

Caddisflies in the Białowieża Forest – Study Them Before They Disappear

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The Białowieża Forest is the best-preserved area of primeval forest in the lowland part of Europe and is largely covered by legal protection (The National Park). The primeval forest not only includes forest habitats, but also little-modified water bodies. This is an excellent reference point for an evaluation of the anthropogenic changes in water of the lowland part of Europe. Caddisflies (Insecta: Trichoptera) are aquatic insects, used in water monitoring as part of the macrobenthos. A large number of species, clear habitat differentiation and a large population size make it a useful bioindicator of the environment condition. Moreover, they are relatively well-recognised.

According to the recommendations and requirements of the European Union's Water Framework Directive, evaluation of the ecological status of water bodies should be based on communities of organisms, including macrobenthos. Contemporary methods of evaluation and monitoring are based on different types of biotic indexes (such as BMWP). However, evaluation and correct interpretation require a good reference point, i.e. knowledge of the ecological situation in the least-modified water bodies. The Białowieża Forest is a good object for such studies. Also, biodiversity indexes, such as the Shannon–Wiener (H'), Pielou (J') and Hurlbert (PIE) indexes are not good tools for ecosystem monitoring, because the biodiversity of benthos communities is affected by many factors, as a result of which natural habitats can be colonised by fauna of low diversity (specialised species). Good tools for the monitoring of an ecosystem health require two things: a large amount of data and good ecological theory.

There are naturalness indexes currently being developed and tested based on habitat preferences of specific species and new models of ecological succession. The naturalness index (OWS), which takes into account the ecological valence of species (ecological tolerance) and adaptation to specific habitats, was first used in the evaluation and monitoring of springs in Germany [1]. The OWS index was modified by the author (Wze) and caddisflies were used to evaluate the quality of aquatic biocenoses: springs, water courses, minor water bodies, lakes, peat land, following different degrees of anthropotransformation. After being tested on large amounts of data, it appears to be highly promising [2-7]. It has also been used with dragonflies [8] and verified for peat land in the Czech Republic [9].

Studies of caddisfly larvae in the Białowieża Forest were carried out in 2010 in several water courses (streams and small rivers) and in periodical water reservoirs. Earlier, only imagines were studied [10-12]. Two Trichoptera species new to the Białowieża National Park and 10 species new to the Białowieża Forest were collected in 2010. The two new species are a typical feature in small, Forest Rivers with a sandy bottom. This result indicates an urgent need for further studies of the distribution of invertebrates in water habitats in the Białowieża Forest. It is also necessary to study infiltration of elements atypical to water bodies of a primeval forest (foreign, invasive and synanthropic species). The formation of small garden ponds and other artificial water

bodies (clay pit ponds, fire protection ponds) will increase biodiversity, but their role in introducing species that are atypical and foreign to the (primeval) forest landscape needs to be studied.

Of particular interest is the very numerous and frequent occurrence of the caddisfly *Iroboquia dubia* – a species so far regarded as semi-synanthropic and occurring in anthropogenically transformed ecosystems (e.g. in periodical, forest ditches). This would suggest a sort of disturbance in water courses, possibly attributed to a variable hydrological regime and a decrease in the groundwater level and greater flow irregularity. However, this species occurred frequently in the material collected in the years 1960-1962 [10]. Further, more detailed studies are necessary to establish beyond doubt whether the common occurrence of this species in the Białowieża Forest is typical of this ecosystem or whether it indicates hydrological disturbances, both now and in the early 1960s.

The biodiversity indexes, biotic indexes (BMWP, BMWP-PL) and the indexes of naturalness indicate that the quality of the water courses under study is good or very good. The biodiversity indexes and the Pielou index (J') for the water courses under study were high, comparable to other lowland water courses. This may indicate the good condition of the benthos fauna of the water courses under study. The indexes of naturalness indicate that the water quality is good or very good. The effect of the small-water-body element on the fauna of the water courses is well-marked, which is facilitated by the overflow nature of the water courses, numerous logs and trees in the current and the presence of beavers which back up water with their dams. This is also an effect of the nature of the land.

Lower classes of water quality (at certain sites) with simultaneously high biodiversity indexes, high indexes of naturalness and the presence of rare species, such as the caddisflies *Oligostomis reticulata*, *Beraeodes minutus* – may be a consequences of the nature of the water courses: large amounts of detritus and their marshy nature. For further monitoring of the ecological status of water bodies in the Białowieża National Park, it is necessary to establish the reference status of the specific nature of the Forest Rivers. Detritivorous grinders, with a small numbers of filtrators, dominate among macro invertebrates (Figure 1).

Effective monitoring of water bodies (rivers, lakes, etc.) requires intensive work, both with respect to collecting data and good ecological

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Figure 1: Caddisflies in the Białowieża forest.

theory. The former must be done as soon as possible because the natural environment is changing fast.

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