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Methodological Experience Gained from a Zoocoenological Examination of Aquatic Macrophyte Stands

By

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As compared with their significance, there are uncommonly few data at disposal about the zoological conditions of the macrophyte stands of the stagnant waters. One of the reasons for this is connected with the difficulties of quantitative collection.

Among the works dealing with the zoological conditions of macrovegetation Müller–Liebenau's (1956) study stands eminent. From it detailed information on the fauna of the *Potamogeton* fields of the East Holstein lakes can be obtained. Also the publications of Berg (1949, 1960), Bíró–Gulyás (1974), Entz (1974), Macan (1949), Korinkova (1971), Ponyi (1956), Smyly (1952) and Varga (1941) deserve attention.

A common characteristic of these works is that they publish data on the fauna of the macrovegetation areas with different taxonomic exactness and, within the possibilities ensured by the generally applied, so-called quasi-quantitative collecting method, they also indicate relative quantitative data.

It appeared, above all in the respect of the invertebrate macrofauna, that – apart from exceptions – rather identity than diversity was characteristic of the composition as to species of the various pondweed fields. The zoological material collected from different lakes is surprisingly similar in taxonomic respect. On the other hand, from the data obtained by estimation and by various quantitative methods it appeared that in quantitative respect the differences were remarkable. Yet for determining the quantitative conditions, for drawing conclusions on the material- and energy exchange a collecting method is needed, which supplies with results to be correlated with units of area, phytomass or plant surface.

On the quantitative collecting methods

A common feature of the apparatus serviceable for quantitative collection: they enclose a volume of water belonging to a definite area and, upon cut-

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ting off the stalks of the rooted plants and closing the apparatus, they raise the whole material to the surface ("Macan sampler", "Korinková sampler", etc. in: EDMONDSON and WINDBERG, 1971).

However, the execution of the theoretically simple method raises numerous technical problems, among them first of all those of the optimum size of the area, of cutting the plants and of closing the apparatus. For comparative examinations covering several animal groups the prism of a base of 50×50 cm. proved best. Although theoretically the application of apparatus of more extensive, e. g. of 1×1 m. bases would be justified by the so-called „edge effect" further, in case of animals of infrequent occurrence, by the extension of the minimum area, the exact selection of material collected from such a wide surface means an almost unsolvable problem.

For cutting the stalks of the plants either the apparatus working similarly to EKMAN's sampler or various cutting devices controlled from boats are mentioned in the literature (EDMONDSON and WINBERG, 1971). On account of the weakness of the cutting mechanism these methods do not make possible reliable successive sampling in reeds or dense pondweed stands.

Far more reliable than these is the diving method to be applied with good success in reed-, rush- and alga stands alike. When making use of it, the stalks of the plants are cut on the bordering surface between mud and water, reaching in from outside with a lawn-cutter made of steel. By carefully carrying out the collection, the macrofauna of the vegetation can be separated from the one of the benthos.

Out of the methods suggested in the literature for closing the apparatus the procedure proved best, in which, after having been pulled together with a string, the apparatus was tied up from the outside (KANGAS, 1972). From the above it is clear that the cutting of the plant stalks and the closing of the apparatus can be managed only with the help of a diver. The diving gear suitable for realizing the work of collection in practice should be chosen depending on the temperature of the water. In summer and in case of shallower waters two men can pluck out $20-25$ samples in a day. In deeper water or under adverse climatic conditions also oxygen tanks and diving suits are needed.

A special type of macrovegetation is the carpet of the algae *Vaucheria dichotoma*, covering wide areas of the sediments in Lake Velence. For its zoological examination the various kinds of sediment samplers cannot be applied. On the other hand, the diving method adapted for the special conditions seems reliable. The applied apparatus is a metal cube of a 15×15 cm. base open at the bottom with sharp edges, which is pressed down through the alga carpet to the surface of the sediments. Having taken out the surrounding mass of plants, under the apparatus, exactly on the bordering surface between the sediments and alga carpet, the author separated the alga grass from the sediment surface with a sharp metal plate.

In the further parts of the paper the results of elaboration of samples taken from stands occurring with major frequency under Hungarian conditions.

Some of the results attained by the diving method

1. *Phragmites communis*

Lake Velence, 15th June, 1974; depth of water 80 cm; number of samplings: 4. Average air-dry weight of plants: 2.825.6 g per m².

Taxa	A	B
Mollusca	80	0.0020
Ephemeroptera	68	0.0060
Odonata	20	0.0228
Trichoptera	80	0.0292
Coleoptera	80	0.1280
Ceratopogonidae	40	0.0080
Dixidae	240	0 3960
Chironomidae	7.200	0.1800
Total	7.808	0.7720

A = avg. No. per sq. m.; B = avg. D wt. per sq. m.

2. *Utricularia vulgaris* (ANDRIKOVICS, 1975 *a)*

Lake Velence, 3rd August, 1972; depth of water 80 cm; number of samplings: 3. Average air-dry weight of plants: 158.4 g per m².

Taxa	A	B
Hirudinoidea	4	0.0022
Mollusca	308	0.0148
Isopoda	4	0.0058
Ephemeroptera	156	0.1052
Odonata	4	0.0112
Trichoptera	4	0.0036
Heteroptera	12	0.0007
Chaoboridae	4	0.0048
Chironomidae	3.448	0.8448
Hydracarina	16	0.0042
Total	3.960	0.9973

3. *Vaucheria dichotoma* (ANDRIKOVICS, 1975 *a)*

Lake Velence, 3rd August 1972: depth of water 140 cm; number of samplings: 4. Average air-dry weight of plants: 165.5 g per m².

Taxa	A	B
Mollusca	3.774	1.2520
Isopoda	355	0.6127
Ephemeroptera	44	0.1376
Trichoptera	44	0.3631
Chironomidae	1.242	1.6161
Total	5.459	3.9815

4. *Potamogeton pectinatus*

Lake Velence, 16th December, 1973; depth of water 120 cm; 15 cm thick ice cover; number of samplings: 4. Average air-dry weight of plants: 775 g per m^2.

Taxa	A	B
Mollusca	240	0.1280
Isopoda	120	0.1000
Ephemeroptera	192	0.0388
Odonata	8	0.0892
Trichoptera	152	0.1316
Lepidoptera	200	0.1400
Heteroptera	120	0.0160
Chaoboridae	120	0.0600
Chironomidae	1.240	0.5480
Hydracarina	40	0.0080
Total	2.432	1.2596

5. *Ceratophyllum submersum* (ANDRIKOVICS, 1975 *b)*

Középső-tó (Central Lake), Nyékládháza (NE Hungary), 10th August, 1972; depth of water 5–6 m; number of samplings: 13. Average air-dry weight of plants: 36 g per m^2.

Taxa	A	B
Ephemeroptera	42	0.0028
Trichoptera	49	0.0098
Heteroptera	7	0.0007
Chironomidae	56	0.0035
Total	154	0.0168

The number and weight of the animals were determined from a sample fixed in 4% formalin solution, upon drying at 105° C. In the weighting data of the groups Mollusca and Trichoptera also the shells of the animals are to be included.

From the obtained examination data is appears that much larger numbers of animals can be caught by the diving method than this is possible by the quasi-quantitative methods. Another advantage of the former method is that sampling done with the help of a diver and simultaneously controlled makes possible much simpler and much prompter work than the quantitative samplers mentioned in the literature.

Eventually, I mention that, contrarily to KORINKOVÁ's (1971) opinion, the indication of the number of animals per m^2 of mud surface and/or the dry weight of the animals per m^2 of mud surface seem to be the most expendient methods. Naturally, for an exact valuation of the results also the dry weight of the plants per 1 m^2 and the depth of the water should be given.

Owing to the difference between the geometrical and "active zoological surfaces" it does not seem serviceable to indicate the quantitative data of the

animals referred to plant surface. The "active zoological surface" depends, namely, among others on the morphological characteristics of the plant and on its being covered incidentally with filamentous algae.

ZUSAMMENFASSUNG

Methodologische Erfahrungen zoocönologischer Untersuchungen von aquatilen Makrophyta-Beständen

Der Verfasser beschreibt seine Erfahrungen bezüglich der quantitativen Sammelmethoden der Makrofauna litteraler Fundstätten.

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