



THE 16TH POLISH MALACOLOGICAL SEMINAR – WHAT DO WE DO?

SEMINAR REPORT

This year the Seminar was held in a very attractive place: the village of Hel, located at the very tip of the long and narrow peninsula of the same name. The main organizer was Dr. JARMILA KRZYMIŃSKA (THANKS JARKA!) from the Department of Marine Geology, Polish Geological Institute in Gdańsk. She was assisted in this task by Prof. dr. hab. MACIEJ WOŁOWICZ from the Institute of Oceanography, University of Gdańsk. The time was well chosen – in September (20th–22nd) the tourists and holiday makers had already left, so that for three days Hel turned into a truly malacological village.

The people arrived first in Gdańsk, and then reached Hel by train, boat or bus; some, unafraid of several hours driving, came by car. The number of participants was well over 60, including some guests from Ukraine. There were 30 posters and nearly as many papers in 6 sessions; as usual some participants did not present their results, some others had more than one paper/poster, and a few people, originally intending to come, had to cancel the trip at the very last moment. The topics presented and discussed were even more varied than during the previous Seminar: they ranged from removal of organic suspension by bivalves, through variation in mollusc mtDNA, snail antioxidative enzymes, terrestrial or freshwater malacocenoses and thanatocenoses, to systematics and the state of knowledge of gastropods of such remote areas as China or Korea. Only very few speakers made some feeble attempts at making their speech a few minutes longer, and even these failed thanks to the Chairpersons who were all very strict.

The official social events (unofficial events took place in many excellent small restaurants, bars and cafes, at that time of year otherwise rather deserted) were two: an excursion and a formal dinner.

During the Seminar excursion on the second afternoon we could see very interesting fortifications from World War II, and a Marine Station where they are breeding Baltic seal in order to reintroduce them in

the Southern Baltic. Back from the excursion, we barely had time to wash and dress (and some perhaps didn't) and rushed to dinner. All I can tell you is that malacologists are a hopeless lot: not even during an excursion, not even during a formal dinner, not even in a pub can they stop discussing malacology!

My reflections are as optimistic as they were during the previous Seminar: the quality of work, both intellectual and esthetical, is constantly improving. The posters, for example, were not only good from scientific viewpoint, but also beautiful. I especially liked one, prepared by a team of Wrocław physiologists, with snails marching in an Indian file and windows opening to reveal further parts of the text and graphs. Another optimistic thing is that, in spite of all the problems encountered when trying to find a job or funding, the number of young enthusiastic malacologists keeps increasing.

During the General Assembly of the Association of Polish Malacologists it was decided that the next Seminar (17th!) would take place at the very end of May in Ojców, in a nice calcareous area of the Ojców National Park.

Like last year and the year before, we present below very brief abstracts of all the presentations included in the Abstract Book of the XVI Polish Malacological Seminar, plus a few that were submitted too late to appear in the Book. Like before, not all the Seminar participants observed the rule of “not more than one standard page”. Another shortcoming of the Book was that the abstracts were originally published in Polish. All the texts were translated, and most, including the titles some of which were as long as the abstracts themselves, rather drastically abbreviated (without consulting all the respective authors) by Yours Truly.

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ABSTRACTS OF THE 16th POLISH MALACOLOGICAL SEMINAR, HEL 2000

SHELL THANATOCENOSES OF THE PRĄDNIK
STREAM VALLEY IN THE OJCÓW NATIONAL
PARK

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Rich thanatocenoses, accumulated during a flood of 1996, were found in the upper section of the Prądnik stream valley in the Ojców National Park. They include over 18.5 thousand shells of 79 taxa, 19 species not recorded from the Park previously. *Carychium tridentatum*, *Vitrea crystallina* and *Vallonia pulchella* dominate in the assemblages. Among the ecological groups, forest species are the most numerous, while with respect to specimens the proportion of shade-loving, mesophile and open-habitat snails is roughly equal. Snails of the latter group are the most abundant in Sułoszowa while the first group is abundantly represented in Prądnik Ojcowski and Prądnik Korzkiewski, thus reflecting the varied degree of afforestation along the valley. Compared to subfossil faunae, the thanatocenoses have a greater proportion of shade-loving snails which is associated with progressive afforestation of the slopes within the last 50 years. The malacofauna of the Ojców National Park includes 99 taxa, of these 75 species of terrestrial snails, 14 slug species and 10 water molluscs; 11 species found in the thanatocenoses were not previously recorded from the area.

MALACOFAUNA OF HOLOCENE RIVER
DEPOSITS IN THE REGION OF BUSKO ZDRÓJ

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Five profiles of late Quaternary river and marsh deposits from a terrace of a stream flowing across Busko Zdrój were analysed; 20 samples contained mollusc shells. The fauna shows a low proportion of shade-loving species, open-habitat snails being an essential component of the assemblage; snails preferring high humidity habitats dominate. Based on the malacocenosis, it is possible to reconstruct habitat changes within the last 4,000 years.

THE EFFECT OF ANCIENT MINING ON
MOLLUSC SPECIES DIVERSITY IN THE
ŚWIĘTOKRZYSKIE MTS

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Traces of human activity in the Świętokrzyskie Mts date back to the middle Palaeolithic period; mainly silica was exploited there. Areas of ancient mining have been very well preserved in Rydno, Krzemionki Opatowskie, Borownia and Korycizna. Malacofauna was studied quantitatively at 20 localities, on the background of pedological and phytosociological data. The habitats are of mosaic character as a result of transformations by mining. Snail species were found to be associated with habitat conditions resulting from the method of exploitation, ranging from open-cast to shaft mining. Twenty two species were found in Krzemionki, *Cochlicopa lubricella* being common; *Perforatella incarnata* was the most abundant of shade-loving species. Fifteen species were recorded from Borownia, with the dominant *Aegopinella pura* and numerous *Bradybaena fruticum*. In Korycizna only 4 species were found sporadically; Rydno, with its pine forest, harbours only 3 species.

BIOLOGICAL PROPERTIES OF SPERMATOOZOA
OF *DREISSENA POLYMORPHA*JOANNA BIAŁKOWSKA¹, WIESŁAW DEMIANOWICZ²,
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Individuals of the zebra mussel were caught in April 2000 in one of the lakes (Ślesińskie lake) of the Konin heated system, kept in aquaria at 12–15°C and fed with *Chlorella* sp. Gametes were obtained through stimulation with 0.5 mM serotonin. Various staining methods were applied in order to determine liability to staining, viability in various conditions and factors affecting mobility (a combination of two fluorochromes SYBR-14 and propidin iodide (PI), lectin-marked fluorochrome FITC, nigrosin-eosin complex). Attempt at fertilizing the ova with fresh spermatozoa was also made. The staining methods applied made it possible to study the morphology of the spermatozoa, and to estimate their quality. Estimating mobility under the effect of inhibitors, sensitivity to various salt concentrations and temperatures will make it possible to determine optimum conditions for fertilisation; in spite of its expansion abilities the



zebra mussel is sensitive to an array of habitat factors, especially physico-chemical properties of water.

HOLOCENE MOLLUSC ASSEMBLAGES IN THE DEPOSITS OF THE GULF OF SZCZECIN

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Malacological and biometrical analysis was based on 8 samples from various parts of the Gulf of Szczecin. The results made it possible to observe traces of *Littorina* transgression (younger Atlanticum); the transgression phases correspond to late *Littorina* and post-*Littorina* phases determined by WOJCIECHOWSKI in the lowland Nizina Gardzieńsko-Łębska. Palaeoecological conditions were identified, with division into limnic and lagoon-marine habitats with their associated mollusc-bearing deposits. Biometrical analysis of *Cardium glaucum* revealed a dominance of specimens 12–18 mm long, 10–16 mm high and with shell valves 4–6 mm thick; the population was probably autochthonous. The results can be correlated with similar associations in other parts of the Baltic and provide information on palaeohaline conditions.

EXPANSION OF *DREISSENA POLYMORPHA* IN THE LOWER Odra RIVER VALLEY

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Dreissena polymorpha is the most frequent species in the waters of the Gulf of Szczecin and the lake Dąbie. It is commonly assumed that this Pontic species appeared in C Europe as late as in the 18th and 19th c., some data, however, suggest its earlier appearance. New observations indicate the presence of an older population of the zebra mussel in the studied area; its traces were found in a few samples of the bottom deposits of the Gulf of Szczecin. The recent population is a part of the freshwater malacocenosis, the old population is accompanied by marine and brackish-water species. Though in this case it can be suspected that the shells have been re-deposited from younger strata, in the Gulf of Pomerania the older population was found within a residual shell bed below two strata of marine deposits.

THE EFFECT OF EXPANSION OF *POTAMOPYRGUS ANTIPODARUM* ON NATIVE MOLLUSCS OF THE WIGRY NATIONAL PARK

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Depending on surface area, from 1 to 20 sites were selected at each of 24 studied lakes. In the Wigry lake *Potamopyrgus antipodarum* was dominant (up to 95% molluscs), in the remaining lakes it constituted 4–48%. There was no correlation between the number of mollusc species and the density of *P. antipodarum*. The mollusc species diversity in the lake Wigry decreased twice between 1986 and 1997/98 which may result from eutrophication or a competitive exclusion of native species by *P. antipodarum*, suggested in the literature. The index of species diversity PIE calculated for the malacofauna with exclusion of *P. antipodarum* was positively correlated with the density of *P. antipodarum*, as was the density of some species. In the laboratory *Theodoxus fluviatilis* was the only species whose viability decreased in the presence of *P. antipodarum*. It is thus doubtful if the latter is responsible for the impoverishment of the native malacofauna; it is not excluded that in water bodies under anthropopressure it occupies a niche unused or abandoned by native species.

WHY ARE GROWTH CURVES OF THE ZEBRA MUSSEL DIFFERENT?

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Data from various populations of *Dreissena polymorpha* were used to estimate individual growth curves, mortality and production conditions in the populations, as well as relationships between these parameters. Then, with an optimization model, we generated populations of organisms of optimum energy balance under randomly designed production and mortality conditions. Relationships between the parameters of the optimized organisms and the actual mussel populations are compatible, suggesting that the zebra mussel divides its resources between growth and reproduction. In this context, the considerable diversification of life histories during the colonisation of Europe and N America (200 and 14 years, respectively) may result from a rapid microevolution or from an adaptive phenotypic plasticity.

DEROCERAS LAEVE – A PEST OF GREENHOUSE PLANTS

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Slugs are among the most serious greenhouse pests. They damage all plant organs and can transmit spores of fungi. *Deroceras laeve* is among the most frequent greenhouse slugs. Since it inhabits a variety of humid habitats, it gets to greenhouses with unprocessed peat. Under high-humidity conditions and with abundant food, being able to reproduce uniparentally and having no natural enemies, it lays eggs throughout the year and feeds on various plant species causing considerable damage. It can be supposed that, with increasing use of pesticides, the slug has evolved resistant biotypes. Biology of *D. laeve*, its importance as pest and control methods are also discussed.

WHAT IS THE SMALLEST SIZE OF MATURE FEMALE *DREISSENA POLYMORPHA*?

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The material came from the Odra river, vicinity of Dziewoklicz. Young zebra mussels, less than 10 mm long (minimum length 5 mm) were measured, weighed and their gonads examined with standard histological methods. In May females 6 mm long contained oocytes at all development stages; the situation was the same in females exceeding 10 mm. The gonad development stage was estimated as stage four. In June and July the gonads of young mussels also contained all stages of oocyte development, the diameter of f_4 oocytes exceeding 40 μm . In these months the maturity peak was reached. In the autumn f_4 oocytes were less numerous. The gonads of the smallest available females developed like those of specimens exceeding 10 mm. Probably all the females reach maturity in their first season of life. The minimum shell size of a mature female is 5 mm.

THE EFFECT OF FLUORIDES ON THE ENERGY BALANCE OF *HELIX ASPERSA MAXIMA*, BASED ON ANALYSIS OF PURINE DERIVATIVES IN SOFT PARTS

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Toxic effect of fluorine on plants, animals and humans is among the greatest environmental problems. One of its main mechanisms is binding magnesium ions into inactive magnesium-fluorine-phosphate

complexes, resulting in e.g. inhibition of magnesium-dependent enzymes or limited ATP synthesis. Purines were determined in eggs and muscles of active and hibernating *Helix aspersa maxima*. The content of purine derivatives was determined with liquid chromatography, fluoride content with gas chromatography. The quantitatively prevailing purine was AMP (over 90% all purines in eggs, 40% in young and 50% in adult snails); the content of UA, IMP, ADP and Xan varied considerably between the age classes; no detectable quantities of GTP, GDP and ADP were found in any group. The mean EC (energy charge) values were 0.016 (egg), 0.16 (young) and 0.17 (adult). The viability decreased with increasing fluoride content.

HELIX POMATIA – PROTECTION AND EXPLOITATION IN THE MAŁOPOLSKA REGION

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Distribution and habitat requirements of *Helix pomatia* were studied in the Małopolska region in 1997–1999. Cluster analysis was applied in order to trace the dependence between the occurrence of the snail and the habitat factors: type of habitat, its natural versus transformed character, humidity, vegetation, soil, mosaic structure. The snail occurs more often in anthropogenic habitats located in areas of mosaic character. Morphometric analysis revealed that individuals from suburban areas were smaller; there was also a relation between the shell and habitat humidity. The analysis suggests that the critical size for the Roman snail collecting should be verified. The results will provide a basis for a local strategy for management of Roman snail resources.

COMPARATIVE STUDIES ON ANTIOXIDATIVE ENZYMES IN *HELIX ASPERSA* AND *POMACEA BRIDGESI*

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Besides E and C vitamins and B-carotene, anti-oxidative function is played by some enzymes. The study was aimed at detecting antioxidative enzymes and determining their physiological role in terrestrial *Helix aspersa* and aquatic *Pomacea bridgesi*. The activity of glucose-6-phosphate dehydrogenase (EC 1.1.1.49) (G6PDH), catalase (EC 1.11.1.6) (CAT), glutathione peroxidase (EC 1.11.1.9) (GSH-Px) and glutathione reductase (EC 1.6.4.2) (GSSGR) was determined in the haemolymph, hepatopancreas and foot muscle.



The respective values in the land snail are: hepatopancreas GSH-Px 0.373 U/g, CAT 0.404 U/g, GSSGR 1.050 U/g, G6PDH 0.192 U/g, foot muscle GSH-Px 1.226 U/g, CAT 0.150 U/g, GSSGR 0.398 U/g, G6PDH 0.255 U/g, haemolymph GSH-Px 0.246 U/g, CAT 0.088 U/g, GSSGR not detected, G6PDH not detected; in the aquatic snail: hepatopancreas GSH-Px not detected, CAT not detected, GSSGR 0.754 U/g, G6PDH 0.095 U/g, foot muscle GSH-Px not detected, CAT not detected, GSSGR 0.499 U/g, G6PDH 0.230 U/g, haemolymph GSH-Px 0.248 U/g, CAT 0.080 U/g, GSSGR 0.312 U/g, G6PDH not detected. The much higher activity of antioxidative enzymes in the land snail is probably associated with the higher quantity of free radicals in terrestrial environment.

THE ROLE OF SNAILS IN TRANSMISSION OF A TEMATODE *ALARIA ALATA*

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Snails are often intermediate hosts of various species of digenetic trematodes. *Planorbis planorbis* and *Anisus vortex* are the first intermediate hosts of *Alaria alata* (order Strigeida), the wild boar being its parathenic host. The studies, conducted in the vicinity of Toruń in 1999 and 2000, were aimed at determining the extensity and intensity of invasion of *P. planorbis*, *A. vortex* and another intermediate host – frog *Rana terrestris*. The material was collected from a marshy area – a refuge of the infected boars. In the autumn 1999, 30% examined snails were infected with furcocercariae while in the case of frogs the extensity was 67%. In the spring 2000, 100% snails were infected with furcocercariae, the mean intensity being ca. 500 larvae. The high intensity of infection of the first intermediate host and an easy access of the second intermediate host to it are important in transmitting the parasite among the ultimate and parathenic hosts.

VIVIPARUS VIVIPARUS – A SNAIL ON THE BORDER OF K AND R STRATEGIES

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Reproduction (mean number of embryos per female and percentage of gravid females) of *Viviparus viviparus* was studied during five years at selected localities of the Zegrzyński reservoir and lowermost sec-

tion of its tributary rivers. The number of embryos was the lowest in April, the highest in summer and gradually decreased in the autumn, but in November it was still twice higher than in the spring; the differences indicate that “giving birth” to the embryos starts earlier than in April. The higher percentage of gravid females in the spring compared to autumn, together with the generally higher number of snails and higher percentage of females, testifies to their lower mortality in the winter. Comparison of reproduction in the studied habitats reveals great differences in the number of embryos. The high fertility, quick reproduction and high rate of spatial expansion are features of r-strategists, while inhabiting stable environments, and producing few large young combined with parental care are typical of K-strategists. *V. viviparus* displays K rather than r strategy, like most other freshwater snails.

MOLLUSCS OF THE LOWER SECTION OF THE Odra RIVER VALLEY

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Information on the malacofauna of the lowermost section of the Odra River valley is very scanty. The study area included the landscape park of the Lower Odra River valley. It is a specific complex of oxbows, stagnant water bodies and water courses connecting both beds of the Odra River, of different flow speed. The conditions provide a mosaic of habitats. Twenty four mollusc species have been recorded during preliminary studies (1999): 11 bivalves and 13 snails. Two of the species are legally protected: *Anodonta cygnea* and *Unio pictorum*, five are threatened with extinction: *Sphaerium rivicola*, *Pisidium pulchellum*, *Viviparus viviparus*, *Valvata pulchella* and *Lymnaea glabra*.

INTRA- AND INTERSPECIFIC VARIATION IN PHOSPHORUS CONCENTRATION IN SELECTED MOLLUSC SPECIES OF THE ZEGRZYŃSKI RESERVOIR

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The Zegrzyński reservoir is characterized by a high trophy, the bottom sediments being very rich in phosphorus. The objective of the study was determination and comparison of the mean phosphorus content in shells and soft parts of molluscs (*Viviparus viviparus*, *Lymnaea stagnalis*, *L. peregra*, *Dreissena polymorpha*, *Anodonta anatina* and *A. cygnea*), as well as analysis of its intraspecific spatio-temporal variation. The molluscs were collected in 1997–1999 in various parts of the reservoir. The mean phosphorus content in the

soft parts ranged from 0.63% (*V. viviparus*) to 2.68% dry weight (*A. cygnea*). In most cases interspecific differences were statistically significant. Shells contained much less phosphorus (its content was lower by at least an order of magnitude) and its content was similar between species. In the dominant molluscs of the reservoir: *V. viviparus* and *D. polymorpha*, the phosphorus content increased with the size. Spatio-temporal variation of the content was rather slight.

MITOCHONDRIAL DNA TRANSMISSION IN THE HYBRIDIZATION AND INTROGRESSION ZONE OF *MYTILUS EDULIS* AND *M. TROSSULUS* IN THE BALTIC AND DANISH STRAITS

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Mytilid bivalves display a unique mode of mitochondrial heredity. Of two different kinds of mitochondrial DNA (mtDNA), one is transmitted to the progeny by females (F genome), the other is present only in males and inherited only by male progeny (M genome). In the Baltic populations of *M. trossulus* the male genome is absent, but it is common in populations of *M. edulis* from the North Sea. Our studies with RFLP method revealed phylogenetic relationships and differentiation in the regions ND2 and COIII. Seven samples (347 specimens) representing populations from the hybridization zone of *M. trossulus* and *M. edulis* were examined. Size variation was found in the main non-coding region of mtDNA. M genome was sporadic in populations from the Swedish coast, western part of the Baltic.

MOLLUSCS OF LITTORAL, SUBLITTORAL AND PROFUNDAL ZONES OF THE LAKE HAŃCZA

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Studies on molluscs of an oligotrophic lake Hańcza, started in 1999, include littoral (meadows of Characeae), and bottom sediments of sublittoral and profundal to the depth of ca. 100 m. *Dreissena polymorpha* is the most abundant species on both stony bottom and Characeae, as well as on the bottom sediments to the depth of 12–13 m. Below that depth only sphaeriids are present. Larger size of the zebra mussel in the wave-exposed zone may indicate a migration direction reverse to that commonly observed. *D. polymorpha* penetrates also the Czarna Hańcza river, up to ca. 100 m from the lake. The presence of a rare post-glacial relict *Marstoniopsis scholtzi* has been confirmed, and *Lymnaea glutinosa*, not found previously, has been recorded. Single shells of *Potamopyrgus antipodarum* have been found in the shallow littoral. The current studies focus on the significance of par-

ticular species of Characeae as substratum for molluscs, use of stony shallow littoral by particular mollusc species and testing the possibility of mutual penetration of the river and lake malacofauna.

MOLLUSCS OF THE LIWIEC RIVER

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Twelve collecting localities were evenly distributed along the Liwiec river, a left tributary to the Bug river. Eleven snail species (*Valvata piscinalis*, *Bithynia tentaculata*, *Lymnaea auricularia*, *L. glutinosa*, *L. occulta*, *L. peregra*, *L. stagnalis*, *Planorbis planorbis*, *Anisus contortus*, *A. vortex*, *Planorbarius corneus*), 3 unionid bivalves (*Unio tumidus*, *U. pictorum*, *Anodonta anatina*) and 2 sphaeriid genera (*Sphaerium* and *Pisidium*) were recorded. The density of molluscs and the number of species varied: in the upper and lower sections there were 2–7 snail species compared to 1–3 in the mid section. Bivalves were present in the upper and lower section. The mean densities in the upper and lower sections were 1–13 indiv./m² compared to the mid section (0.5–1 indiv./m²). The reason for the poverty of the malacofauna in the mid section of the river is the load of insufficiently purified sewage from the Siedlce sewage-treatment plant. The unregulated river is still capable of self-purification which is evidenced by the rich malacofauna of its lower section.

DIURNAL ACTIVITY OF *ARION LUSITANICUS*

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Diurnal activity of *Arion lusitanicus* was studied under field (Wysoka nr. Łańcut, E Poland, June 1998) and laboratory conditions (day 21°C, night 16°C, RH 95–98%, 15 hrs daylight). The activity of the slug was found to depend on the time of day (light intensity) and weather; when the weather is rainy and air humidity high, most slugs are active also during the day; during sunny and dry weather they seek shelter. The slugs leave their shelters 3 hrs before sunset, the full activity starting after sunset. During dry and sunny weather the activity of most slugs lasts 12 hrs. In the laboratory the slugs were the most active in the third hour of night. The activity was maintained during the whole dark period and the first 2–4 hours of the light period. The rest:activity time ratio was 1:1, at day:night ratio of 5:3.



A CHINESE BIVALVE *ANODONTA WOODIANA* IN THE KONIN LAKES: DISTRIBUTION, STRUCTURE AND SUSPENSION REMOVAL

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The system of Konin lakes, affected by water heating, retention and pollution, is inhabited, among others, by a Chinese bivalve *Anodonta woodiana*, introduced from Hungary with fish stocking material. The distribution and morphology of the species were studied in the vegetation season 1999. The species inhabits all zones of the lakes, preferring habitats of considerable water turbulence and fairly high temperature, and constitutes over 70% unionid bivalves. Typical colonies of *A. woodiana* consist of individuals aged 3–5 years; in the lake littoral specimens 80–120 mm long predominate, in moderately heated canals – 100–140 mm, in the warmest – 110–180 mm. The bivalves prefer muddy-sandy bottom at the depth of 1.5–2 m. Their maximum density is 30–60 indiv./m², the maximum biomass being up to 25 kg/m². At a mean suspension concentration of 8.5 mg/l the bivalves remove 2.3 tons suspension per day.

MAXIMUM SIZE OF *DREISSENA POLYMORPHA* IN POLISH LAKES

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The maximum size of *Dreissena polymorpha* reported in the literature is 25–40 mm shell length, 17–23 mm width and 13–18 mm height. Ca. 1,000 empty shells were collected in each of 37 lakes in the Mazurian, Suwałki and Pomeranian lakelands. The maximum length ranged from 27.0 (Tały lake) to 39.5 mm (Dłużec lake). The largest shells were found in flow lakes along the Krutynia river (Mazurian lakeland). The smallest mussels were found in strongly polluted and in pure mesotrophic lakes.

AQUATIC MALACOCENOSES OF WYSOCZYŻNA CIECHANOWSKA

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The studies were carried out in 1991–1998 in both running and stagnant waters of Wysoczyżna Ciechanowska (Upper Silesia). Thirty snail species

were found in the studied waters. The most abundant and frequent species in the running waters was *Bithynia tentaculata*. Of the 23 species recorded from the clay pits the most abundant was *Lymnaea stagnalis*. *Ferrissia wautieri* was found in one of anthropogenic reservoirs. The organic matter content in the bottom sediments ranged from 0.43 to 28.44%; no correlation was found between the content and snail density or the number of species. The density was correlated with the number of species, magnesium content, the density of some species decreased with decreasing pH, chlorophyll content and alkalinity.

GROWTH OF *HELIX ASPERSA* IN LABORATORY CULTURE

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Growth rate, depending on feed preparation technology, kind of mineral supplements, the so called soil preparation and age, was studied in *Helix aspersa aspersa* and *H. aspersa maxima*. The growth rate was found to decrease with age. Access to soil of pH exceeding 7.0, adequate structure and chemical composition resulted in an increased growth rate. Extruded feed resulted in a body mass 1.5–4.9 times higher than unprocessed feed. Siblings kept in different conditions showed very similar coefficients of body mass increase. The time of maturity depended on the age rather than on the body mass.

REPRODUCTION OF *HELIX POMATIA* IN FARMING CONDITIONS

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Egg batches of *Helix pomatia*, collected in the park in Balice, were studied in 1998–1999; in 2000 reproduction of the first generation obtained from batches transferred to the laboratory was observed. A total of 225 individually marked snails, aged 2 years, were studied in 2000. The first copulations in the greenhouse took place in the second decade of April, the first eggs were laid at the beginning of May. The egg-laying individuals in June were twice as numerous as in May. The mean number of eggs per batch decreased with progressing season, and the variation in the number of eggs increased; the same tendencies were found for the batch weight while the mean egg mass increased.

SEASONAL ACTIVITY OF THE GONAD OF *HELICODONTA OBVOLUTA*

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Gonads of adult *Helicodonta obvoluta* were histologically examined (Bouin fixative, paraffin sections, haematoxylin and eosin) at monthly intervals, from August 1998 till January 2000. From January till December the number and size of oocytes changed while spermatozoa were numerous throughout the year. Two reproductive peaks (spring and autumn), observed both in the field and in the laboratory, correspond to the maturation of oocytes. The number of oocytes increased in March, in April large vitellogenic oocytes appeared and their number reached its maximum to decrease drastically at the end of June and in July. An analogous situation was observed in the autumn. The intensity of meiotic divisions increased from the end of December till May and from the end of August till October. Both packets of fresh spermatozoa and new generations of growing oocytes appeared in these periods.

DRAINAGE DITCHES AS HABITAT OF AQUATIC SNAILS

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Because of water level fluctuations, temperature changes and drought periods, drainage ditches do not offer a favourable habitat for molluscs. Fifteen ditches in Upper Silesia were studied in 1996–1999. A total of 34,384 snail specimens were collected, representing 21 species. The most abundant and common were *Planorbis planorbis* and *Radix peregra*. *Potamopyrgus antipodarum* was abundant but rare. Common but scarce species were *Lymnaea stagnalis* and *Gyraulus albus*. An evident rarity was *Ferrissia wautieri*.

MALACOFAUNA OF THE BRDA RIVER VALLEY NEAR SĄPOLNO

STANISŁAW MYZYK

Sąpolno Czulchowski

An area of 5 km², located near the village of Sąpolno (Pomeranian lakeland) and including a fragment of the Brda River valley, mouth of the river Lipczynka, two lakes, adjacent forests and cultivated fields, was examined with respect to its malacofauna. Of the total of 107 mollusc species recorded, 56 were terrestrial gastropods, 28 aquatic snails and 23 bivalves. Besides common molluscs, *Cochlicopa nitens*, *Columella aspera*, *Vertigo alpestris*, *Euconulus alderi*, *Lymnaea glutinosa*, *Unio pictorum*, *Pisidium hibernicum*, *P. pseudosphaerium* and *P. pulchellum* were present. In

several thanatocenoses 54 species were found, 48 of these being present in the area also now.

GROWTH OF SHELL VALVES IN *UNIO PICTORUM* AND *U. TUMIDUS*

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Interdependence between the increase of length and weight of two shell valves during ontogeny was studied in *Unio pictorum* and *U. tumidus*. *U. pictorum* (673 left and 651 right valves) came from the lake Łebsko, *U. tumidus* (187 left and 198 right valves) from the lake Sarbsko. In both species initially the growth of the left valve is quicker in terms of weight. In *U. tumidus* about 40 mm long the difference is ca. 300 mg, in shells 63 mm long it disappears and then the right valve grows more quickly. In *U. pictorum* 40 mm long the difference is ca. 240 mg, disappears at 85 mm, and then a reverse tendency is observed.

SYMBIOCOENOSIS OF *DREISSENA POLYMORPHA* AND *D. BUGENSIS*

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Parasitological sections and histological examination included individuals from Ukraine and western Europe. The main components of the mussel symbiocoenoses in Europe are commensal and parasitic protozoans: in the pallial cavity *Conchophthiris acuminatus*, *Hypocomagalma dreissenae*, *Ancistrumina limnica* and ciliates of the order Peritricha, in the gills species of *Sphaenophria* (*S. dreissenae*, *S. naumiana*), in the alimentary canal *Ophryoglena*, in the connective tissue Haplosporidia. Of invertebrates of the pallial cavity nematods, oligochaetes, copepods, dipteran larvae and mites of the genus *Unionicola* were found. Among parasitic invertebrates, trematode metacercariae and adult stages dominated (*Bucephalus polymorphus*, *Leucochloridiomorpha constantiae*, *Echinoparyphium echinatoides*, *Phyllodistomum folium*, *Aspidogaster* sp.). Of prokaryotic organisms rickettsiae and numerous bacteria were observed.

STUDIES ON THE GENUS *ANDREFRANCIA*

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The endemic genus *Andrefrancia* is the most speciose and the least studied of the New Caledonian Charopidae. It includes 23 nominal species which can be divided into 6 groups based on shell characters; till now there were no data on their internal structure.



The first stage of the studies was an attempt at correlating conchological characters of these provisional groups with their anatomical characters, and the interpretation of their phylogenetic significance. Each of the six species groups differs from the remaining ones in 2 (groups II/VI) to 7 (I/V) shell characters; groups I (sinuate lip, gutter-like suture), III (toothed aperture), IV (rib reduction), and V (body whorl keeled) show characteristic features; groups II and VI differ only slightly (shell proportions) and have no clear distinctive features. The reproductive system was examined in selected representatives of each group; it displays the following distinctive characters: group I – epiphallus coiled around penial retractor, mushroom-like structure inside vagina; group II – constricted penis, penial glands present, vas deferens coiled around penial retractor; group III – finger-like process on penis; group IV – penis provided with two processes, epiphallus terminally swollen; group V – epiphallus coiled around penial retractor, inside penis additional cone-like structures; group VI – penis constricted, insertion of penial retractor surrounding base of epiphallus, spermatheca duct provided with a retentor.

BIVALVE FAUNA OF THE PLANNED MARINE ZONE OF THE SŁOWIŃSKI NATIONAL PARK

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Marine bivalves were studied in 1998 in the littoral zone of the Słowiński National Park. Typical species: *Mytilus edulis*, *Macoma baltica*, *Mya arenaria* and *Cardium glaucum* were recorded, the dominant being *M. baltica* (mean density 6.7 indiv./m², frequency 40%), the remaining species having a mean density of 1.3 indiv./m² and frequency 7–13%. The quantitative poverty of the fauna indicates that in the zone of “moving sands” the bivalves do not find favourable conditions.

HYDROBIID SNAILS OF THE INNER PART OF THE PUCK BAY

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The inner part of the Puck Bay (S Baltic) provides good conditions for mollusc fauna, but recently has undergone pollution and eutrophication. Besides many other mollusc species, it harbours four hydrobiids: *Hydrobia ulvae*, *H. ventrosa*, *H. neglecta* and *Potamopyrgus antipodarum*. The studies based on materials collected in 1969–1971 and 1998–99 indicate that the habitat changes in recent years have not affected the hydrobiid species composition.

CONCENTRATION OF SELECTED HEAVY METALS AND ORGANIC CARBON IN *DREISSENA POLYMORPHA* AND *VIVIPARUS VIVIPARUS* FROM THE Odra RIVER ESTUARY

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The material was collected in April/May 1996 from the Odra River estuary. The concentrations of heavy metals (Cu, Pb, Zn, Co, Cd, As, Hg, Sr) and organic carbon in *Dreissena polymorpha* and *Viviparus viviparus* were generally higher in the soft parts than in the shells, except Sr in *D. polymorpha*, and Co, As, Hg and Sr in *V. viviparus*.

MOLLUSCS OF THE Odra RIVER ESTUARY

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Molluscs of selected areas in the Odra River estuary were studied in 1988–1995. Forty four species were recorded: *Theodoxus fluviatilis*, *Viviparus viviparus*, *V. contectus*, *Valvata cristata*, *V. naticina*, *V. piscinalis*, *V. pulchella*, *Hydrobia ulvae*, *Potamopyrgus antipodarum*, *Lithoglyphus naticoides*, *Bithynia leachi*, *B. tentaculata*, *Lymnaea auricularia*, *L. glutinosa*, *L. peregra*, *L. stagnalis*, *Planorbis planorbis*, *Anisus septemgyratus*, *Gyraulus albus*, *G. laevis*, *Planorbarius corneus*, *Menetus dilatatus*, *Ancylus fluviatilis*, *Acroloxus lacustris*, *Unio crassus*, *U. tumidus*, *U. pictorum*, *Anodonta anatina*, *A. cygnea*, *Pseudanodonta complanata*, *Dreissena polymorpha*, *Sphaerium corneum*, *S. rivicola*, *S. solidum*, *Pisidium amnicum*, *P. casertanum*, *P. obtusale*, *P. pseudosphaerium*, *P. pulchellum*, *P. subtruncatum*, *P. supinum*, *P. hen-slowanum*, *P. milium*, *P. moitessierianum*.

MOLLUSC SHELL SIZE AND CONCENTRATION OF SELECTED HEAVY METALS AND ORGANIC CARBON

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Shell size in *Lymnaea stagnalis* and *L. peregra* is statistically significantly ($p = 0.05$) correlated with the concentration of the studied heavy metals (Cu, Co, Pb, Cd, Zn, As, Hg, Sr) and organic carbon. In *Dreissena polymorpha* only at $p = 0.1$ a correlation was found between the shell length and Sr concentration. The results suggest caution when interpreting monitoring results. Metal concentration may depend on age and maturity of a mollusc, shells of different mass and from different parts of a water body can not be compared directly, the metal concentration may be

affected by the time of sampling, sex of the mollusc, depth of sampling, water salinity and temperature.

FISH GLOCHIDIOSIS IN ANTHROPOGENIC WATER BODIES OF THE UPPER SILESIAN INDUSTRIAL REGION – BIOMETRICAL ANALYSIS OF *CARASSIUS CARASSIUS*

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Populations of *Carassius carassius* from selected anthropogenic water bodies in the Upper Silesian industrial region were studied: 127 fish were measured, weighed and sectioned; glochidiosis was found in 27 individuals, the intensity being 1–173 glochidia. A significant decrease in the condition coefficient was observed at infection intensity exceeding 50 glochidia. Probable reasons may be decreased feeding intensity resulting from parasite-induced stress and limiting of area of active gas exchange as a result of the presence of parasites.

FISH GLOCHIDIOSIS IN ANTHROPOGENIC WATER BODIES OF THE UPPER SILESIAN INDUSTRIAL REGION – BLOOD PICTURE OF *CARASSIUS CARASSIUS*

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Carassius carassius were caught in the spring and summer in anthropogenic water bodies of the Upper Silesian industrial region; 19 uninfected and 29 infected individuals (gill glochidiosis) were examined. In the blood of infected fish the erythrocyte and leukocyte count and haemoglobin level were significantly increased; the increase in erythrocyte count and haemoglobin level were found in fish with 25–50 glochidia (moderate level of infection), the leukocyte pattern was the most differentiated in the fish of maximum infection intensity. The varied increase in erythrocyte count and haemoglobin level in fish of different intensity of infection is explained by processes that compensate for the limitation of active gas exchange area, less efficient in cases of high intensity infection.

PUPILLA MUSCORUM – SHORTCOMINGS OF OVOVIVIPARITY

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The number of embryos incubated by *Pupilla muscorum* is negatively correlated with the maximum depth to which the snail can retract into the shell. Re-

traction into the shell to the greatest possible depth makes it possible for the animal to withstand drought or avoid predators. Consequently, the more numerous the incubated embryos, the lower the chances to survive and reproduce. This purely mechanical limitation, created by the incubated embryos, may be a selection factor which, through decreased fertility, may act against ovoviviparity and contribute to its relative rarity among terrestrial snails.

POPULATION STRUCTURE OF *DREISSENA POLYMORPHA* FROM KONIN HEATED LAKES

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The variation of *Dreissena polymorpha* in the Konin lakes results from the heterogeneity of their habitat conditions (varied degree of heating, flow speed and turbulence, food abundance). *D. polymorpha* inhabits all zones of the system. It is fairly scarce in the profundal zone (0.1–74.6 g/m²) while in the littoral its biomass reaches a few kg/m², the density being several thousand indiv./m². Studies on its population in 1993–1998 revealed considerable fluctuations in the density and biomass; the size structure varied between years and localities. The analysis of shell sculpture and colour pattern made it possible to distinguish 150 phenotypes, some of them characteristic of particular habitats.

ENDEMIC MALACOFUNA OF THE LAKE BAIKAL AND ITS DISCOVERY: BENEDIKT AND WŁADYSŁAW DYBOWSCY

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BENEDIKT DYBOWSKI was the discoverer of the rich endemic malacofauna of the lake Baikal; his brother WŁADYSŁAW DYBOWSKI examined and described the materials collected by him. W. DYBOWSKI's paper of 1875 contains, among others, detailed descriptions and figures of the examined snails (including anatomy!). Before B. DYBOWSKI's exploration, the Baikal malacofauna was regarded as very poor – only 7 mollusc species were known. W. DYBOWSKI described 25 new endemic species. At present over 80 mollusc species are known from the Baikal, over 2/3 being endemic. Three snail families/subfamilies and 7 genera/subgenera are endemic to the lake. Bivalves are poorly represented, almost exclusively by widely distributed species. A great majority of the Baikal endemic snails are benthic, and especially deep-water forms.



TAXONOMIC STATUS OF MEMBERS OF THE SUBGENUS *STAGNICOLA* IN THE LIGHT OF RAPD RESULTS

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Out of eleven European lymnaeid species, three (*Lymnaea palustris*, *L. occulta*, *L. turricula*) were included in the subgenus *Stagnicola*. Specific status of these three species, as well as that of *L. corvus*, was later questioned. RAPD technique was employed to verify their status; *L. stagnalis*, a species of unquestionable status among the Lymnaeidae, was included in the analysis. In the five studied species 253 characters (bands) were obtained; based on these distance coefficients were calculated with RAPDistance programme. The coefficients indicate a distinct status of taxa anatomically identified as *L. corvus*, *L. stagnalis* and *L. occulta*. *L. palustris* and *L. turricula* display a lower distance coefficient, thus suggesting a closer relationship. Trees constructed with PHYLIP package suggest a doubtful status of *L. occulta* – a taxon intermediate between *Lymnaea* s. str. (*stagnalis*, *corvus*) and *Stagnicola* (*palustris*, *turricula*).

FOUR HUNDRED YEARS OF MALACOLOGICAL STUDIES IN SILESIA

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Malacological studies in Silesia date back to the 17th c., resulting at least partly from interest in the freshwater pearl mussel, then common in the region. The species was mentioned by KASPAR SCHWENKFELD in the first decade of the 17th c. The first period of intense studies was the first half of the 19th c., with an array of papers by H. SCHOLTZ who mentioned 146 species of gastropods and bivalves. In the second half of the 19th c. many authors were interested in the malacofauna of Silesia, especially the Sudetes. Results of O. REINHARDT's studies are still an important source of data on the mountain malacofauna of Silesia. Little attention was devoted to Upper Silesia, which was considered to be of little malacological interest. The end of the 19th c. was the period of E. MERKEL's activity; he summarized his own and earlier malacological studies in a monograph, providing data on 140 gastropod and 24 bivalve species. In that period papers of first Polish authors (STOBIECKI, WAGNER) were also published. The first half of the 20th c. was characterized by a poverty of malacological studies, on both Polish and German sides of the divided Silesia. After World War II Silesia was in-

tensely studied by malacologists from Wrocław (Sudetes and Lower Silesia) and Katowice (aquatic molluscs of Upper Silesia). As a result of 400 years of studies Silesia is at present one of the best studied areas in Poland: its bibliography includes 171 papers.

FUNCTIONAL CHARACTERISTICS OF A POPULATION OF *DREISSENA POLYMORPHA*

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Thermal and hydrological conditions in the Konin heated lake system determine the structure, distribution and functioning of the population of *Dreissena polymorpha*. Its density, biomass and efficiency of organic suspense removal were studied in 1993–1998. The highest indices of organic suspense destruction ($17.4 \text{ kJ/m}^2 \times \text{h}$) were those in the initial cooling reservoir; the density in the least heated lake was seven times lower, biomass and destruction index – 1.8 and 2.4 times lower, respectively. The heterogeneity of habitats in the studied lake system results in a high heterogeneity of size structure, with the widest spectrum (all 7 size classes) and 40–45% juvenile specimens in the heated lakes. In the least heated reservoirs the structure is different, young individuals not exceeding 15%.

APPLICATION OF CYTOCHROME OXIDASE-ENCODING MITOCHONDRIAL GENE (COI) IN BIVALVE TAXONOMY

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PCR and RFLP techniques were applied in order to identify Chinese bivalves introduced from Hungary to Poland; an isolated locality is situated near Konin, in a cooling water system of the power plants Konin and Pątnów. Three groups of bivalves from three sampling sites were examined, individuals from one being morphologically identified as *Anodonta woodiana*, those from the other two as *Anodonta* sp. Restriction analysis of the amplified fragment of COI (710 bp), with the use of five restriction enzymes, revealed identical restriction patterns for all the three sampling sites, thus testifying to the conspecificity of the bivalves. The mitochondrial gene COI is useful in identification of various bivalve species.

MOLLUSCS OF THE UPPER SECTION OF THE WARTA RIVER

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The studies (1998–99) included the upper section of the Warta river meandering in a wide, wooded valley, localities being selected based on diversity of bottom sediments and vascular vegetation, flow intensity and depth. Twenty species of molluscs (14 snails and 6 bivalves) were found in the river and 15 (14 snails and 1 bivalve) in other water bodies of the valley. The most common species were *Bithynia tentaculata* and *Lymnaea peregra*. *Valvata cristata*, *Lymnaea corvus*, *Planorbis planorbis*, *Gyraulus albus*, *Segmentina nitida*, *Planorbarius corneus*, *Ancylus fluviatilis*, *Physa fontinalis*, *Pisidium supinum*, *P. milium*, *P. subtruncatum* and *P. casertanum* were found only in few specific microhabitats. The mollusc distribution in the river does not depend on the physico-chemical properties of water, but on the insular occurrence of vascular flora.

POLISH MALACOLOGICAL STUDIES IN NORTH KOREA

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While the malacofauna of South Korea is fairly well known, the knowledge of North Korean molluscs is still fragmentary. As a result of the geopolitical situation on the Korean peninsula, its northern part has long remained inaccessible. First data on its molluscs date from the end of 19th c., but more extensive studies at a few N Korean sites were performed by Japanese malacologists in 1907–1939. Polish studies on N Korean malacofauna started in 1959; the materials were collected by consecutive expeditions till 1991. The only comprehensive publication based on these materials was devoted to Zonitidae (RIEDEL); information on all land snails collected to date (40 species) was published by STWORZEWICZ, with a discussion on relationships with S Korean, Japanese and Chinese fauna. At present the materials collected by all the expeditions are being revised, and Gastrocoptinae are studied in detail.

ALTITUDE-DEPENDENT SHELL VARIATION IN *VESTIA TURGIDA*

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Vestia turgida is common in the northern part of the Carpathians and displays a considerable shell variation. The material included 282 snails from 15 sites in the Bieszczady and Beskid Niski mountains, located at 380–1250 m a.s.l. Eight metric characters, 4 indices of shell shape, number of whorls and of ribs on penultimate whorl, number of tubercles between the lower and upper lamella and the degree of shell erosion were analysed. Most metric characters are negatively correlated with altitude, except shell width and lip thickness at upper lamella. The number of whorls decreases with altitude while the number of ribs increases. With increasing altitude the shells become more tumid but the aperture proportions do not change significantly. The altitude-correlated variation results probably from climatic factors: decreased temperature, shorter vegetation period, as well as increased insolation and microclimatic fluctuations above the timberline.

VARIATION OF MITOCHONDRIAL DNA IN EUROPEAN POPULATIONS OF *MYTILUS*

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Three species/subspecies of *Mytilus* occur in European seas: *M. edulis* in the North, Celtic, Norwegian and Baltic Seas, *M. galloprovincialis* in the Mediterranean and Black Seas, as well as along the Atlantic coasts of S Europe, and *M. trossulus* in the Baltic. They are able to hybridize. Mitochondrial DNA (fragments containing ND2-COIII of F and M genome, almost entire non-coding region of F genome) was analysed using RFLP method, in 9 samples from European seas. Haplotypes characteristic of particular taxa and common haplotypes were identified; their frequencies varied much between localities.

RATE OF PHOSPHORUS REMOVAL FROM WATER BY *DREISSENA POLYMORPHA*

MAREK ŚWIERCZYŃSKI

Szczecin

The zebra mussel *Dreissena polymorpha* was obtained in 1998 from 6 water bodies of the Pomeranian lakeland: lakes Małe Ińsko, Duże Ińsko, Woświn, Duże, Miedwie and the Odra River estuary. Experiments were conducted in aquaria containing water from the above water bodies, with addition of algae constituting a source of phosphorus assimilable to *Dreissena*. During 24 hrs 1 gram of fresh mass of



Dreissena removes ca. 0.009 mg phosphorus from water, irrespective from the native water body of the mussels.

ORCONECTES LIMOSUS AND DREISSENA POLYMORPHA IN THE LAKE MIEDWIE

MAREK ŚWIERCZYŃSKI

Szczecin

The studies were conducted in 1994–1999 on the bottom between 5 and 10 m isobates. Samples were taken quarterly; density and biomass of *Dreissena polymorpha* were estimated, as well as their growth rate and gut contents. Since 1995 the crayfish were cultured on the bottom inhabited by *D. polymorpha* and on the bottom from which the mussels were removed. A strong pressure on the mussel bed was observed throughout the year. Besides, the mussel bed proved to be a perfect shelter for the crayfish, and due to its filtration activity affects favourably the crayfish habitat. On mussel-inhabited bottom the crayfish reached a larger size and were in a better condition compared to the crayfish from sandy bottom.

STUDIES ON GASTROPODS OF AN OLD MANSION PARK IN RADOJEWÓ

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The park in Radojewo near Poznań, designed in an English style, 15 ha in surface area, is located on a moraine and surrounded by oak-hornbeam and riverine forests. Since the pre-war times the park has not been subject to any management due to which it has a rich shrub vegetation. It is one of the few localities of *Viola odoratae-Ulmetum* in the Wielkopolska region. Thirty three gastropod species were found in both qualitative and quantitative samples, the most interesting being *Acicula polita*, *Truncatellina costulata*, *Discus rudersatus*, *Nesovitrea petronella* and *Limax cinereoniger*.

SLUGS OF CHINA – THE STATE OF KNOWLEDGE

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Fragmentary data on the slugs of China, mainly species descriptions, date from the beginning of the 19th c. Within the last 50 years materials were collected mainly by CHEN DE-NIU; though he published only 6 small contributions, he collected a rich material of over 3,700 specimens which served as a basis for the study. At present 13 terrestrial slug species are known to occur in China, and there are two more of uncertain status. Two species were introduced from

Europe, one is distributed in whole Holarctic, four inhabit Far East of Asia. One species was described in 1982, further four in 2000. Another five species were reported also from Siberia, Mongolia and Korea. The state of knowledge of the vast area of China is still far from satisfactory.

CHANGES IN THE MOLLUSC FAUNA OF THE JUNIKOWSKI STREAM IN POZNAŃ AND ASSOCIATED WATER BODIES

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The mollusc fauna of the stream Strumień Junikowski in Poznań was studied in 1996–1999; the results indicate a deterioration in the quality of the waters located in its valley. The number of mollusc specimens obtained from the Junikowski stream decreased from 4,156 in 1996 to 775 in 1999, the number of species from 33 in 1996 to 26 in 1999. The situation was similar in Ceglanka (187 specimens of 14 species in 1996 and 14 specimens of 6 species in 1999) and the clay pits (the numbers of specimens being 30,377 in 1996 and 1,373 in 1999). The most frequent species were: *Pisidium casertanum*, *P. subtruncatum*, *P. nitidum*, *P. obtusale*, *Bithynia tentaculata*, *Gyraulus albus*, *Segmentina nitida*, *Potamopyrgus antipodarum*, *Lymnaea peregra*.

HELICELLA OBVIA IN THE VICINITY OF KRAKÓW

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Shells of *Helicella obvia* were collected from two sites near Kraków; published data on a population from the vicinity of Pińczów were used for comparative purposes. The first locality of ca. 50 m² has a high soil salinity and very scanty vegetation, the second is a vegetation belt along the railroad, on a substratum resulting from accumulation of dusts from a nearby ironworks. The third (control) site is a sunny hill slope of xerothermophilous vegetation. Biometrical analysis (width of embryonic whorls, shell increment from hatching till collecting, shell width and height, aperture height) revealed that the largest specimens came from locality 1; the analysis indicates optimum conditions at locality 2.

STRUCTURE OF THE MAIN NON-CODING REGION OF mtDNA OF *MYTILUS TROSSULUS*MAŁGORZATA ZBAWICKA, ARTUR BURZYŃSKI,
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Seventeen variants of mtDNA of various length from 16 individuals collected in the Puck Bay were subject to PCR, sequencing and analysis with CLUSTAL algorithm. The section 5', about a dozen bp long, is invariable and probably is the 3' end of rRNA gene. The next section, ca. 300 bp long, is different in the shortest variants and terminates with a very long polyA sequence (15–20 bp). The mid region is relatively constant and terminates with a characteristic A₆G₂A₈₋₁₀ sequence. From that place starts a region of variable length, containing repetitions. In the sequenced variants the repetitions may be 190, 120 or 80 bp long; they terminate with a polyA sequence directly preceding tRNA^Y gene. The further part contains exclusively coding sequences. The high heterogeneity of the variation along the studied DNA section suggests caution when drawing phylogenetic conclusions.

SHELL CALCIFICATION IN TREMATODE-INFECTED *LYMNAEA STAGNALIS*

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Digenetic trematode larvae cause disturbances, among others, in snail reproduction; the latter is strongly dependent on calcium balance. For this reason we sought an association between the trematode infection and calcium balance, viz. calcium content in shells. 540 individuals of *Lymnaea stagnalis* were collected during the vegetation season, and divided in two age classes and three categories with respect to the infecting larvae. Snails of ca. 35 and 47 mm shell height, infected with furco-, xiphidio- and echinocercariae were examined, their calcium content in shells being compared with that of parasite-free snails. Hypercalcification of shells of infected snails suggested by some authors does not seem to be common; only snails infected with xiphidiocercariae showed an increased calcium content. Among snails infected with echinocercariae only young individuals contained more calcium, while snails infected with furcocercariae did not depart from the control. Larvae of only some trematode species disturb calcium balance; hypercalcification may be caused by a decreased calcium expenditure when reproduction is limited as a result of infection.

