

Brown bullhead *Ameiurus nebulosus* — a new fish species for Russia

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Abstract

The native habitat of the brown bullhead *Ameiurus nebulosus* is located in the eastern part of North America. This species was introduced in Europe, South-western Asia and New Zealand. It was supposed that it entered Russia from the southwest and now inhabits some water bodies at the border with Ukraine and Belarus. Information about bullheads in Russia was searched for in scientific editions and angler's blogs. Anglers' reports have been verified by survey and fishing. It turned out that brown bullheads did in fact appear in Russia, but not where they were expected: they were found by the city of Saint Petersburg on the Karelian Isthmus, i.e., on the territory between Lake Ladoga and the Gulf of Finland of the Baltic Sea. They inhabit at least three lakes. This invasion resulted from release by unauthorized individuals. The revealed habitats are linked by brooks with the river systems of the Baltic Sea Basin. The following spread of the brown bullhead is possible due to intentional releases and natural processes.

Keywords: brown bullhead, *Ameiurus nebulosus*, introduction, unauthorized individuals, Saint Petersburg, Russia.

Introduction

The brown bullhead *Ameiurus nebulosus* Lesueur, 1819 is a small catfish. Average length of adult individuals is 70–380 mm, with the maximum recorded at 532 mm (Lee et al., 1980). This species belongs to the family Ictaluridae, order Siluriformes. There are six other species in the genus *Ameiurus* (Ferraris, 2007). The native range of the brown bullhead is in the eastern part of North America. It inhabits various freshwater bodies including very small ones hardly suitable for other fish. It feeds on invertebrates, algae, small fish and their eggs (Rizevsky, 2016; www.sevin.ru/vertebrates). The brown bullhead usually occurs in vegetated shallows over soft substrate. It tolerates a low concentration of oxygen in water, and during winter it can burrow into silt and stay inactive for a long time (NatureServe, 2013; Page and Burr, 2011). The brown bullhead has some popularity as an object of sport fishing, fish farming and as an ornamental fish. For this reason it was widely introduced and established outside its native range. Nowadays it occurs in Europe, Southwestern Asia and New Zealand (<http://www.iucngisd.org>). In the beginning of the 20th century it was introduced in some lakes in southern Belarus. Since these lakes are linked by canals with other lakes and river systems, the brown bullhead spread somewhat out of the site of introduction. Further intentional releases around it also took place. By the end of the 1930s it settled in several water bodies of southern Belarus and adjacent areas of Ukraine. These new habitats belong to the upper reaches of the rivers Zapadny Bug and Pripiat', i. e., the Baltic and Black Sea Basins (Ivlev and Protasov, 1948; Makushok, 1951; Zhukov, 1965). Recently, the brown bullhead has been noted in

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the neighboring areas of Poland (Kapusta et al., 2010). In the 1940s brown bullhead breeding was organized in Belarus. It was expected that even the smallest water bodies (including shell holes filled by rain water) would be involved in fish farming. The species was considered a promising object for aquaculture because it yielded some harvest even in lakes hardly suitable for the other local commercial fish (Makushok, 1951; Zhukov, 1965). The number of brown bullheads increased, and special fishing of them was organized. In the 1960–80s the registered harvest was several tons per year. However, these activities might have declined over the past decades. The last commercial harvest was registered in 2011 (628 kg). Special actions concerning bullhead breeding and commercial use have not been reported since that time. Currently it attracts attention rather as an undesirable alien species (Rizevsky, 2016).

Since the brown bullhead has inhabited Belarus and Ukraine for a long time, it was thought that it occurred in neighboring Russian water bodies as well (Bogutskaya and Naseka, 2004; www.sevin.ru). However, such records have not been reported so far. In the most well-known recent reviews on fish and alien species of Russia, it was either not mentioned (Kudersky, 2001; Biological invasions..., 2004) or mentioned without indication of the locations of occurrence and details of registration (Bogutskaya and Naseka, 2004; www.sevin.ru). It turned out recently that brown bullheads did in fact appear in Russia, but not where they were expected: instead of the water bodies at the borderline with Belarus and Ukraine, they were found in Saint Petersburg on the Karelian Isthmus, i.e., on the territory between Lake Ladoga and the Gulf of Finland of the Baltic Sea. This article presents information about its new populations. They are a recurrent illustration of the fact that the release of fish by unauthorized individuals is a significant and uncontrolled source of invasions of alien species.

Material and methods

Information about brown bullheads in Russia was searched for in the Russian Citation Index Database (<http://elibrary.ru>). Reports about them were also collected from publications in the mass media and angler's blogs (using the Russian equivalents of the key words "American catfish", "small catfish", "brown bullhead"). In such a way we revealed which water bodies had reported occurrence of bullheads. Anglers' reports were verified: we visited the indicated water bodies, observed local recreational fishing, and fished. One fishing rod with one hook and one bottom rod with two hooks were used; earthworms were used as bait. The verification aimed to establish the facts of bullhead occurrence in the water body, i.e., after catching a brown bullhead, the mission was considered fulfilled. The fishing and survey of water

bodies took place during daytime up to the moment of establishing bullhead presence (1–6 hrs). The main survey was carried out in June 2018. Species identification was done based on external characters using American fish guides (Lee et al., 1980; Page and Burr, 2011) and descriptions presented in other sources (NatureServe, 2013; Zhukov, 1965; www.sevin.ru/vertebrates).

Results and discussion

No records on the brown bullhead in Russia were found in scientific editions. However, this species was mentioned several times in anglers' blogs¹. These sources indicate water bodies located 15–20 km from the northern border of Saint Petersburg (Vsevolozhsky district of Leningradskaya Oblast): three lakes — Pastorskoye, Svetloye and Mednoye — as well as several small quarries remaining after exploration of sand deposits (Fig. 1). The biggest lake inhabited by the brown bullhead is 100 hectares in area (Mednoye); the other ones are significantly smaller: 20 hectares (Pastorskoye), 2 hectares (Svetloye); the quarries are about 3 hectares in area. One of these lakes (Svetloye) is drainless, and the two others are linked by brooks with the basin of the Sestra River flowing into the Gulf of Finland of the Baltic Sea, although these links are hampered by dams.

During the survey, brown bullheads were registered in the lakes (Fig. 2): four were caught in Svetloye Lake (in an hour), and two individuals were registered in the catches of local anglers made in Mednoye and Pastorskoye Lakes (self-dependent fishing for four hours failed to yield brown bullheads). Other fish species were not registered in the brown bullhead habitats. The lakes Mednoye and Pastorskoye are popular sites of recreation which are often visited by numerous people in summer; this might have resulted in the low number of fish. By contrast, Svetloye Lake is less suitable for recreation as it is surrounded by mires; access to it by car is problematic. The fishing in quarries failed because they are surrounded by private plots of land.

The registered catfish demonstrated the main diagnostic characters indicated in the above-mentioned guides and reviews: brown-white coloration, eight barbels, a large adipose, pectoral fins with saw-like teeth, no black membranes contrasting with pale rays on caudal and anal fins. The most similar catfish to the brown bullhead is the black bullhead *Ameiurus melas*. However, confusion is unlikely as the *Ameiurus melas* has a rather black-yellow coloration, less developed teeth in the pectoral fins and pale rays of caudal fins (Page and Burr, 2011). One collected specimen of *Ameiurus nebu-*

¹ <http://forum.rybachim-vmeste.ru/>; <http://www.spoon.spb.ru>; <http://beloostrov.ru>; <http://sz-rk.ru>; <http://fisher.spb.ru>; <http://www.youtube.com/watch?v=GMzRZrg55vQ>

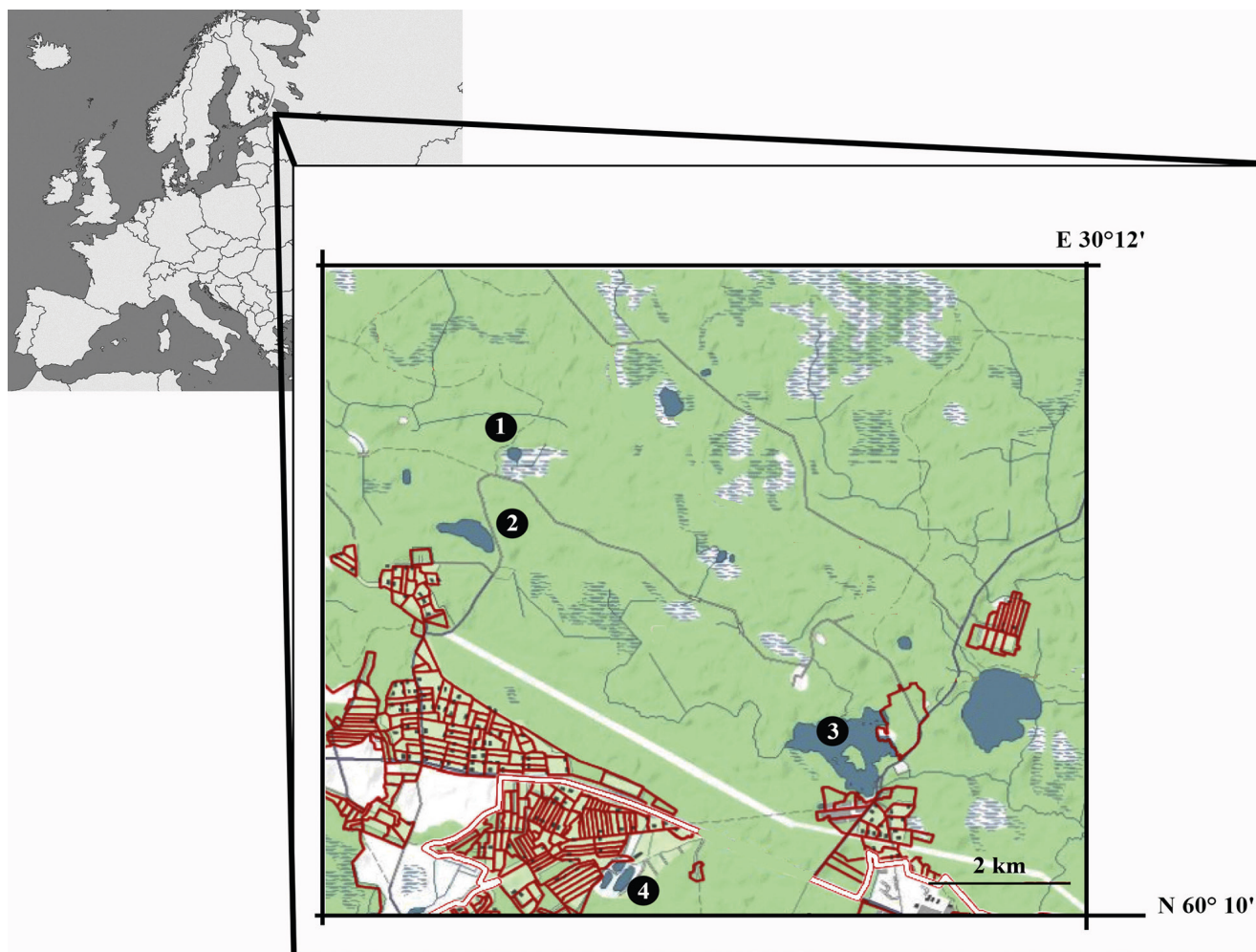


Fig. 1. Locations of bullhead habitats in Saint Petersburg: 1 — Svetloye Lake, 2 — Pastorskoye Lake, 3 — Mednoye Lake, 4 — quarries.

losus was kept for the collection of Saint Petersburg State University.

The details of the source of this invasion remain unknown. Information on brown bullheads started to spread actively in the 2010s. The first records concern Pastorskoye Lake. Probably, brown bullheads were released there some years before 2010 by unauthorized individuals. Afterwards, these fish might have been spread by local anglers to the neighboring lakes. In 2012–13 the reports on brown bullheads in Saint Petersburg were especially numerous in the above-mentioned forums of local naturalists and anglers. These reports provoked the impression that these fish were so numerous that anybody could catch an indefinitely large number of them. This likely resulted in the increase of fishing pressure on the species, leading to a decrease in their number. Nowadays they are not numerous and their capture takes time.

The invasion of the brown bullhead in Russia is reminiscent of the spread of the Chinese sleeper (*Perccottus glenii*) in Europe. Both fish can live in habitats that are hardly suitable for most local fish, i.e., in small stagnant water bodies with a low concentration of oxygen. The

Chinese sleeper was also introduced in the water bodies of Saint Petersburg, although earlier. About 100 years ago they were released in the Neva River and Neva Bay; they successfully settled there (Dmitriev, 1971; Reshetnikov, 2003), and currently they are actively spread by unauthorized individuals over all possible water bodies. Meanwhile, those spreading the fish cannot explain why they do it (Popov, 2014). Now, some anglers are discussing the idea of spreading the brown bullhead in the same way. Such claims occur sometimes in their forums. Some anglers plan to introduce the brown bullhead to habitats of the Chinese sleeper to estimate which species will be more competitive; others intend to release them at their summer cottages (<http://www.spoon.spb.ru/forum>). These initiatives are a recurrent illustration of the fact that the intention to release fish is a widespread human instinct that is almost as strong as the desire to catch them (Popov, 2014). Moreover, the state policy on the introduction of fish is not sufficiently thought-out. Some decades ago, numerous alien animal species were actively distributed throughout the country: pacific pink salmon (*Oncorhynchus gorbuscha*) was introduced



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Fig. 2. Brown bullhead *Ameiurus nebulosus* caught in Saint Petersburg (A) and one of its habitats — Svetloye Lake (B).

in the White Sea Basin, European cyprinids were introduced to Siberia, Siberian white fish were introduced in European Russia, etc. (Kudersky, 2001). With the lapse of time this enthusiasm has diminished. However, the rationality of these actions was never questioned by relevant institutions; in the summary of these activities, the possible damage of alien species to local ecosystems and probable unsuccessful introductions were not mentioned at all, i.e., absolutely all introductions should be considered successful (Dubinina et al., 2017). The existing rules governing fisheries do not prohibit introduction of alien species, although the procedure of such actions is not described in details; such details must be specified on the regional level (Federal law..., 2004). Meanwhile, unlike many other countries, in Russia water bodies cannot be private property (except for small artificial reservoirs located in private plots); therefore, the rational management of huge areas is possible, but is not fully realized. The existing rules concerning alien fish species introductions correspond to the fact that unauthorized individuals releasing alien fish are not brought to trial. Usually they remain unknown, but in some cases they are well known, but it does not result in legal procedures. (One such case was the introduction of alien species in the protected areas of Saint Petersburg: the rainbow trout *Oncorhynchus mykiss*, Siberian white fish *Coregonus peled* and Chinese sleeper were released there by local inhabitants; trout and white fish were exterminated soon after, but Chinese sleepers still exist and increase in number (Popov, 2014)). All this creates favorable conditions for further expansion of alien species. In such a situation the following spread of the brown bullhead is only a matter of time.

Since the new habitats of brown bullheads in Saint Petersburg are linked with the Gulf of Finland, the natural spread of this species over the Baltic Sea Basin is possible, as its coastal waters are almost fresh; freshwater fish including the Chinese sleeper spread into them. The latter has already been found in the Gulf of Finland at a distance of more than 100 km from the location of release (Popov, 2016). If the brown bullhead seizes this opportunity it could widely spread across the river systems linked with the Gulf of Finland. Since these systems are linked by canals with the basins of the Caspian Sea, Black Sea and White Sea, the potential range of the bullhead covers a huge area including almost all of European Russia. However, judging by the example of Belarus this process can take place slowly. These fish can spread more rapidly due to intentional release by anglers.

It is problematic to estimate the impact of brown bullheads on local ecosystems, as all water bodies of Saint Petersburg suffer from intensive fishing and their “initial” state is not well known (Popov, 2017). Local anglers often claim that brown bullheads suppress local fish — perch (*Perca fluviatilis*) and pikes (*Esox lucius*) —

based on the fact that the number of the latter continuously decreases. However, the anglers themselves continuously exterminate them; therefore, it is probable that the bullhead occupied a free niche, rather than suppressed the other fish.

The introduction of Chinese sleepers results in the decline of the populations of newts and frogs, as these fish exterminate the amphibian larvae. The cases of extinction of newt populations and other amphibians for this reason are becoming more and more numerous (Reshetnikov and Manteifel, 1997; Reshetnikov, 2003; Pupina and Pupins, 2012). Toads (*Bufo bufo*) turned out to be resistant to this impact. For some reason the Chinese sleepers do not eat them (Poliakov and Buzmakov, 2008). Such data for bullheads are not available, although during the survey of their new habitats, groups of toad tadpoles were noted, while other amphibians were not observed.

The brown bullhead is included in the international database of alien species (<http://www.iucngisd.org>), but it was noted that there is no data on a significant negative impact on local ecosystems. In some cases, competition with trout (*Oncorhynchus mykiss*, *Salmo trutta*) is supposed, as well as the undermining of the number of crayfish (Dedual, 2002; Barnes and Hicks, 2003). These reports concern the water bodies of New Zealand, which is a “hotspot” of biological invasions. Since the native ecosystems contained numerous “gaps” including freshwater fishes, many alien species have been introduced there. The bullhead turned out to be one of the most successful ones (Collier et al., 2017). However, since trout and crayfish are more preferred objects of fishing than brown bullheads, the assumption of the negative impact of bullheads is reminiscent of the above-mentioned complaints of Saint Petersburg anglers. Probably, brown bullheads currently are not exerting a significant influence upon local ecosystems. However, continuing spread of the species is not desirable because the results of such introductions cannot be well predicted and the benefits of such introductions are doubtful.

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