

Data Paper

Checklist of non-native benthic macroinvertebrates and fish in the Dnieper River basin

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Abstract

An annotated checklist of non-native benthic macroinvertebrates and fish in 6 sub-basins (assessment units) of the Dnieper River is presented (based on a literature survey and the author's unpublished data). In total, the checklist includes 92 non-native aquatic species (invertebrates – 57, fish – 35), primarily of Ponto-Caspian origin. This background information provides support for possible future development of relevant management options towards control of invasive species in the studied area, which is an important part of the European network of inland waterways and the European inland water “central invasion corridor”.

Key words: invasive species, invasion corridor, Ponto-Caspian, data management

Introduction

The Dnieper River basin is an important part of the European network of inland waterways and the European inland water “central invasion corridor”, linking basins of the Black and Baltic seas (Black Sea–Dnieper River–Pripyat River–Bug/Pripyat Canal–Vistula River–Baltic Sea waterway). It facilitates the dispersal of invasive aquatic species, primarily those of Ponto-Caspian origin in Europe (Karatayev et al. 2007; Panov et al. 2009; Semenchenko et al. 2009).

Despite publications during the last 15 years of review papers concerning non-native fauna of the Dnieper River (Grigorovich et al. 2002; Alexandrov et al. 2007; Arbačiauskas et al. 2008; Pligin et al. 2013; Semenchenko et al. 2009, 2015), a complete list of non-native aquatic species for the whole river basin is still not available. The main objective of this data paper is to provide a first comprehensive annotated check-list for non-native aquatic benthic macroinvertebrates and fish for the Dnieper River basin.

Methods

For the present study, published information (primarily literature in Russian, Appendix 1) and the author's unpublished data on first records of non-native aquatic benthic invertebrates and fish for 10 study areas, comprising 6 assessment units within the Dnieper River basin were analysed (Figure 1). Assessment units included: 1 – Dnieper Liman; 2 – Dnieper Delta and Kakhovka Reservoir; 3 – Zaporizhia, Dniprodzierzhinsk and Kremenchug reservoirs; 4 – Kanev and Kiev reservoirs; 5 – Upper Dnieper River (Belarus); 6 – Prypiat River (Belarus) (Supplementary material, Table S1).

The lower sections of the river, namely the Dnieper Liman and Kakhovka Reservoir, were considered in our analysis as native areas for Ponto-Caspian species. The Zaporizhia, Dniprodzierzhinsk and Kremenchug Reservoirs are also deemed native areas for some of the species according to Mordukhai-Boltovskoi (1960) (Table S1).

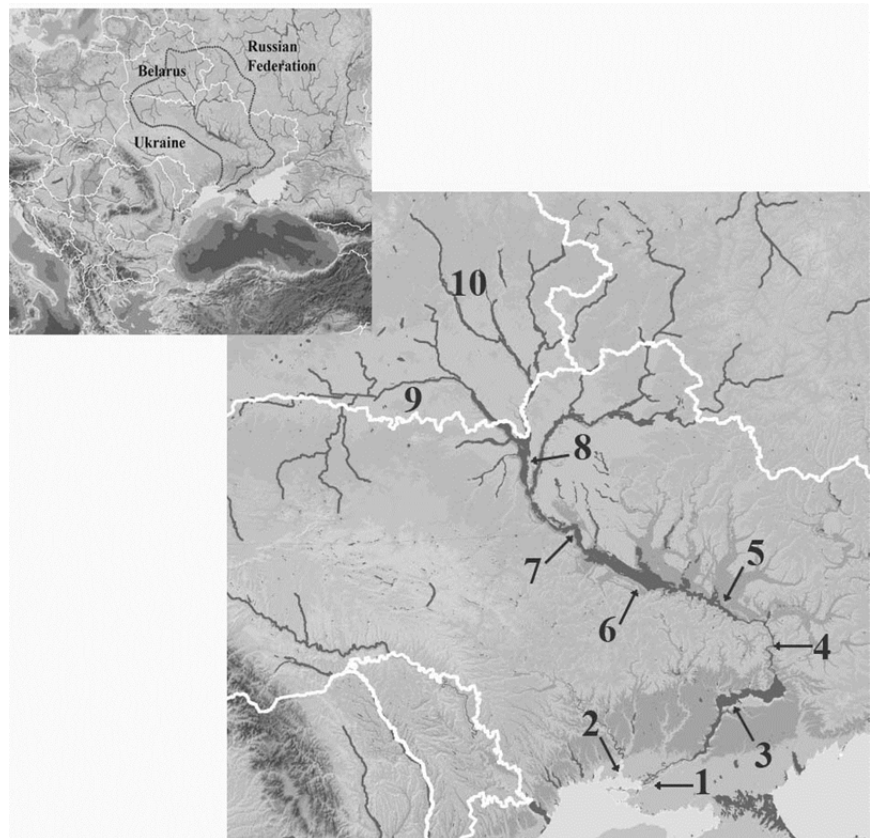


Figure 1. Main subbasins of the Dnieper River: 1 – Dnieper delta, 2 – Dnieper Liman, 3 – Kakhovka Reservoir, 4 – Zaporizhia Reservoir, 5 – Dniprodzierzhinsk Reservoir, 6 – Kremenchug Reservoir, 7 – Kanev Reservoir, 8 – Kiev Reservoir, 9 – Prypiat River (Belarus), 10 – Dnieper River (Belarus). From: Semenchenko et al. 2015.

For the majority of deliberately introduced species, exact dates of their first records or their first introduction events are not known, and in these cases the most likely periods of introduction are provided. Also, our estimates of most probable pathways of introductions for accidentally introduced species are based primarily on our own expert opinion and may involve some level of uncertainty.

Results and discussion

The present version of the checklist includes 92 non-native species (57 aquatic invertebrates and 35 fish), primarily of Ponto-Caspian origin (Table S1 and Semenchenko et al. 2015).

Species of Atlantic origin are limited to the lower parts of the Dnieper River, which can be attributed to intense shipping and numerous river ports in the Dnieper Liman. In other parts of the river and its basin, the number of non-native species other than those of Ponto-Caspian origin is low. They include 6 East Asian species of fish [*Carassius gibelio* (Bloch,

1782), *Ctenopharyngodon idella* (Valenciennes, 1844), *Hypophthalmichthys nobilis* (J. Richardson, 1845), *Liza haematocheilus* (Temminck & Schlegel, 1845), *Percocottus glenii* Dybowski, 1877, *Pseudorasbora parva* (Temminck&Schlegel, 1846), and 3 fish species of American origin (*Ictalurus punctatus* (Rafinesque, 1818), *Ictalurus nebulosus* (Lesueur, 1819), *Lepomis gibbosus* (Linnaeus, 1758)]. Among these species, *Carassius gibelio* and *Pseudorasbora parva* are the most widespread and recorded in all parts of the river basin. Only four non-native species of invertebrates other than those of Ponto-Caspian origin [*Physella acuta* (Draparnaud, 1805), *Ferrissia fragilis* (Tryon, 1863), *Eriocheir sinensis* H. Milne Edwards, 1853 and *Rhithropanopeus harrisi* (Gould, 1841)] are recorded in the middle and upper parts of the studied area.

The most widespread Ponto-Caspian non-native invertebrate species include: polychaete *Hypania invalida* (Grube, 1960), amphipods *Dikerogammarus villosus* (Sowinsky, 1894), *Dikerogammarus haemobaphes* (Eichwald, 1841), *Chaetogammarus ischnus*

(Stebbing, 1898), *Obesogammarus crassus* (Sars G.O., 1894), *Obesogammarus obesus* (Sars G.O., 1894), *Chelicorophium curvispinum* (G.O. Sars, 1895), mollusks *Lithoglyphus naticoides* (C.Pfeiffer, 1828), *Dreissena polymorpha* (Pallas, 1771) and mysids *Paramysis lacustris* (Czerniavsky, 1882), *Limnomysis benedeni* (Czerniavsky, 1882). Some of the Ponto-Caspian species are recorded in only a few reservoirs. The fish are mainly gobiids, such as *Neogobius fluviatilis* (Pallas, 1814), *Neogobius melanostomus* (Pallas, 1814), *Neogobius gymnotrachelus* (Kessler, 1857), *Proterorhinus marmoratus* (Pallas, 1814), *Knipowitschia longicaudata* (Kessler, 1877), *Mesogobius batrachocephalus* (Pallas, 1814) and *Benthophilus nudus* Berg, 1898.

Among the fish species, gobiids (specifically *Neogobius* spp), Black Sea sprat *Chupeonella cultriventris* (Nordmann, 1840) and the Amur sleeper (*Perccottus glenii* Dybowski, 1877) are the most successful invaders. Potentially these fish species could spread to other parts of the basin.

Semenchenko et al. (2015) reviewed pathways and temporal trends of introductions of non-native aquatic species in the studied area (based on the initial version of the checklist in Table S1), as well as potential impacts of invasive species. Research into the ecological and economic impacts of aquatic non-native species in the Dnieper River basin is lacking. However, a list of 21 potentially harmful invasive (“Black list”) species, namely 16 species of invertebrates and 5 species of fish is given.

Most likely, the present version of the checklist of non-native aquatic species in the Dnieper River basin is not complete, and should be consistently updated. However, the current information is useful in the development of relevant management options towards the control of invasive species in the region, as well as the generation of a predictive risk assessment for the spread of invasive aquatic species in adjacent European inland waters. Future research should be focused on the evaluation of actual impacts of these species and the development of a predictive risk assessment for new introductions in the area.

Supplementary material

The following supplementary material is available for this article:

Table S1. Annotated checklist of non-native benthic macroinvertebrates and fish in 6 sub-basins (assessment units) of the Dnieper River.

Appendix 1. List of references for annotated checklist.

This material is available as part of online article from:

http://www.reabic.net/journals/bir/2016/Supplements/BIR_2016_Semenchenko_et_al_Supplement.xls

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References

- Alexandrov B, Boltachev A, Kharchenko T, Lyashenko A, Son M, Tsarenko P, Zhukinsky V (2007) Trends of aquatic alien species invasions in Ukraine. *Aquatic Invasions* 2: 215–242, <http://dx.doi.org/10.3391/ai.2007.2.3.8>
- Arbačiauskas K, Semenchenko V, Grabowski M, Leuven R, Paunović M, Son M, Csanyi B, Gumuliauskaitė S, Konopacka A, Nehring S, van der Velde G, Vezhnovets V, Panov V (2008) Assessment of biocontamination of benthic macroinvertebrate communities in European inland waterways. *Aquatic Invasions* 3: 211–230, <http://dx.doi.org/10.3391/ai.2008.3.2.12>
- Grigorovich IA, MacIsaac HJ, Nikolai V, Shadrin NV, Mills EL (2002) Patterns and mechanisms of aquatic invertebrate introductions in the Ponto-Caspian region. *Canadian Journal of Fisheries and Aquatic Sciences* 59: 1189–1208, <http://dx.doi.org/10.1139/f02-088>
- Karatayev AY, Mastitsky SE, Burlakova LE, Olenin S (2007) Past, current, and future of the central European corridor for aquatic invasions in Belarus. *Biological Invasions* 10: 215–232, <http://dx.doi.org/10.1007/s10530-007-9124-y>
- Mordukhai-Boltovskoi FD (1960) Caspian fauna in the Azov and Black Sea Basin. Akad. Nauk SSSR Press, Moscow–Leningrad, 287 pp [in Russian]
- Panov VE, Alexandrov B, Arbačiauskas K, Binimelis R, Copp GH, Grabowski M, Lucy F, Leuven RSEW, Nehring S, Paunović M, Semenchenko V, Son MO (2009) Assessing the risks of aquatic species invasions via European inland waterways: from concepts to environmental indicators. *Integrated Environmental Assessment and Management* 5: 110–126, http://dx.doi.org/10.1897/IEA_M_2008-034.1
- Pligin YV, Matchinskaya SF, Zhelezniak NI, Linchuk MI (2013) Distribution of alien species of macroinvertebrates in the Dnieper Reservoirs in long-term aspect. *Hydrobiological Journal* 49(6): 21–36 [in Russian]
- Semenchenko V, Rizevsky V, Mastitsky S, Vezhnovets V, Pluta M, Razlutsky V, Laenko T (2009) Checklist of aquatic alien species established in large river basins of Belarus. *Aquatic Invasions* 4: 337–347, <http://dx.doi.org/10.3391/ai.2009.4.2.5>
- Semenchenko V, Son M, Novitsky R, Panov V (2015) Alien invertebrates and fish in the Dnieper River basin. *Russian Journal of Biological Invasions* 6(1): 51–64, <http://dx.doi.org/10.1134/S207511715010063>