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Pressure of the Grey Heron breeding colony (*Ardea cinerea*) on the phytocoenosis of lowland acidophilous beech forest in the 'Czapliniec w Wierzysku' reserve (Kaszubskie Lake District)

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Abstract: Bird breeding colonies have always a significant influence on the habitats and phytocoenoses they occupy. Long-lasting existence of the Grey Heron colony in Wierzysko (over 100 years) has resulted in formation of two different parts of it – a currently occupied area and a post-colony area. Within the colony area, most changes concern the floor flora of *Luzulo pilosae-Fagetum* phytocoenosis. Plants of different habitats, especially nitrophilous ones, appear. At the same time, some mosses and vascular plants specific for that association decline. In the post-colonized area the spontaneous, but relatively stable, shrub community with elder (*Sambucus nigra*) domination. The rest part is covered by a low-growing forest community, which has appeared after removing elder and introducing larch (*Larix decidua* et *kaempferi*) and partly lime (*Tilia cordata*). Forest floor in the post-colonized area is distinguishably heterogeneous and consists mostly of forest, clear-cut, meadow and ruderal species, however the floristic composition of the phytocoenoses is unstable. The rate of forest decaying and shifting of the breeding colony in Wierzysko is not very rapid. Spontaneous restoration of forest phytocoenosis is also very slow, probably due to the persistence of enormous soil fertilization and specific biotope as well as the strong influence of *Sambucus nigra*.

Key words: lowland acidophilus beech forest, Grey Heron, breeding colony, acidophilus and nitrophilous species

Bird breeding colonies always have a significant influence on the habitats and phytocoenoses they occupy (Smith 1978). Those changes depend mostly on the species of nesting bird, size of its local population, nest density, length of the occupancy time, type and floristic composition of the occupied phytocoenoses, quality and property of the soils and the level of ecosystem organization (Sobey & Kenworthy 1979; Maesako 1991; Ishida 1996; Mun 1997; García *et al.* 2002). It concerns also Grey Heron colonies.

The breeding colony in Wierzysko has been settled over 100 years ago. It is a medium size colony ranging from 10 to almost 100 occupied nests in particular years. It occupies phytocoenosis of lowland acidophilous beech forest, which is moderately altered by the existence of 220 years old Scots pine trees in the forest stand. Grey Heron nests exclusively on pines. Long-lasting existence of the colony has resulted in formation of two different parts of it – a currently occupied area and a post-colony area.

The main aim of the study was to recognize structural and floristic changes that have been caused by the Grey Heron colony in the lowland acidophilus beech forest phytocoenosis and to evaluate the restoration rate of forest phytocoenosis in the post-colony area.

The research was carried out in 1998 and in 2004-2005. The phytosociological documentation was collected using the Braun-Blanquet method. Syntaxonomical names are accepted after Matuszkiewicz (2001), names of vascular plants after Mirek *et al.* (2002), and mosses after Ochyra *et al.* (2003).

The nature reserve 'Czapliniec w Wierzysku' was established in January 1981 to protect the old-growth pine forest as well as the breeding place of Grey Heron. This is a faunistic reserve, taken under the partial law protection. The reserve covers the area of 10.33 ha and

is situated about 2 km to the south of Kościerzyna (Fig. 1), in the Kościerzyna forest section (N° 234) of the Wierzysko forest district. According to the physical and geographical regionalization the area is a part of the Pojezierze Południowopomorskie macroregion and the Bory Tucholskie mesoregion (Kondracki 2002).

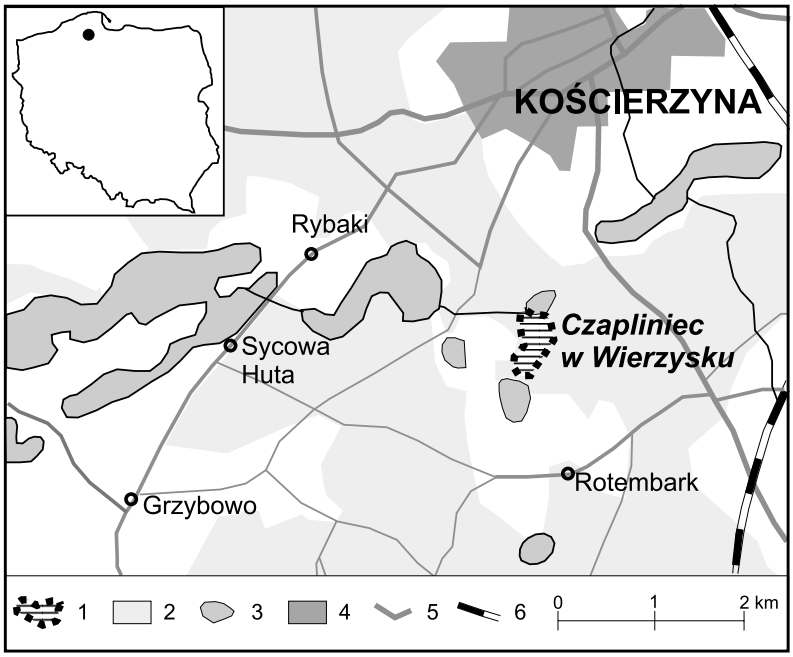

Fig. 1. Location of the 'Czapliniec w Wierzysku' reserve
Explanations: 1 – reserve; 2 – forests; 3 – lakes; 4 – city area; 5 – roads; 6 – railway

The birds build nests in a small part of the reserve (forest section N° 234h and 234k). The colony is dense, except one outlying occupied tree, and covers a narrow old-growth forest strip of 30 m width, situated next to the post-colonized area.

Lowland acidophilous beech forest is a dominating plant community in the studied area. It is differentiated into two subassociations: typical and slope-mossy, as well as in few degeneration forms. The Grey Heron colony is situated in the phytocoenosis of typical subassociation of *Luzulo pilosae-Fagetum*, which is moderately deformed by earlier introducing of Scots pine.

Both the colony and post-colonized area cover a part of strongly rolling, outwash plain (Wda Outwash Plain). Prevailing type of soil in both areas are Spodic Udipsamments, which formed from slightly loamy, outwash sands, underlain by loose sands. Less frequent are Typic Udipsamments, made of sands of glacial and fluvioglacial accumulation, consisted of medium sand grain size and underlain by loose sands and gravels (Plan ochrony… 1999).

Grey Heron build nests on the 225 years old pines, which are a part of the main tree-stand of 25-30 m height and 60-80% density. The lower tree layer is built by beech (mostly 110-160 years old), which doesn't exceed 17 m in height and its density is usually 10-40%. Strong shading of forest floor, observed outside the colony area, causes qualitative and quantitative impoverishment of the forest undergrowth flora, while within the colony area the undergrowth flora is strongly modified due to soil fertilization by the bird excreta.

As most of trees in the stand occupied by Grey Heron die, the colony moves to the nearby old trees. At the first stage of the colony influence on newly occupied area, species from different habitats appear in acidophilous undergrowth. They are mostly nitrophilous plants, such as *Sambucus nigra*, which quickly builds a shrub layer of varied density. Among other non-specific species which settle in the beech forest there are *Poa trivialis*, *Stellaria media*, *Urtica dioica* and *Galeopsis tetrahit*. At the same time, some species specific for that association, such as mosses: *Dicranum scoparium, Polytrichastrum formosum*, *Mnium hornum* and vascular plants as *Vaccinium myrtillus* decline. Among forest species, which stay or appear, most often are: *Mycelis muralis*, *Moehringia trinervia*, *Oxalis acetosella* and *Trientalis europaea*.

In the post-colonized area the shrub community with elder *Sambucus nigra*, of 5 m height, dominates. This spontaneous community is a substitute to the beech forest and it has been developing since the beginning of the breeding colony. Shrub community with elder is relatively

stable type of ecosystem, unlikely to change into a forest community. The rest of post-colonized area is covered by a low-growing forest community, which has appeared after removing *Sambucus nigra* and introducing larch (*Larix decidua* et *kaempferi*) and partly lime (*Tilia cordata*).

In all cases, forest floor in the post-colonized area is distinguishably heterogeneous and consisted mostly of forest, clear-cut, meadow and ruderal species. Plants such as *Sambucus nigra*, *Poa trivialis*, *Geranium robertianum*, *Urtica dioica* and *Stellaria media* are relatively often. Still, floristic composition of those phytocoenoses is unstable, similarly as it was observed in other Grey Heron colonies (see Krotoska 1976).

Taking into account the time of existence of the breeding colony in Wierzysko (over a hundred years) as well as the preceding size of post-colonized area (ca. 1.29 ha) it is clear that the rate of forest decaying and colony shifting is not very rapid. Spontaneous restoration of forest phytocoenosis is also very slow. It is probably due to the persistence of enormous soil fertilization and specific biotope, as well as the strong influence of *Sambucus nigra* on floristic composition and structure of the community. Elder has a great dynamic value and plays a role of typical edificator.

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