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FRESHWATER MOLLUSCS OF THE DYJE (THAYA) RIVER AND ITS TRIBUTARIES – THE ROLE OF THESE WATER BODIES IN EXPANSION OF ALIEN SPECIES AND AS A REFUGE FOR ENDANGERED GASTROPODS AND BIVALVES

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ABSTRACT: The malacofauna of the Dyje River, including the lower sections of its five tributaries, is still rich and diversified despite the pollution, regulation and building of several dam reservoirs. In total, 42 freshwater mollusc species (24 gastropods, 18 bivalves) were found at 75 sites. The richest malacofauna (30 species) was recorded in the lower section of the Dyje. Populations of endangered or rare molluscs *Theodoxus danubialis*, *Viviparus acerosus*, *Lithoglyphus naticoides*, *Unio crassus*, *Pseudanodonta complanata*, *Pisidium amnicum* and *P. moitessierianum* were found. The first three species inhabit only the area under study in the Czech Republic. Especially the occurrence of *Unio crassus* corresponds with river sections that were only partly affected by human activities (long distance below dam reservoirs, less polluted sections, unregulated watercourses). The occurrence of five invasive species, four originating from other continents (*Potamopyrgus antipodarum*, *Physella acuta*, *Ferrissia fragilis*, *Sinanodonta woodiana*) and one (*Dreissena polymorpha*) originally Ponto-Caspian, was confirmed for the Dyje River and its tributaries. The Dyje River formed the main invasion route from the Danube River into Moravia (eastern part of the Czech Republic).

KEY WORDS: Dyje (Thaya) River, molluscan assemblages, zoogeographical analyses, invasion corridor, *Unio crassus*

INTRODUCTION

The Dyje (Thaya) River is one of the largest rivers in the Czech Republic and belongs to the Black Sea drainage area. The lower section of the Dyje River has been of interest to malacologists for more than 100 years. The first data are mentioned in ULIČNÝ (1885), who studied this area in 1882. Published and unpublished data (e. g. material deposited in the National Museum in Prague) till 1998 have been summarised in BERAN & HORSÁK (1998, 1999) who studied aquatic molluscs of the Dolnomoravský úval lowland, including the lower stretch of the Dyje. The macroinvertebrate fauna of the Dyje River downstream of the Nové Mlýny reservoir was studied by HORSÁK (2001). On the other hand, aquatic molluscan fauna of the upper part of the Dyje was poorly known and no published data were available. Little attention was paid to the aquatic molluscs of the lower sections of its tributaries except for the Kyjovka River which was studied by BERAN & HORSÁK (1998).

The Dyje River flows into the Morava River at the Czech-Austrian-Slovak boundary, and both rivers drain a large part of Moravia (eastern part of the Czech Republic). The river was partly changed due to canalisation, dam construction and pollution. To assess how much these changes affected the molluscan assemblages of the Dyje and its tributaries was one of the aims of this research, with special reference to populations of endangered or rare molluscs and, on the other hand, to invasions of non-native gastropods and bivalves.

MATERIAL AND METHODS

The field work was conducted in 2001–2013. In total, 41 sites were sampled in the Dyje River, including the Věstonice dam reservoir (sites 20–30, one of the five dam reservoirs). The remaining 31 sites were located on five tributaries, and three sites on the canalised Morava River upstream of the inflow of the Dyje River (Fig. 1, Appendix 1). The main sampling method for freshwater molluscs was washing vegetation or sediments on a metal sieve (kitchen strainer, diameter 20 cm, 0.8 mm mesh), combined with collecting by eye (searching of stone, wood and anthropogenic material, e.g. plastic bags and bottles, surface). Unionids were sampled by means of visual inspection of suitable habitats while wading upstream and searching for live molluscs or fresh shells (nacreous layer still lustrous, periostracum coloured). Places with fine sediment were searched by hand. All live individuals of endangered *Unio crassus* were measured and released. In the case of abundant populations the data were used to study the size structure of the population.

Freshwater molluscs were identified conchologically or, when identification based only on shells was impossible, dissected and determined based on their genitalia. Specimens for dissection were killed in hot water and then fixed in 70% ethanol. No specimen of legally protected species (*Unio crassus*, *U. pictorum*, *Anodonta cygnea*) was killed. Selected material of shells of endangered or rare species is deposited in the author's collection. The classification follows HORSÁK et al. (2010) while WELTER- SCHULTES (2012) was used for zoogeographical classification.

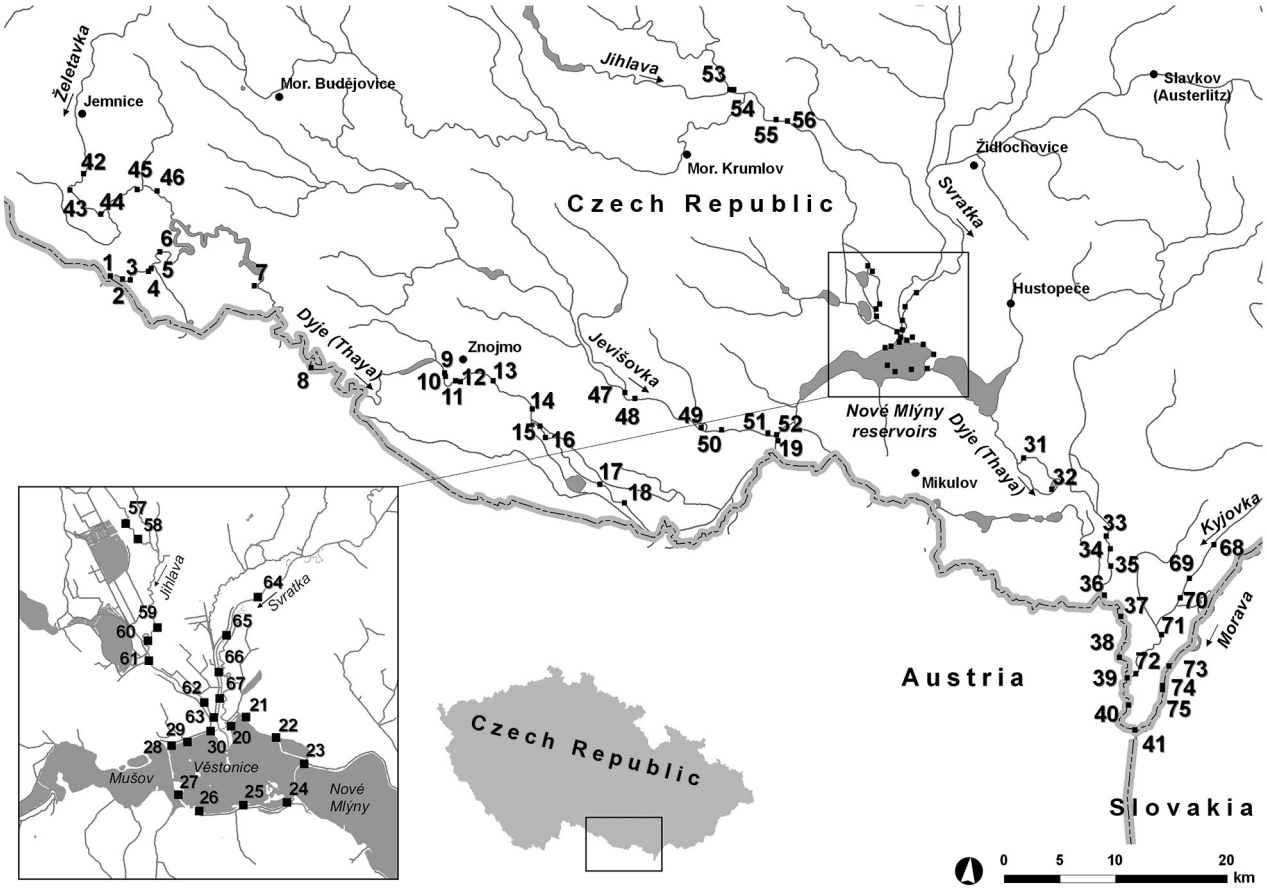

Fig. 1. The map of the Dyje River and its tributaries with the geographical distribution of the sampling sites. Drawn by MARTIN DOLEJŠ

STUDY AREA

Dyje

The Dyje (Thaya) River arises from the confluence of the Austrian Dyje River and the Moravian Dyje River near Raabs in Austria at the altitude of 410 m and, after 235 km, flows into the Morava River south of Břeclav at the Czech-Austrian-Slovak boundary at the altitude of 148 m. The annual mean discharge before the inflow to the Morava River is 43.9 m^3/sec (VLČEK 1984). The watercourse has been only partly changed and canalised, but the Vranov, Znojmo, Mušov, Věstonice and Nové Mlýny dam reservoirs have changed the river's character for a long distance below the dams and divided it into several isolated segments. The largest tributaries are the Jihlava and Svratka rivers which flow into the Dyje River at the Věstonice dam reservoir. The Želetavka, Jevišovka and Kyjovka rivers are smaller tributaries. The Dyje was studied at the part between the Czech-Austrian boundary near Uherčice (average flow rate 8.5 m^3/sec, Figs 1, 2) and the inflow into the Morava River at the Czech-Austrian-Slovak boundary (ca. 208 km). The studied part of the Dyje River was divided into four sections:

Dyje I – Dyje River between the Czech-Austrian boundary and the Vranov dam reservoir,
Dyje II – Dyje between the Vranov dam reservoir and the Mušov dam reservoir,
Dyje III – the Věstonice dam reservoir,
Dyje IV – Dyje between outflow from the Nové Mlýny dam reservoir and inflow into the Morava River at the Czech-Slovak-Austrian boundary.

Želetavka

The Želetavka Brook arises near Lesná at the altitude of 660 m and after 56 km flows into the Dyje River in the Vranov dam reservoir with the average discharge of 1.1 m^3/sec (VLČEK 1984). The lower section of this brook, ca. 18 km long, downstream of Bačkovice was studied. This part has a relatively natural character.

Jevišovka

The Jevišovka River is a left-bank tributary of the Dyje River. It originates in the Bohemian-Moravian Highlands (Českomoravská vrchovina) upland at the elevation of 560 m and flows for 81 km to Jevišovka,

Fig. 2. The Dyje River near the Czech–Austrian border in its upper part (Dyje I, site No. 3). Photo: LUBOŠ BERAN

Fig. 3. The canalised part of the Jevišovka River (site No. 50). Photo: LUBOŠ BERAN

where it enters the Dyje River with the average discharge of 1.1 m^3/sec (VLČEK 1984). The downstream section, ca. 16 km long, was studied. The watercourse was hardly changed and canalised (Fig. 3).

Jihlava

The Jihlava River arises near Jihlávka at the altitude of 670 m and after 185 km flows into the Věstonice dam reservoir at the altitude of 170 m, with the average discharge of 11.8 m^3/sec (VLČEK 1984). The river stretch downstream of the inflow of the Oslava River, ca. 34 km long, was studied. The watercourse of this section is only partly changed and several weirs were built.

Svratka

The Svratka River arises in the Žďárské vrchy Mts. at the altitude of 760 m and after 174 km flows into the Dyje River at the Věstonice reservoir at the altitude of 170 m with the average discharge of 27.2 m^3/sec (VLČEK 1984). The lower, studied section, ca. 5 km long, was canalised and changed into a straight and slowly flowing canal.

Kyjovka

A small river originating in the Chřiby upland at the altitude of 512 m; after 86.7 km it flows into the Dyje River at the altitude of 150 m, with the average discharge 1.1 m^3/sec (VLČEK 1984). A section about 20 km long was searched. The downstream river stretch approximately 10 km long flows through a floodplain forest and has natural character while the upper studied section was canalised.

RESULTS

MOLLUSCAN ASSEMBLAGES

In total, 42 freshwater mollusc species were found in the Dyje River and the lower sections of its five tributaries: 24 gastropods and 18 bivalves. The Dyje River harbours 41 freshwater molluscs. Fourteen species were recorded in the upper section of the Dyje River (Dyje I, upstream of the Vranov dam reservoir), while in the lower section the molluscan assemblages included from 24–27 (27 in Dyje II; 24 in Dyje III – Věstonice dam reservoir) to 30 (Dyje IV) species (Fig. 4). The lower section of the Dyje River was the richest studied part while the poorest one was the Želetavka Brook, with only eight species. The other four tributaries (Jevišovka, Jihlava, Svratka, Kyjovka) were found to hold from 20 to 24 species. In the canalised Morava River above the inflow of the Dyje River only 14 species were recorded. *Bithynia tentaculata*, *Valvata piscinalis*, *Radix auricularia*, *Physella acuta*, *Ancylus fluviatilis*, *Unio pictorum*, *U. tumidus*, *Anodonta anatina*, *Sphaerium corneum*, *Pisidium henslowanum*, *P. supinum*, *P. subtruncatum* were recorded at more than seven studied sections or tributaries while *Theodoxus danubialis*, *Viviparus viviparus*, *Valvata cristata*, *Stagnicola palustris*, *Physa fontinalis*, *Gyraulus crista*, *Planorbarius corneus*, *Ferrissia fragilis*, *Pisidium amnicum* and *Dreissena polymorpha* occurred in only one or two studied sections. *Dreissena bugensis* was not found in any studied site. Species which prefer slowly flowing or stagnant water (e.g. *Lymnaea stagnalis*, *Planorbis planorbis*, *Anisus vortex*, *P. corneus*, *Anodonta cygnea*) dominated in the Věstonice dam reservoir which was studied as the only one out of the five reservoirs built on this river. The lists of studied sites and molluscs found at particular localities are shown in Appendices 1 and 2 (Tables 1–5).

ZOOGEOGRAPHICAL ANALYSIS

More than half of the recorded species have Holarctic or Palaearctic distribution ranges (Fig. 5). Five species are Euro-Siberian and eight are European. Only *Th. danubialis*, *Viviparus acerosus* and originally also *L. naticoides* and *D. polymorpha* occur especially in the Danube drainage area and belong to species with Danubial or Pontic (Ponto-Caspian) distribution ranges. The first three species were recorded only in the lowest section of the Dyje River (Dyje IV) and the Kyjovka River, *L. naticoides* also at site No. 19

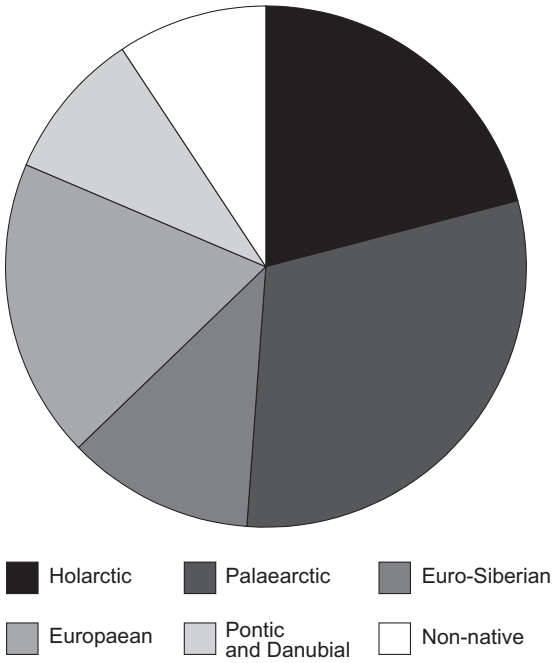

Fig. 5. Zoogeographical analysis of molluscs found in the Dyje River and its tributaries

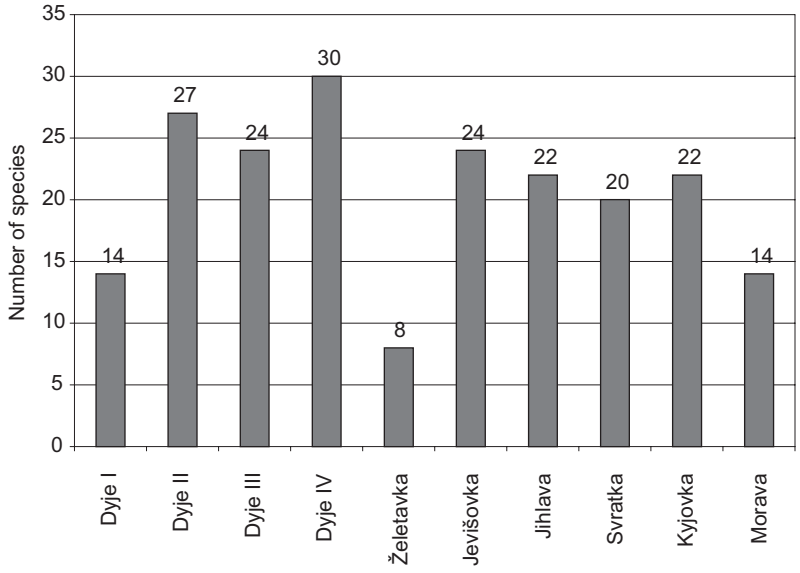

Fig. 4. Number of species recorded in particular parts of the Dyje River and its tributaries

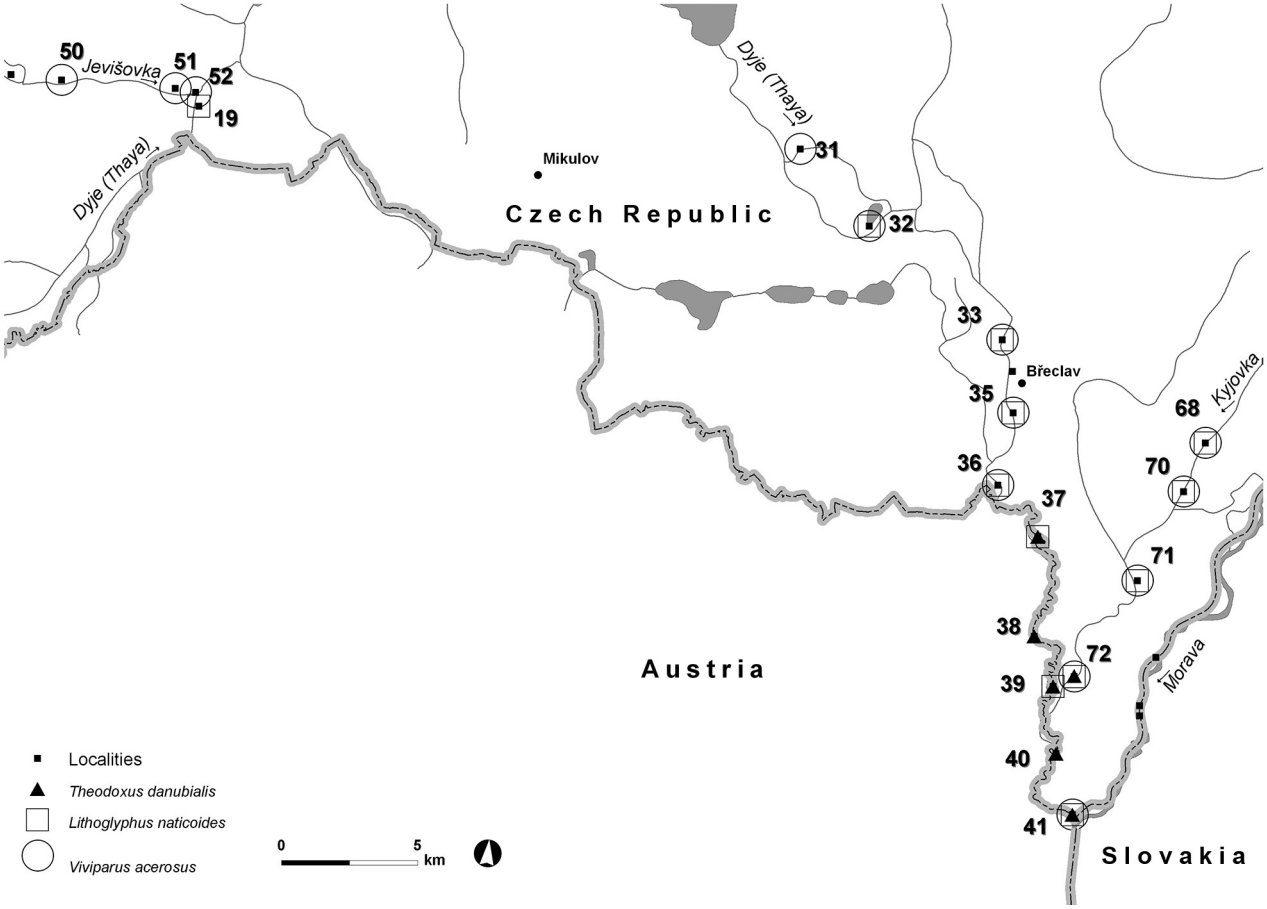

Fig. 6. Distribution of aquatic molluscs with Danubial or Pontic distribution ranges. Drawn by MARTIN DOLEJŠ

(Dyje II) upstream of a system of three dam reservoirs (Mušov, Věstonice, Nové Mlýny) and *V. acerosus* also in the lower section of the Jevišovka River (Fig. 6). The invasive *D. polymorpha* was recorded also in the lowest stretch of the Dyje River and in the Kyjovka. *Potamopyrgus antipodarum*, *Ph. acuta*, *F. fragilis* and *Sinanodonta woodiana* are invasive species originating from other continents.

ENDANGERED AND RARE MOLLUSCS

More than 50% of the recorded species are common and widespread, but it is noteworthy that also several molluscs that inhabit the Dyje River and its tributaries are rare and endangered species (Fig. 7). Three prosobranchs (*Th. danubialis*, *V. acerosus*, *L. naticoides*) occur in the Czech Republic only in the studied area. The first one is red-listed (BERAN et al. 2005) as Critically Endangered while the other two – as Endangered. Another endangered mollusc, *Unio crassus*, was found in the Dyje River and three of its tributaries. Probably abundant populations were recorded in two sections of the Dyje River (Dyje I, Dyje II), scattered populations were found in the Jevišovka and Jihlava, and some specimens were found in the lower section of the Dyje (Dyje IV) and the Želetavka Brook (Appendix 2: Tables 1–5). An especially abundant population was found in site No. 18, with 78 specimens per 10 m^2 in a shallow place with sandy bottom. Specimens with shell length of 45–55 mm

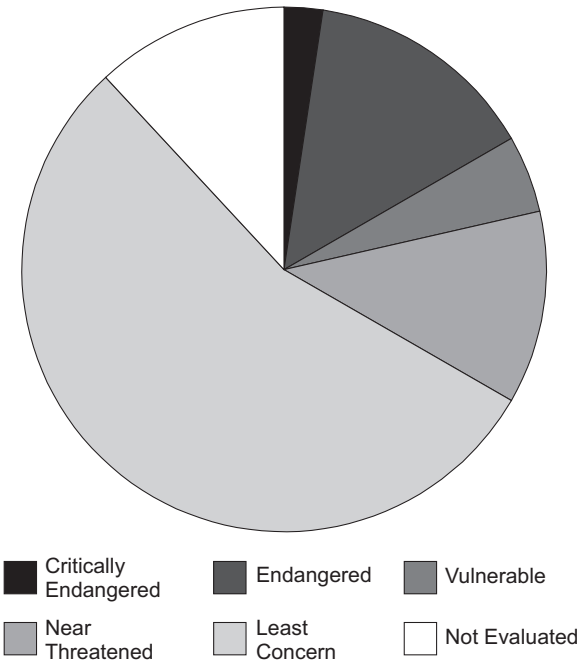

Fig. 7. Proportion of different species categories of the Red List

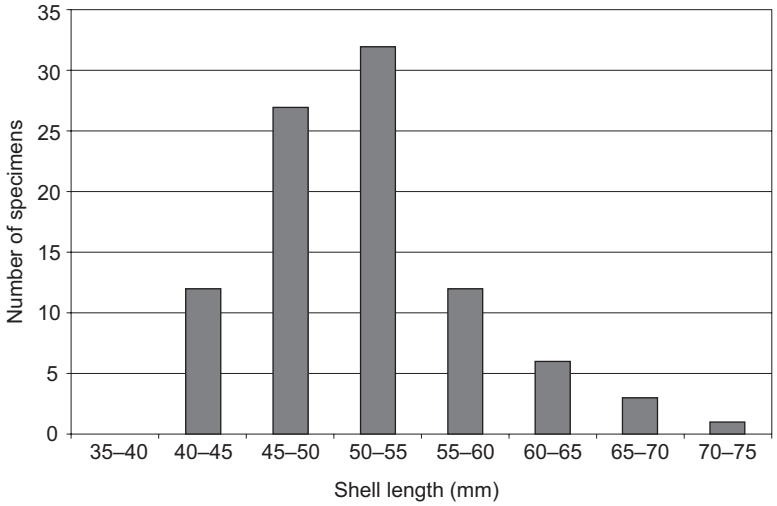

Fig. 8. Shell length of observed *Unio crassus* individuals

formed more than 60% of the population (Fig. 8). The estimated abundance of *Unio crassus* in the other sites was much smaller, approximately less than 1 specimen per 1 m of the watercourse. *Pseudanodonta complanata*, a unionid vulnerable or endangered in many European countries, was occasionally found at several localities in the Dyje River and in only one site of the Morava River. Two endangered pea mussels were recorded only occasionally. Only one specimen of *P. amnicum* was found at site No. 8 (Dyje II) while *P. moitessierianum* was found at three sites of the Dyje River (two sites of the Věstonice reservoir) and two sites of the Jevišovka River (Fig. 9).

NON-NATIVE MOLLUSCS

Four non-native molluscs were recorded in the study area (Fig. 10). *P. antipodarum*, an invasive spe-

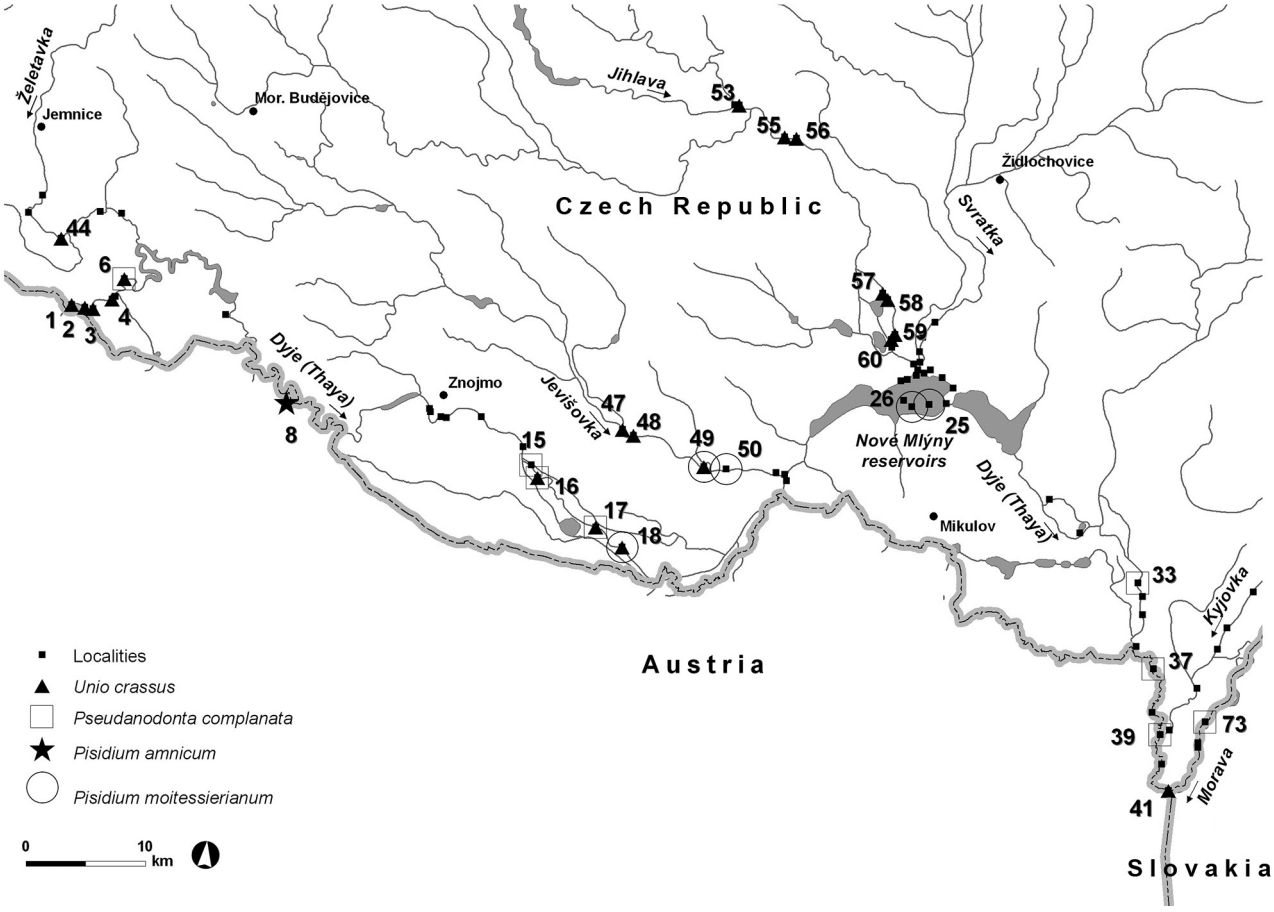

Fig. 9. Distribution of endangered bivalves. Drawn by MARTIN DOLEJŠ

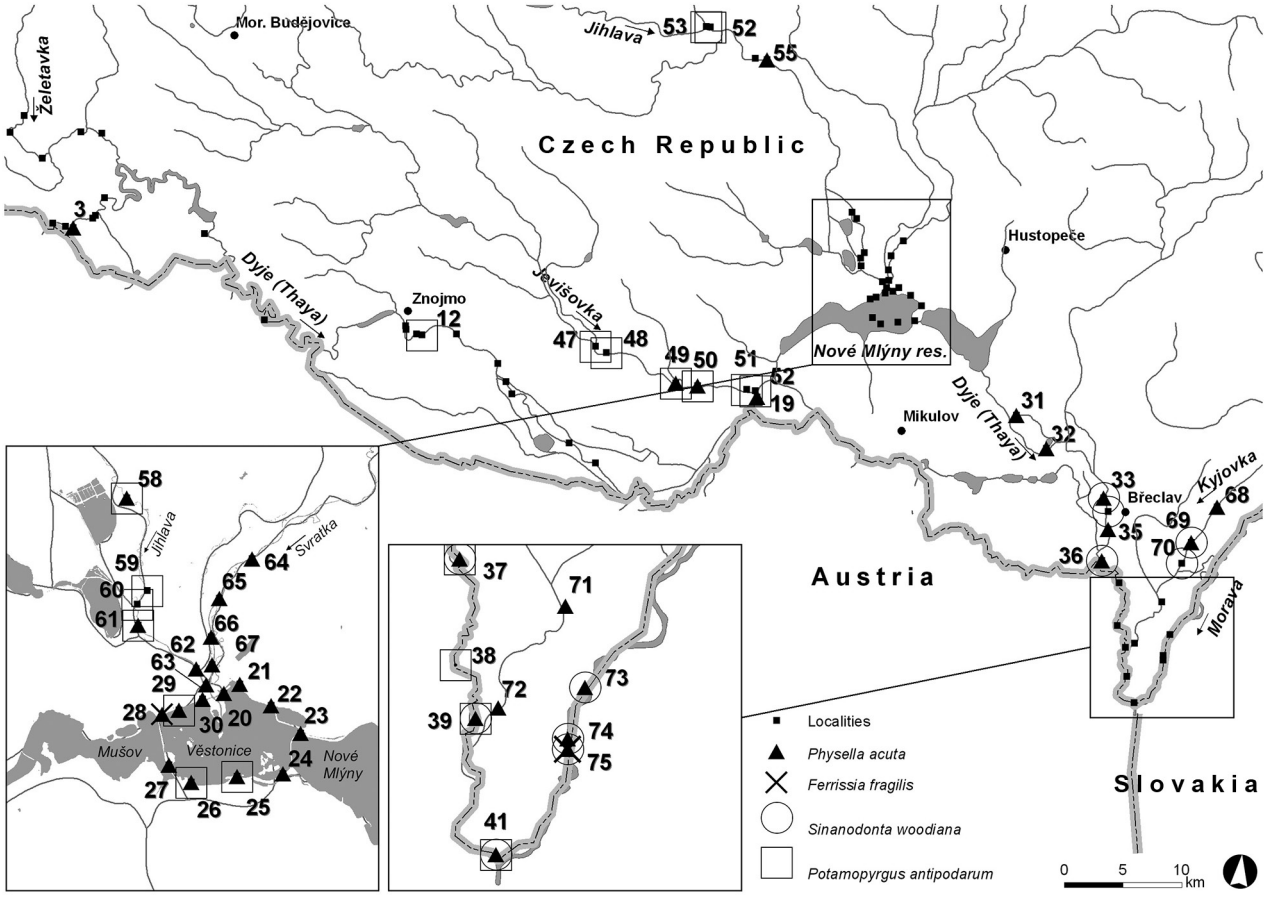

Fig. 10. Distribution of non-native molluscs. Drawn by MARTIN DOLEJŠ

cies originating from New Zealand, occurs in the Dyje River except the upper section, and also in the Jevišovka and Jihlava rivers. North American *Ph. acuta* was found in the Dyje River where it was one of the dominant species in the Věstonice dam reservoir and was also recorded in all the tributaries except the Želetavka Brook. Another North American species, *F. fragilis*, was found in only two sites in the Kyjovka River and in the Věstonice dam reservoir. *S. woodiana*, originally distributed in southeastern Asia, was recorded from the lower section of the Dyje River (Dyje IV), Morava River and Kyjovka River. This bivalve was the dominant unionid in several sites (Appendix 2: Tables 1–5).

DISCUSSION

The Dyje River and the lower sections of its tributaries still harbour rich and diverse molluscan assemblages. Although only the main streams of these rivers were studied, the occurrence of 42 freshwater mollusc species (24 gastropods, 18 bivalves) was recorded. This constituted ca. 54% of the total freshwater malacofauna of the Czech Republic. The lowest stretch of the Dyje with its 30 species is among the richest Czech rivers, comparable e. g. with the Labe (Elbe) River which is the largest river in the Czech Republic (BERAN 2005, 2009). One of the possible reasons for the diversity is probably the natural character of the watercourse (downstream of Břeclav), combined with the presence of several species which occur only there in the Czech Republic (*Th. danubialis*, *V. acerosus*, *L. naticoides*, see below) and also the occurrence of invasive non-native species originating from other continents (*P. antipodarum*, *Ph. acuta*, *F. fragilis*, *S. woodiana*) as well as invasive *D. polymorpha*, originally a Ponto-Caspian species. This richness is in contrast with the canalised section of the Morava River upstream of the confluence with the Dyje, where only 14 species were recorded.

The comparison with distributional data on freshwater molluscs in the Czech Republic (BERAN 2002) showed that the lower stretch of the Dyje River together with the lower section of the Kyjovka River are the only watercourses with the occurrence of molluscs with Danubial and Pontic distribution ranges (*Th. danubialis*, *V. acerosus*, *L. naticoides*), except the inva-

sive *D. polymorpha* which is originally also Pontic (Ponto-Caspian) species. Another exception is *L. naticoides* which occasionally occurred in the Dyje River upstream of the system of three dam reservoirs, and also the population of *V. acerosus* which was recorded in the lowest section of the Jevišovka River and upstream of these reservoirs (see Fig. 6). The populations of these species are probably relicts that inhabited (together with *Th. danubialis*) this river section before building of the system of three dam reservoirs (BERAN & HORSÁK 1998). The section of the Dyje around the inflow of the Jihlava and Svratka rivers with its extensive floodplain is among the sites with the highest diversity, not only of freshwater molluscs, and was damaged by construction of the reservoirs between 1969 and 1989 (BUČEK 2012).

The population of *Th. danubialis* in the Dyje and Kyjovka rivers is situated on the northern edge of the species' range (see e.g. WELTER-SCHULTES 2012). The species is regarded as a Critically Endangered mollusc in several countries, e.g. Austria and Germany (GLÖER 2002, WELTER-SCHULTES 2012), it is endangered in Slovakia (ŠTEFFEK & VAVROVÁ 2006), rare in Hungary (FEHÉR et al. 2004), while in the southern part of its range it is common and widespread. In Croatia it belongs to dominant species, especially in karstic rivers like Korana (BERAN 2013) or Kupa (HADBIJA et al. 1995), where it forms the main part of gastropod biomass. Similarly, the site of *V. acerosus* is located on the north-western edge of its geographical range (WELTER-SCHULTES 2012), except new introduction(s) in northwestern Europe (e. g. SOES et al. 2009).

Building of the five dam reservoirs, combined with pollution and river canalisation, caused many changes of the Dyje river and also other studied watercourses. The situation of the population of endangered thick-shelled river mussel *U. crassus* is a good example of how these changes affected the molluscan asemblages of this river. At present this population is divided in two (three) subpopulations, one around the Czech-Austrian boundary in the upper part of the river (sites No. 1–4, 6). This part has a natural character and ends in the Vranov dam reservoir. The second subpopulation (sites No. 16–18) inhabits the short part of the river which has also a relatively natural character and is located about 18 km downstream of the Znojmo dam reservoir. This part is followed by a canalised watercourse and a system of three dam reservoirs without populations of *U. crassus*. This bivalve was also occassionaly found in the third section of this river, upstream of the inflow to the Morava River. In the past, *U. crassus* was one of the most common and widespread unionids and was also used as feed for domestic livestock (ULIČNÝ 1892–1895), so it can be supposed that its occurrence in the Dyje River before anthropogenic changes was nearly continuous while now only isolated and mostly scattered populations live there. Several smaller populations (or only some specimens) found in the tributaries (Želetavka, Jevišovka, Jihlava) are also isolated from the populations in the Dyje River. The fragmentation of most populations is another negative effect which can cause a decrease or extinction of the thick-shelled river mussel in this region; in Moravia in the Danube drainage area more numerous populations are known only from the studied area and also from the Bečva River, from Malá Bečva canal and from four mill races (BERAN & DOUDA 2009, DOUDA & BERAN 2009).

Like the *U. crassus* population, populations of another endangered unionid *P. complanata* are divided into subpopulations. The situation is worse due to the very low density. The scattered occurrence and low densities of this species in many rivers are common in the Czech Republic (BERAN 2002), and make survival of its populations uncertain.

P. amnicum, the biggest pea mussel in the Czech Republic, was found in the Dyje River at site No. 8. The species inhabits unregulated and unpolluted rivers and brooks. In the Czech Republic it belongs to endangered molluscs (BERAN 2002). Unfortunately, only one specimen was found and more detailed research is necessary to confirm the existence of the population. Subfossil shells were found also in the Jevišovka River. In the studied area *P. amnicum* is known also from a small pond in Vranov (LOŽEK & VAŠÁTKO 1997). Other closest sites with the recent occurrence of abundant populations are known from central Moravia in two canals (mill races) of the Bečva River (BERAN 2003, 2007). The last endangered mollusc is *P. moitessierianum*. The species inhabits slowly flowing waters with muddy sediment; it was found in the Dyje (site No. 18), and surprisingly also in the Věstonice dam reservoir (site No. 25, 26) and in the Jevišovka R. (site No. 49, 50). The species was found in the studied area for the first time in 1996 (BERAN & HORSÁK 1998) and this record was the first for Moravia (eastern part of the Czech Republic).

Finding of an abundant population of *V. viviparus* in the upper section of the Dyje River (Dyje I, site No. 3–6) between the Czech-Austrian border and the Vranov dam reservoir is noteworthy. The species occurs in the Czech Republic only in Bohemia (western part of the Czech Republic) in the Labe (Elbe) River basin (BERAN 2002) while *V. acerosus* is known from the Dyje River and in the past also from the Morava River (Danube river basin) (BERAN 2002). The existence of population of *V. viviparus* is surprising and no information exists on the occurrence of this species in the Dyje River in Austria or the Moravian Dyje River. The Czech section of the Moravian Dyje River was studied (BERAN 2008b) and *V. viviparus* was not recorded. It is possible that the species was introduced in the Vranov dam reservoir (construction finished in 1934) from the Labe (Elbe) River drainage area in the past (e. g. during

Fig. 11. *Theodoxus danubialis* uses living specimens and empty shells of *Sinanodonta woodiana* in the lowest parts of the Dyje River where stones and other suitable habitats for *Th. danubialis* are rare. Photo: LUBOŠ BERAN

building of the dam reservoir). The population lives 115 km away from the nearest population of *V. acerosus* (site No. 52, see Fig. 1).

The Chinese pond mussel, *S. woodiana* was first found in the Czech Republic in an oxbow of the Dyje River downstream of Břeclav in 1996 (BERAN 1997). This record is also mentioned in BERAN & HORSÁK (1998) as the only site with the occurrence of this invasive alien species; HORSÁK (2001) did not find it in any of the five studied sites located on the Dyje River downstream of the system of three dam reservoirs. The results confirm the continuing invasion as observed by BERAN (2008a) and show that the Chinese pond mussel has become a dominant bivalve in some sites in the rivers Kyjovka and Dyje. DOUDA et al. (2012) demonstrated that the spread of this alien bivalve was not limited by the availability of hosts and that the temperature conditions in Central European lowland rivers were suitable for completion of its life cycle; they also identified potential threats to native habitats and communities. It is not possible to exclude a negative impact on the populations of common as well as endangered unionids, together with water pollution and habitat alteration. On the other hand, in the lowest section of the Dyje River (site No. 41) where stones are very rare, live specimens and also empty shells of *S. woodiana* are often used by critically endangered *Th. danubialis* as suitable microhabitat (Fig. 11).

In comparison with earlier studies (BERAN & HORSÁK 1998, HORSÁK 2001) *P. antipodarum* was discovered in three studied sections of the Dyje River. This non-native species was first found in the Dyje river basin in the Dyje near Čížov (between sites No. 7 and 8) in 1996 (VOJEN LOŽEK, unpublished data). These findings confirmed its rapid expansion also in this river. However, the densities were relatively low and *P. antipodarum* did not belong among dominant molluscs. The species was also recorded in the Jevišovka and Jihlava but it is impossible to confirm these records with the occurrence in the past because historical data were not available. The presence of *P. antipodarum* does not seem to have an unequivocally negative effect on the native malacofauna. Another non-native species, *F. fragilis*, was known only from the floodplain of the Morava River (BERAN & HORSÁK 1998, 2007) and in the Dyje river basin it was first discovered during this research in 2008 at site No. 72.

Ph. acuta was first recorded in the Dyje river basin between 1969 and 1971 in a small ditch in the floodplain of the Dyje River in Lednice (BALŮSEK & VOJTEK 1973) (the nearest studied locality is site No. 32) and later was recorded also in the Dyje River and its tributaries (BERAN & HORSÁK 1998). The non-native gastropod *Gyraulus parvus* inhabits only the floodplain of the Dyje River (BERAN & HORSÁK 2002) and was not found in the studied rivers. In the future expansion of other invasive non-native species such as *Corbicula fluminea* can be expected; it was already found in the Danube River in Slovakia (VRABEC et al. 2003) and Austria (TITTIZER & TAXACHER 1997).

Altogether, four alien species originating from other continents and the invasive *Dreissena polymorpha* which is originally Ponto-Caspian were recorded in the Dyje River, its tributaries and the surrounding floodplain. While the Labe (Elbe) River with seven non-native species (*P. antipodarum*, *Ph. acuta*, *G. parvus*, *Menetus dilatatus*, *F. fragilis*, *C. fluminea*, *D. polymorpha*) is a main corridor for the invasion of alien molluscs into Bohemia (western part of the Czech Republic) (PETRUSEK & BERAN 2006), the Morava and Dyje rivers are the main route for invasions from the Danube drainage area into Moravia (eastern part of the Czech Republic).

The canal connecting the Danube, Odra and Labe rivers whose building has been discussed for many decades (centuries in the case of the Dunaj-Odra canal) (KRÁTKÝ & LÖW 2005) would significantly increase the possibility of invasion of non-native species, similarly as in the case of many European rivers (BIJ DE VAATE et al. 2002, LEUVEN et al. 2009), as well as consequent changes in the gene pool of autochtonous molluscs. It would also change the character of the lower part of the Dyje River, through significant negative impact to the molluscan assemblages. This would increase the probability of extinction of populations of endangered and rare mollusc species.

CONCLUSIONS

The research on the Dyje River and lower sections of its main tributaries confirmed the existence of rich molluscan assemblages, including three species occurring in the Czech Republic only in this area. The malacofauna of the Dyje River was negatively altered by the construction of several dam reservoirs which divided the river into several sections, changed the watercourses below the dams and in the case of the system of three dam reservoirs (Mušov, Věstonice, Nové Mlýny) also damaged one of the richest floodplains in the Czech Republic. Other negative effects, such as pollution and regulation, affected also the tributaries. Despite the negative anthropogenic impact, isolated populations of endangered or rare species are still present in several less altered river sections.

The biodiversity of the Dyje River was affected by the occurrence of several non-native aquatic molluscs. The river forms a major route along which alien fauna disperses to the southern part of Moravia.

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APPENDIX 1

LIST OF INVESTIGATED SITES

Data in the list are as follows: site number, geographical co-ordinates (http://www.mapy.cz/), code of the mapping grid for faunistic mapping (according to PRUNER & MÍKA 1996), name of the nearest settlement, description of the site, date of investigation.

Dyje

1 – 48°53'23"N, 15°38'08"E, 7159, Mitrovice, the Dyje River on the Czech-Austrian border, 28.7.2009;
2 – 48°53'19"N, 15°39'02"E, 7159, Uherčice, the Dyje River 400 m upstream of the road bridge Uherčice – Podhradí nad Dyjí, 13.9.2008;
3 – 48°53'18"N, 15°39'36"E, 7159, Uherčice, the Dyje River about the road bridge Uherčice – Podhradí nad Dyjí, 28.10.2011;
4 – 48°53'50"N, 15°40'51"E, 7160, Podhradí nad Dyjí, the Dyje River about 300 m upstream of a weir in Podhradí nad Dyjí, 28.10.2011;
5 – 48°53'59"N, 15°41'01"E, 7160, Podhradí nad Dyjí, the Dyje River near a weir in Podhradí nad Dyjí, 31.8.2008;
6 – 48°54'50"N, 15°41'30"E, 7160, Podhradí nad Dyjí, the Dyje River 1 km north of Podhradí nad Dyjí, 31.8.2008;
7 – 48°53'45"N, 15°48'41"E, 7160, Vranov nad Dyjí, the Dyje River in Vranov nad Dyjí, 28.10.2011;
8 – 48°50'08"N, 15°53'32"E, 7161, Lukov, the Dyje River near the inflow of the Kaja Brook (Kajabach), 3.11.2006;
9 – 48°50'37"N, 16°03'19"E, 7162, Znojmo, the Dyje River between the bridge and the monastery in Znojmo, 1.11.2006;
10 – 48°50'28"N, 16°03'23"E, 7162, Znojmo, a mill race of the Dyje River near the monastery, 2.11.2006;
11 – 48°50'18"N, 16°04'09"E, 7162, Znojmo, the Dyje River near the weir in the south-eastern part of Znojmo, 2.11.2006;
12 – 48°50'17"N, 16°04'32"E, 7162, Znojmo, a canal of the Dyje River near Oblekovice, 3.11.2006;
13 – 48°50'31"N, 16°06'54"E, 7162, Dyje, the Dyje River in Dyje, 19.9.2009;
14 – 48°49'23"N, 16°09'59"E, 7163, Hodonice, the Dyje River near a road between Hodonice and Krhovice, 20.9.2009;
15 – 48°48'36"N, 16°10'41"E, 7163, Krhovice, the Dyje River 500 m southeast of Krhovice, 20.9.2009;
16 – 48°48'04"N, 16°11'12"E, 7263, Micmanice, the Dyje River downstream of the bridge of a road near Micmanice, 30.8.2011;
17 – 48°46'08"N, 16°15'32"E, 7263, Hrádek, the Dyje River downstream of the road Hrádek-Jaroslavice, 22.10.2011;
18 – 48°45'22"N, 16°17'29"E, 7263, Dyjákovice, the Dyje River south of Dyjákovice, 23.10.2011;
19 – 48°49'11"N, 16°28'08"E, 7164, Jevišovka, the Dyje River near the railway station Jevišovka, 19.9.2009;
20 – 48°54'41"N, 16°36'44"E, 7065, Strachotín, the bank of the Věstonice dam reservoir east of the inflow of the Svratka River, 15.7.2012;
21 – 48°54'52"N, 16°37'07"E, 7065, Strachotín, northern edge of the Věstonice dam reservoir, 2.6.2012;
22 – 48°54'34"N, 16°37'59"E, 7065, Strachotín, riprap at the northern edge of the Věstonice dam reservoir, 2.6.2012;
23 – 48°54'09"N, 16°38'49"E, 7065, Strachotín, riprap at the northeastern part of the dam of the Věstonice water reservoir, 2.6.2012;
24 – 48°53'26"N, 16°38'28"E, 7065, Dolní Věstonice, southeastern part of the Věstonice dam reservoir, 11.8.2012;
25 – 48°53'18"N, 16°37'18"E, 7065, Dolní Věstonice, southern bank of the Věstonice dam reservoir, 11.8.2012;
26 – 48°53'07"N, 16°36'08"E, 7065, Mušov, southwestern edge of the Věstonice dam reservoir, 11.8.2012;
27 – 48°53'22"N, 16°35'31"E, 7065, Mušov, western bank of the Věstonice dam reservoir, 11.8.2012;
28 – 48°54'13"N, 16°35'12"E, 7065, Mušov, northwestern edge of the Věstonice dam reservoir, 8.9.2012;
29 – 48°54'19"N, 16°35'37"E, 7065, Mušov, northwestern bank of the Věstonice dam reservoir near inflow of the canal, 8.9.2012;
30 – 48°54'33"N, 16°36'12"E, 7065, Ivaň, the edge of the Věstonice dam reservoir ca. 300 m southwest from the inflow of the Jihlava River, 8.9.2012;
31 – 48°49'37"N, 16°46'11"E, 7166, Bulhary, the Dyje River upstream and downstream of a weir, 20.10.2012;
32 – 48°48'15"N, 16°48'29"E, 7166, Lednice, the Lednický náhon (man made branch of the Dyje River) downstream of the weir in Lednice, **a)** 22.3.2008, **b)** 24.4.2010;
33 – 48°46'17"N, 16°52'48"E, 7267, Břeclav, the Dyje River upstream of a weir in Břeclav, 31.8.2011;
34 – 48°45'41"N, 16°53'12"E, 7267, Břeclav, the Dyje River downstream of a weir in Břeclav, 31.8.2011;
35 – 48°44'52"N, 16°53'21"E, 7267, Břeclav, the Dyje River near the bridge, **a)** 26.9.2003, **b)** 22.9.2007;
36 – 48°43'25"N, 16°53'07"E, 7267, Břeclav, the Dyje River near Pohansko (near a bridge), 3.10.2009;
37 – 48°42'29"N, 16°54'28"E, 7367, Břeclav, the Dyje River west of Lány castle, 3.10.2009; **38** – 48°40'31"N, 16°54'40"E, 7367, Břeclav, the Dyje River about 4 km upstream of the inflow of the Kyjovka River, 4.10.2008;
39 – 48°39'34"N, 16°55'23"E, 7367, Břeclav, the Dyje River about 1,5 km upstream of the inflow of the Kyjovka River, 3.10.2009;

40 – 48°38'15"N, 16°55'41"E, 7367, Lanžhot, the Dyje River about 1,5 km downstream of the inflow of the Kyjovka River, 4.10.2008;
41 – 48°37'05"N, 16°56'21"E, 7367, Lanžhot, the Dyje River before inflow to the Morava River, **a)** 20.4.2008, **b)** 31.3.2013.

TRIBUTARIES

Želetavka

42 – 48°58'08"N, 15°35'15"E, 7059, Bačkovice, the Želetavka Brook near the bridge in Bačkovice, 29.7.2009;
43 – 48°57'17"N, 15°34'25"E, 7059, Dančovice, the Želetavka Brook near Šimkův Mlýn (Mill) east of Dančovice, 27.7.2009;
44 – 48°56'18"N, 15°36'52"E, 7059, Lubnice, the Želetavka Brook in Lubnice, 27.7.2009;
45 – 48°57'42"N, 15°39'19"E, 7059, Police, the Želetavka Brook east of the Bahnův Mlýn (Mill), 29.7.2009;
46 – 48°57'45"N, 15°40'47"E, 7060, Zblovice, the Želetavka Brook east of the Svobodův Mlýn (Mill), 30.7.2009.

Jevišovka

47 – 48°50'40"N, 16°16'36"E, 7163, Božice u Znojma, the Jevišovka near the road bridge near the seclusion Mlýnské domky, 19.9.2010;
48 – 48°50'27"N, 16°17'23"E, 7163, Božice u Znojma, the Jevišovka near the road bridge Božice – Mackovice, 19.9.2010;
49 – 48°49'24"N, 16°22'26"E, 7164, Hrušovany nad Jevišovkou, the Jevišovka near the railway bridge Hrušovany nad Jevišovkou – Brno, 27.9.2009;
50 – 48°49'24"N, 16°23'57"E, 7164, Hrušovany nad Jevišovkou, the Jevišovka near the road bridge south of Hrušovany nad Jevišovkou, 27.9.2009;
51 – 48°49'29"N, 16°27'22"E, 7164, Jevišovka, the Jevišovka 800 m upstream of the road bridge near the Jevišovka railway station, 2.10.2009;
52 – 48°49'27"N, 16°27'59"E, 7164, Jevišovka, the Jevišovka between the Jevišovka railway station and village, 27.9.2009;

Jihlava

53 – 49°05'48"N, 16°21'47"E, 6964, Ivančice, the Jihlava River upstream of the inflow of the Oslava River, 31.7.2011;
54 – 49°05'49"N, 16°22'05"E, 6964, Ivančice, the Jihlava River at the road bridge Ivančice – Moravský Krumlov, 31.7.2011;
55 – 49°04'37"N, 16°25'26"E, 6964, Moravské Bránice, the Jihlava River 1 km upstream of the road bridge Moravské Bránice – Nové Bránice, 16.10.2010;
56 – 49°04'36"N, 16°26'16"E, 6964, Moravské Bránice, the Jihlava River downstream of the road bridge Moravské Bránice – Nové Bránice, 16.10.2010;
57 – 48°58'04"N, 16°33'19"E, 7065, Přibice, the Jihlava River 300 m upstream of the road bridge north of Přibice, 28.9.2010;
58 – 48°57'49"N, 16°33'41"E, 7065, Přibice, the Jihlava River 300 m downstream of the bridge north of Přibice, 28.9.2010;
59 – 48°56'17"N, 16°34'28"E, 7065, Ivaň, the Jihlava River about 1 km northwest of Ivaň, 4.10.2009;
60 – 48°56'02"N, 16°34'15"E, 7065, Ivaň, the Jihlava River northwest of Ivaň, 4.10.2009;
61 – 48°55'41"N, 16°34'20"E, 7065, Ivaň, the Jihlava River near the road bridge in Ivaň, 4.10.2009;
62 – 48°55'03"N, 16°35'57"E, 7065, Ivaň, the Jihlava River 1 km upstream of the inflow to the Svratka River and the Nové Mlýny Water Reservoir by the bridge, **a)** 28.4.2001, **b)** 15.7.2012;
63 – 48°54'48"N, 16°36'15"E, 7065, Ivaň, the Jihlava River at the inflow to the Svratka River and the Nové Mlýny Water Reservoir, 15.7.2012;

Svratka

64 – 48°57'01"N, 16°37'05"E, 7065, Vranovice nad Svratkou, the Svratka River near the road bridge Pouzdřany – Vranovice, 11.10.2009;
65 – 48°56'17"N, 16°36'21"E, 7065, Pouzdřany, the Svratka River 2 km downstream of the road Pouzdřany – Vranovice, 11.10.2009;
66 – 48°55'37"N, 16°36'15"E, 7065, Ivaň, the Svratka River 2 km upstream of the Nové Mlýny Water Reservoir, 11.10.2009;
67 – 48°55'09"N, 16°36'21"E, 7065, Ivaň, the Svratka River 1 km upstream of the Nové Mlýny Water Reservoir, **a)** 28.4.2001, **b)** 2.6.2012;

Kyjovka

68 – 48°46'24"N, 17°00'42"E, 7267, Týnec, the Kyjovka River in Týnec, 4.10.2001, LB+MH;
69 – 48°44'40"N, 16°59'10"E, 7267, Kostice, the Kyjovka River near Kostice, 22.9.2007;
70 – 48°43'40"N, 16°58'40"E, 7267, Lanžhot, the Kyjovka River near the road bridge Lanžhot – Kůty, 31.12.2007;
71 – 48°41'49"N, 16°57'34"E, 7263, Lanžhot, the Kyjovka River near the bridge 3 km south of the church in Lanžhot, 31.12.2007;
72 – 48°39'48"N, 16°55'59"E, 7263, Lanžhot, the Kyjovka River 2,5 km upstream of its inflow to the Dyje River, 4.10.2008;

Morava

73 – 48°40'21"N, 16°58'21"E, 7367, Lanžhot, the Morava River northwest of Kůty, 10.10.2009;
74 – 48°39'22"N, 16°58'01"E, 7367, Lanžhot, the Morava River west of Kůty, 10.10.2009;
75 – 48°39'10"N, 16°58'03"E, 7367, the Morava River southwest of Kůty, 10.10.2009.

APPENDIX 2: Table 1. List of freshwater molluscs recorded at Dyje I and II study sites

Species/Site No.	Dyje I										Dyje II								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Theodoxus danubialis (C. Pfeiffer, 1828)																			
Viviparus viviparus (Linnaeus, 1758)			2	60	200	28													
Potamopyrgus antipodarum (Gray, 1843)												3							
Lithoglyphus naticoides (C. Pfeiffer, 1828)																			3
Bithynia tentaculata (Linnaeus, 1758)						45					18	12	300	180	40	40	200	35	400
Valvata piscinalis (O. F. Müller, 1774)																		16	
Acroloxus lacustris (Linnaeus, 1758)								2	10			2	2						
Galba truncatula (O. F. Müller, 1774)								3	2	3			3	13					
Radix auricularia (Linnaeus, 1758)		20	3	12	15	10			1		12	5			3				2
Radix ampla (Hartmann, 1821)							14	70	1	2	3	3	7						
Physella acuta (Draparnaud, 1805)			1																18
Anisus vortex (Linnaeus, 1758)											2	6	2		7				5
Gyraulus albus (O. F. Müller, 1774)			2	30	10				2										
Gyraulus crista (Linnaeus, 1758)											1								
Hippeutis complanatus (Linnaeus, 1758)											1								
Ancylus fluviatilis (O. F. Müller, 1774)	25	40	70		35	15		900	40		40	2	180	90	50	350	350	200	200
Unio pictorum (Linnaeus, 1758)	4	8	2	4	2	7													
Unio tumidus Philipsson, 1788	3	18	14	34	18	40													
Unio crassus Philipsson, 1788	6	13	3	1		8										3	14	78	
Anodonta anatina (Linnaeus, 1758)	20	3	37	13	7	1				7				2	6	3	1	5	3
Pseudanodonta complanata (Rossmässler, 1835)						1									2	2	1		
Sphaerium rivicola (Lamarck, 1818)																		12	14
Sphaerium corneum (Linnaeus, 1758)			2	20					80	40	50	80	18	40	25	18			
Musculium lacustre (O. F. Müller, 1774)							2												
Pisidium amnicum (O. F. Müller, 1774)								1											
Pisidium henslowanum (Sheppard, 1823)									7	45		20		2		3			8
Pisidium supinum A. Schmidt, 1851				1											2				
Pisidium subtruncatum Malm, 1855				2				25	6	5	7	4			3		3		6
Pisidium nitidum Jenyns, 1832							3	8	8	15	12	12	3		2	2			4
Pisidium casertanum Poli, 1791								6											
Pisidium moitessierianum (Paladilhe, 1866)																		16	
Number of species	5	6	10	10	7	9	3	8	10	7	10	11	8	6	10	8	6	7	11

Number of specimens recorded at the sites is given (only estimation in the case of more abundant species). x – only old shells found

APPENDIX 2: Table 2. List of freshwater molluscs recorded at Dyje III and IV study sites

Species/Site No.	Dyje III														Dyje IV										
	20	21	22	23	24	25	26	27	28	29	30	31	32a	32b	33	34	35a	35b	36	37	38	39	40	41a	41b
Theodoxus danubialis (C. Pfeiffer, 1828)																				60	4	8	500		22
Viviparus acerosus (Bourguignat, 1862)												300	2	8	14		1		2						1
Potamopyrgus antipodarum (Gray, 1843)						3	8			2										4	30	2			2
Lithoglyphus naticoides (C. Pfeiffer, 1828)														4	3		3		35	35		15		15	17
Bithynia tentaculata (Linnaeus, 1758)	6	200	350	300	600	300	300	150	40	70	5	250	15	28	16	28	40	30	24	25	25	24	20	15	4
Valvata piscinalis (O. F. Müller, 1774)				40		18	20		4	10	8	80	10	35	60				17	30	12			10	6
Acroloxus lacustris (Linnaeus, 1758)			2						3	3			2		2										
Galba truncatula (O. F. Müller, 1774)															5					2	40		30	150	
Stagnicola palustris (O. F. Müller, 1774)															10										
Radix auricularia (Linnaeus, 1758)		15	15	18	8	6	25	8	35	23	3	16		2	14	2			20	20	18	38			2
Lymnaea stagnalis (Linnaeus, 1758)					12	10	7	10	3		5	6			5							1			
Physa fontinalis (Linnaeus, 1758)												14													
Physella acuta (Draparnaud, 1805)	70	5	4	20	25	15	60	35	150	18	35	40	20		13		8	20	40	45		35		6	
Planorbis planorbis (Linnaeus, 1758)							3	6																	
Anisus vortex (Linnaeus, 1758)	3	2			15		20	10		13	13	10		40	18										
Gyraulus albus (O. F. Müller, 1774)		3		6	10	12				2		4	2		3										
Gyraulus crista (Linnaeus, 1758)							4																		
Hippeutis complanatus (Linnaeus, 1758)						10	12					3													
Planorbarius corneus (Linnaeus, 1758)					4	4	3	3		4															
Ancylus fluviatilis (O. F. Müller, 1774)															1	80	5	15	8		90				
Ferrissia fragilis (Tryon, 1863)									30																
Unio pictorum (Linnaeus, 1758)	3					3	2	2	1	4		4		6	5	2	7	8	4	18	2	16		3	4
Unio tumidus Philipsson, 1788		3				1				1	7	3		8	100	46	17	6	8	24	3	30		8	7
Unio crassus Philipsson, 1788																x3				x4	x7	x3			2
Anodonta cygnea (Linnaeus, 1758)	2	2				1	1				2			3											
Anodonta anatina (Linnaeus, 1758)	8	5				7	3	12	1	9	2	5	1		40	9	10	4	3	15	3	18			1
Pseudanodonta complanata (Rossmässler, 1835)															1					1		2			
Sinanodonta woodiana (Lea, 1834)															3	6			2	6		14			35
Sphaerium rivicola (Lamarck, 1818)																									
Sphaerium corneum (Linnaeus, 1758)			28				15		4			10			4	4	6		3			6			
Pisidium henslowanum (Sheppard, 1823)						4	2		3	5			2		1		2		8	4		6			
Pisidium supinum A. Schmidt, 1851						7	3					2									12				2
Pisidium subtruncatum Malm, 1855									1	1			4		2										
Pisidium nitidum Jenyns, 1832	3					3	2		3	3		1	2	3	1				2	2	3	2			
Pisidium moitessierianum (Paladilhe, 1866)						2	4																		
Dreissena polymorpha (Pallas, 1771)												70		6		45			25	14	6	8			6
Number of species	7	8	5	5	7	17	19	9	13	14	9	17	10	11	22	10	10	6	15	17	14	17	3	7	14

For explanations see Table 1.

APPENDIX 2: Table 3. List of freshwater molluscs recorded at Želetavka and Jevišovka study sites

Species/Site No.	Želetavka					Jevišovka					
	42	43	44	45	46	47	48	49	50	51	52
Viviparus acerosus (Bourguignat, 1862)									200	70	65
Potamopyrgus antipodarum (Gray, 1843)						14	80	130	120	3	8
Bithynia tentaculata (Linnaeus, 1758)						28	35	40	18	30	40
Valvata piscinalis (O. F. Müller, 1774)									2	12	30
Acroloxus lacustris (Linnaeus, 1758)	2										60
Galba truncatula (O. F. Müller, 1774)			6			20	6				
Radix auricularia (Linnaeus, 1758)								2			8
Radix ampla (Hartmann, 1821)											80
Physella acuta (Draparnaud, 1805)								350	300		
Gyraulus albus (O. F. Müller, 1774)											6
Ancylus fluviatilis O. F. Müller, 1774	7	13	6	8	8	10	15		13		
Unio pictorum (Linnaeus, 1758)						2	1	30	8		7
Unio tumidus Philipsson, 1788								65	23	5	10
Unio crassus Philipsson, 1788			2	x2		1	7	1			
Anodonta cygnea (Linnaeus, 1758)								1			4
Anodonta anatina (Linnaeus, 1758)		3	6	9	7	4	3	18	18	4	16
Sphaerium rivicola (Lamarck, 1818)								4	10		8
Sphaerium corneum (Linnaeus, 1758)				60	30	6	7	6	15	6	6
Musculium lacustre (O. F. Müller, 1774)						2	3				
Pisidium amnicum (O. F. Müller, 1774)										x3	x3
Pisidium henslowanum (Sheppard, 1823)								4	4		
Pisidium supinum A. Schmidt, 1851						8	13	8	12		
Pisidium subtruncatum Malm, 1855						4	2	2	3	4	8
Pisidium nitidum Jenyns, 1832	6	7	4		6						
Pisidium casertanum (Poli, 1791)	4					2	3	1	2		
Pisidium moitessierianum (Paladilhe, 1866)								1	1		
Number of species	4	3	5	4	4	12	12	16	16	8	15

For explanations see Table 1.

APPENDIX 2: Table 4. List of freshwater molluscs recorded at Jihlava study site

Species/Site No.	Jihlava											
	53	54	55	56	57	58	59	60	61	62a	62b	63
Potamopyrgus antipodarum (Gray, 1843)	4	12				3	35	20	20			
Bithynia tentaculata (Linnaeus, 1758)		100	8	14	70	350	15	35	40	4	300	300
Valvata piscinalis (O. F. Müller, 1774)		4					8			25	500	250
Galba truncatula (O. F. Müller, 1774)		3										
Radix auricularia (Linnaeus, 1758)				2			10	8	8		12	18
Lymnaea stagnalis (Linnaeus, 1758)										12	3	8
Physella acuta (Draparnaud, 1805)				3		2			40	15	30	12
Planorbis planorbis (Linnaeus, 1758)											2	16
Anisus vortex (Linnaeus, 1758)										2	70	35
Gyraulus albus (O. F. Müller, 1774)									3	13	160	80
Ancylus fluviatilis O. F. Müller, 1774	60	45	15	10	20	40		35				
Unio pictorum (Linnaeus, 1758)	1		1	12					12	15	3	
Unio tumidus Philipsson, 1788					5	5	3	8	8	18	40	12
Unio crassus Philipsson, 1788		4	4	1	1	1	1	2				
Anodonta cygnea (Linnaeus, 1758)										5		

Anodonta anatina (Linnaeus, 1758)		6	5	8	2	2	2	14	6	8	23	4
Sphaerium corneum (Linnaeus, 1758)	3	8	7	4	3	6	8	5	3		13	6
Musculium lacustre (O. F. Müller, 1774)											15	
Pisidium henslowanum (Sheppard, 1823)	5	2								25	4	3
Pisidium supinum A. Schmidt, 1851			2	1	2	2	2	4	2		1	
Pisidium subtruncatum Malm, 1855	1	2	3	2			2	1	2	3	10	5
Pisidium nitidum Jenyns, 1832	2	5									6	6
Number of species	7	11	8	10	7	9	10	10	11	12	17	14

For explanations see Table 1.

APPENDIX 2: Table 5. List of freshwater molluscs recorded at Svratka, Kyjovka and Morava study sites

Species/Site No.	Svratka						Kyjovka				Morava		
	64	65	66	67a	67b	68	69	70	71	72	73	74	75
Theodoxus danubialis (C. Pfeiffer, 1828)										1			
Viviparus acerosus (Bourguignat, 1862)							60	200	3	2			
Lithoglyphus naticoides (C. Pfeiffer, 1828)							200	250	150	2			
Bithynia tentaculata (Linnaeus, 1758)	600	800	600	100	300	15	10	15	10	18	150	40	300
Valvata cristata O. F. Müller, 1774						3			2				
Valvata piscinalis (O. F. Müller, 1774)	8	40	30	80	16	5			4				
Acroloxus lacustris (Linnaeus, 1758)					4								
Galba truncatula (O. F. Müller, 1774)						4				2			
Radix auricularia (Linnaeus, 1758)				1	10	5				7	10	35	16
Radix ampla (Hartmann, 1821)	8	25			4								
Lymnaea stagnalis (Linnaeus, 1758)		8	2	4	12								
Physella acuta (Draparnaud, 1805)	6	30	30	12	8	30	30		40	15	18	60	20
Planorbis planorbis (Linnaeus, 1758)									1				
Anisus vortex (Linnaeus, 1758)			30		4	15			2	1			
Gyraulus albus (O. F. Müller, 1774)	10	15	12		3								
Hippeutis complanatus (Linnaeus, 1758)			2										
Planorbarius corneus (Linnaeus, 1758)									1				
Ancylus fluviatilis O. F. Müller, 1774	70												
Ferrissia fragilis (Tryon, 1863)										50			
Unio pictorum (Linnaeus, 1758)	3			8	2	5		1			23	3	4
Unio tumidus Philipsson, 1788	35	15	12	6	16			3	8	14	18	8	45
Anodonta cygnea (Linnaeus, 1758)			1	4									
Anodonta anatina (Linnaeus, 1758)	10	10	14		3	3	5	12	4	2	8	4	10
Pseudanodonta complanata (Rossmässler, 1835)											1		
Sinanodonta woodiana (Lea, 1834)							25	6			9	2	3
Sphaerium rivicola (Lamarck, 1818)				4	60	3				1			
Sphaerium corneum (Linnaeus, 1758)	100	30	25	2	5		2	2	3	35	3		2
Musculium lacustre (O. F. Müller, 1774)			2				3						
Pisidium henslowanum (Sheppard, 1823)		2			1	4					2	2	4
Pisidium supinum A. Schmidt, 1851											8		
Pisidium subtruncatum Malm, 1855	2			2	24					2	1		
Pisidium nitidum Jenyns, 1832												3	1
Pisidium casertanum (Poli, 1791)						3							
Dreissena polymorpha (Pallas, 1771)											350	300	500
Number of species	11	10	12	11	16	12	8	8	12	14	13	10	11

For explanations see Table 1.