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# ON THE DRIFT IN THE LOUČKA CREEK (CZECHOSLOVAKIA)

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Výtah. V říčce Loučce na Českomoravské Vysočině byl po dobu dvou let sledován drift, jeho kvalitativní a kvantitativní složení a vztah k bentosu a potravě pstruha. Nejvyšší podíl driftujících organismů tvořil zooplankton rybniční oblasti povodí Loučky, zatímco rheobentické organismy driftovaly nejméně.

Směrem po proudu ubývalo hlavně planktonních organismů a přibývalo rheobentontů. Celkový podíl rheobentických organismů v driftu byl větší, než bylo dosud známo (viz např. ELLIOTT). Také nabídka driftujících organismů v potravě pstruhů byla relativně vysoká.

In the years 1965 and 1966 drift samples were taken with the aid of a drift tube and a plankton net (No. 14) on a 44 km long stretch of the Loučka Creek (a right-hand tributary of the river Svratka, Moravia (for details see LIBOSVÁRSKÝ and LELEK 1966) downstream in three localities — Podolí, Blažkov, and Skryje. The sampling method was already described earlier (KUBÍČEK 1966). Each locality was visited thirteen times, the mean amount of filtered water being 100 litres per 1 drift sample. The drift was caught in the torrential stretch of the creek (depth 15 cm) in day time between 9 and 16 hours.

## QUALITATIVE COMPOSITION OF THE DRIFT

In the total number of taxons found in all localities of the Loučka Creek under observation the share of plankton organisms was high (42.5 per cent). The greatest part of plantkon organisms was found in the uppermost reaches — Podolí (50.7 per cent), downstream this share of plankton organisms in the drift was decreasing (Blažkov 39.6 per cent; Skryje 32.3 per cent). This condition is given by the nearly sources and communications of some tributaries of the Loučka with the ponds of the Bohemian-Moravian Highlands.

The share of genuine rheobenthonites present in the drift amounted to 27.6 per cent (Podolí 13.5, Blažkov 5.6, Skryje 8.5 per cent). The rest of carried way organisms (29.9 per cent) consisted of indifferent forms. The number of taxons in the drift was highest in the upper reaches of the creek (transport of pond organisms), while downstream it was lower (Tab. 6).

The composition of the drift changed in the course of the year mainly according to the amount of water flowing through, the water level in the ponds, and according to the development of the benthos population in the creek. Since some tributaries of the Loučka carry also water from smaller village, field, and forest ponds of the Bohemian-Moravian Highlands, the share of washed out

zooplankton in the drift of the Loučka was varying during the period under study (Tab. 2). Longest downstream drifted *Rotatoria*, while euplanktonic forms (e.g. *Daphnia*, *Eudiaptomus*, etc.) were liquidated already in the uppermost stretch of the creek or its tributaries (Tab. 6).

The composition of the other organisms in the drift was not proportional to the benthic organisms in the Loučka. MÜLLER (1953) pointed to this correlation already earlier in the study of the North Swedish rivers and straems.

The bulk of the drift was formed of midge larvae (*Orthocladiinae*) and *Oligochaeta* (*Naididae* and *Tubificidae*) or *Ephemeroptera*. Black fly and caddis fly larvae occurred in the drift only in some cases. On the other hand, *Ephemeroptera* and *Trichoptera* prevailed in the benthos, while a greater presence of midge larvae was limited only to the spring months.

The share of benthic organisms in the drift (P %) calculated according to ELLIOTT (1967, p. 222) was as follows:

Tab. 1

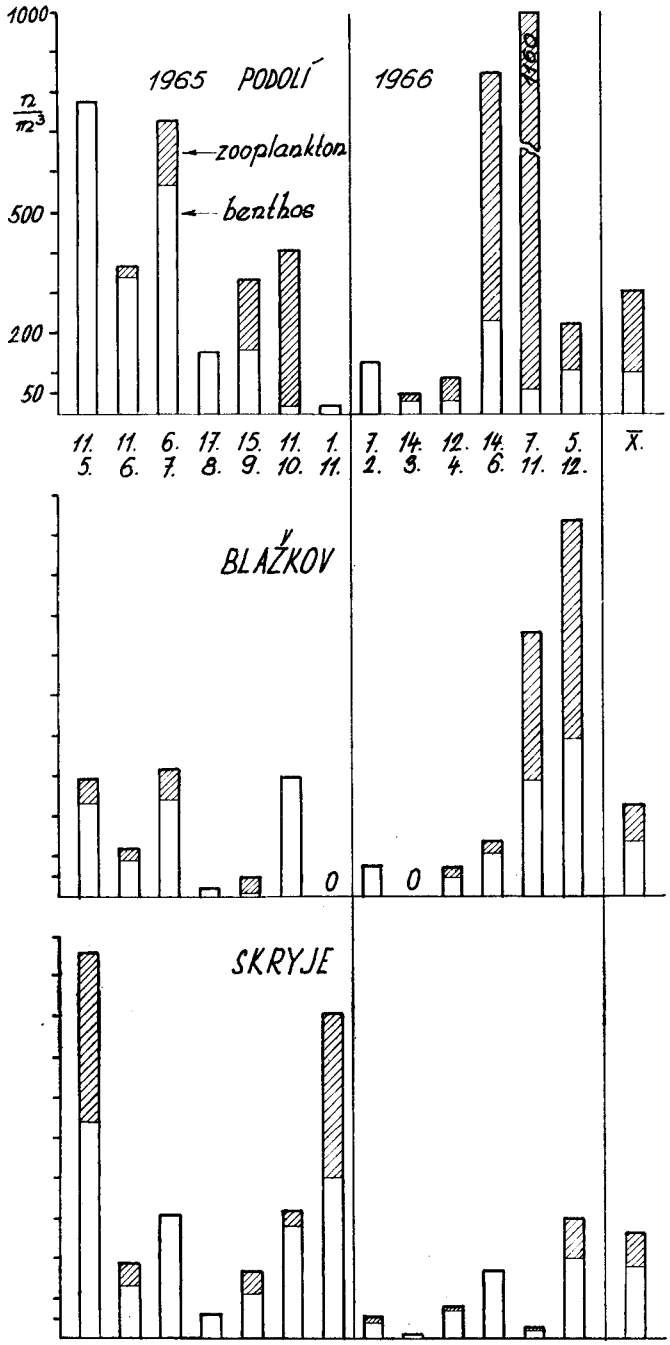
**Percentage share (P) of benthic organisms in the drift of the Loučka Creek**

| Date | 1965 | | | | | |
|---|---|---|---|---|---|---|
| | May 11 | July 5 | Aug. 17 | Sept. 15 | Oct. 11 | Nov. 1 |
| Loc. | | | | | | |
| Podolí | 3.3 | 41.2 | 3.5 | 1.1 | 3 | 0 |
| Blažkov | 4 | 4.2 | 0.7 | 0.3 | 0 | 0 |
| Skryje | 1.5 | 3.2 | 1.8 | 3.5 | 1.7 | 1.4 |
| Date | 1966 | | | | | |
| | March 14 | Apr. 12 | June 14 | Nov. 7 | Dec. 5 | $P\bar{x}$ |
| Loc. | | | | | | |
| Podolí | 0.74 | 0.5 | 2.4 | 0.4 | 1.5 | 2.6 % |
| Blažkov | 0 | 1.3 | 1.1 | 7.2 | 0.5 | 2.4 % |
| Skryje | 0 | 2.4 | 2.1 | 0.1 | 0.1 | 2.2 % |

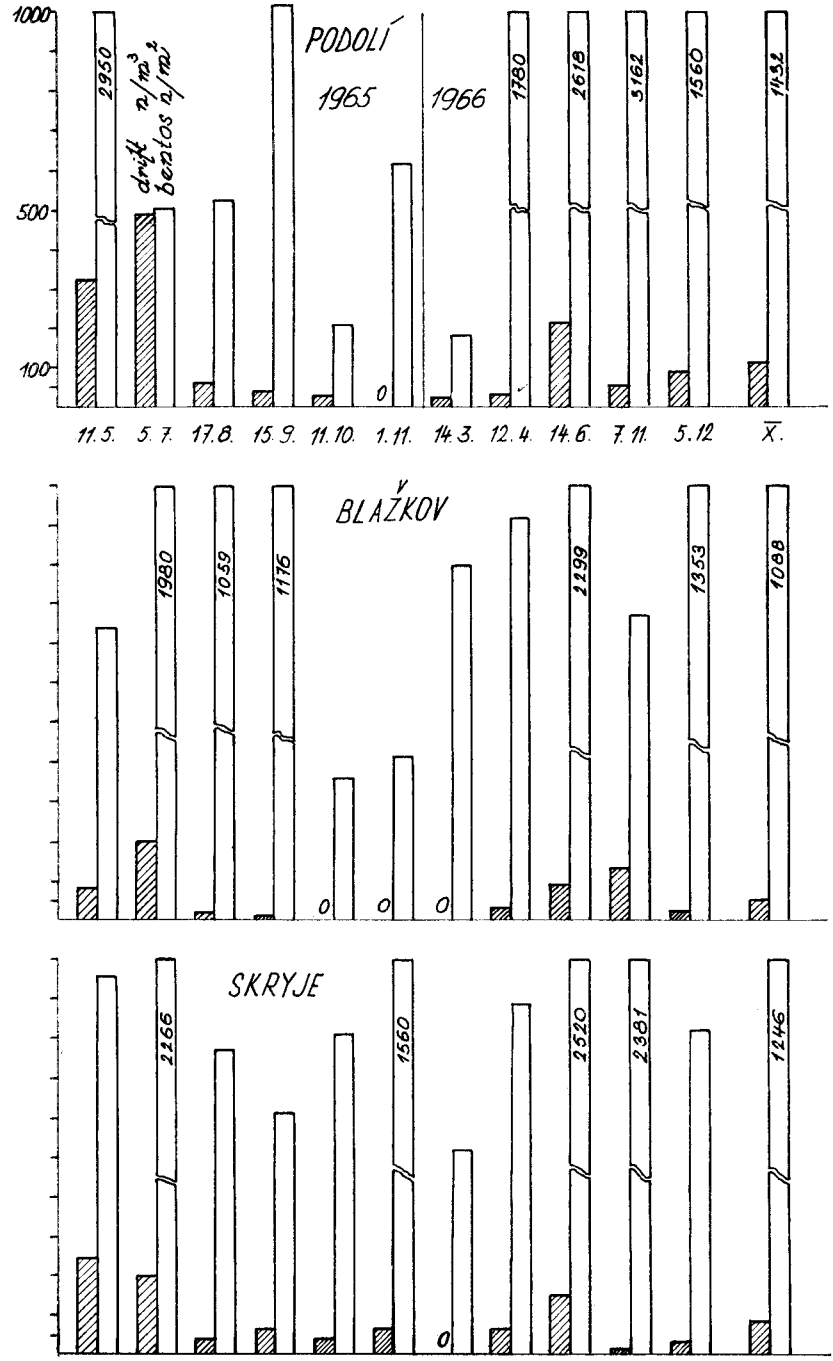
The values found in the Loučka Creek were many times higher than reported, for example, by ELLIOTT (1967) in the Walla Brook, despite the fact that he caught drift also at night, where a certain increase in the amount of carried away organisms occurs. The high share at Podolí, July 5th (41.2 per cent) was temporarily distorted by the higher flow at the time of sampling and the low density of the benthos population (506 members per 1 square metre).

## QUANTITATIVE COMPOSITION OF THE DRIFT

The abundance of members of drifting organisms varied greatly during the period of observation (Tab. 2). The minimum abundance was 10 members per 1 cubic meter, while the maximum abundance made 1220/cu. m. The mean abundance of members in the individual stretches was: Podolí 413/cu. m, Blažkov




Tab. 2. Abundance of drift in the Loučka Creek




Tab. 3. Abundance of benthic organisms of the drift and the benthos in the Loučka Creek

231.5/cu. m, Skryje 266/cu. m. The abundance of zooplankton members in the drift decreased downstream as follows:

| | Podolí | Blažkov | Skryje |
|---|---|---|---|
| n/100 lit | | | |
| Zooplankton | 21.00 | 9.15 | 8.60 |
| Benthos | 20.30 | 14.00 | 18.00 |

Upstream, also *Oligochaeta* and certain *Diptera* (*Chironomidae*, *Simuliidae*) decreased in number. The course of these changes could also in the case of the Loučka be associated with the activities of "traps" of caddis fly larvae of the genus *Hydropsyche* (see, e.g. KUBÍČEK 1968a, b), whose share in the total abundance of benthos downstream was growing (Podolí 1.1, Blažkov 10.6, Skryje 14.2 per cent.)

The quantitative composition of the drift benthos (excl. *Protozoa*, *Nematoda*) distinguished itself by the preponderance of midget larvae and *Oligochaeta* in the uppermost reaches of the Loučka (Podolí), while downstream by the increasing number of mayfly larvae, especially of the genera *Baëtis* and *Rhitrogena* in the localities of Blažkov and Skryje. The larger occurrence of larvae of *Diptera* individuals (Tab. 4) at Skryje was mainly due to the increased portion of midget larvae.

Tab. 4

**Mean abundance (n/cu.m) of drifting benthic organisms in the Loučka Creek**

| Loc. | Podolí | Blažkov | Skryje |
|---|---|---|---|
| Oligochaeta | 56 | 11 | 16 |
| Ephemeroptera | 12 | 14 | 22 |
| Diptera | 64 | 26 | 38 |
| Varia (incl. Trichoptera) | 5 | 5 | 4 |
| Total | 137 | 56 | 80 |

In the groups of organisms listed in Tab. 4 as Varia were also included *Mollusca* (*Ancylus*), *Hydracarina*, *Plecoptera*, *Heteroptera*, and *Coleoptera*, whose occurrence in the drift was sporadic and low in the number of individuals (max. 2 in 100 litres).

## THE SHARE OF THE DRIFT IN THE FOOD OF TROUT

Out of a total number of 392 trout, whose food was studied by TUŠA (1967), only 3 were shorter than 100 mm. The bulk of the investigated trout belonged into the size group of 150 to 200 mm.

In the digestive organs of the trout no representatives of zooplankton were found. Neither were other drift organisms ascertained in the food (e.g. *Testacea*, *Nematoda*).

The benthic drift organisms belonged, for the most part, to the juvenile

stage, reaching a size of up to 5 mm. Only in some cases (rush of water, draining of ponds, pupation, taking wing of adult insects, and the like) bigger members (larvae, puppae) were also caught in the drift.

With regard to these factors we tried to calculate the possible share (Pf %) of drift in the food of trout with the aid of the formula:

$$Pf = \frac{c \,.\, 100}{A}$$

which is analogous to ELLIOTT's AF factor calculated in values of the biomass (ELLIOTT 1967b, p. 68).

In the formula the used symbols stand for:

A = number of all organisms in the drift (n/cu. m)
c = A — d
c = supply of drift organisms taken up in the given time with the food (n/cu. m)
d = number of drift organisms not taken up in the given time with the food (n/cu. m).

According to this formula, the Pf value for the individual reaches of the Loučka Creek was as follows:

Tab. 5

**Possible share of drift (Pf in %) in the food of trout in the Loučka Creek**

| Date | May 11 | June 11 | July 5 | Aug. 17 | Sept. 15 | Oct. 11 | Nov. 1 |
|---|---|---|---|---|---|---|---|
| | 1965 | | | | | | |
| Loc. | | | | | | | |
| Podolí | 41 | 86.4 | 70 | 37 | 11.4 | 4.7 | 0 |
| Blažkov | 30.6 | 50 | 62.5 | 100 | 20 | 0 | 0 |
| Skryje | 25 | 68.4 | 64.5 | 66.6 | 35.2 | 12.5 | 7.4 |

| Date | Feb. 7 | March 14 | April 12 | June 14 | Nov. 7 | Dec. 5 | $\bar{x}$ | $\bar{x}_1$ |
|---|---|---|---|---|---|---|---|---|
| | 1966 | | | | | | | |
| Loc. | | | | | | | | |
| Podolí | 92.3 | 40 | 33.3 | 24.7 | 4 | 39.1 | 33.1 | 67.2 |
| Blažkov | 100 | 0 | 37.5 | 64.4 | 19.6 | 21.2 | 24 | 38.1 |
| Skryje | 80 | 0 | 75 | 88.2 | 33.3 | 10 | 29.7 | 45.6 |

From Tab. 5 it is to be seen that the majority of drift organisms might serve as food of trout at Podolí ($\bar{x}$ = over 33 per cent), least at Blažkov (24 per cent).

This share of drift in the food of trout is not proportional to the total number of members in the drift, but depends on the time of day and the season of the year. The share of drift in the food of trout may be highest at night, when the amount of drift increases, while during the day it is lower. In the time of taking wing of imagines of water insects, the uptake of "air food" increases in day time, while the share of drift decreases at the same time (derived from TUŠA's results 1967). Therefore, the values of the share of drift in the food of trout

Tab. 6

**Taxons of drift in the Loučka Creek in the years 1965—1966**

| | Podolí | Loc. Blažkov | Skryje |
|---|---|---|---|
| Protozoa | | | |
| Testacea (Arcella, Difflugia, Centropyxis) | + | + | + |
| Peritricha (Vorticellidae) | | + | + |
| Coelenterata | | | |
| Hydroidea (Hydra sp.) | | + | |
| Vermes | | | |
| Nematoda (Anguillulata) | + | + | + |
| Rotatoria | | | |
| Asplanchna priodonta Gosse | + | | + |
| Brachionus angularis Gosse | + | + | |
| Brachionus calyciflorus Pallas | | | + |
| Brachionus leydigii rotundatus Rousselet | | | + |
| Brachionus leydigii quadratus Rousselet | + | | |
| Brachionus quadridentatus Hermann | + | | |
| Brachionus rubens Ehrenberg | | | + |
| Euchlanis dilatata Ehrenberg | + | + | + |
| Euchlanis cf. meneta Myers | | + | |
| Euchlanis sp. | + | | |
| Keratella cochlearis cochlearis (Gosse) | + | | + |
| Keratella quadrata dispersa Carlin | | | + |
| Keratella quadrata quadrata Edmonson et Hutchinson | + | + | + |
| Lecane lunaris (Ehrenberg) | | + | |
| Mytilina ventralis ventralis (Ehrenberg) | | | + |
| Polyarthra dilichoptera Idelson | + | + | + |
| Synchaeta sp. | + | | + |
| Rotatoria g. sp. div. | + | + | + |
| Oligochaeta (Naididae, Tubificidae) | + | + | + |
| Mollusca | | | |
| Ancylus fluviatilis (Müller) | | + | |
| Arthropoda | | | |
| Acarina | | | + |
| Hydrozetes lacustris (Michael) | + | + | |
| Hydracarina g. sp. | | | |
| Cladocera | + | + | |
| Alona quadrangularis (O. F. Müller) | + | | |
| Alona rectangula Sars | + | + | + |
| Bosmina longirostris (O. F. Müller) | + | | |
| Daphnia hyalina Leydig | + | + | + |
| Chydorus sphaericus (O. F. Müller) | | | + |
| Peracantha truncata (O. F. Müller) | + | + | |
| Rhynchotalona rostrata Koch | | | |
| Ostracoda | | | + |
| Candona sp. juv. | + | | |
| Ostracoda g. sp. juv. | | | |
| Copepoda | + | + | |
| Cyclops strenuus Fischer | + | | |
| Eucyclops serrulatus (Fischer) | + | | |
| Eudiaptomus gracilis (Sars) | + | + | + |
| Harpacticidae | + | | |
| Paracyclops fimbriatus (Fischer) | + | + | + |
| nauplii | + | + | + |
| copepodites | | | |

| | Podolí | Loc. Blažkov | Skryje |
|---|---|---|---|
| Ephemeroptera (larvae juv.) | | | |
| Baëtis sp. | + | + | + |
| Paraleptophlebia sp. | | + | + |
| Rhitrogena semicolorata (CURTIS) | + | | + |
| Plecoptera (larvae juv.) | | | |
| Nemoura sp. | + | | + |
| Perla sp. | | + | |
| Heteroptera (juv.) | | | |
| Aphelochirus aestivalis (FABRICIUS) | | | + |
| Coleoptera (imagines) | | | |
| Elmis latreillei BED. | | | + |
| Trichoptera (Limnephilidae larvae) | + | + | |
| Diptera (larvae et puppae) | | | |
| Ablabesmyia sp. | + | | |
| Brillia gr. modesta MG. | + | | |
| Cricotopus sp. | + | | + |
| Diamesariae | + | | |
| Diplocladius cultriger KIEFF. | + | | |
| Eukiefferiella brevicalcar KIEFF. | + | | + |
| Eukiefferiella sp. | + | + | + |
| Limnophyes gr. hydrophilus GTGH. | | + | |
| Orthocladius sp. | + | | |
| Polypedilum sp. | | | + |
| Thienemaniella flaviforceps KIEFF. | | | + |
| Chironomidae div. | + | + | + |
| Ceratopogonidae | | | + |
| Simuliidae | + | | + |
| Atherix sp. | + | | |
| Total | 44 | 29 | 38 |

differ with the various authors. While ELLIOTT (1967b) reports a mean monthly share of drift in the food of trout about 9 per cent, MÜLLER (1953) found more than 80 per cent. On the basis of TUŠA's diurnal observations in May and September 1966, the share of drift in the food of trout makes 29 to 70 per cent for the Loučka Creek in the reaches of Skryje, the remainder being made up primarily of air food (imagines fo mayflies and caddis flies, terrestrial insects). Since most authors studying organic drift use nets of a bigger mesh size than was employed in the case of the Loučka Creek, or catch in plankton-enriched streams, I calculated the Pf value with the aid of the same formula and values deducting the number of zooplankton members, *Protozoa* and *Nemathoda*. The obtained mean Pf values approached in the individual localities of the Loučka Creek still more markedly the results of MÜLLER and TUŠA (see $\bar{x}_1$ in Tab. 5).

## SUMMARY

The drift in the Loučka Creek is composed of planktonic (42.5 per cent), rheobenthic (27.6 per cent), and indifferent organisms (29.9 per cent).

The composition of the drift changes in the course of the year according to the hydrological conditions and to the number of benthos populations. The

number of taxons in the drift decreases downstream. The number of taxons and the abundance of members in the drift are not proportional to the composition of the benthos of the Loučka Creek. The mean share of benthic organisms in the drift is relatively high downstream and varies little (Podolí 2.6, Blažkov 2.4, Skryje 2.2 per cent).

The abundance of drifting organisms varied very much (min. 10, max. 1220 members per 1 cu. m). On the average, 413 (Podolí), 231.5 (Blažkov), and 266 (Skryje) members went to 1 cu.m in the individual reaches.

The highest number of benthic organisms in the drift as food of trout was yielded by the Podolí stretch (67.2 per cent), this share being smaller downstream (Blažkov 38.1, Skryje 45.6 per cent).

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