

THE SPECIFIC POVERTY OF *Ephemeroptera* IN THE BROOKS OF THE KRKONOŠE (GIANT MOUNTAINS)

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In this brief communication I wish to point to an interesting phenomenon I encountered in elaborating the materials of water insects collected in the Czech part of the Krkonoše Mountains (northern Bohemia). In July 1954 and in June 1965, as a contribution to the faunistic exploration of the Krkonoše National Park, I collected there 20 samples from various types of brooks, rivulets, and spring trickles. The samples were collected in a conventional way: the larvae and nymphs from submersed stones, logs, or mosses, the imagines by means of an entomological net from the vegetation along the banks or individually from various objects in the vicinity of the brooks. The altitudinal distribution of all localities was between 520 and 1390 m above sea level (The results of this exploration will be published in 1977 in the year-book "Opera Corcontica" edited by the Krkonoše National Park).

When I was determining the collected materials, I was surprised at the conspicuous poverty of the mayfly species. While I found 27 species of stoneflies (*Plecoptera*) and 11 species of caddis-flies (*Trichoptera*), only one species of *Ephemeroptera*, viz. *Ameletus inopinatus* EATON, was present here, at 2 localities with an altitude of 1250–1300 m. At first I thought that this lack of *Ephemeroptera* in my materials was caused by some errors in my collecting methods or by the unfavourable season (when the time of emergence of imagines was already past and the young stages were eggs or larvae only). But when I consulted the relevant literature, I found the same situation. In the books compiled on the fauna of the Krkonoše Mts. (ČERNÝ, 1948, OBENBERGER, 1952, ČERNÝ et DOSKOČIL 1969) only the same species, *Ameletus inopinatus*, is mentioned; the most modern monograph of the Czechoslovak *Ephemeroptera* by LANDA (1969) mentions explicitly only 5 species from the territory of the Krkonoše Mts. (*Ameletus inopinatus*, *Siphonurus lacustris*, *Rhithrogena semicolorata*, *Heptagenia lateralis*, *Ecdyonurus venosus*). Dr. KOWNACKI (according to oral intimation) also found the mayfly fauna of the northern slopes of this mountain range to be very poor.

This poverty is in strong contrast, e.g., with the observations of MÜLLER-LIEBENAU (1973), who in the northern part of the neighbouring Ore Mountains (Erzgebirge, Krušné hory) found 35 species of *Ephemeroptera* (which number, of course, includes also a good many finds from localities situated lower), or of ZELINKA (1953 a, 1953 b), who found in the High Tatra — in spite of the late season — 9 species at 14 localities and in the basin of the River Moravice in the Jeseníky Mts. 23 species at 18 localities. LANDA (1969) mentions from the Šumava Mts. (Böhmerwald) 19 species.

Last July I spent part of my holidays in the Krkonoše Mts. again and used the occasion to verify this phenomenon once more. I looked in vain for the mayfly imagines and nymphs in several brooks and I even inspected the spiders' webs along the brooks and inside the shades of the electric lamps

in the chalet (altitude 750 m above sea level), which functioned as spontaneous light traps and in which every evening very numerous and variable insect remnants were gathered. I found there many representatives of *Diptera*, *Lepidoptera*, *Coleoptera*, *Heteroptera*, and *Trichoptera*, but not a single specimen of *Ephemeroptera*.

It would be premature to try to explain this phenomenon without a detailed analysis of a rich material. In any case, the poverty of mayflies in the explored territory cannot be explained by water pollution. The brooks of the Krkonoše National Park are almost completely protected from any human pollution and belong altogether to the katharobic (xenosaprobic) or beta-oligosaprobic zones, this being documented by the common presence of other organisms belonging to these zones. Natural chemical influences also seem to be eliminated: the water is very soft, with a very low content of salts and a high content of oxygen, and the temperatures are mostly low. The low pH values might be the cause of absence but unfortunately the pH values were not measured. The decimation of mayflies by fish also cannot be taken into consideration, because the fish stocks in the investigated brooks, are, as a rule, very low or non-existent. The specific poverty of mayflies in the Krkonoše Mts. may be caused by zoogeographical reasons, especially by the last ice period, during which the mountain range was covered with ice, so that after its regression the majority of mayflies were not able — owing to their slight ecological plasticity — to reoccupy their former habitats. But this is only a suggestion. It does not explain why other border mountains of Czechoslovakia, which were also more or less covered with ice, harbour much more rich fauna of *Ephemeroptera*.

It is also possible that after more detailed explorations of the Krkonoše Mts. in the future, more species hitherto unknown here will be discovered and the opinion of their specific poverty will prove to be fictional. At present, however, this problem seems to be real and demands to be solved.

SUMMARY

The specific poverty of Ephemeroptera in the brooks of the Krkonoše (Giant Mountains)

The author elaborated two series of bottom fauna collected in summer time of the years 1954 and 1965 in the brooks of the Giant Mountains (NE. Bohemia) at various altitudes. While a relatively rich fauna of stoneflies (*Plecoptera*) and caddisflies (*Trichoptera*) was found in the samples, the *Ephemeroptera* were represented by only one species, viz. *Ameletus inopinatus* EAT. This specific poverty could be perhaps explained by the subjective methodical approach of the collector — but other scientists dealing with the brook fauna of the Giant Mountains met the same phenomenon.

The author does not dare to make any premature conclusions of zoogeographical, ecological, etc. characters, owing to the lack of material. However, he wishes to point to this interesting phenomenon which, maybe, is worthy to be investigated more in detail.

DISCUSSION

U. JACOB: Ihr vorgetragenes Phänomen ist sehr interessant. Auch bei uns in der DDR gibt es Bäche, in denen Ephemeropteren weitgehend fehlen, z.B. im Westerzgebirge und im Vogtland. Könnte einer der Gründe darin bestehen, dass Ephemeropteren dort ungünstige Nahrungsverhältnisse vorfinden? Mir ist aufgefallen, dass in derartigen Bächen nur braune, belagbildende Kieselalgen dominieren, deren Namen ich allerdings nicht kenne.

O. WINKLER: Ich kann die Frage, ob der Nahrungsmangel ein limitierender Faktor für das Vorkommen der Eintagsfliegen ist, nicht eindeutig beantworten, da ich mich mit der qualitativen und

quantitativen Untersuchung der Algenvegetation nicht befasste. Ich erinnere mich nur, dass die Algenbewüchse in den betreffenden Bächen, makroskopisch beobachtet, keinesfalls arm zu sein schienen. Ausserdem befinden sich an ruhigeren Orten der Bäche nicht geringe Mengen von Detritus, der als Nahrungsquelle wenigstens für manche Ephemeropterenarten dienen könnte. Die Anwesenheit von zahlreichen filipalpen Plecopterenlarven, die ebenso Algen- und Detritusfresser sind, scheint auch gegen die Vermutung zu sprechen, dass die spezifische Armut der Ephemeropterenfauna im Riesengebirge durch Nahrungsmangel verursacht werden kann. Ich bin der Ansicht, dass die Ursachen anderswo zu suchen sind.

A. STRENGER: Das Vorkommen von Ephemeropteren Larven ist nicht unbedingt an Algen gebunden, da es bei ihrer Ernährung allein auf die Partikelgrösse ankommt. Sie ernähren sich sowohl von Algen als auch Detritus. Einer der beiden Ernährungsfaktoren kann auch fehlen. WINKLER bestätigt, dass der in Frage stehende Bach sehr reich an Detritus war.

U. HUMPESCH: I want to recall the studies of Dr. SUTCLIFFE about the fauna in the River Duddon (England). He pointed out that there are differences in the number of species of *Ephemeroptera*, *Plecoptera* etc. in the different becks of this river. Dr. SUTCLIFFE connected this difference with that in the inorganic content in the water.

To the remark on algae in rivers: from the studies of Dr. KANN in 9 Austrian rivers we know that the quantity of algae in species and weight is connected with the water chemistry. In rivers with a low calcium and magnesium content we always have a very low content of algae. Because we found that these rivers are also rich in fauna we think that the available food comes not only from the algae.

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