



# World Scientific News

An International Scientific Journal

WSN 126 (2019) 276-282

EISSN 2392-2192

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SHORT COMMUNICATION

## **Alien aquarium fish species found in open waters of Poland with new record of Amazonian Red Pacu *Piaractus brachypomus*, Cuvier, 1818 (Serrasalminidae) from Bzura river**

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### **ABSTRACT**

Aquarium fish are often kept pets. Due to inappropriate actions of fishkeepers some of them are released into natural environment in many countries around the world, also in Poland. Species of exotic ichthyofauna usually do not have the possibility of survival and reproduction in a temperate climate, however the environment of thermally polluted waters in Poland could provide the tropical fish with appropriate living conditions. Cold water species may settle stable populations and threaten native fauna

and flora. This work, based on the available scientific literature, describes the invasive potential of aquarium fish species introduced in Poland. The scale of introducing alien species of aquatic origin into Polish waters is difficult to estimate. It is recommended that monitoring should cover the largest possible number of water reservoirs in this country.

**Keywords:** uncontrolled introductions, exotic species, invasive species, inland waters, central Europe, Serrasalmidae, *Piaractus brachypomus*, *Lepomis gibbosus*

## 1. INTRODUCTION

Freshwater aquarium fish are one of the most frequently kept pets all over the world. The variety of colors and shapes of these vertebrates, their interesting behavior and ability to adapt to life in the captivity of many of them may determine their attractiveness as animals accompanying humans (Ezhil et al., 2008). In many amateur aquariums fishkeepers mix both tropical species with those from local natural environment that prefer lower water temperatures (Jagtap and Kulkarni, 2013). The relatively low acquisition cost and availability on the zoological market result in often ill-considered purchase and as a consequence discouragement of aquarists, that sometimes encourages them to release fish into the natural environment.

The phenomenon of human introduction of alien species native ichthyofauna is present in many countries on different continents (Latini and Petrere, 2004), also on the European continent, including Poland (Maciaszek and Sosnowski, 2019). Minimum temperatures in Polish water bodies are often out of the thermal tolerance range for aquarium fish, therefore the possibility of creating new populations is limited. One exception may be thermally polluted water systems in this country, where animals belonging to tropical species could potentially find suitable environmental conditions (Maciaszek et al., 2019).

In contrast to thermophilic fish, aquatic cold-water species are in many cases capable of creating stable populations in the temperature range prevailing in Polish reservoirs and watercourses. Sometimes they may be a threat for native species of fauna and flora, therefore the possibility of their occurrence should be subject to continuous monitoring (Rixon et al., 2005; Singh and Lakra, 2011). In this work evidences of the occurrence of foreign fish species in Polish water bodies were presented, based on the available scientific literature.

## 2. LITERATURE REVIEW

The first recorded introduction of a non-native aquarium fish species in Poland took place in 1927 and concerned the *Lepomis gibbosus* pumpkinseed (Linnaeus, 1758), whose presence was noted in the Odra basin, as a consequence of spreading in the neighboring country (Copp and Fox, 2007).

Natural range prevalence ranged from the eastern part of North America and New Brunswick in Canada to Florida and the Gulf of Mexico (Panek and Weis, 2013). After importing to Europe in 1887 this species quickly mastered the waters almost all over the continent thanks to his ability to adapt to European environmental conditions. Currently, its population in Poland is stable, it is found in the Oder and some of its tributaries, appearing en masse at some places (Copp and Fox, 2007).



**Fig. 1.** Pumpkinseed *Lepomis gibbosus* caught in the thermally polluted channel of Dolna Odra power plant near Szczecin, NW Poland (Photo: A. Kociołkowski)

The introduction of golden carassius *Carassius auratus auratus* (Linnaeus, 1758) whose artificially selected ornamental varieties are referred to in Polish as the colloquial name "goldfish" was recorded in Poland in the 1930s. These fish have come to Europe from East Asian countries. Currently in Poland it is readily maintained in aquariums and backyard ponds, sporadically found in the natural environment. It is considered a potentially invasive species, but there is no evidence of its ability to reproduce in Polish waters or interbreeding with the domestic species of the same genus - *Carassius carassius* (Linnaeus, 1758) (Nowak et al., 2008).

In 1995, in Poland, in the basin of Mała Panew, the presence of american umber *Umbra pygmaea*, De Kay, 1842 (Grabowska et al. 2010) that natural range of occurrence includes the eastern US coast was recorded. It is supposed that its presence in natural environment is thanks to introductions with the participation of aquarists. Currently, it occurs in the basin of Mała Panew near Żędowice and Potępa and in the river Liswarta with some of its tributaries. It is estimated that the national population is up to several thousand individuals and is still growing (Verreycken et al., 2010).

Since 2000, there have also been occasional introductions of red pacu *Piaractus brachipomus* (Cuvier, 1818), probably near the places of their release into natural waters by aquarists, which we present on the example of a 25cm length of an individual from the Bzura river on August 17, 2013 in Leśmierz (Fig. 2). Due to the scope of its thermal tolerance, this species creates stable populations in Poland not only in thermally polluted water areas, similarly to other tropical aquarium fish released into Polish reservoirs, such as oscar *Astronotus ocellatus* (Agassiz, 1937), first recognized in this country in the first in the decade of the 21st century, nile tilapia *Oreochromis niloticus* (Linnaeus, 1758) was observed in warm lakes near

Konin or the Rybnicki Reservoir, in which red piranha *Pygocentrus nattereri*, Knerr, 1858 (Półgęsek et al., 2011) is also reported. Another location is the Nowa Huta warm canal, in which, in addition to Nile tilapia and red piranha, users of angling and aquarium forums have been recording for many years the occurrence of guppy fish *Poecilia reticulata*, Peters, 1859. In 2006, in the center of the cities of Bydgoszcz, the leopard catfish was caught in the Brda River, *Pterygoplichthys gibbiceps*, Kner, 1854 (Więcaszek et al., 2017).



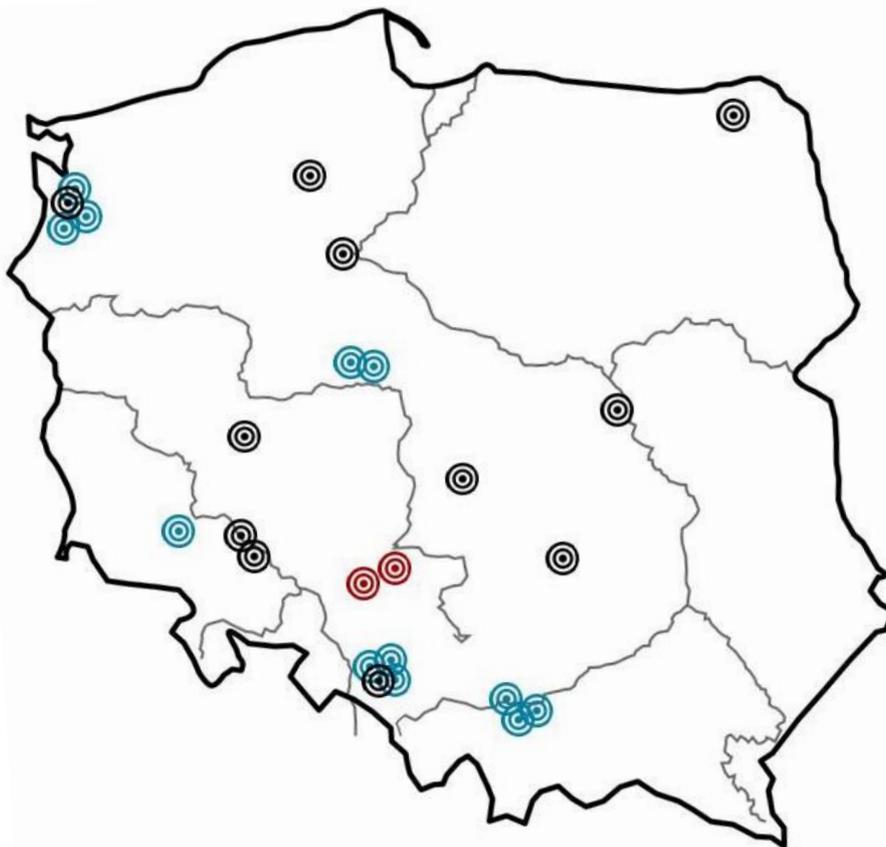
**Fig. 2.** Pirapitinga *Piaractus brachypomus* observed in Bzura river (Photo: B. Szpakowski).

The last documented introduction of the fish species of aquarium origin in open waters was the arowana silver *Osteoglossum bicirrhosum* (Cuvier, 1928), in Lake Powsinkowskie in the city of Warsaw found in 2016 (Maciaszek and Sosnowski, 2019).

### 3. RESULTS AND DISCUSSION

Unsuccessful introductions aquarium fish species, as well as those that ended up with the creation of stable populations in local waters of Poland bothtook place. Some alien species have limited expansion potential, and other significant invasive potential (Nowak et al., 2019). The described places of fish presence of possible aquarium origin in Poland is illustrated in Figure 3. Tropical species of aquarium fish that have been introduced in Poland are in general unable to create stable populations in a temperate climate. Most of them are killed as the ambient temperature decreases in the colder seasons (Więcaszek et al., 2016). The possibility of surviving the winter period and appropriate conditions for reproduction of these fish would be possible if they were introduced into the system of thermally polluted waters that are located in Poland.

The phenomenon of successful introductions of exotic species in such an environment has been found in other animals of aquarium origin (Maciaszek et al., 2019). Goldfish, pumpkinseed and American mace are able to survive colder seasons in natural Polish waters (Jagtap et al 2013) thanks to their thermal tolerance range. Goldfish is considered a potentially invasive species, despite the fact that this fish has not been observed in domestic waters (Jagtap and Kulkarni, 2013). Pumpkinseed creates stable populations in Poland, which due to environmental requirements are located in the catchment area of the Odra River, in the heated waters of the power plant in the Gryfino area, therefore its invasive potential is limited (Copp and Fox, 2007). The American mule population is also currently found in a limited area in Polish waters, but there is an increase in the number of individuals in the Odra basin (Grabowska et al. 2010). This species should be considered as potentially invasive.



**Fig. 3.** Introduction of non-native species of aquarium fish in Poland until 2019: unsuccessful introductions (black spot), successful introductions - limited invasion possibility (blue point), successful introductions - invasion ability (red spot), based on available literature scientific.

Introduction of animals of aquarium origin most often occurs near large urban agglomerations, where there is a higher risk of possible actions of irresponsible aquarists and breeders aimed at getting rid of unwanted individuals by releasing them into the natural environment. Therefore, it is recommended to monitor all reservoirs and watercourses

occurring in cities, with particular emphasis on places characterized by the possibility of escaping into open waters. Due to unique environmental conditions and the danger of creating stable populations by exotic ichthyofauna should also pay attention to control activities involving systems of thermally polluted waters in Poland.

#### 4. CONCLUSIONS

This work presents data obtained on the basis of available scientific literature. Many introductions of species of freshwater aquarium fish in Polish waters may not have been documented yet, which can be seen regularly on the example of photography and information about the trapping of non-native specimens posted on Polish angling and aquarium forums. Determining the actual scale of this phenomenon is difficult to estimate, and therefore the largest possible number of water reservoirs should be monitored in Poland, as well as update data on the trends of the described populations.

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