

THE OCCURRENCE OF SNAILS (GASTROPODA) ON THE DUMPS OF THE OSTRÓWKA AND OŁOWIANKA QUARRIES

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ABSTRACT: In the paper, the author describes the occurrence of snails on the dumps of the Ostrówka and Ołowińska quarries, which was studied quantitatively by means of a biocenometer. The four localities in question differ between each other in succession level. Three snail species have been found: *Helicella obvia* (Menke, 1828), *Bradybaena fruticum* (O. F. Müller, 1774) and *Cepaea vindobonensis* (Ferussac, 1821). The author pays attention to the succession of the snails on the described dumps.

KEY WORDS: malacofauna, succession, pile, quarry

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The occurrence of snails (*Gastropoda*) on the dumps of the Ostrówka and Ołowianka quarries

ABSTRACT

In the paper, the author describes the occurrence of snails on the dumps of the Ostrówka and Ołowianka quarries, which was studied quantitatively by means of a biocenometer. The four localities in question differ between each other in succession level. Three snail species have been found: *Helicella obvia* (MENKE, 1828), *Bradybaena fruticum* (O. F. MÖLLER, 1774) and *Cepaea vindobonensis* (FERUSSAC, 1821). The author pays attention to the succession of the snails on the described dumps.

1. Introduction

In the Holy Cross Mountains there are numerous quarries of limestones and dolomites as well as plants to process the rough materials. It was due to the discovery of copper and lead ores occurring in small concentrations in Devonian limestones that the Chęciny mining-metallurgic centre developed in the XIXth century in the vicinity of Miedzianka, Chęciny and Skiby (FIJAŁKOWSKA & FIJAŁKOWSKI 1976). At the beginning of this century the limestones and dolomites started to be intensively exploited and the recent 40 years development of surface mining and building industry has brought about a serious degradation of environment and changes in the landscape of the said region.

A new element of the relief of the area are both huge dumps of waste material and vast cavings. They are remains of the worked out parts of deposits. To put a limit on the further devastation a development plan concerning the Chęciny area was put forward. In the nearest future several nature reserves are going to be created to cover five hills and a fragment of an inoperative quarry. The reserves will be part of the protected landscape zone that will save the natural environment of the Chęciny region. The landscape value of the area, the interesting communities of flora and fauna, and the presence of numerous valuable objects of inanimate nature rank the said region among the natural landscape and geological museums.

The Ostrówka and Ołowianka quarries are situated in the southwest part of the Holy Cross Mountains, between the rivers Bobrza and Łośna and the rivers Czarna Nida and Biała Nida, in the square determined by the UTM coordinates DB-62 (Fig. 1). This is a warm, strongly insolated, well-drained area, its substratum being largely limestone. No large forest complex can be found in



the closest vicinity: it is only in the southern part of the area that the hills Góry Skibskie are overgrown with forests. The Ostrówka quarry covers an area of 42 ha, and the Ołowianka one, out of operation since 1970, covers an area of 11.4 ha.

The region in question is the warmest part of the Holy Cross Mountains. The average annual temperature is 7.2...7.4°C; the temperature ranges from -3.0°C to -2.2°C and from 17.9°C to 18.2°C, in January and July, respectively. The number of sunny days per year is 35 - 42, the one of cloudy days being 97 - 142. The snow cover lasts for 60 - 84 days in a year, and the annual rainfall is 600 - 650 mm (KOZŁOWSKA-SZCZĘSNA & PASZYŃSKI 1967). In 1987, the year of sampling, the parameters were as follows: mean annual temperature: 5.5°C, mean temperature in January: -12.2°C, mean temperature in July: 17.6°C, total annual rainfall: 624 mm.

2. Description of localities (Fig. 2)

Locality I is situated on a dump of the Ostrówka quarry, at 253 m a.s.l. The dump was created in 1986 and is now being enlarged in its western part. It covers an area of 3 ha and is formed of sandy clay mixed with a considerable amount of limestone rubble. The slopes of the dump fall at a steep gradient to NW and SE. The plant community is two-layered (d, c). The mossy layer (d) is little compact and comprises *Pohlia nutans* LINDB., *Creatodon purpureus* BIRD., *Tortula* sp., and other taxons. In the herbaceous plants layer three sub-layers can be distinguished: the lowest sub-layer (c1) with small patches of *Polygonum aviculare* L. and *Medicago lupulina* L., the intermediate sub-layer (c2) with *Tussitago farfara* L., *Daucus carota* L., *Centaurea cyanus* L., *Sedum sexangulare* L., and the upper sub-layer (c3) with scarce specimens of *Verbascum thapsiformae* SCHRAD. and *Carduus crispus* L. In its composition, the community corresponds to the *Senecioni-Tussilaginetum* community of the class *Chenopodiacea* and to communities of the class *Sedo-Scleranthetea*.

Locality II is situated on the main dump of the Ostrówka quarry. The dump was created 10 years before the year of the study. The slope of the dump is steep (40 - 50°) and is exposed to NW. The main compound of the substratum is fine limestone rubble containing 95...97% of calcium carbonate and a small part of clay. The plant community is two-layered (d, c). The mossy layer has 30% of cover and consists of a.o. *Polytrichum piliferum* SCHREB., *Bryum* sp., *Pohlia nutans* LINDB., and *Tortula* sp. The herbaceous plants layer consists of two parts: c1, with the dominant species *Thymus pulegioides* L. and c2 with *Festuca rubra* L., *Sanguisorba minor* SCOP., *Daucus carota* L., and *Fragaria vesca* L. The community corresponds to turfs of the class *Sedo-Scleranthetea*.

Locality III is situated at a dump of the Ostrówka quarry. The dump was created 8 years ago and is now being raised, its slope exposed to the north. The plant community is three-layered (d, c, b). The mossy layer (d), developed rather well, is composed of, a.o., *Pohlia nutans* LINDB., *Polytrichum piliferum* SCHREB., *Catharinaea undulata* WEB. et MOHR. In the herbaceous plants layer three parts can be distinguished: c1, with *Heriaria glabra* L. and *Arenaria serpyllifolia* L., c2, with large aggregations of *Tussitago farfara* L., c3, with single tussocks of *Chamaenerion*

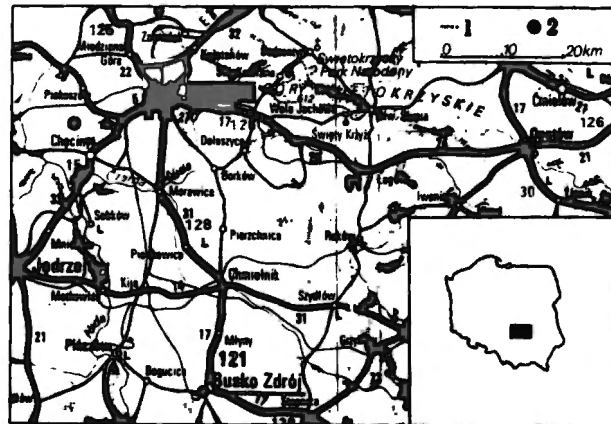


Fig. 1. Situation of study area: 1 – border of Holy Cross Mountains National Park; 2 – study area

palustre. In the shrub layer (b) there are small aggregations of *Rubus* sp. and single specimens of *Juniperus communis* L. The community corresponds to the *Senecioni-Tussilaginetum* community of the class *Chenopodiataea* and to communities of the class *Sedo-Scleranthetea*.

Locality IV is situated at an old dump of the Otowlanka quarry which was being exploited in 1950 – 1960. The dump is about 30 years old and consists of limestone fragments of various size, weathered to a various degree, containing a small amount of clay. The slope of the dump is slanting to SE, at an angle of 40°. The dump is bordered from the north and west, by a turf growing on a limestone soil, and from the east and south, by a marsh. The plant community is three-layered. The well developed mossy layer (d) contains, a.o., *Thuidium abietinum* BR., *Catharinaea undulata* WEB. et MOHR., *Pohlia nutans* LINDB., *Polytrichum piliferum* SCHREB. In the lower part of the herbaceous plants layer (c1) *Sedum ochroleuca* L. and *Medicago lupulina* L. occur, while in the upper one (c2) there are *Scabiosa ochroleuca* L., *Daucus carota* L., *Centaurea rhenana* BOR., *Fragaria vesca* L., *Equisetum arvense* L., and other taxons. The shrubs layer (b) consists of *Juniperus communis* L. and *Betula verrucosa* EHRENB. The community corresponds to ones of the class *Festuco-Brometea*, showing a tendency to change into a scrub community.

3. Material and methods

Samples of the fauna were collected and examined on two occasions, in July and in October. Quantitative samples were taken according to a method described by OEKLAND (1929), by means of a square biocenometer, the side length 25 cm, at a depth of 10 cm. 10 samples made a

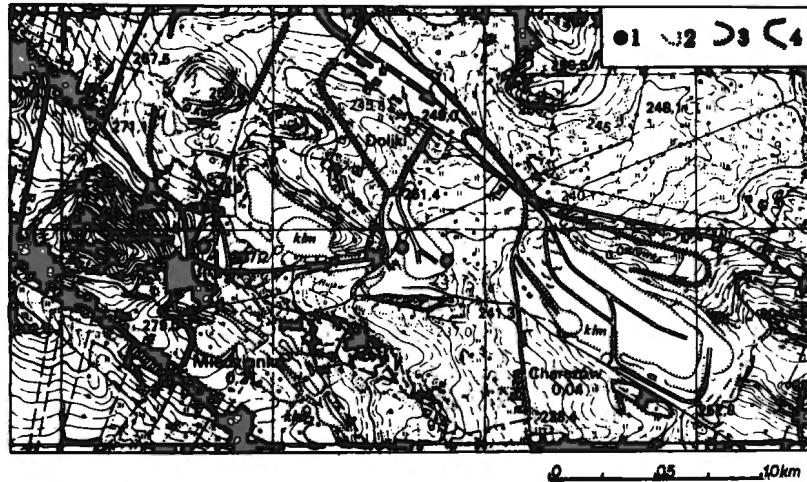


Fig. 2. Localities at Ostrówka and Ołowianka quarries: 1 - locality; 2 - forest border; 3 quarry border; 4 - dump border

series representing 1 sq. m of surface. All samples were taken in the lower and middle parts of the dumps' slopes, 2 m to 10 m from the base. They were sorted just after they had been taken. Over 200 living specimens altogether were found on Locality II, III, and IV. On Locality II and III two species were found apiece, while on Locality IV there was a very big population of one species - *Helicella obvia* (MENKE, 1828).

4. Species found

Helicella obvia (MENKE, 1828) is a Southeast European species. In Poland, its contiguous distribution range covers the southern part of the country, the western limit running through the Silesian Upland and West Beskidy Mountains. According to PIECHOCKI (1981) the species is very common in the SW part of the Holy Cross Mountains, living in numerous colonies on limestones or xerophilic turfs. Some localities of *H. obvia* in the Holy Cross Mountains were also recorded by GEYER (1917), POLIŃSKI (1917), CZUBIŃSKI & URBAŃSKI (1933), KAZANOWSKI (1938, 1939) and the complete set of distribution data is given by RIEDEL (1988). *H. obvia* finds favourable conditions in habitats that are unfavourable to other snail species, which are, for instance, habitats changed by man; the species may also be numerous in towns (ALEXANDROWICZ 1988).

Bradybaena fruticum (O.F. MÜLLER, 1774) is a European species. In Poland it is common throughout the Lowland and, less numerous, it occurs in the Uplands and Foot-Hills (RIEDEL 1988). The snail can live in shrubs, forests, parks and gardens, on humid and moderately

humid substrates, in more or less shady habitats but is much scarcer in places where it can find little shade. Its young live among xerophiles and in forests growing on a dry or rather dry substrate being rich in calcium carbonate (LOŽEK 1964). PIECHOCKI (1981) found two localities of the species in the Holy Cross Mountains: the Wilkomija Hill (277 m a.s.l.) and the Łysa Góra Mountain (500 m a.s.l.), whereas DZIĘCZKOWSKI (1971) recorded its occurrence in the Świnia Góra Nature Reserve by Kielce (325 – 350 m a.s.l.). It is probable that, unlike in other regions of Poland, in the Holy Cross Mountains *B. triticum* is a rare species.

Cepaea vindobonensis (FÉRUSAC, 1821) is a Southeast European species. In Poland, it occurs mainly in the southern part whereas is absent in the northern one (RIEDEL 1988). The north distribution range of the species is the Holy Cross Mountains (POLIŃSKI 1924). In that region, *C. vindobonensis* is quite numerous and PIECHOCKI (1981) recorded it from 10 localities in the vicinity of Chełciny. Another locality is the Wietrznia Mountain by Kielce (CZUBIŃSKI & URBAŃSKI 1933). *C. vindobonensis* is a typical species of xeric habitats, which lives on sunny slopes in xerophile turfs, on limestone rocks and in dry, light forests and parks.

The shells of the three species have well visible stripes on them. The *Helicella obvia* specimens found at three localities had white shells with very distinct, dark brown, broken stripes. The shells of *Bradybaena triticum* were reddish brown or yellowish white, with a dark stripe and only few specimens were unicolour. The shells of *Cepaea vindobonensis* were white, marked with five dark stripes, two of them narrower and less intensive in colour.

5. Snail succession on dumps

The succession of snails was studied by several authors, a.o., by VALOVIRTA (1979), on small islands of the Baltic Sea, and by BÁBA (1979), on alluvial plains of the Hungarian Lowland. The previous author described a gradual increase in number of the pioneer species that appeared on the islands of a rising archipelago. As on the studied dumps of the quarries of the Holy Cross Mountains, in the initial stage of succession only single taxons were present. The other author gave a characteristics of the conditions of colonising flood plains by snails having been brought by floods. Among the 23 taxons that had gradually got established in the new environment there were all the three species found on the dumps in the vicinity of Chełciny.

Pioneer species appear in habitats where the structure of soil has been destroyed or not developed yet, which are subject to large temperature and humidity fluctuations. As vegetation develops, in two-layered and, then, three-layered plant communities favourable living conditions are created for euryecologic taxons, the ones, in particular, that prefer insolated, dry or moderately humid habitats. One of the taxons is *Helicella obvia*, a species that can be very numerous in artificial habitats (quarries, road and railway embankments, dumps, etc.). The presence of the other two taxons (*Bradybaena triticum*, *Cepaea vindobonensis*) at the described dumps indicates that the environmental conditions are diversified only in the initial stage of the formation of habitats.

The western part of the Holy Cross Mountains makes studying the succession of snails possible. There are numerous dumps of a different age, which are overgrown to a various degree, subject to a natural recultivation. These are dumps consisted of either limestone and dolomite material or sandstones, quartzites and other rocks. The malacofauna of the man-made habitats is to be thoroughly studied in future.

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STRESZCZENIE

Występowanie ślimaków (*Gastropoda*) na hałdach kamieniołomów Ostrówka i Ołowianka

Autorka opisuje występowanie ślimaków na hałdach kamieniołomów Ostrówka i Ołowianka, badane metodą ilościową, przy użyciu biocenometru. Cztery stanowiska różniły się między sobą zaawansowaniem sukcesji. Stwierdzono na nich trzy gatunki ślimaków: *Helicella adria* (MENKE, 1828), *Bradybaena fruticum* (O. F. MÜLLER, 1774) i *Cepaea vindobonensis* (FERUSSAC, 1821). Autorka specjalną uwagę poświęca omówieniu sukcesji ślimaków na badanych hałdach.