ACTA ICHTHYOLOGICA ET PISCATORIA (2008) 38 (1): 37–40 DOI: 10.3750/AIP2008.38.1.05

RANGE EXPANSION OF AN INVASIVE ALIEN SPECIES, CHINESE SLEEPER, *PERCCOTTUS GLENII* DYBOWSKI, 1877 (TELEOSTEI: ODONTOBUTIDAE) IN THE VISTULA RIVER DRAINAGE

Michał *NOWAK*[*], Włodzimierz *POPEK*, and Piotr *EPLER*

Department of Ichthyobiology and Fisheries, Agricultural University of Krakow, Poland

Nowak M., Popek W., Epler P. 2008. Range expansion of an invasive alien species, Chinese sleeper, *Perccottus glenii* Dybowski, 1877 (Teleostei: Odontobutidae) in the Vistula River drainage. Acta Ichthyol. Piscat. 38 (1): 37–40.

Abstract. In October 2007 an invasive alien species, the Chinese sleeper, *Perccottus glenii* Dybowski, 1877 (known also as the Amur sleeper), was recorded in carp ponds in Kraków-Mydlniki (southern part of Vistula River drainage). As far as we know, this is the uppermost site in the Polish part of the Vistula River drainage. Thirty-six individuals of *P. glenii* were collected during fishery works. Basic morphometric measurements were obtained, following the commonly accepted procedures, in order to describe the general body shape of *P. glenii*.

Keywords: Chinese sleeper, Amur sleeper, *Perccottus glenii*, invasive species, alien species, Vistula River drainage, morphometry

The Chinese sleeper (known also as the Amur sleeper, rotan; or trawianka in Polish), *Perccottus glenii* Dybowski, 1877 (Odontobutidae) is a non-native species of Polish ichthyofauna (the terms such as: "non-native", "indigenous", or "alien" species were used herein according to Copp et al. (2005)). *P. glenii* is indigenous to the Far East of Russia, north-east China, and northern North Korea (Berg 1949, Bogutskaya and Naseka 2002, Koščo et al. 2003, Reshetnikov 2004). Within the 20th century, due to intentional and non-intentional introductions, it became widespread throughout Asia and central-eastern Europe (Bogutskaya and Naseka 2002, Reshetnikov 2004).

In the Vistula River drainage *P. glenii* was recorded for the first time in 1988 by Movchan in the Vishnya River (a tributary of the San River) in the territory of Ukraine (Bogutskaya and Naseka 2002). In Poland it was found for the first time in 1993–1994 in an oxbow lake of the Vistula River near Dęblin (Antychowicz 1994). Terlecki (1995) refers also its presence in the Vistula River, near the town of Kazimierz Dolny. Since then, *P. glenii* has been caught in several places within the Vistula River drainage (Terlecki and Pałka 1999, Andrzejewski and Mastyński 2004, Kostrzewa et al. 2004). Terlecki (2000) listed 6 isolated sites in Vistula and Western Bug drainages where this species can be found. According to Terlecki (1995, 2000), Terlecki and Pałka (1999), Andrzejewski and Mastyński (2004), Kostrzewa et al. (2004), as well as the results of the presently reported study, there have been about 15 known and confirmed localities within the Vistula River drainage (Poland), where the species occurs (Fig. 1).

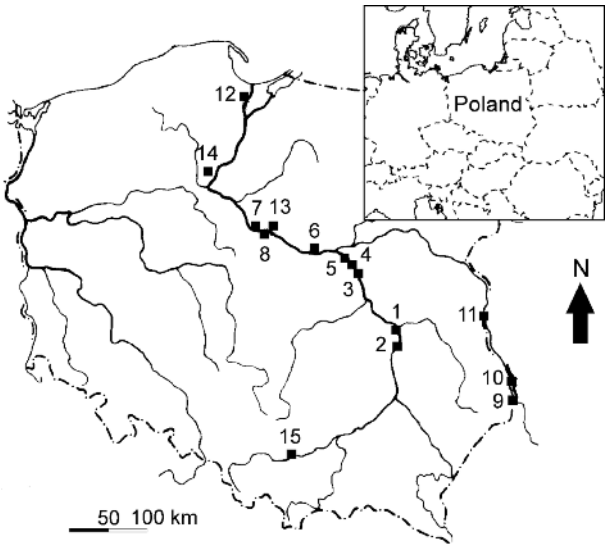

Fig. 1. Occurrence of the *Perccottus glenii* in Poland: 1, Antychowicz (1994); 2, Terlecki (1995); 3–5, Woźniewski (1997); 6–7, Kakareko (1999); 8, Kostrzewa et al. (1999); 9–13, Kostrzewa et al. (2004); 12, Wiśniewolski and Woźniewski (pers. comm.); 14, Andrzejewski and Mastyński (2004); 15, Rudawa river in Kraków, presently reported study (2007)

[*] Correspondence: Dr Michał Nowak, Katedra Ichtiobiologii i Rybactwa Uniwersytet Rolniczy im. Hugona Kołłątaja w Krakowie, ul. Spiczakowa 6, 30-199 Kraków, Poland, phone: +48 12 637 51 76, fax: +48 12 638 59 79, e-mail: *mikhael.nowak@gmail.com*

However, Witkowski (2003) estimated that the total number of *P. glenii* sites in Poland reaches 1000. In 2002 Andrzejewski and Mastyński (2004) speculated that *P. glenii* had broken the borderline of the Vistula River drainage and it will probably continue its dispersal into the western parts of Europe. As far as we know the species has not been recorded in the Odra (Oder) River drainage, although such assumption cannot be rejected (Freyhof 2003).

During the last decade a fast spreading of *P. glenii* in south-eastern Europe has been noticed. In 1998 the species was recorded in Latvia (Plikšs and Aleksejevs 1998). In the same year it was collected in the Gulf of Finland (Panov et al. 1999). During the last few years Chinese sleeper has been consecutively found in the Tisza River drainage area in Ukraine, Slovakia, Hungary, and Romania (Koščo et al. 2003, Hegediš et al. 2007) and in Danube River within the territory of Serbia and Bulgaria (Jurajda et al. 2006, Hegediš et al. 2007). *P. glenii* was also found in White Sea and Arctic Ocean basins (Bogutskaya and Naseka 2002; Koščo et al. 2003). Furthermore the species spreads through the Asian part of Russia (Bogutskaya and Naseka 2002, Reshetnikov 2004).

In the middle of October 2007 more than 40 individuals of *P. glenii* were collected during fishery works in the "Podkamycze II" carp pond (the Experimental Fisheries Station "Mydlniki", Department of Ichthyobiology and Fisheries, Agricultural University of Krakow). This was the first time the species was reported in the area (lat 50°03'N, long 19°56'E). The fish were harvested in the pond with well developed water vegetation, with predominant species such as: *Phragmites australis*, *Glyceria aquatica*, *Typha latifolia*, *Potamogeton perfoliatus*, and *P. crispus*. Chinese sleeper co-occurred with the following fish species: common carp, *Cyprinus carpio* (age 2+); Prussian carp, *Carassius gibelio*; and pikeperch, *Sander lucioperca* (2+). This site seems to be the uppermost limit of its distribution area in the Vistula River drainage within the territory of Poland.

Thirty-six specimens of *P. glenii* were anaesthetised with Propiscin and preserved in 4% formaldehyde. Then, in order to describe better the general body shape of the collected fish, 22 morphometric- and 6 meristic characteristics were measured, according to Hubbs and Lagler (1947) (Fig. 2, Tables 1, 2). As far as we know, such characteristic has never been used in Poland for such purposes. Standard length (SL) and head length (HL) were measured from the tip of the snout (upper jaw) to, respectively, posterior end of hypural complex (localised by bending out the caudal fin) and posteriormost point of the opercular membrane. All measurements were taken as straight lines, by the "point-to-point" method.

Table 1

Morphometric characteristics of *Perccottus glenii* caught in ponds in Kraków-Mydlniki (n = 36)

No.	Character	Range	Mean	s
1	Total length (TL) [mm]	77.7–106.5	93.68	4.86
2	Standard length (SL) [mm]	61.4–88.0	75.98	4.24
	% of SL			
3	Head length (HL)	33.47–37.87	35.63	1.10
4	Maximum body depth	23.68–29.41	26.26	1.16
5	Depth of caudal peduncle	11.48–13.54	12.56	0.57
6	Body width at dorsal fin origin	16.76–20.37	18.39	0.91
7	Width of caudal peduncle at anal fin insertion	9.09–11.10	10.17	0.50
8	Predorsal length	40.22–44.35	42.57	1.13
9	Postdorsal length	23.18–28.97	26.06	1.36
10	Prepelvic length	34.64–38.07	36.41	1.02
11	Preanal length	60.48–65.36	63.48	1.19
12	Pelvic to anal–fin origin distance	26.67–30.86	28.74	0.90
13	Length of caudal peduncle	23.55–28.21	26.07	1.01
	% of HL			
14	Snout length	22.18–26.74	24.65	1.02
14	Horizontal eye diameter, the greatest fleshy diameter	15.19–19.61	16.56	1.06
16	Postorbital length	57.48–65.10	61.07	1.45
17	Head depth at eye centre	40.73–47.78	43.81	1.69
18	Head depth at nape	59.26–70.71	64.13	2.64
19	Head width at posterior margin of preopercle	49.63–60.71	55.30	2.76
20	Interorbital width, the least fleshy width	20.80–25.93	24.00	1.30
21	Upper jaw length	29.93–38.28	35.41	1.76
22	Lower jaw length	30.66–39.84	36.84	1.75

s, standard deviation of the mean.

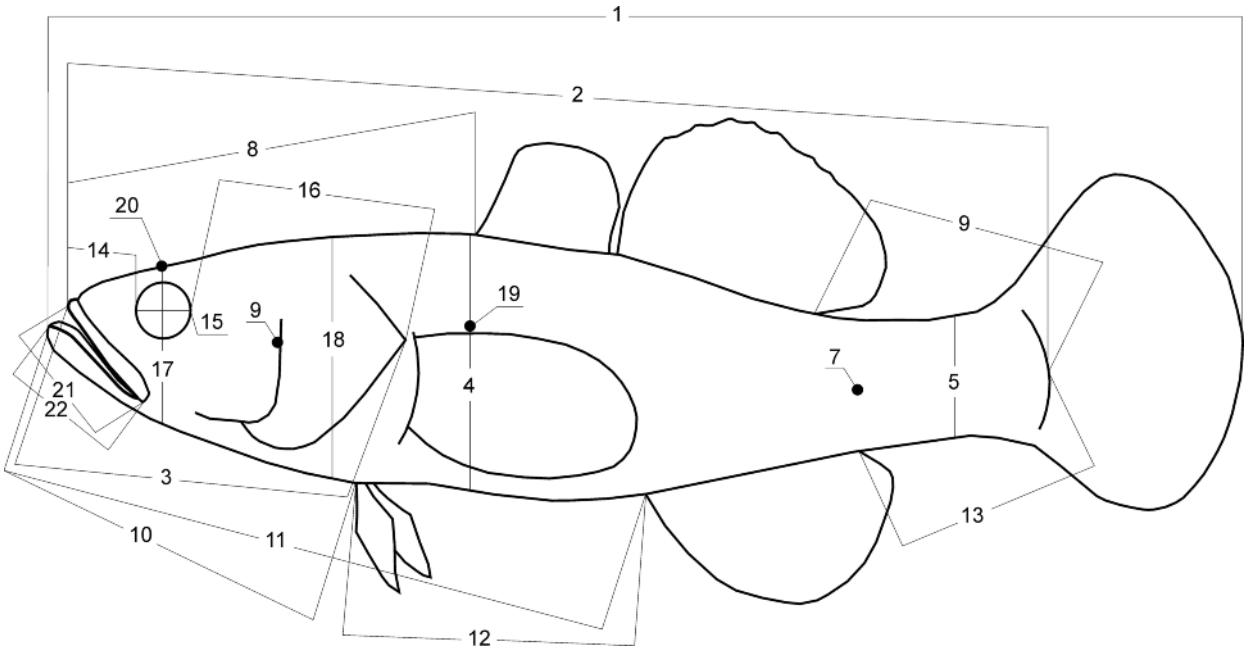

Fig. 2. Measurement diagram of the *Perccottus glenii* according to Hubbs and Lagler (1947) scheme; characters description as in Table 1

Table 2

Meristic characteristics of *Perccottus glenii* caught in ponds in Kraków-Mydlniki (n = 36)

Character	Number of specimens with the character value																			
	7	8	9	10	11	12	16	17	18	19	37	38	39	40	41	42	43	44	45	46
D1	1	32	3																	
D2				1	20	15														
A			1	7	24	4														
sq											2	3	11	10	8	2				
cf															5	12	10	6	2	1
cp							1	10	20	5										

D1, number of rays in first dorsal fin; D2, number of rays in second dorsal fin; A, total number of rays in anal fin; sq, numbers of scales in lateral row; cf, circumference rows of scales; cp, cicumpeduncular rows of scales.

Circumference (cf) and circumpeduncular (cp) rows of scales were counted, respectively, in advance of the dorsal fin and at the lowest point of the caudal peduncle.

The occurrence of *P. glenii* in ponds in Kraków-Mydlniki denotes the invasive character of this species. It is potentially dangerous not only to the fishes, but also to the other indigenous animals (Reshetnikov 2003). Furthermore, *P. glenii* has no economic importance, attaining only about 250 mm in total length and up to 250 g in weight, though the most specimens do not exceed 120 mm total length (Berg 1949, Koščo et al. 2003, Reshetnikov 2003).

Its appearance and dispersal in Polish water bodies, simultaneously with other non-indigenous species (e.g., brown bullhead, *Ameiurus nebulosus*; pumpkinseed, *Lepomis gibbosus*; round goby, *Neogobius melanostomus*; and stone moroko, *Pseudorasbora parva*) could cause serious problems to the local fauna. *P. glenii* threat the native ichthyofauna by competition, displacement, and direct predation (Bogutskaya and Naseka 2002, Koščo et al. 2003, Witkowski 2003, Reshetnikov 2003, 2004, Kostrzewa et al. 2004, Copp et al. 2005). Furthermore, it has been demonstrated that this species may be a vector of certain parasites and fungi (Czeczuga et al. 2002, Koščo et al. 2003, Uzunova and Zlatanova 2007). Sustained monitoring of the spreading of this species is needed to prevent, if possible, new invasions (Witkowski 2003, Kostrzewa et al. 2004). Due to its resistance to adverse ecological conditions, gluttony and dispersal caused by floods (Bogutskaya and Naseka 2002, Koščo et al. 2003, Reshetnikov 2003, 2004, Kostrzewa et al. 2004) a consecutive dispersal of this species in the territory of Poland is expected, as well as in other regions of Eurasia.

The origin of the individuals of *P. glenii* collected in Kraków-Mydlniki is another question. They probably have been brought with juveniles of *Carassius gibelio* which were purchased a few times. The possibility of releasing them from aquarium cultures is also taken into account. Despite all efforts to annihilate all the specimens of *P. glenii*

in ponds and to prevent its dispersal outside, some individuals were found in the draining ditches emptying to the Rudawa River, the left-bank tributary of the Vistula River. It could cause a new invasion to the Rudawa River system, and subsequently also the Vistula River. As far as we know, all attempts of eradication of *P. glenii* from various bodies of water have failed (Bogutskaya and Naseka 2002, Reshetnikov 2003, 2004), what does not make an optimistic prediction for the future.

ACKNOWLEDGMENTS

Special thanks are due to Dr Jerzy Szymacha, Dr Ewa Łuszczek-Trojnar, Dr Magdalena Socha, Dr Paweł Szczerbik, Mr. Krzysztof Tatoj, and Mr. Artur Klaczak of the Department of Ichthyobiology and Fisheries, Agricultural University of Krakow for their support with collecting and handling the material. The authors want to express their appreciation to Mrs. Karolina Woźniak and Mrs. Izabela Woźniak for the linguistic revision, and to the two anonymous reviewers for their valuable remarks on the manuscript.

REFERENCES

Andrzejewski W., Mastyński J. 2004. Nowe stanowisko trawianki (*Perccottus glenii* Dybowski 1877). [A new site of the Chinese sleeper (*Perccottus glenii* Dybowski 1877).] Komunikaty Rybackie **2004** (2): 22–23. [In Polish.]

Antychowicz J. 1994. *Perccottus glehni* [sic] w naszych wodach. [*Perccottus glehni* [sic] in our waters.] Komunikaty Rybackie **1994** (2): 21–22. [In Polish.]

Berg L.S. 1949. Ryby presnyh vod SSSR i sopredel'nyh stran. [Fishes of the USSR and adjacent countries.] Vol. 3. Moskva–Leningrad. [In Russian.]

Bogutskaya N.G., Naseka A.M. 2002. *Perccottus glenii* Dybowski, 1877. *In*: Freshwater fishes of Russia, Zoological Institute RAS. http://www.zin.ru/Animalia/pisces/eng/taxbase_e/species_e/perccottus/perccottus_glenii_eng.pdf.

Copp G.H., Bianco P.G., Bogutskaya N.G., Erős T., Falka I., Ferreira M.T., Fox M.G., Freyhof J., Gozlan R.E., Grabowska J., Kováč V., Moreno-Amich R., Naseka A.M., Peňáz M., Povž M., Przybylski M., Robillard M., Russell I.C., Stakėnas S., Šumer S., Vila-Gispert A., Wiesner C. 2005. To be, or not to be, a non-native freshwater fish? Journal of Applied Ichthyology **21**: 242–262.

Czeczuga B., Kiziewicz B., Danilkiewicz Z. 2002. Zoosporic fungi growing on the specimens of certain fish species recently introduced to Polish waters. Acta Ichthyologica et Piscatoria **32**: 117–126.

Freyhof J. 2003. Immigration and potential impacts of invasive freshwater fishes in Germany. Berichte des IGB **17**: 51–58.

Hegediš A., Lenhardt M., Mićković B., Cvijanović G., Jarić I., Gačić Z. 2007. Amur sleeper (*Perccottus glenii* Dybowski, 1877) spreading in the Danube River Basin. Journal of Applied Ichthyology **23**: 705–706.

Hubbs C.L., Lagler K.F. 1947. Fishes of the Great Lakes Region. Bulletin of the Cranbrook Institute of Science **26**: 1–186.

Jurajda P., Vassilev M., Polačik M., Trichkova T. 2006. A First Record of *Perccottus glenii* (Perciformes: Odontobutidae) in the Danube River in Bulgaria. Acta Zoologica Bulgarica **58**: 279–282.

Kakareko T. 1999. *Perccottus glenii* Dybowski 1877 (Odontobutidae) w Zbiorniku Włocławskim na dolnej Wiśle. [*Perccottus glenii* Dybowski 1877 (Odontobutidae) in Włocławski Dam Reservoir on the lower Vistula River.] Przegląd Zoologiczny **42**: 107–110. [In Polish.]

Kostrzewa J., Marszał L., Tłoczek K. 1999. Czy trawianka *Percottus glenii* ma szansę stać się trwałym elementem polskiej ichtiofauny? [Could the Chinese sleeper, *Percottus glenii*, become a permanent element of the Polish ichthyofauna?] Chrońmy Przyrodę Ojczystą **55** (5): 98–101. [In Polish.]

Kostrzewa J., Grabowski M., Zięba G. 2004. Nowe inwazyjne gatunki ryb w wodach Polski. [New invasive fish species in Polish waters.] Archives of Polish Fisheries **12** (Suppl. 2): 21–34. [In Polish.]

Koščo J., Lusk S., Halačka K., Lusková V. 2003. The expansion and occurrence of the Amur sleeper (*Perccottus glenii*) in eastern Slovakia. Folia Zoologica **52**: 329–336.

Panov V., Leppakoski E., Ojaveer H. 1999. Introduction of alien species into the Gulf of Finland—an increasing environmental problem. *In*: Regional Biological Invasions Center. http://www.zin.ru/projects/invasions/gaas/aliens3r.htm.

Plikšs M., Aleksejevs E. 1998. Zivis. [Fishes]. Gandrs, Riga. [In Latvian.]

Reshetnikov A.N. 2003. The introduced fish, rotan (*Perccottus glenii*), depresses populations of aquatic animals (macroinvertebrates, amphibians, and fish). Hydrobiologia **510**: 83–90.

Reshetnikov A.N. 2004. The fish *Perccottus glenii*: history of introduction to western regions of Eurasia. Hydrobiologia **522**: 349–350.

Terlecki J. 1995. *Percottus glenii* Dybowski 1877 (Pisces, Eleotridae) w Polsce. [*Percottus glenii* Dybowski 1877 (Pisces, Eleotridae) in Poland.] P. 163. *In*: Proceedings of the 11th Congress of the Polish Zoological Society, 14–16 September 1995, Łódź, Poland. [In Polish.]

Terlecki J. 2000. Trawianka *Perccottus glenii* Dybowski, 1877. [Chinese sleeper, *Perccottus glenii* Dybowski, 1877.] Pp. 476–479. *In*: Brylińska M. (ed.) Ryby słodkowodne Polski [The freshwater Fishes of Poland.] PWN, Warszawa. [In Polish.]

Terlecki J., Pałka R. 1999. Occurrence of *Perccottus glenii* Dybowski, 1877 (Perciformes, Odontobutidae) in middle stretch of the Vistula River, Poland. Archives of Polish Fisheries **7**: 141–150.

Uzunova E., Zlatanova S. 2007. A review of the fish introductions in Bulgarian freshwaters. Acta Ichthyologica et Piscatoria **37**: 55–61.

Witkowski A. 2003. Amur sleeper (*Perccottus glenii*). *In*: Solarz W. (ed.) Alien species in Poland. http://www.iop.krakow.pl/ias/species.asp?215.

Woźniewski M. 1997. Trawianka – nowy gatunek ryby w Wiśle. [Chinese sleeper—a new fish species in the Vistula River.] Wiadomości Wędkarskie **1997** (12): 69. [In Polish.]

Received: 29 November 2007
Accepted: 20 March 2008
Published electronically: 20 June 2008