

MATERIALS TO THE KNOWLEDGE OF MOLLUSCS OF WIELKOPOLSKA (WEST-CENTRAL POLAND). V. FAMILY: PLANORBIDAE (GASTROPODA: PULMONATA)

MICHAŁ JAN CZYŻ¹, PAWEŁ WOLIŃSKI², PATRYCJA TALARSKA², BARTŁOMIEJ GOŁDYN^{2,3*}

¹The Research Centre of Quarantine, Invasive and Genetically Modified Organisms,
Institute of Plant Protection – National Research Institute, Węgorka 20, 60-318 Poznań, Poland
(e-mail: mczyz@iortib.poznan.pl)

²Department of General Zoology, Faculty of Biology, Adam Mickiewicz University, Umultowska 89,
61-614 Poznań, Poland (e-mail: wolis2@wp.pl; patitalarska@gmail.com; glodny@amu.edu.pl)

³Laboratorio de Ecología Tropical Natural y Aplicada, Universidad Estatal Amazónica, Campus Principal
Km 2.1/2 via a Napo (Paso Lateral) Puyo, Pastaza, Ecuador

*corresponding author

ABSTRACT: The paper presents data on 20 freshwater snail species: *Planorbis planorbis*, *P. carinatus*, *Anisus spirorbis*, *A. leucostoma*, *A. septemgyratus*, *A. vortex*, *A. vorticulus*, *Bathymphalus contortus*, *Gyraulus albus*, *G. laevis*, *G. acronicus*, *G. rossmaessleri*, *G. riparius*, *G. crista*, *Hippeutis complanatus*, *Segmentina nitida*, *Planorbarius corneus*, *Menetus dilatatus*, *Ancylus fluviatilis* and *Ferrissia fragilis*, recorded over the last fifty years in the Wielkopolska Province (W. Poland). Their distribution is shown on maps with UTM/MGRS grid; most typical habitats of each are described. Among the recorded species *P. corneus* (497 sites) and *P. planorbis* (465 sites) are the most frequent. Two species are known from more than three hundred localities, namely: *A. vortex* (362 sites) and *B. contortus* (330 sites). The next two species should be also regarded as very frequent in the region: *G. albus* (242 sites), *S. nitida* (230 sites). Among the three species with the smallest number of localities, two are introduced alien species – *M. dilatatus* and *F. fragilis*, recorded from five localities each; one, *G. riparius*, recorded from six sites, is native and endangered.

KEY WORDS: malacofauna, Wielkopolska province, distribution

INTRODUCTION

Part V is part of the series of papers by KORALEWSKA-BATURA et al. (2010a, b), SZYBIAK & JANKOWIAK (2012) and CZYŻ & GOŁDYN (2013). Here, we present characteristics of a family of freshwater snails (subclass Pulmonata) – Planorbidae,

found in Wielkopolska after 1957. Their distribution is shown on maps with UTM/MGRS grid. Most typical habitats of each of the species occurring in Wielkopolska are described.

METHODS

We followed 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 created by the Natural History Collections and Department of General Zoology, AMU in Poznań and are available on request. The number of sites recorded in each UTM square is marked on the maps. We analysed

only reports from the last 50 years; pre-1957 publications containing information on the past occurrences in Wielkopolska or the Wielkopolsko-Kujawska Lowland were listed earlier (URBAŃSKI 1957, RIEDEL 1988, KORALEWSKA-BATURA 1992). We also include

some previously unpublished localities bordering with the region but not enclosed in its administrative boundaries. The classification used follows WELTER-SCHULTES (2012).

RESULTS

PLANORBIDAE O. F. MÜLLER, 1774

It is a widely distributed family of freshwater snails, suborder Basommatophora, order Pulmonata. They include three subfamilies: Plesiophysinae (Central and Southern America), Bulininae (Africa, Australia and Eurasia), and Planorbinae (worldwide). The last two subfamilies with 12 genera represented by 41 species have been reported for Europe (WELTER-SCHULTES 2012); 20 species from eight genera are known from Poland and all of these occur also in Wielkopolska (PIECHOCKI 1979, 2008).

Planorbis planorbis (Linnaeus, 1758)

P. planorbis typically occurs in small water bodies such as field ponds, swamps or turf pits overgrown by plants. The species inhabits also lakes and slow flowing rivers and streams. It is also characteristic of ponds and pools of river floodplains. *P. planorbis*

is a Holarctic species. It is one of most common and widespread planorbids. Its range includes all the countries of mainland Europe and in Asia it extends as far east as Lake Baikal, Russia. In Poland it is common mainly in the lowlands, however there are some localities in the mountains (Western Sudety, and Eastern Beskidy; PIECHOCKI 1979).

In the last 50 years, 465 localities of *P. planorbis* were recorded from 199 UTM/MGRS 10×10 km squares in Wielkopolska (Fig. 1) by the following authors: BZDZIEL-GRENDA (1952), ANTCHAK (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 & DZIECZKOWSKI (1977), LISIAK (1977), MICHAŁKIEWICZ (1977), MARKIEWICZ (1978), NASKRĘT (1978), SZCZEPANIK (1980), KACZMAREK (1981), WITOSŁAWSKA (1981), ĆWIKLIŃSKA (1982), WANAD (1982), KORALEWSKA-BATURA (1983, 1992), PIECHOCKI (1986), KOŃCIAK (1988), MISIAK (1988), SIKORA (1988), STĘPCZAK & WŁOSIK-BIEŃCZAK (1988), KORALEWSKA-BATURA & DZIABASZEWSKI (1992), MIZGIER (1993), WŁOSIK-BIEŃCZAK (1994, 1996, 1997, 1998, 1999, 2000b, 2001), KUCNER (1995), STATNIK (1996), BASIŃSKI (1996), MILLER (1997), GOŁDYN (2002).

This species inhabits mostly lakes and ponds (28% and 25% of the records, respectively). *P. planorbis* was also found in ditches (16%), wetlands (including swamps and flooded meadows; 4%) and flowing waters: rivers (13%), streams (7%) and channels (4%). It is also known from five oxbow lakes, six peat pits and two clay pits.

Planorbis carinatus (O. F. Müller, 1774)

P. carinatus inhabits permanent water bodies. It typically occurs in lake littoral. Occasionally, it is found in slow flowing rivers, streams or oxbow lakes. The species most often occurs in densely vegetated, shallow waters with bottom sediments rich in organic matter. Its distribution covers most of Europe (except north Scandinavia), extending eastward to western Siberia (WELTER-SCHULTES 2012). In Poland

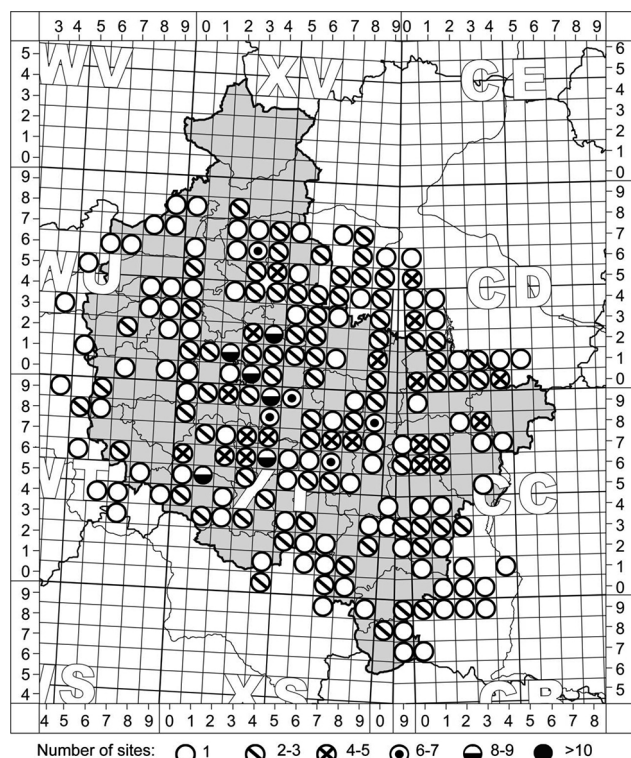


Fig. 1. Distribution of *Planorbis planorbis* in Wielkopolska Province

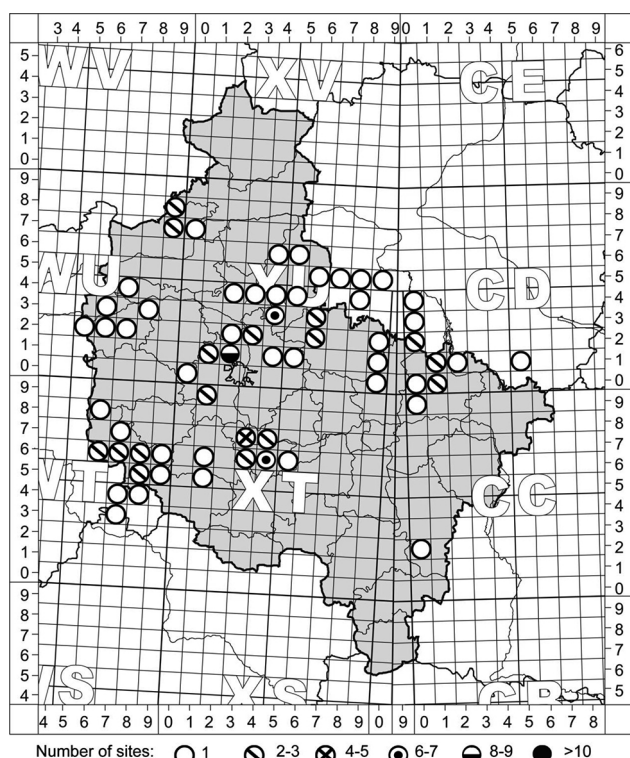


Fig. 2. Distribution of *Planorbis carinatus* in Wielkopolska Province

it is common in the Pomorskie and Mazurskie Lake Districts, Wielkopolsko-Kujawska Lowland and partly in Podlasie, although its populations are in decline and the species is listed as near threatened in the red list of threatened animals (PIECHOCKI 2002). Single localities are known from Lower Silesia, Cracow and Eastern Beskidy (PIECHOCKI 1979).

The last 50 years brought 107 records of *P. carinatus* from 63 UTM/MGRS 10×10 km squares in Wielkopolska (Fig. 2): BZDZIEL-GRENDA (1952), ANTCAK (1958), WŁOCHOWICZ (1960), BERGER (1961), STACHOWIAK (1971), STROJKOWSKA (1971), MACIEJEWSKA (1972), LENARTOWICZ (1972), SAPA (1972), CHMURA (1975), BERGER & DZIECZKOWSKI (1977), MARKIEWICZ (1978), SZCZEPANIK (1980), ĆWIKLIŃSKA (1982), WANAD (1982), KORALEWSKA-BATURA (1983, 1992), SIKORA (1988), BERNARD (1994), KUCNER (1995), WŁOSIK-BIEŃCZAK (1996, 2001).

In 67% of its localities the species occurred in lakes. Ponds constituted 13% of the localities in Wielkopolska. It was rarely found in ditches (6%), rivers (7%) and channels (5%). *P. carinatus* was also found in one each: a stream, a swamp and a peat pit.

Anisus spirorbis (Linnaeus, 1758)

A. spirorbis inhabits small water bodies (ponds, field and forest ditches, wetlands). It also occurs in flowing waters in densely vegetated habitats.

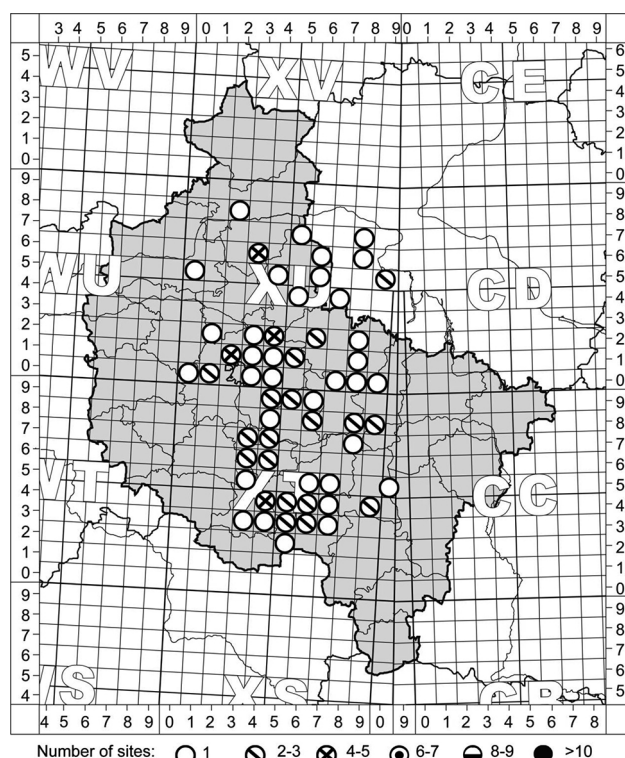


Fig. 3. Distribution of *Anisus spirorbis* in Wielkopolska Province

A. spirorbis is a Palearctic species. In Poland it is common in the Pomorskie and Mazurskie Lake Districts, Wielkopolsko-Kujawska, Mazowiecka and Sandomierska Lowlands, Upper and Lower Silesia, and Western Sudety. In other regions of Poland it is rare or absent (PIECHOCKI 1979). Due to the habitat loss and because of the poor state of knowledge of its habitats it is classified as data deficient in the red list of threatened animals in Poland (PIECHOCKI 2002).

Ninety four localities of *A. spirorbis* from 56 UTM/MGRS 10×10 km squares were recorded during the last 50 years in Wielkopolska (Fig. 3) by the following authors: BERGER (1961), CYBULSKA (1965), DWORNICZAK (1971), KĘDRA (1971), STACHOWIAK (1971), STROJKOWSKA (1971), LENARTOWICZ (1972), MACIEJEWSKA (1972), KORALEWSKA (1974, 1979), CHMURA (1975), JAZDON (1976), LISIAK (1977), NASKRĘT (1978), KACZMAREK (1981), WITOSŁAWSKA (1981), ĆWIKLIŃSKA (1982), KORALEWSKA-BATURA (1983, 1992), KORALEWSKA-BATURA & DZIABASZEWSKI (1992), WŁOSIK-BIEŃCZAK (1994, 1996, 2000c), KUCNER (1995), STATNIK (1996).

Most of the records come from ponds (45%) and ditches (21%). The species was also found in lakes, though rarely (16%), and in wetlands (13%; including flooded meadows and swamps) and occasionally in channels (3 sites) and rivers (2 sites).

Anisus leucostoma (Millet, 1813)

A. leucostoma inhabits small water bodies (flooded fields and meadows, drainage ditches, shallow ponds and swamps), often temporary ones. It rarely occurs in slow flowing streams, shallow lakes and puddles in river floodplains. *A. leucostoma* is a Palearctic species. In Poland it is common in all the lowlands and in some of the mountain areas (Sudety and Beskidy) (PIECHOCKI 1979).

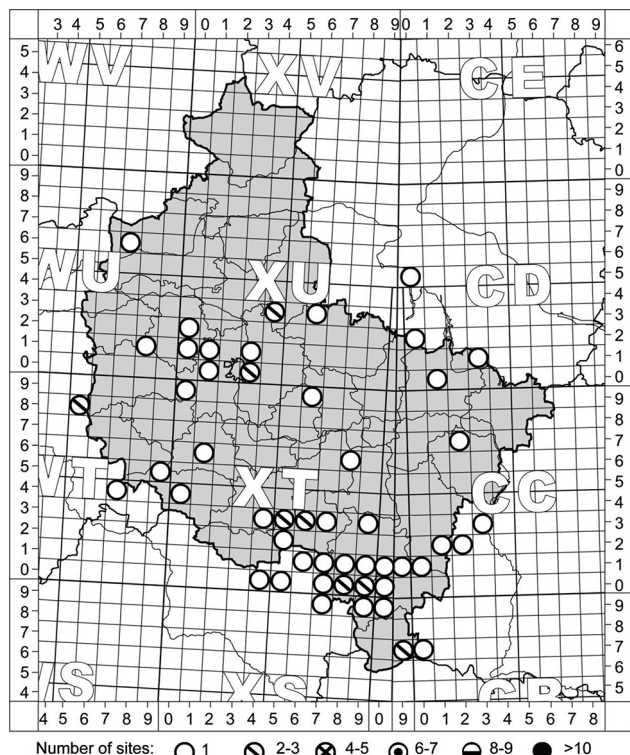


Fig. 4. Distribution of *Anisus leucostoma* in Wielkopolska Province

Sixty two records of *A. leucostoma* from 51 UTM/MGRS 10×10 km squares were made during the last 50 years in Wielkopolska (Fig. 4) by the following authors: WŁOCHOWICZ (1960), BERGER (1961), BERGER & DZIECZKOWSKI (1977), MARKIEWICZ (1978), KORALEWSKA-BATURA (1983, 1992), WŁOSIK-BIEŃCZAK (1994), KUCNER (1995), GOŁDYN (2002), KACZMAREK (unpublished – collection stored at Natural History Collections, AMU, Poznań).

A. leucostoma occurs mostly in ditches (32%), ponds (19%) and wetlands (15%; including swamps and flooded meadows). It was also found in lakes (13%), streams (11%) and rivers (8%) as well as in one channel.

Anisus septemgyratus (Rossmässler, 1758)

A. septemgyratus inhabits shallow forest and field ponds, oxbows, ponds and vegetated lakes, as

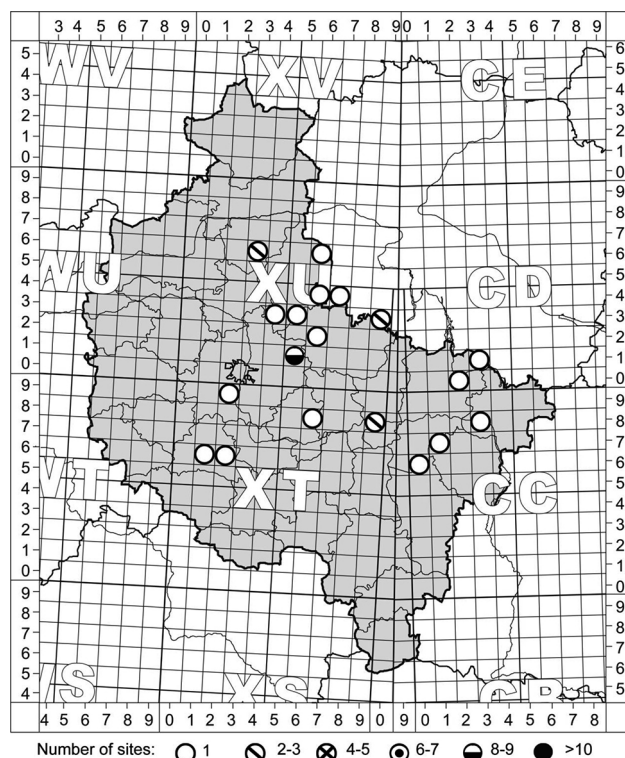


Fig. 5. Distribution of *Anisus septemgyratus* in Wielkopolska Province

well as drainage ditches. It occurs in Central and Eastern Europe and in Western Siberia. In Poland it was regarded as quite common in the Pomorskie and Mazurskie Lake Districts, Wielkopolsko-Kujawska, Mazowiecka and Sandomierska Lowlands (PIECHOCKI 1979), although more recently it was red listed and classified as vulnerable due to the habitat loss (PIECHOCKI 2002). It is also known from single localities in Upper Silesia, Lubelska Upland, Roztocze and Eastern Beskidy (PIECHOCKI 1979).

Thirty localities of *A. septemgyratus* from 19 UTM/MGRS 10×10 km squares were recorded during the last 50 years in Wielkopolska (Fig. 5) by the following authors: CYBULSKA (1965), KĘDRA (1971), STROJKOWSKA (1971), LENARTOWICZ (1972), MARKIEWICZ (1978), NASKRĘT (1978), SZCZEPANIK (1980), KACZMAREK (1981), ĆWIKLIŃSKA (1982), KORALEWSKA-BATURA (1983, 1992), KUCNER (1995), BASIŃSKI (1996), MILLER (1997).

This species was found in lakes (7), ponds (6), ditches (6), wetlands (4; including flooded meadows and swamps), rivers and oxbow lakes (3 each), and in one channel.

Anisus vortex (Linnaeus, 1758)

A. vortex often inhabits small, densely vegetated water bodies. It can be also found in lake littoral and in slow flowing waters. *A. vortex* is a Euro-Siberian species. In Poland it is common in all the low-

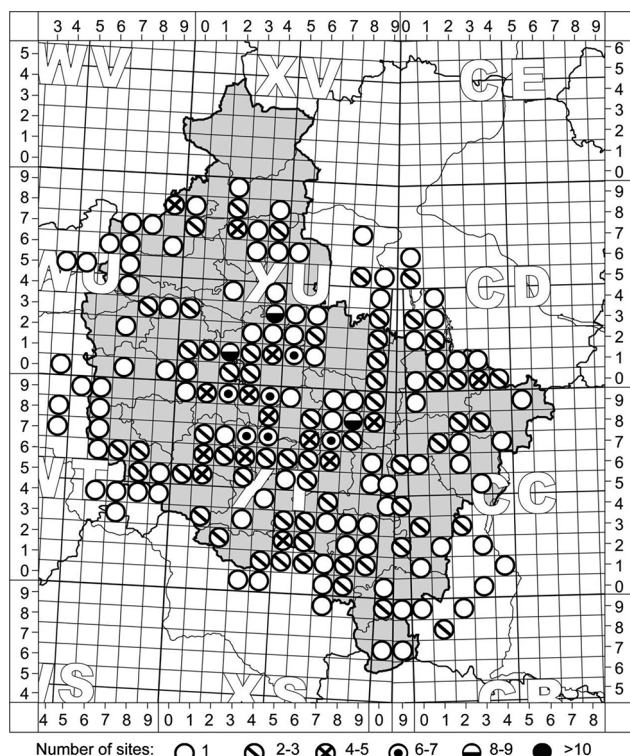


Fig. 6. Distribution of *Anisus vortex* in Wielkopolska Province

lands and in some mountain areas (Western Sudety, Eastern and Western Beskidy) (PIECHOCKI 1979).

The last 50 years of surveying Wielkopolska brought 362 records of *A. vortex* from 176 UTM/MGRS 10×10 km squares (Fig. 6) by the following authors: BZDZIEL-GRENDA (1952), ANTCHAK (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 & DZIĘCZKOWSKI (1977), LISIAK (1977), MICHAŁKIEWICZ (1977), MARKIEWICZ (1978), NASKRĘT (1978), SZCZEPANIK (1980), KACZMAREK (1981), WITOSŁAWSKA (1981), ĆWIKLIŃSKA (1982), WANAD (1982), KORALEWSKA-BATURA (1983, 1992), KOŃCIAK (1988), MISIAK (1988), SIKORA (1988), KORALEWSKA-BATURA & DZIABASZEWSKI (1992), MIZGIER (1993), WŁOSIK-BIEŃCZAK (1994, 1996, 1997, 1998, 1999, 2000a, b, 2001), KUCNER (1995), BASIŃSKI (1996), MILLER (1997).

Lakes and ponds constituted more than 50% of the localities of *A. vortex* (33% and 25%, respectively). The species was less frequent in rivers (14%), streams (11%), ditches (7%) and channels (4%). It was also found in eight oxbow lakes, four wetlands, six peat pits and two clay pits.

Anisus vorticulus (Troschel, 1834)

A. vorticulus is rare and sparsely distributed. It inhabits small, densely vegetated water bodies: shallow ponds, oxbows, floodplains, swamps, drainage ditches, turf pits. It can be also found in lake littoral and in slow flowing waters. It prefers higher temperatures and thus occurs predominantly in well isolated, shallow water bodies. The range of *A. vorticulus* includes Central and Eastern Europe, and Western Siberia. In Poland it was reported from the Pomorskie and Mazurskie Lake Districts and Wielkopolsko-Kujawska Lowland. Single localities are known from the Baltic Coast, Mazowiecka Lowland, Białowieża Forest, Upper and Lower Silesia and Małopolska Upland (PIECHOCKI 1979). It is protected across Europe as one of the species listed in Annex II of the EU Habitats Directive (ZAJĄC & GOŁDYN 2012) and for Poland it is classified as near threatened in the red list of threatened animals (PIECHOCKI 2002).

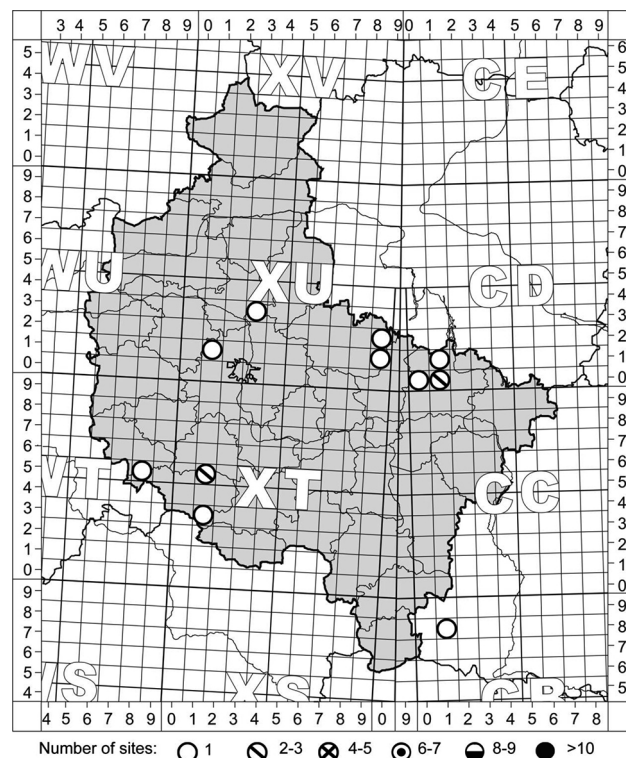


Fig. 7. Distribution of *Anisus vorticulus* in Wielkopolska Province

Only 14 localities of *A. vorticulus* were found during the last 50 years in Wielkopolska, in 11 UTM/MGRS 10×10 km squares (Fig. 7) by the following authors: WŁOCHOWICZ (1960), BERGER (1961), STACHOWIAK (1971), BERGER & DZIĘCZKOWSKI (1977), KORALEWSKA-BATURA (1983, 1992), KUCNER (1995).

This species was most frequent in lakes (64%). It was occasionally found in streams and rivers (2 localities each); it was also found in one pond.

Bathyomphalus contortus (Linnaeus, 1758)

B. contortus inhabits flowing and standing waters. Most often it occurs in densely vegetated, shallow waters with bottom deposits rich in organic matter. *A. contortus* is a Palaearctic species. In Poland it is common and widely distributed in all the lowlands and highlands. It is also known from a few mountain areas (Western Sudety, Eastern and Western Beskidy) (PIECHOCKI 1979).

During the last 50 years 330 occurrences of *B. contortus* in 163 UTM/MGRS 10×10 km squares (Fig. 8) in Wielkopolska were recorded by the following authors: BZDZIEL-GRENDA (1952), ANT CZAK (1958), WŁOCHOWICZ (1960), BERGER (1961), CYBULSKA (1965), KĘDRA (1971), STACHOWIAK (1971), STROJKOWSKA (1971), LENARTOWICZ (1972), MACIEJEWSKA (1972), SĄPA (1972), DZIĘCZKOWSKI (1974), ROSZAK (1974), CHMURA (1975), JAZDON (1976), BERGER & DZIĘCZKOWSKI (1977), LISIAK (1977), MICHAŁKIEWICZ (1977), MARKIEWICZ (1978), NASKRĘT (1978), SZCZEPANIK (1980), KACZMAREK (1981), ĆWIKLIŃSKA (1982), WANAD (1982), KORALEWSKA (1974, 1979), KORALEWSKA-BATURA (1983, 1992), KOŃCIAK (1988), MISIAK (1988), SIKORA (1988), KORALEWSKA-BATURA &

DZIABASZEWSKI (1992), MIZGIER (1993), WŁOSIK-BIEŃCZAK (1994, 1996, 1997, 1998, 2000a, b, c, 2001), KUCNER (1995), BASIŃSKI (1996), STATNIK (1996), MILLER (1997).

B. contortus was frequent in lakes (35%) and ponds (23%), but also found in ditches (15%), rivers (10%), and rarely in streams (6%), swamps (4%), channels (4%), peat and clay pits (6 and 2 sites, respectively) and oxbow lakes (3 sites).

Gyraulus albus (O. F. Müller, 1774)

G. albus inhabits both small and large, stagnant and running waters (turf pits, floodplains, oxbows, ponds, lakes, rivers). It is a Holarctic species. In Poland it is common and widely distributed in all the lowlands and highlands. It is also known from some mountain areas (Eastern and Western Sudety, Eastern and Western Beskidy, Pieniny) (PIECHOCKI 1979).

The 242 records of *G. albus* from the last 50 years come from 126 UTM/MGRS 10×10 km squares in Wielkopolska (Fig. 9) and were made by the following authors: BZDZIEL-GRENDA (1952), ANT CZAK (1958), WŁOCHOWICZ (1960), BERGER (1961), CYBULSKA (1965), KĘDRA (1971), STACHOWIAK (1971), STROJKOWSKA (1971), DWORNICZAK (1971), LENARTOWICZ (1972), SĄPA (1972), KORALEWSKA (1974, 1979), CHMURA (1975), JAZDON (1976), BERGER & DZIĘCZKOWSKI (1977), LISIAK (1977),

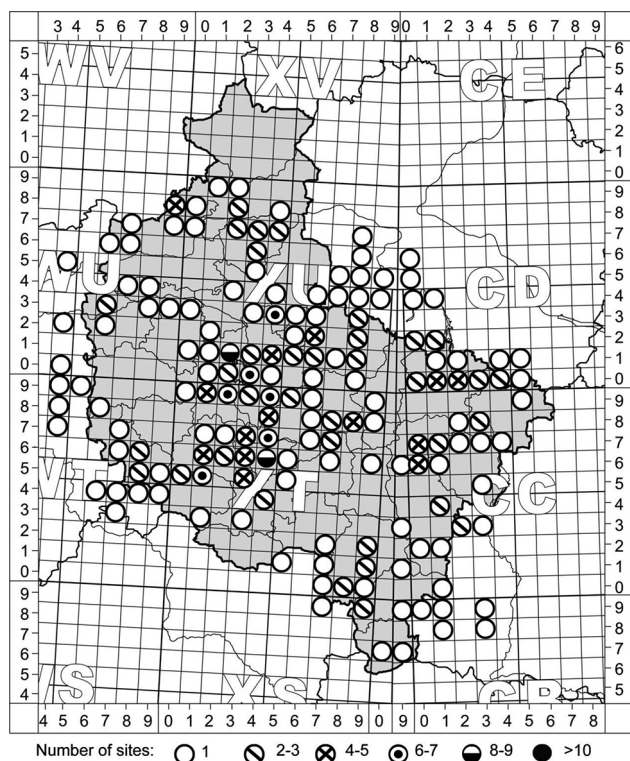


Fig. 8. Distribution of *Bathyomphalus contortus* in Wielkopolska Province

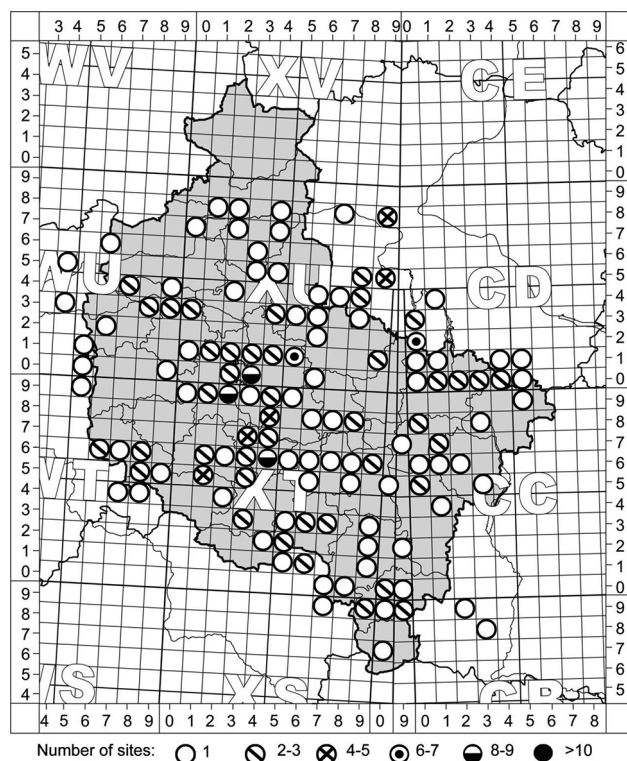


Fig. 9. Distribution of *Gyraulus albus* in Wielkopolska Province

MICHAŁKIEWICZ (1977), MARKIEWICZ (1978), NASKRĘT (1978), SZCZEPANIK (1980), KACZMAREK (1981), ĆWIKLIŃSKA (1982), WANAD (1982), KORALEWSKA-BATURA (1983, 1992), PIECHOCKI (1986), MISIAK (1988), SIKORA (1988), KORALEWSKA-BATURA & DZIABASZEWSKI (1992), MIZGIER (1993), BERNARD (1994), WŁOSIK-BIEŃCZAK (1994, 1996, 1997, 2000a, b, 2001), KUCNER (1995), BASIŃSKI (1996), STATNIK (1996), MILLER (1997), GOŁDYN (2002).

In 42% of its localities *G. albus* occurred in lakes. Ponds constituted 28% of its localities. Besides, it was found mostly in rivers (11%), streams (7%) and ditches (5%), as well as in some channels (7 sites), peat and clay pits (4 sites each), wetlands (2 sites) and oxbow lakes (2 sites).

Gyraulus laevis (Adler, 1838)

G. laevis inhabits ponds, lakes and oxbows and is a Holarctic species. In Poland it is rare and is often mistaken for *G. acronicus*, *G. rossmaessleri* and *G. albus*. It is often found in Quarternary sediments. At present it is known from a few localities in Poland (PIECHOCKI 1979) and is classified as endangered in the red list of invertebrates (PIECHOCKI 2002).

Eight localities of *G. laevis* were found in six UTM/MGRS 10×10 km squares in Wielkopolska during the last 50 years (Fig. 10) (DWORNICZAK 1971, CHMURA 1975, BERGER & DZIĘCZKOWSKI 1977, SZCZEPANIK

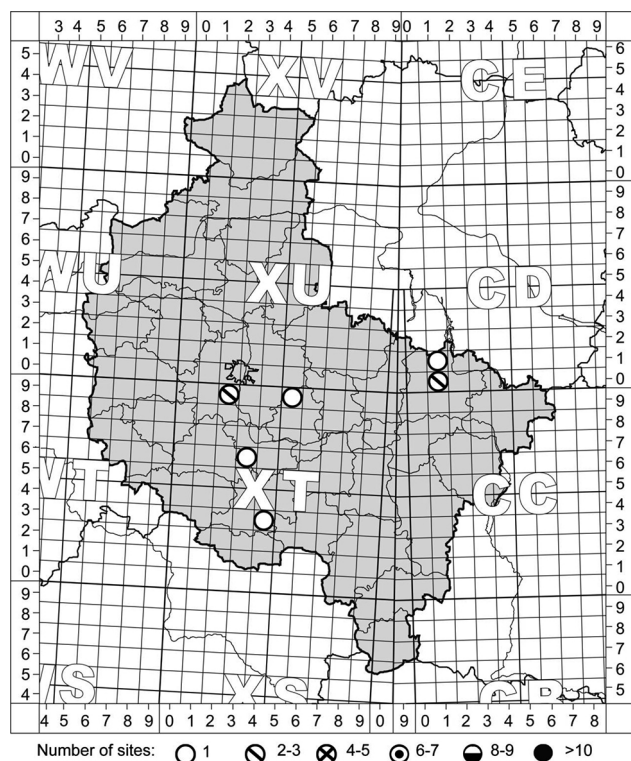


Fig. 10. Distribution of *Gyraulus laevis* in Wielkopolska Province

1980, KACZMAREK unpublished – collection stored at Natural History Collections, AMU, Poznań).

G. laevis was found in six lakes and two ponds.

Gyraulus acronicus (Ferussac, 1807)

G. acronicus inhabits ponds, lakes and oxbows. The species occurs in alpine-boreal zone in the Holarctic. In Poland it is rare and is probably a glacial relict. It is known from only a few localities (see PIECHOCKI 1979) and is classified as endangered in the red list of invertebrates (PIECHOCKI 2002).

Ten localities of *G. acronicus* were found during the last 50 years in Wielkopolska, in nine UTM/MGRS 10×10 km squares (Fig. 11) (BERGER 1961, CYBULSKA 1965, KĘDRA 1971, BERGER & DZIĘCZKOWSKI 1977, KORALEWSKA-BATURA 1983, 1992, WŁOSIK-BIEŃCZAK 2001).

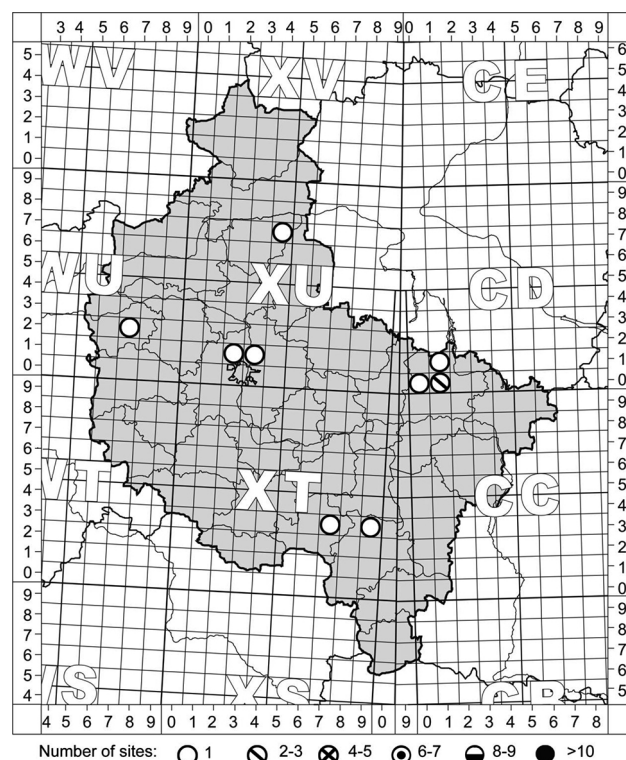


Fig. 11. Distribution of *Gyraulus acronicus* in Wielkopolska Province

Lakes accounted for half of the localities of *G. acronicus*. The remaining sites were three ponds and one small river at its outflow from a lake.

Gyraulus rossmaessleri (Auerswald, 1851)

G. rossmaessleri inhabits mainly astatic water bodies (forest and field ditches, ponds, puddles, floodplains). Sometimes it is found in permanent water bodies such as lakes, turf pits, oxbows. *G. rossmaessleri* occurs in Central, Eastern and Northern Europe. In Poland

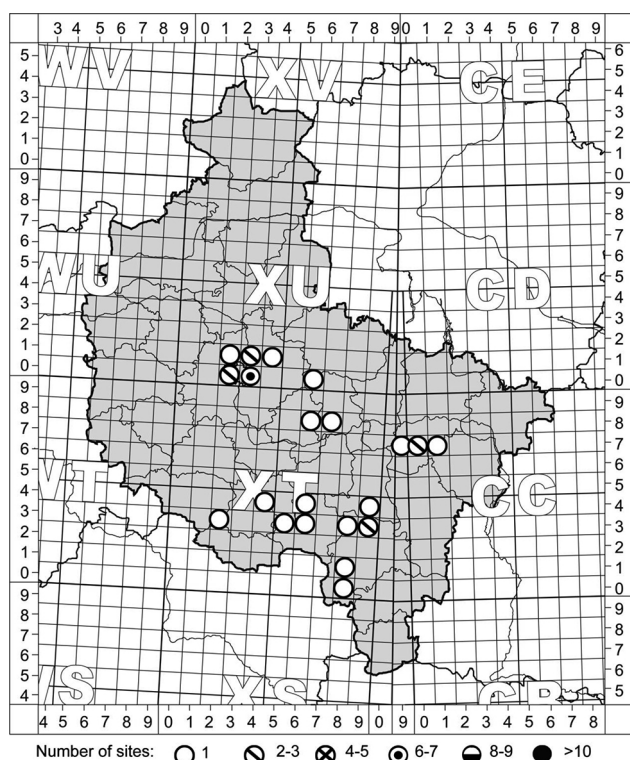


Fig. 12. Distribution of *Gyraulus rossmaessleri* in Wielkopolska Province

it was found in freshwaters of the Baltic Coast, in the Pomorskie and Mazurskie Lake districts, Mazowiecka, Sandomierska and Wielkopolsko-Kujawska Lowlands, Białowieża Forest, Lower Silesia, Małopolska Upland and Świętokrzyskie Mountains (PIECHOCKI 1979). Due to the habitat loss it is classified as near threatened in the red list of invertebrates (PIECHOCKI 2002).

The effect of the 50-year survey of Wielkopolska is 33 records of *G. rossmaessleri* from 21 UTM/MGRS 10×10 km squares (Fig. 12). The localities were reported by BERGER (1961), KORALEWSKA (1974, 1979), KACZMAREK (1981) and WŁOSIK-BIEŃCZAK (1994, 1997, 2000a, b, 2001).

This species was most often found in ditches (42%) and ponds (30%). It was rare in rivers and lakes (3 localities each); it was also found in one peat pit, a clay pit and a stream.

Gyraulus riparius (Westerlund, 1865)

G. riparius inhabits ponds, lakes, turf pits, ox-bows, forest and field ditches and floodplains. The species occurs in Northern Europe and Siberia. In Poland it was found in single localities on the Baltic Coast, in the Pomorskie and Mazurskie Lake districts, Mazowiecka, Sandomierska and Wielkopolsko-Kujawska Lowlands, Białowieża Forest and Małopolska Upland (PIECHOCKI 1979) and is classified as vulnerable in the red list of invertebrates (PIECHOCKI 2002).

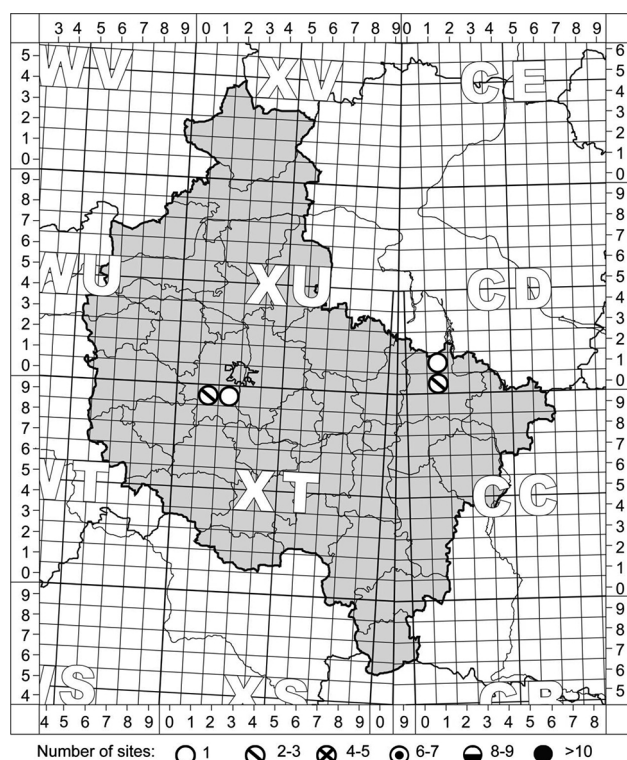


Fig. 13. Distribution of *Gyraulus riparius* in Wielkopolska Province

Only six localities of *G. riparius* were found during the last 50 years in Wielkopolska, in four UTM/MGRS 10×10 km squares (Fig. 13) (BERGER & DZIEŃKOWSKI 1977, SZCZEPANIK 1980). Five of the sites were lakes, one a river.

Gyraulus crista (Linnaeus, 1758)

G. crista inhabits various types of standing and flowing waters, however it avoids astatic water bodies. It occurs in Europe, Siberia and Western Asia. In Poland it is common in the lowlands. It is also found at lower mountain altitudes (Eastern and Western Sudety, Western Beskidy) (PIECHOCKI 1979).

During the last 50 years, 103 records of *A. crista* from 61 UTM/MGRS 10×10 km squares in Wielkopolska (Fig. 14) were made by the following authors: ANTCHAK (1958), WŁOCHOWICZ (1960), BERGER (1961), CYBULSKA (1965), DWORNICZAK (1971), KĘDRA (1971), STACHOWIAK (1971), STROJKOWSKA (1971), SĄPA (1972), DZIEŃKOWSKI (1974), KORALEWSKA (1974, 1979), CHMURA (1975), BERGER & DZIEŃKOWSKI (1977), LISIAK (1977), SZCZEPANIK (1980), KACZMAREK (1981), ĆWIKLIŃSKA (1982), WANAD (1982), KORALEWSKA-BATURA (1983, 1992), MIZGIER (1993), BERNARD (1994), WŁOSIK-BIEŃCZAK (1994, 1996, 1997, 1998, 2000b, c, 2001), KUCNER (1995), BASIŃSKI (1996), STATNIK (1996), GOŁDYN (2002).

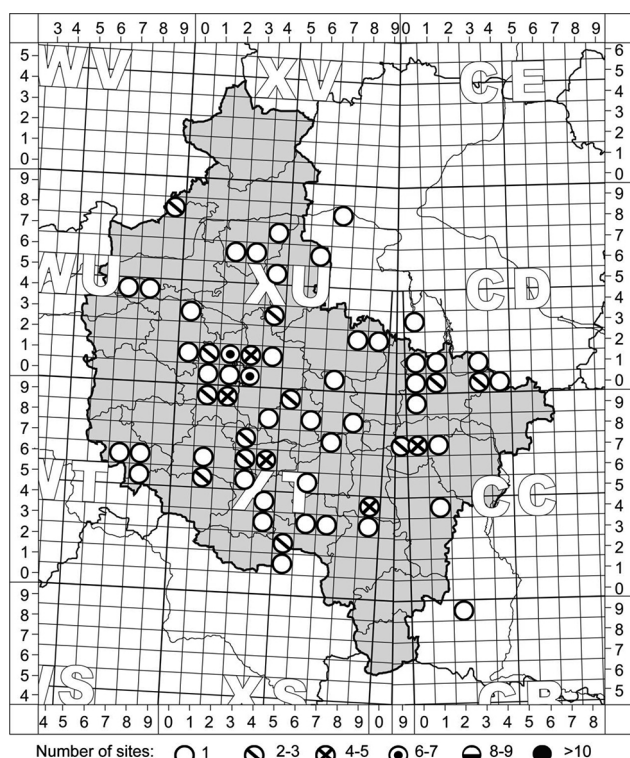


Fig. 14. Distribution of *Gyraulus crista* in Wielkopolska Province

Lakes (34%) and ponds (48%) combined constituted more than 80% of habitats of *G. crista*. The remaining localities were rivers (6 sites), ditches (3 sites), wetlands, streams, channels, peat and clay pits (2 sites each).

Hippeutis complanatus (Linnaeus, 1758)

H. complanatus inhabits ponds, lakes, oxbows and slow flowing streams. It is a Euro-Siberian species. In Poland it is relatively common in the lowlands, although it is classified as data deficient in the red list of invertebrates (PIECHOCKI 2002) due to the habitat loss and because of the poor state of knowledge of its habitats. It is also found at lower mountain altitudes (Eastern and Western Sudety, Eastern and Western Beskidy; PIECHOCKI 1979).

The 85 records of *H. complanatus* from the last 50 years from 53 UTM/MGRS 10×10 km squares in Wielkopolska (Fig. 15) were contributed by BZDZIEL-GRENDA (1952), ANTCHAK (1958), WŁOCHOWICZ (1960), BERGER (1961), DWORNICZAK (1971), STACHOWIAK (1971), SAPA (1972), CHMURA (1975), BERGER & DZIĘCZKOWSKI (1977), SZCZEPANIK (1980), KACZMAREK (1981), KORALEWSKA-BATURA (1983, 1992), MIZGIER (1993), WŁOSIK-BIEŃCZAK (1994, 1996, 1997, 2000b, c, 2001), KUCNER (1995), MILLER (1997).

In Wielkopolska *H. complanatus* was mainly found in lakes (51%) and ponds (28%), occasionally in riv-

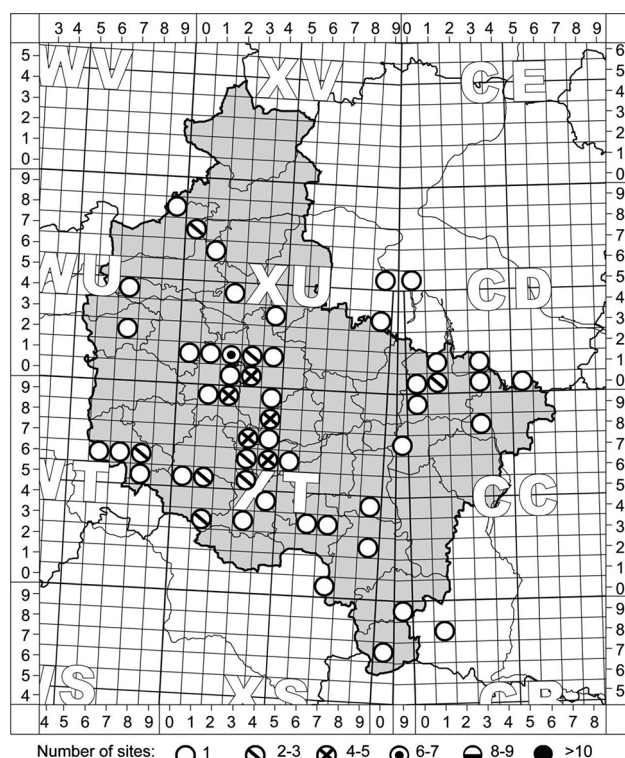


Fig. 15. Distribution of *Hippeutis complanatus* in Wielkopolska Province

ers (8%) and streams (5%), as well as in two ditches, two peat pits, a clay pit, a wetland, a channel and an oxbow lake.

Segmentina nitida (O. F. Müller, 1774)

S. nitida inhabits shallow, astatic water bodies: swamps, floodplains, turf pits, astatic ponds. It is also found in deeper permanent water bodies: lakes and oxbows. *S. nitida* is a Palearctic species. In Poland it is common and widespread in the lowlands and highlands. It is also found in some mountain localities (Western Sudety, Western Beskidy) (PIECHOCKI 1979).

The last 50 years brought 230 records of *S. nitida*, distributed in 129 UTM/MGRS 10×10 km squares in Wielkopolska (Fig. 16). They were contributed by the following authors: ANTCHAK (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), CHMURA (1975), BERGER & DZIĘCZKOWSKI (1977), LISIAK (1977), MICHAŁKIEWICZ (1977), MARKIEWICZ (1978), NASKRĘT (1978), SZCZEPANIK (1980), KACZMAREK (1981), WITOSŁAWSKA (1981), ĆWIKLIŃSKA (1982), WANAD (1982), KORALEWSKA-BATURA (1983, 1992), KOŃCIAK (1988), MISIAK (1988), SIKORA (1988), MIZGIER (1993), BERNARD (1994), WŁOSIK-BIEŃCZAK

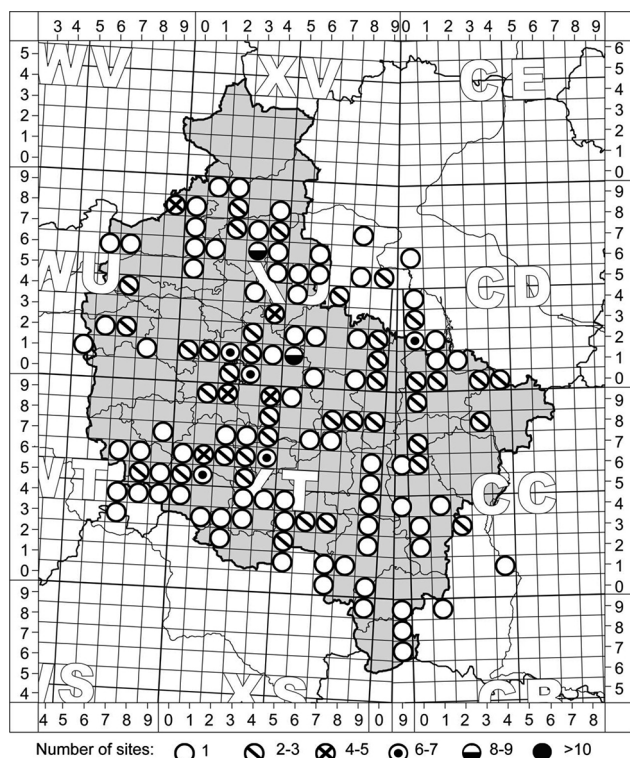


Fig. 16. Distribution of *Segmentina nitida* in Wielkopolska Province

(1994, 1996, 1997, 1998, 2000a, b, c, 2001), KUCNER (1995), BASIŃSKI (1996), STATNIK (1996), MILLER (1997), GOŁDYN (2002).

The species was frequent in ponds (37%) and lakes (28%). It was also found in ditches (12%) and wetlands (including flooded meadows and swamps; 7%). *S. nitida* was rarely recorded from rivers (12 sites), channels (7 sites), peat and clay pits (6 and 3 sites, respectively), streams (3 sites) and oxbow lakes (3 sites).

Planorbarius corneus (Linnaeus, 1758)

P. corneus inhabits turf pits, ponds, lakes, oxbows and slow flowing waters. It is a Euro-Siberian species. In Poland it is one of the most common and abundant freshwater snails; it occurs in all the lowland and highland areas. It is also found in some mountain localities (Sudety, Beskidy) (PIECHOCKI 1979).

As many as 497 localities of *P. corneus* were found during the last 50 years in Wielkopolska Province, in 207 UTM/MGRS 10×10 km squares (Fig. 17) by BZDZIEL-GRENDA (1952), ANTCHAK (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), BIESIADKA

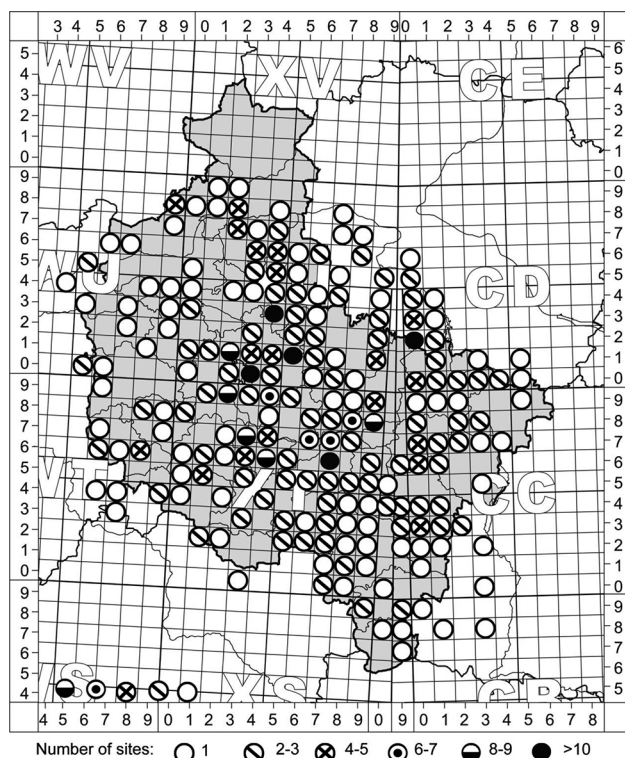


Fig. 17. Distribution of *Planorbarius corneus* in Wielkopolska Province

& KASPRZAK (1977), LISIAK (1977), MICHAŁKIEWICZ (1977), MARKIEWICZ (1978), NASKRĘT (1978), SZCZEPANIK (1980), KACZMAREK (1981), WITOSŁAWSKA (1981), ĆWIKLIŃSKA (1982), WANAD (1982), KORALEWSKA-BATURA (1983, 1992), KOŃCIAK (1988), MISIAK (1988), SIKORA (1988), KORALEWSKA-BATURA & DZIABASZEWSKI (1992), MIZGIER (1993), WŁOSIK-BIEŃCZAK (1994, 1996, 1997, 1998, 2000a, b, 2001), KUCNER (1995), BASIŃSKI (1996), STATNIK (1996), MILLER (1997), GOŁDYN (2002).

P. corneus was frequent in ponds (29%), lakes (26%), rivers (14%) and ditches (13%), and less so in streams (7%), wetlands (4%) and channels (3%). It was also reported from nine oxbow lakes, seven peat pits and two clay pits.

Menetus dilatatus (Gould, 1841)

Within its original range (North America), *M. dilatatus* inhabits a range of freshwater habitats, including lakes, ponds, streams and rivers. It was accidentally introduced in Europe in the 19th century and has been gradually spreading since then. The current European range of *M. dilatatus* covers localities in England, France, Germany, in the Netherlands and the Czech Republic, in Ukraine and Poland. In Poland it is known from heated lakes of the Konin Power Plant (PIECHOCKI 1979) and since recently – from the middle Odra River (PIECHOCKI & SZLAUER-

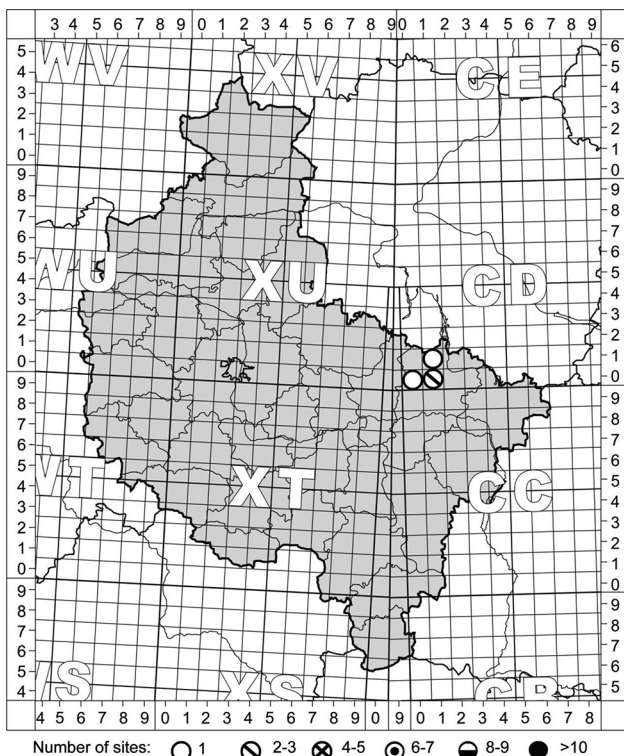


Fig. 18. Distribution of *Menetus dilatatus* in Wielkopolska Province

ŁUKASZEWSKA 2013) and Lake Kamionkowskie in Warsaw (KOŁODZIEJCZYK & LEWANDOWSKI 2015).

Five localities of *M. dilatatus* were found within the last 50 years in three UTM/MGRS 10×10 km squares in Wielkopolska (Fig. 18) (PIECHOCKI 1986, BERGER & DZIĘCZKOWSKI 1977).

In all of its localities the species occurred in lakes heated with hot water from the Power Plants near Konin.

Ancylus fluviatilis (O. F. Müller, 1774)

This snail occurs in various types of flowing waters, including temporary streams. It also occasionally inhabits the rip current zone of lakes. It is a West Palearctic species. In Poland it is one of the most common species in flowing waters. The snail is frequent in the whole of Poland from the Baltic Coast to the Tatra Mts (PIECHOCKI 1979).

During the last 50 years 17 localities of *A. fluviatilis* were found in 14 UTM/MGRS 10×10 km squares in Wielkopolska (Fig. 19) by the following authors: BZDZIEL-GRENDA (1952), ANTCHAK (1958), BERGER (1961), LENARTOWICZ (1972), SAPA (1972), JAZDON (1976), LISIAK (1977), MICHAŁKIEWICZ (1977), KORALEWSKA-BATURA (1983, 1992), STĘPCZAK & WŁOSIK-BIENIĄCZAK (1988), KUCNER (1995).

More than half (53%) of the records come from rivers. The snail was also found in streams (6 sites, 35%) and in lakes (2 sites).

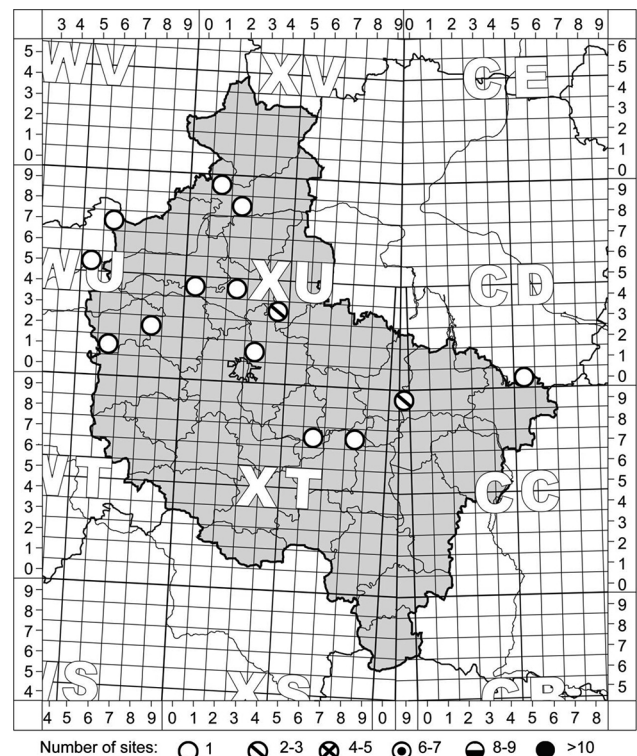


Fig. 19. Distribution of *Ancylus fluviatilis* in Wielkopolska Province

Ferrissia fragilis (Tryon, 1863)

In the Polish literature the species is also known under its synonyms *Ferrissia wautieri* (Mirolli, 1960)

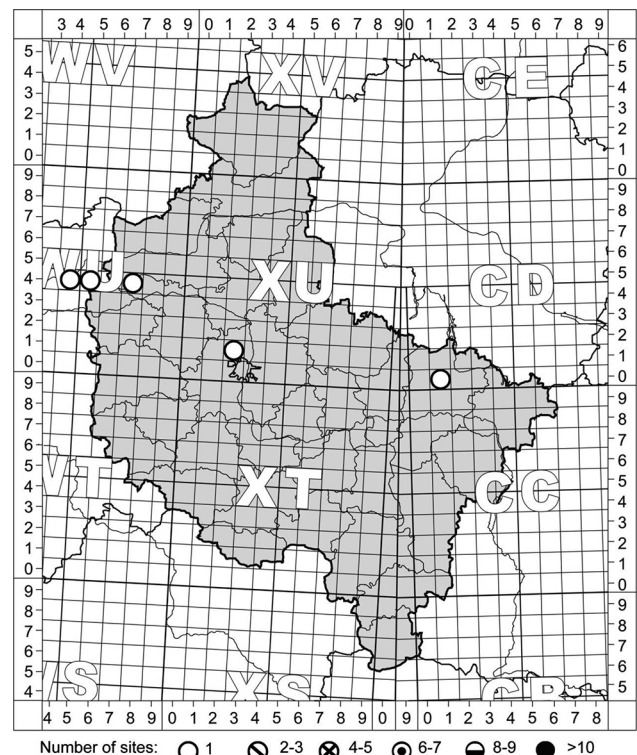


Fig. 20. Distribution of *Ferrissia fragilis* in Wielkopolska Province



or *F. clessiniana* (Jickeli, 1882). It is of North American origin, introduced in many European countries starting from the beginning of the 20th century. It occurs in various types of densely vegetated freshwaters. In Poland it is known from a number of localities in the lowland as well as highland areas (STRZELEC 2011).

In Wielkopolska during the last 50 years the species was found in five localities distributed in five UTM/MGRS 10×10 km squares (Fig. 20) (PIECHOCKI

1986, BERNARD 1994, WŁOSIK-BIEŃCZAK 1996). All of the records come from lakes.

ACKNOWLEDGEMENTS

BG was supported by the Prometeo Project of the Secretariat for Higher Education, Science, Technology and Innovation of the Republic of Ecuador.

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. 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.
- BERNARD R. 1994. New localities of the freshwater limpet *Ferrissia wautieri* (Mirolli, 1960) (Gastropoda: Bassomatophora: Ancyliidae) 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.
- BZDZIEL-GRENDA I. 1952. Mięczaki rzeki Wełny. M. Sc. thesis, supervisor: J. URBAŃSKI, Department of Zoology II, AMU, Poznań.
- 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.
- CZYŻ M. J., GOŁDYN B. 2013. Materials to the knowledge of molluscs of Wielkopolska (West-Central Poland). IV. Families: Neritidae, Viviparidae, Thiaridae, Bithyniidae, Hydrobiidae and Valvatidae. Folia Malacol. 21: 265–274. <http://dx.doi.org/10.12657/folmal.021.027>
- 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.
- DZIĘCZKOWSKI A. 1974. Badania nad strukturą zespołu ślimaków (Gastropoda) lasu grądowego (*Galio-Carpinetum*) w Morasku pod Poznaniem. Bad. Fizjogr. Pol. Zach. 27: 25–51.
- GOŁDYN B. 2002. Oddziaływanie wybranych czynników ekologicznych na strukturę zgrupowań mięczaków małych zbiorników śródpolnych. PhD thesis, supervisor: E. KORALEWSKA-BATURA, Department of General Zoology, Faculty of Biology, AMU, Poznań.
- 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.
- KĘDRA H. 1971. Mięczaki (Mollusca) Ziemi Chodzieskiej. Przyr. Pol. Zach. 9: 48–58.
- KOŁODZIEJCZYK A., LEWANDOWSKI K. 2015. A new record of an alien species, Trumpet Ram's-Horn, *Menetus dilatatus* (Gould, 1841) (Gastropoda: Planorbidae) in Poland. Folia Malacol. 23: 169–172. <http://dx.doi.org/10.12657/folmal.023.012>
- KOŃCIAK K. 1988. Mięczaki (Mollusca) zebrane w strefie zalewowej łąk nad jeziorem Skulskim i nad jeziorem Skulska Wieś w województwie konińskim. M. Sc. Thesis, supervisor: K. STĘPCZAK, Department of General Zoology, AMU, Poznań.
- 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. PhD 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., DZIABASZEWSKI W. 1992. Mięczaki (Mollusca) łągów rogańskich. In: KOSTRZEWSKI A. (ed.). Wielkopolski Park Narodowy, Człowiek i Środowisko Wybrane Problemy. Morena, Poznań–Puszczykowo 1: 42–43.
- 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., 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.
- MILLER M. 1997. Mięczaki (Gastropoda, Bivalvia) miasta Koła. M. Sc. thesis, supervisor: K. STĘPCZAK, Department of General Zoology, AMU, Poznań.
- MISIAK D. 1988. Mięczaki Jeziora Niedźmieł (woj. konińskie) oraz jego pasa przybrzeżnego. 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, Poznań.
- PIECHOCKI A. 1986. *Ferrissia wautieri* (Mirolli) (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. 2008. Mięczaki (Mollusca). In: BOGDANOWICZ W., CHUDZICKA E., PILIPIUK I., SKIBIŃSKA E. (eds.): *Fauna of Poland – characteristics and checklist of species*. Muzeum i Instytut Zoologii PAN, Warszawa, pp. 365–426.
- PIECHOCKI A., SZLAUER-ŁUKASZEWSKA A. 2013. Molluscs of the middle and lower Odra: the role of the river in the expansion of alien species in Poland. *Folia Malacol.* 21: 73–86. <http://dx.doi.org/10.12657/folmal.021.008>
- 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., WŁOSIK-BIEŃCZAK E. 1988. Skład gatunkowy i ilościowy zespołu mięczaków (Mollusca) Noteci koło Drezdenka (woj. gorzowskie). *Bad. Fizjogr. Pol. Zach. Ser. C Zool.* 37: 71–81.
- STROJKOWSKA M. 1971. Mięczaki Wągrowca i okolic. M. Sc. thesis, supervisor: J. URBAŃSKI, Department of General Zoology, AMU, Poznań.
- STRZELEC M. 2011. *Ferrissia clessiniana* (Jickeli, 1882). 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. 91–92.
- SZCZEPANIK G. 1980. Mięczaki (Mollusca) zbiorników wodnych Wielkopolskiego Parku Narodowego. M. Sc. thesis, supervisor: K. STĘPCZAK, Department of General Zoology, AMU, Poznań.
- SZYBIAK 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. URBĄSKI, Department of General Zoology, AMU, Poznań.
- WŁOSIK-BIEŃCZAK E. 1994. Mięczaki (Mollusca) wybranych zbiorników wodnych Maltańskiego Klina Zieleni w Poznaniu (I etap badań). Lubuski Przegl. Przyr. 5: 21–32.
- WŁOSIK-BIEŃCZAK E. 1996. Mięczaki (Mollusca) rzeki Bogdanki w Poznaniu i zbiorników wodnych znajdujących się w jej biegu. Lubuski Przegl. Przyr. 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. Lubuski Przegl. Przyr. 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 powyroboiskowych w dolinie Strumienia Junikowskiego w Poznaniu w latach 1996–1999. Lubuski Przegl. Przyr. 11: 53–63.
- WŁOSIK-BIEŃCZAK E. 2000c. Mięczaki (Mollusca) jeziora Rusałka 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.
- ZAJĄC K., GOŁDYN B. 2012. Zatoczek łamliwy *Anisus vorticulus* (Troschel, 1834). In: MAKOMASKA-JUCHIEWICZ M., BARAN P. (eds). Monitoring gatunków zwierząt. Przewodnik metodyczny. Vol. II. GIOŚ, Warszawa, pp. 504–519.

Received: May 31st, 2016

Revised: September 20th, 2016

Accepted: October 3rd, 2016

Published on-line: December 5th, 2016

