PERCIDS AS INVADERS IN RUSSIA: A REVIEW

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Introduction. Fresh waters of Russia are inhabited by four percid fishes. Two of them are commercially important and two others are game or course species. As a result of intentional introductions, channel and dam construction, overfishing and other kinds of human activities, ranges of percid species altered. The main goals of this review were to update ranges of percids in Russia and adjacent countries, to describe patterns and consequences of percids' invasions, and assess vulnerability of communities to these invasions.

Methods. This review is based on the database of about 80 Russian invasive fishes including all available published data since 1763 and unpublished materials on intentional introductions from correspondent institutions. Field observations of fish distribution and assemblages composition in Karelia, and the Volga River basin were also used. Status of reservoir and lake populations of percids was estimated on the basis of long-term studies of downstream fish migrations carried out in the Severtsov Institute of Ecology and Evolution headed by D.S. Pavlov (see Pavlov et al., 1999).

Results. The natural ranges of four percid species widening and invading new waters within their ranges during the last 50 years were analyzed.

![Figure 1. Geographical distribution of the pikeperch (Stizostedion lucioperca) in the former USSR. Grey area shows the natural range; striped area, the invasive range; black spots, sites of introduction.](image1)

There are two different patterns of percids' invasions in the fresh waters of Russia and adjacent countries. Pikeperch (S. lucioperca) and perch (Perca fluviatilis) were intentionally introduced, and then spontaneously spreading to new water bodies. Range expansions of Ruffe (Gymnocephalus cernuus) and Volga pikeperch (Stizostedion volgense) were connected with accidental introductions.

The invasions of the first type were usually successful. Both pikeperch and perch established many new populations and expanded their ranges to the east of Russia (Figures 1,2). Consequences of the invasion of perch for ecosystems and fishery are usually insignificant or unknown.

![Figure 2. Geographical distribution of the perch (Perca fluviatilis) in the former USSR. Denotations as in Figure 1.](image2)

Results of pikeperch introduction to different zoogeographic provinces: 1 – Baltic, 2 – Pontic-Caspian, 3 – Balkhash, 4 – Arctic Ocean, 5 – Amur. Results: unknown – dark, negative – grey, naturalization – white bars.

Well documented intentional introductions of pikeperch within the limits of its natural range demonstrated negative results in the Baltic and Pontic-Caspian provinces (Figure 3). At the same time, pikeperch introduction to the Amur province with extremely rich fish fauna (more than 120 species) was successful.

The situation with introduced pikeperch populations is variable because of fishery and other kinds of human activities. In some new sites pikeperch forms an important part of total fish production. For example, in Vozhe Lake (White Sea basin) pikeperch naturalized and became an important component of the lake ecosystem; no strong competition with aboriginal species was observed (Bolotova et al., 1995). However, in some places (in Balkhash province, for instance) pikeperch suppresses aboriginal species including rare and endangered...
endemic fishes like *Schizothorax argentatus*, *Perca schrenki* and Asiatic stone loaches. The main limiting factor of pikeperch populations in reservoirs is mass kill of young fish during down-stream migration. In some reservoirs it exceeds several billion individuals a year.

Figure 4. Geographical distribution of the ruffe (*Gymnocephalus cernuus*) within the former USSR. Grey area shows the natural range; solid line shows the former range after L. Berg (1949).

Recent status and trends with ruffe and Volga pikeperch populations may be connected with climate change and human activities.

It seems that the larger present range of ruffe as compared to the range given more than 50 years ago by Berg (1949) is not only the result of better and more numerous recent records. The ruffe widely spread in Western Europe and penetrated to American Great Lakes. In Siberian waters the increase of ruffe abundance was observed during the last decade. Probably, ruffe expansion to the East was due to natural factors. Ruffe have a variety of traits, which allow them to perform successfully in a broad variety of ecological situations and to adapt to fluctuations in both biotic and abiotic factors (Popova, et al., 1998).

On the opposite, in many water bodies of the western part of Russia ruffe abundance declines now, probably due to low oxygen concentration, eutrophication and pollution (Lehtonen et al., 1998).

Volga pikeperch abundance decreases because of dam constructions in the greater part of the natural range (Volga River) and increases in the site of invasion (Kuban’ River) (Figure 5).

Discussion. This review demonstrates significant expansion of percids within Russia and adjacent countries during the last 50 years. The main reasons of percids invasions were intentional and accidental introductions and anthropogenic impact on aboriginal ecosystems. Invasive percids can either destroy aboriginal fish assemblages or stabilize the whole ecosystem. Vulnerability of the communities to percids’ invasions depends on the presence of vacant nishes, rate of disturbance of aboriginal ecosystems, human impact on invaders (especially in man-made lakes), and does not depend on aboriginal fish fauna richness.

Figure 5. Geographical distribution of the Volga pikeperch (*Stizostedion volgensis*) in the former USSR. Grey area shows the natural range; striped area, the invasive range.

The management of established percids populations involves balanced fishery and water flow regulation in reservoirs. More research is needed to elucidate percids’ invasions impacts on native ecosystems.

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