 20.7	20.7–24.6 23.2	21.8–24.9 22.7
h	11.2–11.7 11.4	9.8–11.3 10.7	10.5–11.9 11.2	10.7–11.8 11.2
aD_1	34.3–34.5 34.4	33.3–36.4 34.6	33.6–35.3 34.7	32.0–34.9 33.6
aD_2	48.8–50.3 49.4	47.6–52.1 49.3	50.0–52.4 51.2	48.6–51.3 50.0
aP	32.1–36.2 33.9	33.3–34.0 33.8	33.0–35.4 34.0	31.7–34.3 32.7
aV	29.0–36.2 31.5	31.2–34.3 32.6	28.2–30.6 29.4	28.2–32.5 30.3
aA	55.8–61.0 57.8	55.6–57.3 56.4	56.7–57.3 57.0	55.5–58.9 57.2
pD	11.6–13.5 12.5	12.0–13.8 12.9	12.1–13.5 12.7	12.2–14.9 13.4
lD_1	14.8–16.9 15.9	14.1–16.1 15.1	16.7–17.3 16.9	15.5–17.2 16.4
hD_1	13.0–14.4 13.9	12.6–15.4 13.8	12.4–15.2 14.1	13.5–15.7 14.6
lD_2	35.2–37.9 36.3	34.5–38.3 36.0	35.7–37.4 36.3	35.4–37.4 36.7
hD_2	13.9–16.7 15.7	14.3–17.3 16.1	12.9–17.2 15.6	15.9–17.2 16.6
lA	26.5–28.7 27.7	25.6–28.9 27.8	27.8–29.6 28.3	27.7–28.5 27.9
hA	13.5–13.7 13.6	11.7–12.4 12.0	12.5–14.1 13.2	10.4–13.4 12.1
lP	24.7–25.5 25.1	22.4–27.9 24.9	24.5–6.5 25.4	24.3–28.1 26.6
lpc	13.9–16.3 15.5	14.0–16.0 15.0	14.1–16.3 15.4	15.1–17.0 16.0
lV	24.9–25.8 25.4	23.1–27.6 25.0	22.4–25.6 24.5	22.3–26.1 24.3
V-an	23.5–25.5 24.5	21.1–27.3 23.2	23.6–25.0 24.3	22.3–27.0 23.7
c	31.2–32.1 31.8	31.9–32.9 32.4	31.1–34.1 32.5	30.3–32.6 31.1
		in % *c*		
wc	51.5–56.3 53.6	45.1–54.0 48.5	47.5–54.6 50.5	52.3–56.5 54.9
hc	52.0–59.3 55.2	46.6–54.3 51.2	47.5–52.8 49.7	49.1–51.4 50.4
r	27.5–31.1 28.9	21.1–29.3 24.3	25.1–26.4 25.7	23.3–26.8 25.1
lmx	32.6–35.4 33.6	31.0–39.9 35.2	34.6–42.8 38.8	33.3–36.2 34.9
wlab	7.8–8.8 8.2	7.2–7.8 7.5	6.4–8.5 7.5	6.8–8.0 7.4
lmd	39.5–47.1 44.0	41.1–43.7 42.6	42.5–46.9 44.8	44.0–50.9 46.7
o	23.1–25.7 24.2	24.0–27.1 25.8	23.2–24.7 24.2	25.0–27.0 26.1
po	49.7–53.4 51.3	48.1–48.9 48.4	45.0–50.9 49.1	46.8–54.3 50.2

Table 1.
Окончание табл. 1.

Features	Dneprodzerzhinsk reservoir		Northwestern part of the Black Sea	
	males (n = 3)	females (n = 3)	males (n = 4)	females (n = 5)
io	8.4–11.3	8.5–12.2	7.9–9.6	8.1–11.6
	10.2	10.2	8.9	10.2
		Meristic characters		
D_1	VI	VI	VI	VI
D_2	16–17	15–17	17	16–17
	16.3	16.0	17.0	16.6
A	13–14	13–14	13–14	12–16
	13.7	13.3	13.8	13.6
P	18–19	18–19	19–20	18–19
	18.7	18.7	19.3	18.4
Squ	52–54	50–53	50–52	50–52
	53.3	51.0	50.8	51.2
GR	9–10	10–11	12	11–12
	9.5	10.5		11.5

bay (Manilo, 2008–2009), including Shagansky and Dniester banks, in lower part of the Dniester, Khadzhibey, Tiligul estuaries (from 1970 to 1990) (Shekk, 2004), Berezan and Dnieper-Bug estuaries (and upstream the South Bug to Belousovka village). The species was recorded near Tarkhankut peninsula (Pinchuk, 1968; Eremeev et al., 2012). Near southern coast of Crimea, this species was recorded near Karadag and Kerch peninsula coast, abundant in the Kerch Strait (Shaganov, Milovanov, 2005; Shaganov, 2009). In the Azov Sea, this goby is known in the southern part to the Cape Kazantip (Eremeev et al., 2012), in Utlyuk (Demchenko et al., 2005) and Molochny (during its connection with sea) lagoons (Smirnov, 2006), and in its northern part up to the Berdyansk Bar.

Records of the ratan goby in fresh water during two seasons confirms rare literature data and significantly expands its range. In addition, this record allows categorizing it not as a mesohaline but as a euryhaline species. Dispersal pathways of *P. ratan* into fresh waters of the Dneprodzerzhinsk reservoir are not currently known. It is possible that the ratan goby population from the lower part of the Kakhovka reservoir near Berislav mentioned in the work of V. I. Pinchuk et al. (1985) expanded its range; however, it requires further studies in these reservoirs. It is also possible that this is an isolated population, the first representatives of which or their eggs were accidentally brought to this location by ships berthed here during active construction of the Dnepr-Donbass canal facilities in the 1970s. After finishing this construction, the berth was abandoned. The fact of finding this species can also be an evidence of further spread of Ponto-Caspian species into the Dnieper reservoirs. It is quite possible that this process is related to changes of hydrological and hydrodynamic factors and formation of new biotopes suitable for survival and development of certain aquatic species.

Special thanks are due to the crew of the research vessel YaYa-0252 of the Institute of Fisheries for assisting in field data collection.

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