

MATERIALS TO THE KNOWLEDGE OF MOLLUSCS OF WIELKOPOLSKA (WEST-CENTRAL POLAND). IV: FAMILIES: NERITIDAE, VIVIPARIDAE, THIARIDAE, BITHYNIIDAE, HYDROBIIDAE AND VALVATIDAE

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ABSTRACT: The paper presents data on 13 freshwater snail species: *Theodoxus fluviatilis*, *Viviparus contectus*, *V. viviparus*, *Melanoides tuberculata*, *Bithynia tentaculata*, *B. leachii*, *Potamopyrgus antipodarum*, *Lithoglyphus naticoides*, *Marstoniopsis insubrica*, *Valvata cristata*, *V. pulchella*, *V. piscinalis* and *Borysthenia naticina*, recorded over the last fifty years in the Wielkopolska district (W. Poland). Their distribution is shown on UTM/MGRS grid maps, and habitat information is provided. Among the discussed species, *B. tentaculata* (447 sites) and *V. contectus* (210 sites) are the most frequent in the region. Two alien species – *M. tuberculata* (two sites) and *L. naticoides* (seven sites) and the native *B. naticina*, recorded from five sites, are the least frequent.

KEY WORDS: malacofauna, freshwater, Gastropoda, Orthogastropoda, Wielkopolska district

INTRODUCTION

Part IV is a continuation of the papers by KORALEWSKA-BATURA et al. (2010a, b) and SZYBIAK & JAN-KOWIAK (2012). We present brief accounts of six families of freshwater snails of the subclass Orthogastropoda whose members were found in Wielkopolska after 1957, namely: Bithyniidae, Hydrobiidae,

Neritidae, Thiaridae, Valvatidae and Viviparidae. The distribution of their representatives is shown on UTM/MGRS grid maps (except *Melanoides tuberculata* which occurs only in one square of the grid). Typical habitats of each species found in the region are also listed.

METHODS

We used the methods described in KORALEWSKA-BATURA et al. (2010a, b). Due to the common occurrence of most of the species, the data on their distribution are limited to the maps in the main text. Detailed data on particular localities are stored in the computer database of biodiversity managed by the Natural History Collections and Department of General Zoology, AMU in Poznań and are available upon request. The number of sites recorded in each UTM

square is marked on the maps. We analysed only reports from the last 50 years, as pre-1957 publications containing the information about the past occurrences in Wielkopolska or the Wielkopolsko-Kujawska Lowland were listed earlier (URBAŃSKI 1957, RIEDEL 1988, KORALEWSKA-BATURA 1992). We also included some so far unpublished sites bordering with the region but not enclosed in its administrative boundaries.

RESULTS

NERITIDAE LAMARCK, 1809

It is a widely distributed family of marine, brackish- and freshwater as well as amphibious snails of the order Neritopsina, superorder Neritaemorphi. In Europe, one brackish/freshwater (*Theodoxus* Montfort, 1810; 16 species) and two marine genera (*Smaragdia* Issel, 1869, with two species occurring on the European coasts, and *Nerita* with one species) are present (GOFAS et al. 2001). One species has been recorded from Poland so far.

Theodoxus (Theodoxus) fluviatilis
(Linnaeus, 1758)

In Poland, the species occurs mainly in the northern and central lowlands, with some isolated populations in the southern uplands (FALNIOWSKI 1989). It is most often found in fast-flowing rivers and in lake littoral, usually on stony substrata. Besides the typical form, *T. fluviatilis fluviatilis*, there is a brackish water subspecies, *T. fluviatilis littoralis* (Linnaeus, 1758), known from the Polish Baltic Coast (PIECHOCKI 1979).

In the last 50 years 47 sites of *T. fluviatilis fluviatilis* were recorded from 31 UTM/MGRS 10×10 km squares in Wielkopolska (Fig. 1) (ANTCZAK 1958, STACHOWIAK 1971, DWORNICZAK 1971, STROJKOWSKA 1971, LENARTOWICZ 1972, MACIEJEWSKA 1972, SAPA 1972, KORALEWSKA 1974, 1979, CHMURA 1975,

JAZDON 1976, BERGER & DZIECZKOWSKI 1977, LISIAK 1977, MICHAŁKIEWICZ 1977, SZCZEPANIK 1980, KORALEWSKA-BATURA 1983, 1992, SIKORA 1988, WŁOSIK-BIEŃCZAK 1988, 1996, 2001, MIZGIER 1993).

In 25 of the sites the species occurred in flowing waters, including big rivers – Warta and Noteć – (14 sites), smaller ones, for example Obra and Węna (8) and streams (3). The remaining 22 sites were lacustrine, mainly in postglacial, ribbon-like lakes (e.g. lakes Witobelskie or Góreckie), where *T. fluviatilis* occurred most often in the littoral zone devoid of vegetation.

The species was most frequent in the north-western and central parts of the region, becoming less so to the east and south (Fig. 1). The range of *T. fluviatilis* in Wielkopolska covers the area of moraine heights established during the last glaciation in the northern part of the region. As opposed to the flat lowlands and sandy hills of the southern part of the region, this part of Wielkopolska is rich in suitable habitats, for example fast-current rivers and large postglacial lakes.

VIVIPARIDAE GRAY, 1847 (1833)

It is a widely distributed family of exclusively freshwater snails of the order Architaenioglossa, superorder Caenogastropoda. Representatives of Viviparidae are found on all continents except South America and Antarctic. One subfamily (Viviparinae) with one genus (*Viviparus* Montfort, 1810) and five recent species are known to occur in Europe: *Viviparus acerossus* (Bourguignat, 1862) with mainly Pontic range, Mediterranean *V. ater* (De Cristofori et Jan, 1832), *V. contectus* (Millet, 1813), distributed in the whole of Europe and western Siberia, *V. mamillatus* (Küster, 1852) – Balkan endemic and *V. viviparus* (Linnaeus, 1758), found in most European countries as far as the Ural Mts in the east (WELTER-SCHULTES 2012). Two species have been recorded from Poland so far: *V. contectus* and *V. viviparus* (PIECHOCKI 1979, 2008), and both are present in Wielkopolska.

Viviparus contectus (Millet, 1813)

The species is frequent in the whole of Poland except the mountains (FALNIOWSKI 1989), inhabiting mainly shallow, stagnant water bodies much overgrown by emerged vegetation (PIECHOCKI 1979).

The number of sites of *V. contectus* found in 113 UTM/MGRS 10×10 km squares in Wielkopolska (Fig. 2) within the last 50 years was 210 (ANTCZAK 1958, WŁOCHOWICZ 1960, BERGER 1961, CYBULSKA 1965, DWORNICZAK 1971, KĘDRA 1971, STACHOWIAK 1971, STROJKOWSKA 1971, LENARTOWICZ 1972, MACIEJEWSKA 1972, SAPA 1972, KORALEWSKA 1974, 1979, CHMURA 1975, JAZDON 1976, BERGER &

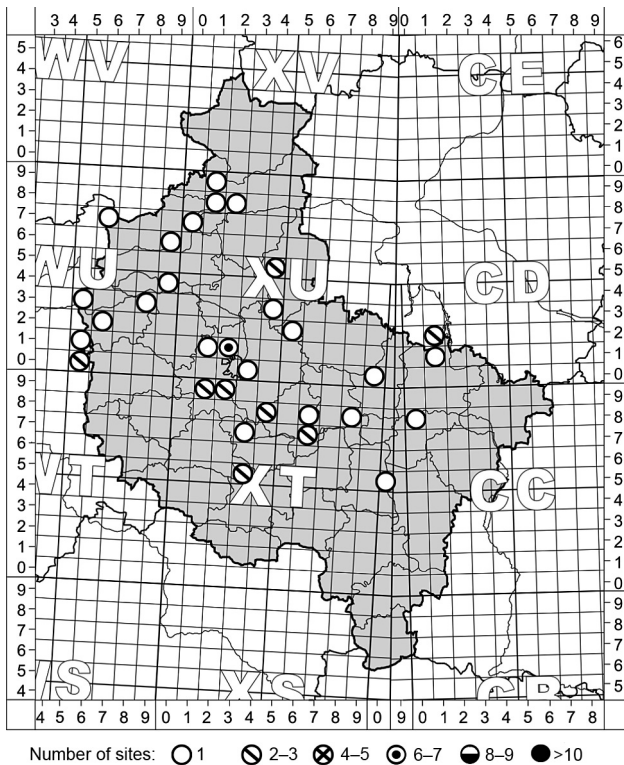


Fig. 1. Distribution of *Theodoxus fluviatilis* in Wielkopolska

DZIECZKOWSKI 1977, LISIAK 1977, MICHAŁKIEWICZ 1977, MARKIEWICZ 1978, NASKRĘT 1978, SZCZEPANIK 1980, KACZMAREK 1981, WITOSŁAWSKA 1981, ĆWIKLIŃSKA 1982, WANAD 1982, KORALEWSKA-BATURA 1983, 1992, SIKORA 1988, KORALEWSKA-BATURA & DZIABASZEWSKI 1992, MIZGIER 1993, KUCNER 1995, BASIŃSKI 1996, WŁOSIK-BIEŃCZAK 1996, 1998, 2001, MILLER 1997).

In 60% of the sites the species occurred in typical stagnant water bodies, mainly lakes (71 sites) and ponds of various kinds (50). The remaining 40% of localities were flowing waters, although those were predominantly slow-flowing drainage ditches (23) or small rivers and channels with very slow current (45). Only 14 records (7%) came from fast-flowing rivers.

Viviparus viviparus (Linnaeus, 1758)

V. viviparus is frequent in the Polish lowlands and becomes rare southward. In the southern uplands the species is very rare and represented only by isolated populations (PIECHOCKI 1979). It is absent from the Polish mountains.

The 55 records of *V. viviparus*, made in Wielkopolska during the last 50 years (Fig. 3), are distributed in 33 UTM/MGRS 10×10 km squares (ANTCZAK 1958, WŁOCHOWICZ 1960, CYBULSKA 1965, KĘDRA 1971, STACHOWIAK 1971, LENARTOWICZ 1972, MACIEJEWSKA 1972, KORALEWSKA 1974, 1979, CHMURA 1975, JAZDON 1976, BIESIADKA & KASPRZAK 1977, LISIAK 1977, MICHAŁKIEWICZ 1977, NASKRĘT 1978, SZCZEPANIK 1980, KORALEWSKA-BATURA 1983, 1992,

KORALEWSKA-BATURA & DZIABASZEWSKI 1992, MILLER 1997, MIEDZIAREK 2006).

According to PIECHOCKI (1979), *V. viviparus* usually inhabits lowland rivers and lakes and is most frequently found in river bays, oxbows and lakes. In stagnant, shallow water bodies with dense vegetation; in slow-flowing rivers it is replaced by *V. contectus*. The data from Wielkopolska confirm this view. The vast majority of records (48; 87%) come from flowing waters, mainly rivers (35). The seven localities in stagnant water bodies are lakes, ponds and oxbows.

In Wielkopolska the species was not recorded south of the 51°54'N which confirms that it is typical of the Polish lowlands (PIECHOCKI 1979), with its continuous range limited probably by the Ostrzeszów Hills in southern Wielkopolska.

THIARIDAE TROSCHEL, 1857 (1823)

It is a widely distributed family of freshwater snails (order Neotaenioglossa, superorder Caenogastropoda). Representatives of Thiaridae occur on all continents except Antarctic, but they are particularly diverse in the tropics and subtropics. One introduced species is found in Europe.

Melanoides tuberculata (Müller, 1774)

It is a subtropical and tropical species, native in Africa and southern Asia. It was introduced in Europe, most probably with plant material imported for botanical gardens, or as an aquarium species. In Europe,

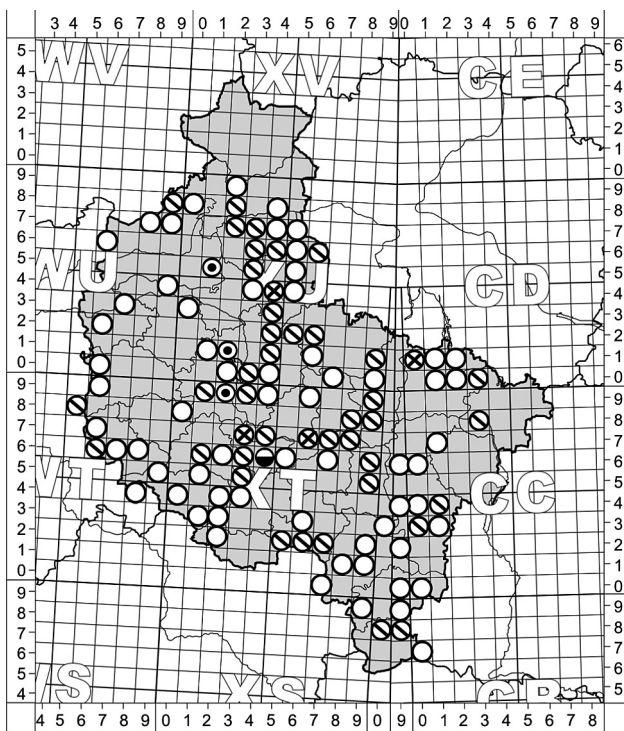


Fig. 2. Distribution of *Viviparus contectus* in Wielkopolska

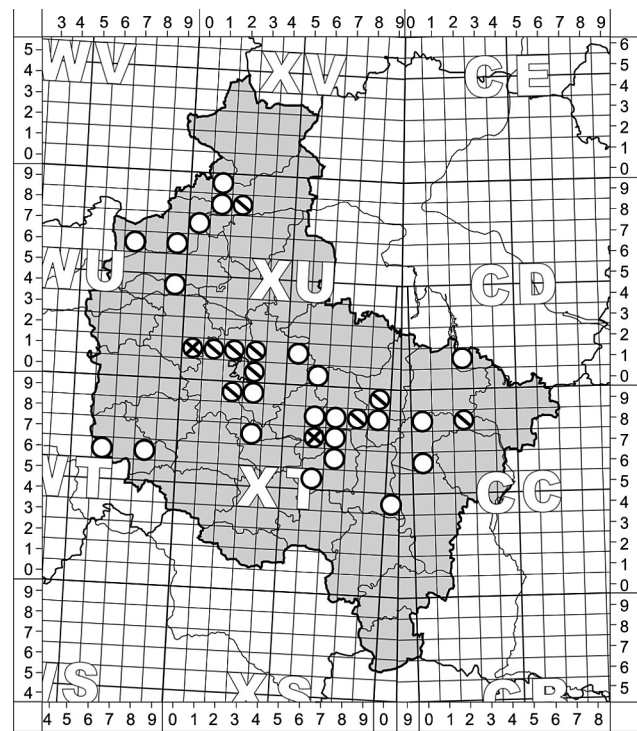


Fig. 3. Distribution of *Viviparus viviparus* in Wielkopolska

M. tuberculata has been recorded from Spain, Malta, Austria, the Netherlands, Hungary and Germany (FECHTER & FALKNER 1990, GITTENBERGER et al. 1998, GLÖER & MEIER-BROOK 1998).

In its two sites in Wielkopolska, both in the same UTM/MGRS square (CD10), *M. tuberculata* occurred in heated waters of discharge canals of the Pątnów and Konin power plants (PIECHOCKI et al. 2003). Those are the only non-captive populations of the species in Poland found so far.

BITHYNIIDAE TROSCHEL, 1857

The family, representing the order Neotaenioglossa, superorder Caenogastropoda, includes ca. 130 freshwater species distributed throughout the Palearctic, Afrotropical, Oriental and Australasian regions (STRONG et al. 2008). Thirty six species are found in Europe, and three – *Bithynia tentaculata*, *B. leachii* and *B. troschelii* – occur in Poland (PIECHOCKI 1979). The first two were recorded in Wielkopolska during the period covered by the inventory.

Bithynia (Bithynia) tentaculata (Linnaeus, 1758)

B. tentaculata is a Palearctic species. It lives in rivers, canals, streams, lakes, ponds, peat pits and ditches, preferring waters with slow to moderately fast current, where it stays on plants and rocks near the banks. It is among the most common snail species in

the Polish lowlands and uplands but is rare in the mountains (PIECHOCKI 1979, FALNIOWSKI 1989).

B. tentaculata is the most frequent among the discussed species (Fig. 4). In the last 50 years 447 records of the species were made in 192 UTM/MGRS 10×10 km squares in Wielkopolska (ANTCZAK 1958, WŁOCHOWICZ 1960, BERGER 1961, CYBULSKA 1965, DWORNICZAK 1971, KĘDRA 1971, STACHOWIAK 1971, STROJKOWSKA 1971, LENARTOWICZ 1972, MACIEJEWSKA 1972, SAPA 1972, KORALEWSKA 1974, 1979, ROSZAK 1974, CHMURA 1975, JAZDON 1976, BERGER & DZIĘCZKOWSKI 1977, BIESIADKA & KASPRZAK 1977, LISIAK 1977, MICHAŁKIEWICZ 1977, MARKIEWICZ 1978, NASKRET 1978, SZCZEPANIK 1980, KACZMAREK 1981, WITOSŁAWSKA 1981, ĆWIKLIŃSKA 1982, WANAD 1982, KORALEWSKA-BATURA 1983, 1992, PIECHOCKI 1986, KASPRZAK 1987, WŁOSIK-BIEŃCZAK 1988, 1994, 1997, 1998, 1999, 2000a, b, c, 2001, KORALEWSKA-BATURA & DZIABASZEWSKI 1992, MIZGIER 1993, BERNARD 1994, KUCNER 1995, BASIŃSKI 1996, STATNIK 1996, MILLER 1997).

B. tentaculata most often occurred in lakes (40%). It was also frequent in rivers (18%) and ponds (16%). The remaining localities were ditches (41 sites), streams (28) and channels (20). It was sporadically found in wetlands (including swamps and flooded meadows) and oxbows (7 sites), as well as peat (5) and clay (2) pits.

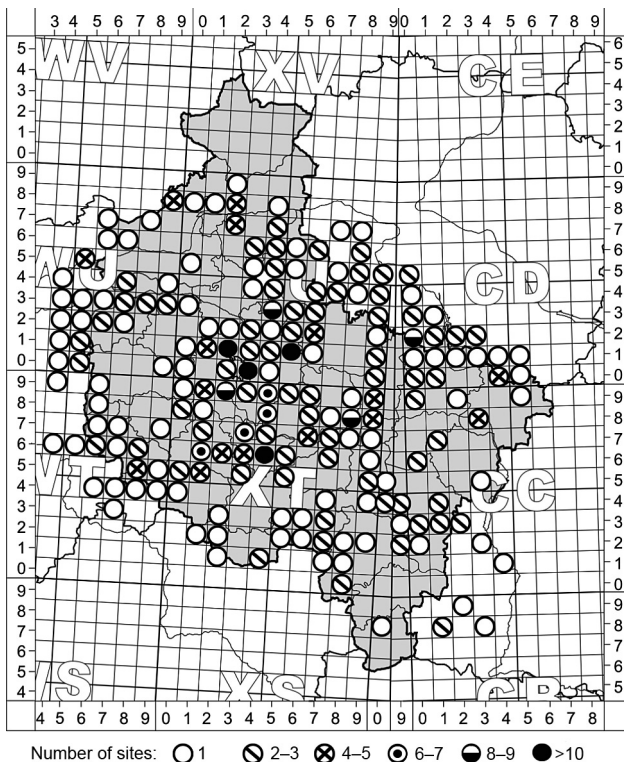


Fig. 4. Distribution of *Bithynia tentaculata* in Wielkopolska

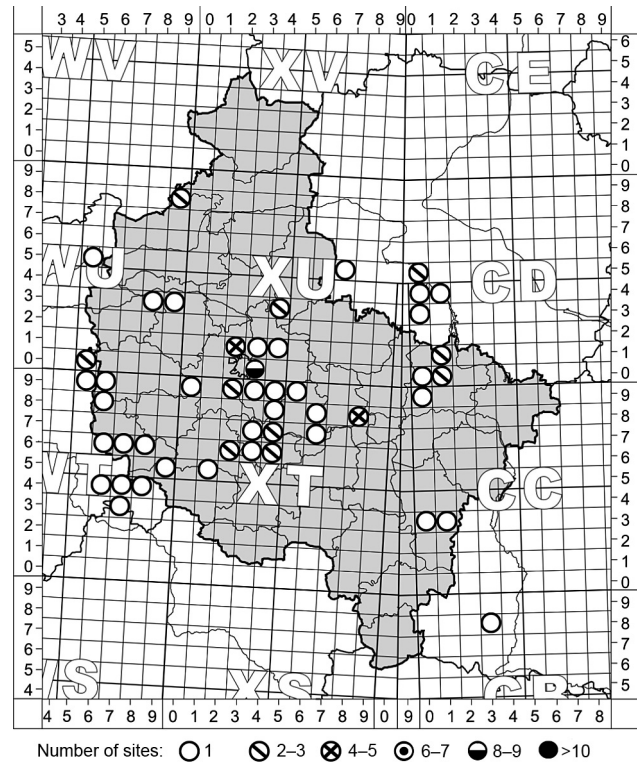


Fig. 5. Distribution of *Bithynia leachii* in Wielkopolska

Bithynia (Codiella) leachii (Sheppard, 1823)

The species has a Palaearctic distribution; in Poland it was recorded from the Pomeranian and Mazurian lake districts and Wielkopolsko-Kujawska and Mazowiecka lowlands (FALNIOWSKI 1989). It usually occurs in floodplain water bodies and is sometimes found in small lowland rivers and in lake littoral (PIECHOCKI 1979). It is red-listed in Poland, with near threatened (NT) conservation status (PIECHOCKI 2002).

Seventy three sites of *B. leachii* were recorded from 49 UTM/MGRS 10×10 km squares in Wielkopolska (Fig. 5) in the last 50 years (ANTCZAK 1958, WŁOCHOWICZ 1960, STĘPCZAK 1966, KORALEWSKA 1974, CHMURA 1975, BERGER & DZIĘCZKOWSKI 1977, MICHAŁKIEWICZ 1977, KORALEWSKA 1979, SZCZEPANIK 1980, ĆWIKLIŃSKA 1982, WANAD 1982, KORALEWSKA-BATURA 1983, 1992, KASPRZAK 1987, WŁOSIK-BIEŃCZAK 1988, 1994, 1996, 1997, 2001, MIZGIER 1993, KUCNER 1995, BASIŃSKI 1996, STATNIK 1996).

In Wielkopolska *B. leachii* occurred mainly in lakes (42%) as well as rivers (22%) and ponds (18%). It was found in few ditches (5 sites), channels (3), oxbows (2), one peat pit and one stream.

HYDROBIIDAE TROSCHEL, 1857

Members of the Hydrobiidae (Neotaenioglossa: Caenogastropoda) are distributed on all continents except Antarctica. The ranges of many genera and species are limited to tropical regions, most species however (ca. 750 out of 1,250) have a Palaearctic distribution (STRONG et al. 2008). In Europe the family is represented by 86 genera with 615 species (WELTER-SCHULTES 2012). Nine species of five genera occur in Poland (FALNIOWSKI 1987, PIECHOCKI 2008); three species are found in Wielkopolska.

Potamopyrgus antipodarum (Gray, 1843)

P. antipodarum is an alien species, introduced in Europe from New Zealand. It occurs in brackish and freshwater habitats: springs, rivers, streams, canals, ponds and lakes (FALNIOWSKI 1987). Its European range covers nearly the whole continent except parts of Russia and the Balkan countries. It is also absent in large parts of Scandinavia, Italy and SE. Europe (WELTER-SCHULTES 2012). In Poland it is found in the whole country except the mountains (STRZELEC 2011).

In Wielkopolska, within the last 50 years, 54 sites of *P. antipodarum* were found in 29 UTM/MGRS 10×10 km squares (Fig. 6) (JAZDON 1976, BERGER & DZIĘCZKOWSKI 1977, SZCZEPANIK 1980, ĆWIKLIŃSKA 1982, KASPRZAK 1982, KORALEWSKA-BATURA 1983, 1992, PIECHOCKI 1986, KASPRZAK 1987, SIKORA 1988,

MIZGIER 1993, BERNARD 1994, WŁOSIK-BIEŃCZAK 1994, 1996, 1999, 2000a, b, c, 2001, KUCNER 1995, BASIŃSKI 1996, MILLER 1997).

Most of the records came from lakes (81%). The species was occasionally found in rivers (3 sites), ponds (2), a channel, a clay pit, a ditch, a stream and a wetland.

Lithoglyphus naticoides (Pfeiffer, 1828)

L. naticoides typically inhabits large rivers and canals, and rarely lakes. It is a benthic species, usually found in the littoral zone, avoiding densely vegetated places. Its original range covered the Pontic region (rivers of the Black Sea basin), from where it spread to central, northern and western parts of Europe. Its expansion started most probably in the early 19th century. In Poland it is found in lowland rivers, the Vistula and Szczecin lagoons, and less frequently in lakes, especially in the north-eastern part of the country (PIECHOCKI 1979, FALNIOWSKI 1987, KOŁODZIEJCZYK 2011). The species is red-listed in Poland, with endangered (EN) conservation status (PIECHOCKI 2002).

Seven sites of *L. naticoides* were recorded from six UTM/MGRS 10×10 km squares in Wielkopolska (Fig. 7) during the last 50 years. All the records come from two large rivers: Warta (KORALEWSKA 1974, BIESIADKA & KASPRZAK 1977, KORALEWSKA-BATURA 1983) and Noteć (ANTCZAK 1958, CYBULSKA 1965, KĘDRA 1971, WŁOSIK-BIEŃCZAK 1988).

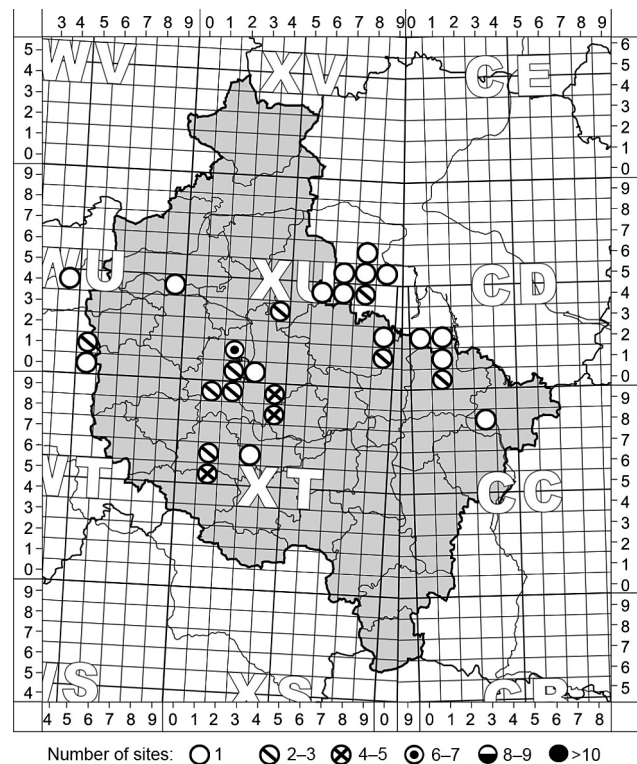


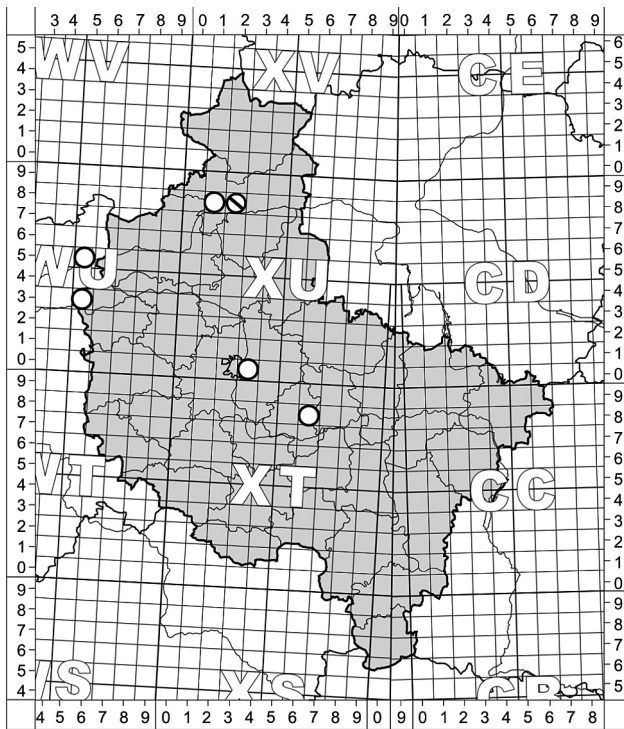
Fig. 6. Distribution of *Potamopyrgus antipodarum* in Wielkopolska

Marstoniopsis insubrica (Küster, 1853)

M. insubrica is distributed in Central Europe and the Baltic region; there are also some isolated populations in N. Italy and W. France. In the west its range extends to England where it is alien, and in the east it reaches the Dnieper and Volga rivers (PIECHOCKI 1979). In Poland *M. insubrica* is fairly common in northern and central parts of the country, however it is also known from the environs of Wrocław and from the Pilica catchment area (FALNIEWSKI 1987). The species is red-listed in Poland, with near threatened (NT) conservation status (PIECHOCKI 2002). *M. insubrica* typically occurs in stagnant and slow-flowing waters. It often lives under rocks or among vegetation, in shaded places with muddy bottom.

The fourteen records of *M. insubrica* made within the last 50 years in Wielkopolska came from 10 UTM/MGRS 10×10 km squares (Fig. 8) (WŁOCHOWICZ 1960, KORALEWSKA 1974, 1979, CHMURA 1975, BERGER & DZIĘCZKOWSKI 1977, SZCZEPANIK 1980, WŁOSIK-BIEŃCZAK 1988, 1996, 2001, MIZGIER 1993, KUCNER 1995). The species was most frequent in lakes (57%) and rivers (21%). It was also found in two ponds and a ditch.

Note! In all the publications cited in the present paper the species was referred to as *Marstoniopsis scholtzi* (Schmidt, 1856). FALNIEWSKI & WILKE (2001), however, synonymised the two names; *M. insubrica* has priority.



Number of sites: ○ 1 ⊖ 2-3 ⊗ 4-5 ⊙ 6-7 ● 8-9 ● >10

Fig. 7. Distribution of *Lithoglyphus naticoides* in Wielkopolska

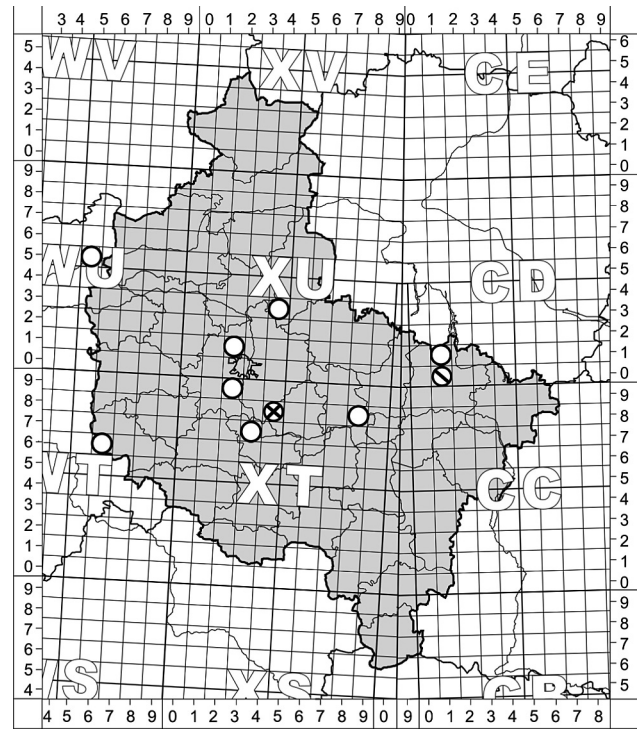
VALVATIDAE GRAY, 1840

Valvatidae, of the order Ectobranchia, superorder Heterobranchia, comprise ca. 71 species worldwide and are almost exclusively limited to the northern hemisphere (STRONG et al. 2008). They include only freshwater species. Eleven species of two genera are found in Europe (WELTER-SCHULTES 2012). Four species have been recorded from Poland; all four occur in Wielkopolska.

Valvata (Valvata) cristata Müller, 1774

V. cristata is distributed in Northern Asia and Europe. It is widespread and common in Poland except the mountains (FALNIEWSKI 1989). This species inhabits slow-flowing rivers, lake littoral, temporary and permanent ponds as well as ditches (PIECHOCKI 1979, 2008).

In the last 50 years 183 sites of *V. cristata* were found in 110 UTM/MGRS 10×10 km squares in Wielkopolska (Fig. 9) (ANTCZAK 1958, WŁOCHOWICZ 1960, BERGER 1961, CYBULSKA 1965, DWORNICZAK 1971, KĘDRA 1971, STACHOWIAK 1971, STROJKOWSKA 1971, LENARTOWICZ 1972, MACIEJEWSKA 1972, SAPA 1972, DZIĘCZKOWSKI 1974, KORALEWSKA 1974, 1979, ROSZAK 1974, CHMURA 1975, JAZDON 1976, BERGER & DZIĘCZKOWSKI 1977, MARKIEWICZ 1978, NASKRĘT 1978, SZCZEPANIK 1980, KACZMAREK 1981, ĆWIKLIŃSKA 1982, WANAD 1982, KORALEWSKA-BATURA 1983, 1992, WŁOSIK-BIEŃCZAK 1988, 1994, 1996, 1997, 2000a, b, c, 2001, KUCNER 1995, BASIŃSKI 1996, MILLER 1997). It was most frequent in lakes



Number of sites: ○ 1 ⊖ 2-3 ⊗ 4-5 ⊙ 6-7 ● 8-9 ● >10

Fig. 8. Distribution of *Marstoniopsis insubrica* in Wielkopolska



(39%), common in ditches (20%) and ponds (18%), less so in rivers (14 sites) and streams (10), and only occasionally found in wetlands (5), channels (4), peat and clay pits (4) and oxbows (3)

Valvata (Tropidina) macrostoma
Mörch, 1864

V. macrostoma is a Euro-Siberian species. It is fairly frequently found in the northern and central parts of Poland, rare in the southern uplands, and absent in the mountains. It typically occupies small, shallow ponds but can also be found in much vegetated lake littoral and slow-flowing rivers (PIECHOCKI 1979, 2008). The species is red-listed in Poland, with vulnerable (VU) conservation status (PIECHOCKI 2002).

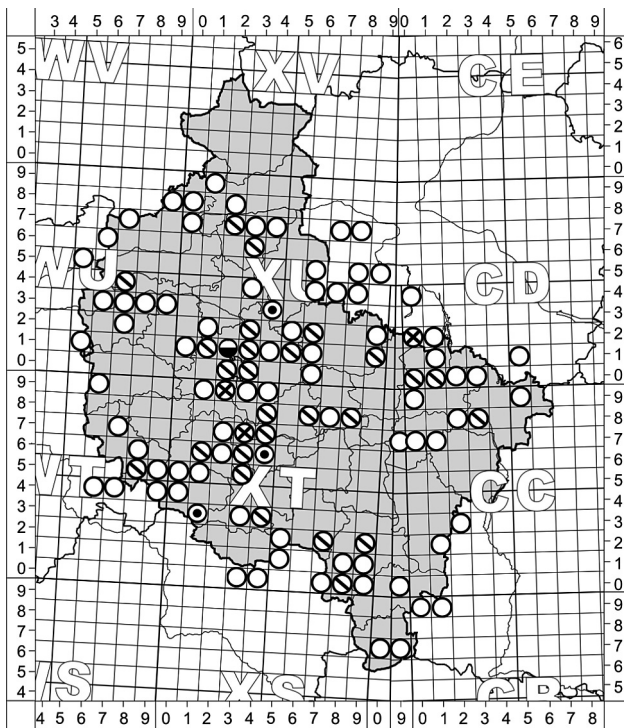
In the last 50 years *V. macrostoma* was recorded from 83 sites in 10 UTM/MGRS 10×10 km squares in Wielkopolska (Fig. 10) (WŁOCHOWICZ 1960, BERGER 1961, CYBULSKA 1965, DWORNICZAK 1971, KĘDRA 1971, STROJKOWSKA 1971, LENARTOWICZ 1972, MACIEJEWSKA 1972, SAPA 1972, KORALEWSKA 1974, 1979, CHMURA 1975, NASKRĘT 1978, SZCZEPANIK 1980, KACZMAREK 1981, WŁOSIK-BIEŃCZAK 1988, 1994, 1997, 1998, 1999, 2000a, b, c, 2001, KORALEWSKA-BATURA 1992, KORALEWSKA-BATURA & DZIABASZEWSKI 1992, MIZGIER 1993, KUCNER 1995, BASIŃSKI 1996, MILLER 1997). It mainly inhabited lakes (35%) and ponds (23%), but was also recorded from ditches (14%) and rivers (12%). Occasionally *V. macrostoma* was also found in wetlands (including

flooded meadows), channels and streams (3 sites), peat pits (2), an oxbow and a clay pit.

Valvata (Cincinna) piscinalis (Müller, 1774)

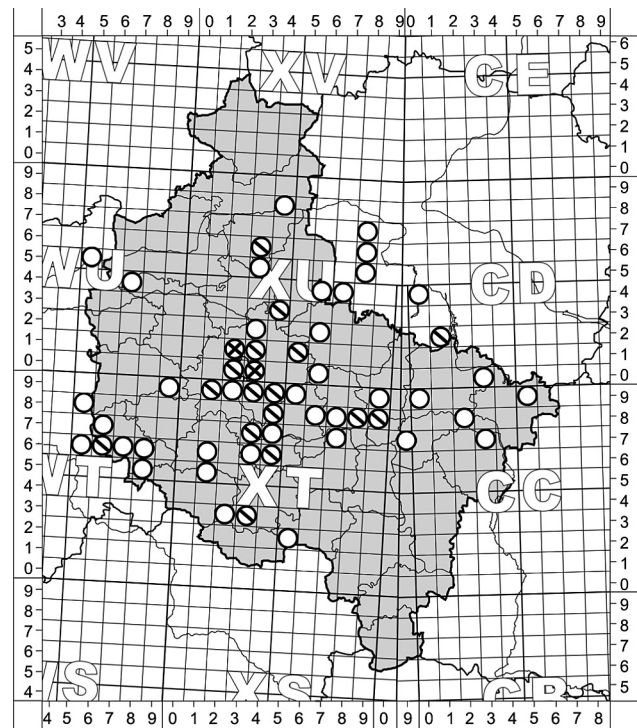
V. piscinalis is a Palaearctic species. It is common and widespread in Poland, except the mountains where it is known from single sites. It inhabits rivers, oxbows, ponds and lake littoral (PIECHOCKI 1979, 2008).

In the last 50 years 183 sites of *V. piscinalis* were recorded from 91 UTM/MGRS 10×10 km squares in Wielkopolska (Fig. 11) (ANTCZAK 1958, BERGER 1958, 1961, WŁOCHOWICZ 1960, CYBULSKA 1965, KĘDRA 1971, STACHOWIAK 1971, STROJKOWSKA 1971, MACIEJEWSKA 1972, LENARTOWICZ 1972, SAPA 1972, KORALEWSKA 1974, 1979, CHMURA 1975, JAZDON 1976, BIESIADKA & KASPRZAK 1977, BERGER & DZIECZKOWSKI 1977, LISIAK 1977, MICHAŁKIEWICZ 1977, MARKIEWICZ 1978, NASKRĘT 1978, SZCZEPANIK 1980, KACZMAREK 1981, ĆWIKLIŃSKA 1982, KORALEWSKA-BATURA 1983, 1992, PIECHOCKI 1986, WŁOSIK-BIEŃCZAK 1988, 1994, 1996, 1997, 1999, 2000b, c, 2001, KORALEWSKA-BATURA & DZIABASZEWSKI 1992, MIZGIER 1993, KUCNER 1995, BASIŃSKI 1996, MILLER 1997). It typically occurred in lakes (66%) and was less frequent in rivers (18%). Occasionally it was found in ponds (8 sites), ditches (7), channels (5), wetlands (swamps and flooded meadows (3), oxbows (2), streams (2), peat and clay pits (1 each).



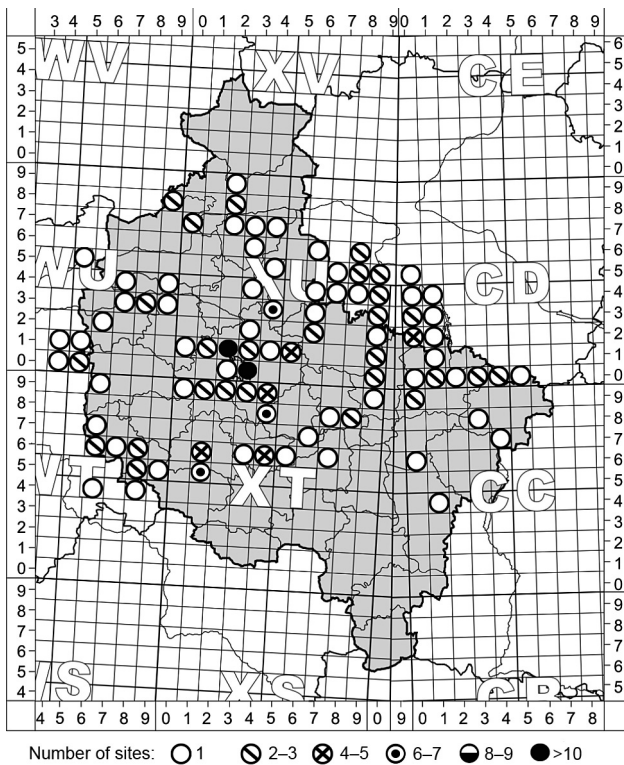
Number of sites: ○ 1 ⊘ 2-3 ⊗ 4-5 ⊖ 6-7 ⊕ 8-9 ● >10

Fig. 9. Distribution of *Valvata cristata* in Wielkopolska



Number of sites: ○ 1 ⊘ 2-3 ⊗ 4-5 ⊖ 6-7 ⊕ 8-9 ● >10

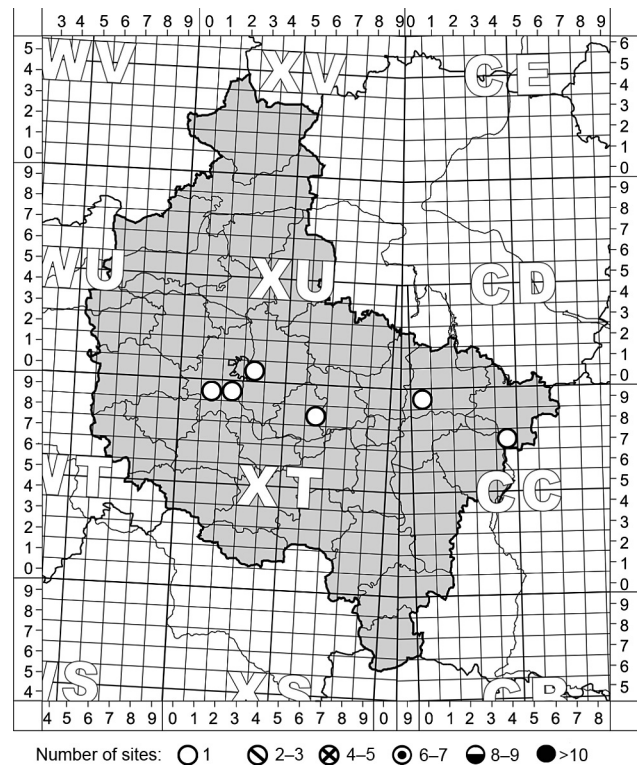
Fig. 10. Distribution of *Valvata macrostoma* in Wielkopolska

Fig. 11. Distribution of *Valvata piscinalis* in Wielkopolska*Borysthenia naticina* (Menke, 1845)

B. naticina inhabits mainly large, lowland rivers. It is rarely found in smaller rivers and lakes. In central and eastern Europe the species occurs in rivers of the southern Baltic and northwestern Black Sea basins (ZETTLER 2012). In Poland it is rare and occurs in large rivers, for example Bug, Warta, Wieprz or Vistula (PIECHOCKI 1979, 2004). Due to the recent decline in the number of its localities it is regarded as critically endangered (CR) in the Polish Red Data Book of Animals (PIECHOCKI 2004).

REFERENCES

- ANTCZAK Z. 1958. Mięczaki okolic Piły na tle malakofauny Ziemi Lubuskiej. M. Sc. thesis, supervisor: J. URBAŃSKI, Department of General Zoology, AMU, Poznań.
- BASIŃSKI G. 1996. Mięczaki (Mollusca) zbiornika Wonieść. M. Sc. thesis, supervisor: K. STĘPCZAK, Department of General Zoology, AMU, Poznań.
- BERGER L. 1958. Nowe stanowiska *Pisidium moitessierianum* Paladilhe, 1866. Pr. Kom. Biol. PTPN 19: 5-9.
- BERGER L. 1961. Mięczaki pogranicza Wielkopolski, Śląska i Jury Krakowsko-Wieluńskiej. Pr. Kom. Biol. PTPN 25: 1-124.
- BERGER L., DZIĘCZKOWSKI A. 1977. Mollusca. In: WRÓBLEWSKI A. (ed.). Bottom fauna of the heated Konin Lakes. Monografie Fauny Polski 7. PWN, Warszawa, pp. 151-179.

Fig. 12. Distribution of *Borysthenia naticina* in Wielkopolska

In the last 50 years six sites of *B. naticina* were found in five UTM/MGRS 10×10 km squares in Wielkopolska (Fig. 12). Five of the sites were in different parts of the Warta river (BERGER 1958, KORALEWSKA 1974, 1979, BIESIADKA & KASPRZAK 1977, SZCZEPANIK 1980) and one was Witobelskie lake in the Wielkopolski National Park (SZCZEPANIK 1980), although the last mentioned record is very doubtful.

- BERNARD R. 1994. New localities of the freshwater limpet *Ferrissia wautieri* (Mirolli, 1960) (Gastropoda: Basommatophora: Ancylidae) in Poland. Mitt. Dtsch. Malakozool. Ges. 53: 19-21.
- BIESIADKA E., KASPRZAK K. 1977. Badania nad malakofauną rzeki Warty w obrębie miasta Poznania. Acta Hydrobiol. 19: 102-122.
- CHMURA U. 1975. Mięczaki wodne powiatu Śremskiego. M. Sc. thesis, supervisor: J. URBAŃSKI, Department of General Zoology, AMU, Poznań.
- CYBULSKA H. 1965. Mięczaki Ziemi Chodzieskiej. M. Sc. thesis, supervisor: J. URBAŃSKI, Department of General Zoology, AMU, Poznań.
- ĆWIKLIŃSKA I. 1982. Mięczaki (Mollusca) wschodniej części Pojezierza Gnieźnieńskiego. M. Sc. thesis, supervisor: K.



- STĘPCZAK, Department of General Zoology, AMU, Poznań.
- DWORNICZAK M. 1971. Mięczaki okolic Gostynia. M. Sc. thesis, supervisor: J. URBAŃSKI, Department of General Zoology, AMU, Poznań.
- DZIECZKOWSKI A. 1974. Badania nad strukturą zespołu ślimaków (Gastropoda) lasu grądowego (*Galio-Carpinetum*) w Morasku pod Poznaniem. *Bad. Fizjogr. Pol. Zach.* 27: 25–51.
- FALNIOWSKI A. 1987. Hydrobioidea of Poland (Prosobranchia: Gastropoda). *Folia Malacol.* 1: 9–121.
- FALNIOWSKI A. 1989. Przodoskrzelne (Prosobranchia, Gastropoda, Mollusca) Polski. I. Neritidae, Viviparidae, Valvatidae, Bithyniidae, Rissooidea, Aciculidae. *Zesz. Nauk. UJ, Prace Zoologiczne* 35: 1–148.
- FALNIOWSKI A., WILKE T. 2001. The genus *Marstoniopsis* (Gastropoda: Rissoidea), intra- and intergeneric phylogenetic relationships. *J. Mollus. Stud.* 67: 483–488. <http://dx.doi.org/10.1093/mollus/67.4.483>
- FECHTER R., FALKNER G. 1990. Weichtiere. Mosaik Verlag, München.
- GITTENBERGER E., JANSSEN A. W., KUJIPER W. J., KUIPER J. G. J., MEIJER T., VAN DER VELDE G., DE VRIES J. N. 1998. De Nederlandse zoetwatermollusken. Recente en fossiele weekdieren uit zoet en brak water. *Nederlandse Fauna 2*. National Natuurhistorisch Museum Naturalis, KNNV Uitgeverij & EIS-Nederland, Leiden.
- GLÖER P., MEIER-BROOK C. 1998. Süßwassermollusken. Deutscher Jugendbund für Naturbeobachtung, Hamburg.
- GOFAS S., LE RENARD J., BOUCHET P. 2001. Mollusca. In: COSTELLO M. J., EMBLOW C., WHITE R. J. (eds). European register of marine species: a check-list of the marine species in Europe and a bibliography of guides to their identification. *Collection Patrimoines Naturels* 50. Muséum National d'Histoire Naturelle, Paris, pp. 180–213.
- JAZDON H. 1976. Mięczaki miasta Poznania. M. Sc. thesis, supervisor: J. URBAŃSKI, Department of General Zoology, AMU, Poznań.
- KACZMAREK M. 1981. Ślimaki (Gastropoda) lądowe i wodne okolic Rychwała, Turku, Stawiszyna i Jankowa. M. Sc. thesis, supervisor: K. STĘPCZAK, Department of General Zoology, AMU, Poznań.
- KASPRZAK K. 1982. Nowe dane o występowaniu i liczebności *Potamopyrgus jenkinsi* (E. A. Smith) (Gastropoda), *Pisidium ponderosum* Stelf. i *Pisidium crassum* Stelf. (Bivalvia) w Wielkopolsce. *Bad. Fizjogr. Pol. Zach. C Zool.* 33: 159–163.
- KASPRZAK K. 1987. Występowanie i zagęszczenie ślimaków (Gastropoda) i małży (Bivalvia) z rodziny Sphaeriidae w osadach dennych jeziora Zbęchy i kanału odwadniającego. *Bad. Fizjogr. Pol. Zach. C Zool.* 36: 51–58.
- KĘDRA H. 1971. Mięczaki (Mollusca) Ziemi Chodzieskiej. *Przyr. Pol. Zach.* 9: 48–58.
- KOŁODZIEJCZYK A. 2011. *Lithoglyphus naticoides*. In: GŁOWACIŃSKI Z., OKARMA H., PAWŁOWSKI J., SOLARZ W. (eds). Alien species in the fauna of Poland. Instytut Ochrony Przyrody PAN w Krakowie, Kraków, pp. 70–75.
- KORALEWSKA E. 1974. Ślimaki (Gastropoda) lądowe i wodne Ziemi Wrzesińskiej. M. Sc. thesis, supervisor: J. URBAŃSKI, Department of General Zoology, AMU, Poznań.
- KORALEWSKA E. 1979. Ślimaki (Gastropoda) Ziemi Wrzesińskiej. *Bad. Fizjogr. Pol. Zach. C Zool.* 32: 105–113.
- KORALEWSKA-BATURA E. 1983. Mięczaki (Mollusca) Wielkopolski. Ph. D. thesis, supervisor: K. STĘPCZAK, Department of General Zoology, AMU, Poznań.
- KORALEWSKA-BATURA E. 1992. Mięczaki (Mollusca) Wielkopolski. *Wyd. Nauk. UAM, ser. Zoologia* 18: 1–41.
- KORALEWSKA-BATURA E., BŁOSZYK J., GOŁDYN B., SZYBIAK K., LESICKI A., NAPIERAŁA A. 2010a. Materials to the knowledge of molluscs of Wielkopolska. I. History and general remarks. *Folia Malacol.* 18: 15–28. <http://dx.doi.org/10.2478/v10125-010-0003-2>
- KORALEWSKA-BATURA E., DZIABASZEWSKI W. 1992. Mięczaki (Mollusca) łęgów rogalińskich. *Morena* 1: 42–43.
- KORALEWSKA-BATURA E., GOŁDYN B., SZYBIAK K., BŁOSZYK J. 2010b. Materials to the knowledge of molluscs of Wielkopolska. II. Checklist. *Folia Malacol.* 18: 29–41. <http://dx.doi.org/10.2478/v10125-010-0004-1>
- KUCNER M. 1995. Mięczaki (Mollusca) miasta Skoków. M. Sc. thesis, supervisor: K. STĘPCZAK, Department of General Zoology, AMU, Poznań.
- LENARTOWICZ E. 1972. Ślimaki lądowe wschodniej części Wysoczyzny Poznańskiej i zachodniej części Wysoczyzny Gnieźnieńskiej. M. Sc. thesis, supervisor: J. URBAŃSKI, Department of General Zoology, AMU, Poznań.
- LISIAK J. 1977. Mięczaki (Mollusca) dorzecza środkowej Warty. M. Sc. thesis, supervisor: J. URBAŃSKI, Department of General Zoology, AMU, Poznań.
- MACIEJEWSKA A. 1972. Mięczaki powiatu słupeckiego. M. Sc. thesis, supervisor: J. URBAŃSKI, Department of General Zoology, AMU, Poznań.
- MARKIEWICZ E. 1978. Mięczaki (Mollusca) zbiorników wodnych i terenów przyległych, południowo-wschodniej części Pojezierza Gnieźnieńskiego. M. Sc. thesis, supervisor: J. URBAŃSKI, Department of General Zoology, AMU, Poznań.
- MICHAŁKIEWICZ M. 1977. Mięczaki ziemi jarocińskiej. M. Sc. thesis, supervisor: J. URBAŃSKI, Department of General Zoology, AMU, Poznań.
- MIEDZIAREK M. 2006. Zgrupowania mięczaków (Mollusca) górnego odcinka rzeki Samicy. B. Sc. thesis, supervisor: E. KORALEWSKA-BATURA, Department of General Zoology, AMU, Poznań.
- MILLER M. 1997. Mięczaki (Gastropoda, Bivalvia) miasta Koła. M. Sc. thesis, supervisor: K. STĘPCZAK, Department of General Zoology, AMU, Poznań.
- MIZGIER M. 1993. Mięczaki zbiorników wodnych Rynny Zaniemysko-Kórnickiej w województwie poznańskim. M. Sc. thesis, supervisor: K. STĘPCZAK, Department of General Zoology, AMU, Poznań.
- NASKRĘT D. 1978. Mięczaki (Mollusca) Parku Natury w Promnie koło Poznania. M. Sc. thesis, supervisor: J. URBAŃSKI, Department of General Zoology, AMU, Poznań.
- PIECHOCKI A. 1979. Mięczaki (Mollusca), Ślimaki (Gastropoda). *Fauna Ślaskowa* Polski 7. PWN, Warszawa-Poznań.
- PIECHOCKI A. 1986. *Ferrissia wautieri* (Mirulli) (Gastropoda, Ancyliidae) nowy gatunek ślimaka dla fauny Polski. *Przegl. Zool.* 30: 299–303.



- PIECHOCKI A. 2002. Gastropoda aquatica Ślimaki wodne. In: GŁOWACIŃSKI Z. (ed.). Red list of threatened animals in Poland. Instytut Ochrony Przyrody PAN, Kraków, pp. 34–37.
- PIECHOCKI A. 2004. *Borysthenia naticina*. In: GŁOWACIŃSKI Z., NOWACKI J. (eds). Polish Red Data Book of Animals. Instytut Ochrony Przyrody PAN, Kraków, pp. 317–318.
- PIECHOCKI A. 2008. Mięczaki (Mollusca). In: BOGDANOWICZ W., CHUDZICKA E., PILIPIUK I., SKIBIŃSKA E. (eds). Fauna of Poland – characteristics and checklist of species, vol. 3. Muzeum i Instytut Zoologii PAN, Warszawa, pp. 365–426.
- PIECHOCKI A., WAWRZYŃNIAK-WYDROWSKA B., ZDANOWSKI B. 2003. *Melanoides tuberculatus* (O. F. Müller, 1774) (Orthogastropoda: Thiaridae) a gastropod species new for the fauna of Poland. *Folia Malacol.* 11: 31–41.
- RIEDEL A. 1988. Ślimaki lądowe (Gastropoda terrestria). Katalog Fauny Polski 36. PWN, Warszawa.
- ROSZAK A. 1974. Badania jakościowe i ilościowe mięczaków olszyn koło Leszna. M. Sc. thesis, supervisors: J. URBAŃSKI, Z. BOGUCKI, Department of General Zoology, AMU, Poznań.
- SAPA L. 1972. Mięczaki okolic Koła. M. Sc. thesis, supervisor: J. URBAŃSKI, Department of General Zoology, AMU, Poznań.
- SIKORA D. 1988. Zróżnicowanie gatunkowe mięczaków (Mollusca) przybrzeżnego pasa Jeziora Góreckiego. M. Sc. thesis, supervisor: K. STĘPCZAK, Department of General Zoology, AMU, Poznań.
- STACHOWIAK M. 1971. Mięczaki Kiekrza i okolic. M. Sc. thesis, supervisor: J. URBAŃSKI, Department of General Zoology, AMU, Poznań.
- STATNIK A. 1996. Ślimaki (Gastropoda) Środy Wielkopolskiej. M. Sc. thesis, supervisor: K. STĘPCZAK, Department of General Zoology, AMU, Poznań.
- STĘPCZAK K. 1966. Mięczaki studzienki osadnikowej przemysłowego ujęcia wody z Warty w Poznaniu. *Przegl. Zool.* 10: 298–301.
- STROJKOWSKA M. 1971. Mięczaki Wągrowca i okolic. M. Sc. thesis, supervisor: J. URBAŃSKI, Department of General Zoology, AMU, Poznań.
- STRONG E. E., GARGOMINY O., PONDER W. F., BOUCHET P. 2008. Global diversity of gastropods (Gastropoda; Mollusca) in freshwater. *Hydrobiologia* 595: 149–166. <http://dx.doi.org/10.1007/s10750-007-9012-6>
- STRZELEC M. 2011. *Potamopyrgus antipodarum*. In: GŁOWACIŃSKI Z., OKARMA H., PAWŁOWSKI J., SOLARZ W. (eds). Alien species in the fauna of Poland. Instytut Ochrony Przyrody PAN, Kraków, pp. 77–81.
- SZCZEPANIK G. 1980. Mięczaki (Mollusca) zbiorników wodnych Wielkopolskiego Parku Narodowego. M. Sc. thesis, supervisor: K. STĘPCZAK, Department of General Zoology, AMU, Poznań.
- SZYBLAK K., JANKOWIAK A. 2012. Materials to the knowledge of molluscs of Wielkopolska (West-Central Poland). III. Families: Aciculidae J. E. Gray, 1850, Carychiidae Jeffreys, 1830, Succineidae H. Beck, 1837, Cochlicopidae Pilsbry, 1900. *Folia Malacol.* 20: 11–19. <http://dx.doi.org/10.2478/v10125-012-0005-3>
- URBAŃSKI J. 1957. Krajowe ślimaki i małże. Klucz do oznaczania wszystkich gatunków dotąd w Polsce wykrytych. PZWS, Warszawa.
- WANAD I. 1982. Mięczaki (Mollusca) południowo-wschodniej części Wysoczyzny Kaliskiej, Wysoczyzny Złoczewskiej oraz Kotliny Grabowskiej. M. Sc. thesis, supervisor: K. STĘPCZAK, Department of General Zoology, AMU, Poznań.
- WELTER-SCHULTES F. W. 2012. European non-marine molluscs, a guide for species identification. Planet Poster Editions, Göttingen.
- WITOSŁAWSKA K. 1981. Mięczaki (Mollusca) Wysoczyzny Kaliskiej. M. Sc. thesis, supervisor: K. STĘPCZAK, Department of General Zoology, AMU, Poznań.
- WŁOCHOWICZ T. 1960. Materiały do fauny mięczaków pogranicza wielkopolsko-śląskiego. M. Sc. thesis, supervisor: J. URBAŃSKI, Department of General Zoology, AMU, Poznań.
- WŁOSIK-BIEŃCZAK E. 1988. Nowe stanowiska *Pisidium moitessierianum* Paladilhe, 1866 (Mollusca, Bivalvia) w Polsce. *Bad. Fizjogr. Pol. Zach. C Zool.* 37: 83–85.
- WŁOSIK-BIEŃCZAK E. 1994. Mięczaki (Mollusca) wybranych zbiorników wodnych Maltańskiego Klina Zieleni w Poznaniu (I etap badań). *Lubuski Przegl. Przyn.* 5: 21–32.
- WŁOSIK-BIEŃCZAK E. 1996. Mięczaki (Mollusca) rzeki Bogdanki w Poznaniu i zbiorników wodnych znajdujących się w jej biegu. *Lubuski Przegl. Przyn.* 7: 53–64.
- WŁOSIK-BIEŃCZAK E. 1997. Mięczaki (Mollusca) rzeki Cybiny i sztucznych zbiorników wodnych utworzonych w jej biegu w granicach miasta Poznania w latach 1992–1994. *Bad. Fizjogr. Pol. Zach. C Zool.* 44: 19–40.
- WŁOSIK-BIEŃCZAK E. 1998. Mięczaki (Mollusca) stawów hodowlanych w Podlesiu i Raszewach. *Molluscs (Mollusca) of the fish ponds in Podlesie and Raszewy. Lubuski Przegl. Przyn.* 9: 43–48.
- WŁOSIK-BIEŃCZAK E. 1999. Mięczaki (Mollusca) odsłoniętego dna jeziora Maltańskiego po spuszczeniu wody w drugim (1992) i szóstym (1996) roku od zakończenia prac renowacyjnych. *Bad. Fizjogr. Pol. Zach. C Zool.* 46: 23–28.
- WŁOSIK-BIEŃCZAK E. 2000a. Fauna mięczaków (Mollusca) Strumienia Junikowskiego w Poznaniu w latach 1996–1999. *Bad. Fizjogr. Pol. Zach. C Zool.* 47: 15–27.
- WŁOSIK-BIEŃCZAK E. 2000b. Zmiany w faunie mięczaków (Mollusca) zbiorników powyrobiskowych w dolinie Strumienia Junikowskiego w Poznaniu w latach 1996–1999. *Lubuski Przegl. Przyn.* 11: 53–63.
- WŁOSIK-BIEŃCZAK E. 2000c. Mięczaki (Mollusca) jeziora Rusalka w Poznaniu w latach 1994–1998. *Bad. Fizjogr. Pol. Zach. C Zool.* 47: 7–14.
- WŁOSIK-BIEŃCZAK E. 2001. Malakofauna rzeki Bogdanki w latach 1994–1998. *Bad. Fizjogr. Pol. Zach. C Zool.* 48: 7–19.
- ZETTLER M. L. 2012. A remarkable record of a very rare freshwater snail *Borysthenia naticina* (Menke, 1845) in north-east Germany compared with three Lithuanian records. *Folia Malacol.* 20: 105–110. <http://dx.doi.org/10.2478/v10125-012-0016-0>

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