

**OCCURRENCE OF *PLUMATELLA CASMIANA* OKA (BRYOZOA)
IN LAKE BALATON**

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Bryozoans of the fresh-waters in Hungary were investigated by J. VÁNGEL and a number of papers was published concerning the occurrence of this group in Lake Balaton. (VÁNGEL 1893, 1894, 1894a, 1894b, 1897, 1897a, 1897b). In the "Fauna Regni Hungariae" published for the celebration of the 1000 th anniversary of our country he enumerates the bryozoans known in our fresh-waters (VÁNGEL 1897b). More recently a work concerning bryozoans appeared in the publication: SZÉKESSY: "Fauna Hungariae" (SEBESTYÉN 1959). This paper takes into account the data of VÁNGEL, the material of the Zoological Department of the Museum of Natural Sciences as well as those found in the Zoological Institutes of the Universities and Teacher Training Colleges (Pedagógiai Főiskola), completed by data in the available literature and some recent occurrences. Unfortunately nobody deals with this interesting group thoroughly in our country since VÁNGEL (1864-1918). Bryozoans are not rare in our waters. It would be worth while to pay more attention to this small group of animals in the course of limnobiological researches.

What is said about the knowledge of the occurrence of bryozoans in our country goes for the situation in Lake Balaton too. This group, as is the case with the microfauna in general, — with exception of Rotifera and Gastrotricha — was not regularly investigated since the Balaton-survey by LÓCZY (VÁNGEL 1897, 1897a). We possess only a mosaic-like picture of the occurrence of bryozoans in the widely extended lake having various habitats. There are substratum and food everywhere at their disposal but for example in demand or toleration of watermovement, of light the species differ from one another. That is true probably in the case of other environmental factors too.

The surface of any submerged objects, of animals or plants etc. will be occupied by various organisms in Lake Balaton too. In many sections of the shore one finds on the stones no other animals perceptible with the naked eye than the delicate branches of *Fredericella sultana*.

The direct role of bryozoans in the circulation of substances in waters is not important, although animals while browsing and grazing upon the coating may surely consume the polypides too besides those forms that find shelter in the network of tubes. Out of injured colonies of certain species not to be found in Hungary (*Lophopodella carteri* HYATT, *Pectinatella gelatinosa*) materials toxic for fishes may be issued into the water (ROGICK 1959, 498).

Massy colonies may develop in hidden parts of artificial water-bodies on account of their food-habit which is microphagy. This occurrence is closely connected with the manner of their spreading, with their sessile mode of life and with their insignificant demand for light.

The study of this group should be a part of the research of inland waters, albeit most of the Bryozoa live in the ocean (± 3500 species) and there are only few species in fresh water (about 40). (PENNAK 256.) The majority of some of the fresh-water forms (Phylactolaemata) has conserved in their bodies ancient traits not found in recent maritime forms (e.g. epistom).

In connection with this fact let us quote J. WALTER's words used by TWITCHELL in his work as motto, discussing the relationship between the "pseudo-Bryozoa" (Bryozoa entoprocta) and the "true-Bryozoa" (Bryozoa ectoprocta): "Man möchte also glauben, dass einfache Stammformen zwei wichtige Eigenschaften in sich vereinigen, nämlich die Fähigkeit, zahlreiche verschiedenartige Zweiggruppen zu bilden und doch den grösseren Teil ihrer Nachkommen zu überleben" (TWITCHELL 1934, 629).

One may regard the presence of statoblasts on the Phylactolaemata Bryozoa as an accomodation to the conditions in fresh-water. This "dormant-bud"-like growths enclosed in a chitinous shell are very resistant against freezing and desiccation. They provide hereby for the survival of the species even under unfavourable conditions the organisms of the inland waters are exposed to especially in the litoral zone, because of the fluctuation of the water level. At the same time they render the spreading and expanding of the species also possible (waterfowl, wind, etc.). The sessile mode of life in itself as well as the latent state in form of the statoblasts promotes the expansion of the species.

Amongst the European "modern emigrants" of present time THIENEMANN enumerates the *Pectinatella magnifica* LEIDY too which penetrated — probably by the intermediation of water conveyances — into European waters also. Nearest to our country it occurs in the Moldavia near Prague (THIENEMANN 1950, 733). This expansion is due very likely to the sessile mode of life.

Other organisms may be introduced by waterplants. The sessile *Cupelopagis* (*Apsilus*) *vorax* LEIDY, a Rotifer being the only representative of the genus so far (EDMONDSON 1958, 448) was introduced probably with *Elodea canadensis* RICH. (*Anacharis canadensis* MICHX.) into European waters (BREHM 1930, 100, 107). Other animals carried by water plants from the West are also established in our waters (*Physa acuta* DRAP., *Dugesia tigrina* (GERARD)).

Elodea canadensis introduced into Europe in the seventies spread in some of our waters rapidly. In Lake Balaton it grows only in limited areas (Balatonkeresztur, Balatonmária, Fenékpusztá). (SEBESTYÉN 1948.) At some places it forms almost monoton stands, in other places in midst of various water plants it forms bright green patches. Thus for instance off Keszthely in shallow water in the vicinity of the strandbridge and at Fenékpusztá on the South corner of the mouth of the river Zala. At Keszthely *Elodea* mingles with a *Ranunculus* sp. where these plants are interlaced by thin threads of *Cladophora*.

While making a survey of the biological conditions of the Bay of Keszthely the author took the opportunity — as she always does when there is a possibility — to search for the Rotifer *Cupelopagis* on *Elodea*. The efforts

were, — as was always the case so far — in the waters of Keszthely also in vain (1960. 27th August, 8th September).

Amongst the samples collected in the *Elodea*-patches off Keszthely young molluscs (*Limnaea* sp., *Acroloxus lacustris*, *Dreissena*), larvae of Chironomidae, *Corophium*, some *Fredericella sultana* and one Chydorid cladoceran etc. were found. In the August samples there occurred some young free swimming one-polyped *Plumatella* individuals carrying yet the empty shells of the statoblast. Quite a few of such young *Plumatella* were noticed and one might consider their occurrence for a seasonal phenomenon. It is known that on certain *Plumatella* species the statoblast developed in this year "germinates" in the same year. The young individuals of *Plumatella* from Keszthely may have been also of a second generation.

In the September samples there were young colonies already settled on the *Elodea* leaves and if the base of the colony was situated on the top of the leaf, the tubes creéped upon the stem. Branches of colonies starting from the base of the leaf outgrowing the substrate supported each other. (*Fig. 1.*) The two parts of the shell of the statoblast remained on some colonies showing thus their origin. (*Fig. 2.*) Here and there only the empty shells were left on the leaves. The peculiar structure of these statoblasts differing from those of other *Plumatella* species led to the recognition that the *Plumatella* from Keszthely belongs to the species described in 1907 from Japan by OKA under the name of *Plumatella casmiana* (OKA 1907).

The habitus of colonies of *Plumatella casmiana* from Keszthely tallies in every respect with those of the American individuals described by ROGICK (ROGICK 1941, 1943, 1959). The transparent tubes attached to the substrate, the free ends of the branches rise somewhat upward and are paler than the older yellowish ones, at the base of the colony. The keel is quite well marked. (*Fig. 2.*) The boundary line in the tubes pertaining to the individuals are visible.

The lophophor is horseshoe-shaped, the number of tentacles was found about 30—40.

The empty statoblasts that remained on the newly hatched free swimming individuals carrying one polypid furthermore those remaining at the base of young and already attached colonies are different — as mentioned previously — from the floatoblasts of other *Plumatella* species in this respect that the annulus is equally broad all around and covers in its full extent the rim of the shell of the statoblast. (*Fig. 3.*)

The drawing of ROGICK gives a true picture of the position of the annulus. (*Fig. 4.*)

An other particular feature of this peculiar statoblast is that it seems delicately built: the wall of the case is thin and pale, the reticulation of the annulus is finer than that of the annuli known on other species of *Plumatella*. Such statoblasts were reported from this species only so far. In addition to this on *Plumatella casmiana* there is also an other floatoblast. Its structure is more robust, the color is rusty brown; both sides are equally flattened. The annulus is in the direction of the longitudinal axis broader than in the direction of the transversal one and covers the capsule at the dorsal side more than on the ventral side, whereby a greater part of the center of the capsule remains free. On the whole it resembles the ordinary floatoblasts known of the other members of the *Plumatella* genus. (*Figs. 5—7.*)

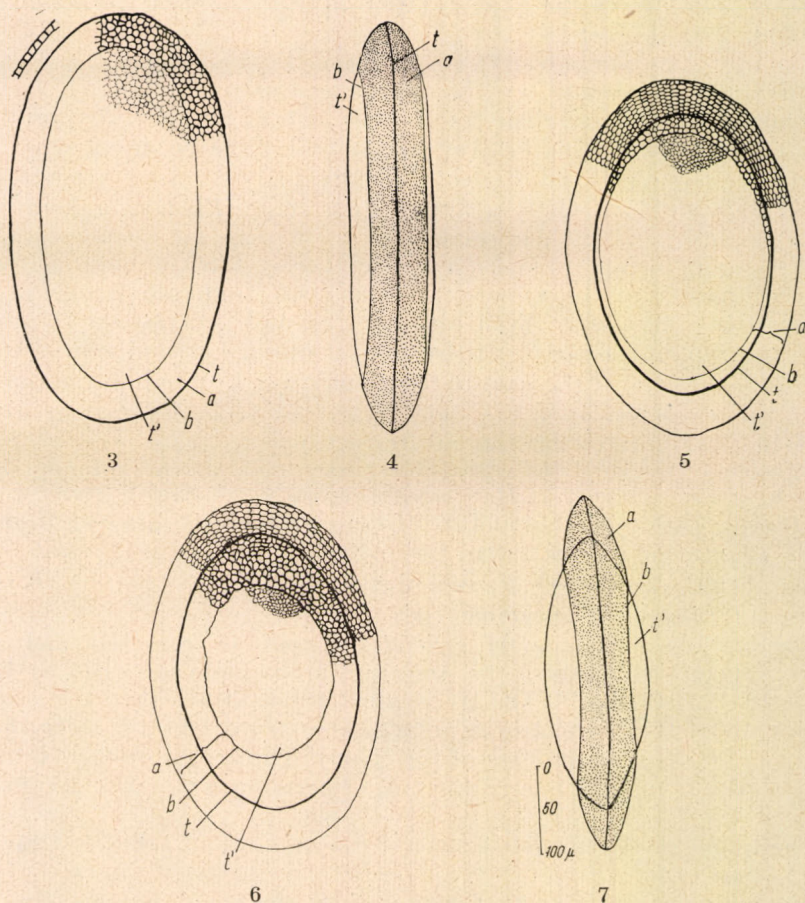


Fig. 3-7 *Plumatella casmiana* floatblasts: 3 = thin walled floatblast, on face, on the left detail showing the thickness of the annulus;

4 = the same, side view, modified after ROGICK

5 = floatblast of the *Plumatella* (ordinary) type, ventral face;

6 = the same, dorsal face;

7 = the same, side view, modified after ROGICK. The reticulation is but partly pictured. (Figs 3, 5, 6.)

a = annulus

b = border of annulus on the capsule

t = border of the capsule

t' = part of the capsule uncovered by the annulus

3-7. ábra. *Plumatella casmiana* flóttoblastok:

3 = vékonyfalú flóttoblast, szemből;

4 = ua. oldalnézetben (ROGICK után, módosítva);

5 = közönséges (*Plumatella* típusú) flóttoblast, ventrális nézet;

6 = ua. dorsális nézet;

7 = ua. oldalnézet (ROGICK után, módosítva).

A retikuláció csak részben van ábrázolva (3, 5, 6. ábra)

a = annulus

b = annulus határa a tokon

t = tok határa

t' = a toknak az annulustól nem fedett része

On the samples from Keszthely one can also observe both kinds of floatoblasts, different in the length of the longitudinal and transversal axes, further in the relation of these two to each other, in color and structure (which is the relation of the annulus to the capsule), floatoblasts were found in the same tube next to each other. (Vide ROGICK 1943, *Fig. 4.*)

The most characteristic feature of *Plumatella casmiana* is that there are two kinds of floatoblasts besides the sessoblast. ROGICK — emphasizing this — calls “floatoblast of the ordinary type” or “capsulated floatoblast” that type which are similar to the floatoblast of other species of *Plumatella* while the type observed so far on *Plumatella casmiana* only is called by her „thin walled floatoblast”. This phrases expresses indeed truly the difference between the two floatoblasts.

Measurements of floatoblast, Keszthely exemplars

Type	Length μ	Breadth μ	Ratio of the two values	Mean value
Ordinary	360—400	215—265	(1,50—1,63) : 1	1,62 : 1
Thin walled	375—400	170—210	(1,78—2,23) : 1	2,09 : 1

Sessoblasts were not yet found by the author so far. For the sake of completeness ROGICK's drawing is used in *Fig. 8.*

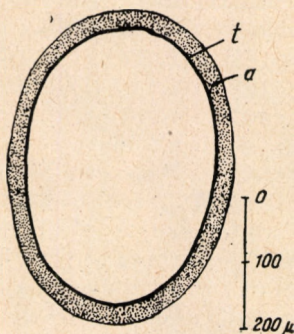


Fig. 8 Sessoblast, on face. Modified after ROGICK.

8. ábra. *Plumatella casmiana* sessoblast szemből (ROGICK után, módosítva)

ROGICK has observed in June ciliated larvae carrying two polyps.

It is not known what becomes the colonies of *Plumatella* developed in late summer.*

* On 3rd March 1961 after an exceptionally mild winter *Elodea* were not found on the collecting place at Keszthely, although in the close neighbourhood in quite a sheltered place a few plants had probably overwintered (temperature of water 6 C°). At the same day a fine bright green colony of *Elodea* stood in the millditch of Diás (N off Keszthely) (watertemperature 12 C°). The winter temperature of the water of small brooks in the vicinity emptying into Lake Balaton is usually 6 C° (B. ENTZ verbal comm.). However no *Plumatella* were found on *Elodea*.

Besides Japan — from where it was described by OKA — *Plumatella casmiana* has been recorded from the U.S. America (Lake Erie; Tippecanoe-river, Ind. USA), from Java and the SSSR (PENNAK 1953, ROGICK 1941, 1959; ROGICK and VAN DER SCHALIE 1950).

According to our present knowledge the occurrence of the Bryozoa *Plumatella casmiana* OKA seems to be very sporadic. The American hydrozoologist PENNAK made a remark that its occurrence is „puzzling” (PENNAK 1953, 268). Considering its occurrence in Lake Balaton this remark seems even more appropriate. We have no reason to connect its occurrence in Lake Balaton with the introduction by means of *Elodea*, albeit this occurrence does not contradict such possibility.

The elucidation of the question — in relation to our country — might be promoted if one would search through the patchy growth of *Elodea* in Lake Balaton as well as in other waters in Hungary, not omitting other submerse macrovegetation too, above all those in Lake Balaton.

In the taxologic determination within the genus *Plumatella* (species, variation, form) morphology of the colony and tubes, number of tentacles and especially, so to say in a decisive manner, the statoblasts (— above all measurement of floatoblasts, relation of measurements to each other, position of the annulus to the capsule —) have to be considered.

The morphologic features of the colonies are influenced by environmental factors too. The situation is today that the opinion of different authors, — except for some species — is not uniform as regards the question whether a certain form has to be classified as a species or merely as some category of lower order. This is the case mainly for *Plumatella repens* (L.) and *Plumatella emarginata* ALLMANN. *Plumatella casmiana* OKA is, according to LOPPENS identical with *Plumatella repens* (L.) (LOPPENS 1908—1909, 159), and according to the Japanese scholar TORIUMI (TORIUMI 1942) it is a variation of *Plumatella repens* (var. *casmiana*). According to American authors TORIUMI's opinion could be accepted if thin-walled floatoblast were found on other varieties of *Plumatella repens* too (ROGICK — VAN DER SCHALIE 1950, 142). The place of *Plumatella casmiana* OKA in the system is at all events beside the *Plumatella repens* (L.) by reason of resemblance of their habitus.

The occurrence of *Plumatella casmiana* OKA in Lake Balaton off Kesztely, represented so far by some unobtrusive small colonies has enriched the bryozoan fauna of Hungary and, according to data of American authors, as well the bryozoan fauna of Europe too (PENNAK 1953, 268; ROGICK 1941, 210).

Bryozoa known in Lake Balaton are as follow:

- Fredericella sultana* BLUMENBACH
- Plumatella emarginata* ALLMANN
- Plumatella repens* (L.)
- Plumatella casmiana* OKA
- Plumatella fungosa* (PALLAS)
- Plumatella fungosa* forma *coralloides* ALLMANN

The species:

- Lophopus crystallinus* PALLAS, and
- Plumatella fruticosa* ALLMANN

are represented in Lake Balaton by one exemplare of floatoblast of each species so far.

Summary

The fresh—waters of Hungary — Lake Balaton being included—are not thoroughly investigated for bryozoans since J. VÁNGEL (1864—1918). Data of occurrences have been summarized by VÁNGEL (1897b) and recently by SEBES-TYÉN (1959).

The bryozoans take a rather unimportant part in the life of fresh—water bodies. Some members of the microfauna find shelter and substratum of the second order in the colonies. Fresh—water animals, browsing and grazing in the coating of the various submerged substrates, may devour the polypids also. Colonies of certain bryozoan species may grow in waterworks in such extent as to cause considerable trouble.

Plumatella casmiana OKA has not been recorded from European waters as yet. Its distribution in a world-wide sense is scattered and — using PENNAK's expression — is "puzzling" (PENNAK 1953, 268). It has been noted from Japan, North-America, West-Java and the USSR (PENNAK 1953, ROGICK 1941, ROGICK and VAN DER SCHALIE 1950).

In the late summer of 1960 (27th August, 8th September) its occurrence in Lake Balaton has been established by the author. In an *Elodea canadensis*-patch amidst other macrovegetation-growths several free swimming individuals, newly hatched from the thin walled floatoblast characteristic to this species, were found. In September several young colonies attached to *Elodea* leaves occurred. (Fig. 1) Floatoblasts of the ordinary kind and the thin walled type were enclosed in the tubes, however no sessoblast came to sight. (Figs. 3—7) Measurements of the floatoblasts agree fairly with same of the North-American samples. (ROGICK 1941.)

According to V. BREHM (1930, 100, 107) the wheel-animalkule *Cupelopagis* (*Apsilus*) *vorax* LEIDY was very likely introduced into some European waters by means of *Elodea canadensis*. This Rotifer has not been noted as yet from Hungarian waters (VARGA in lit.). The occurrence of *Plumatella casmiana* in *Elodea*-growth in Lake Balaton can not prove its spread by means of *Elodea*, but at the same time it stands not against such possibility.

Bryozoans recorded from Lake Balaton are the following:

Fredericella sultana BLUMENBACH

Plumatella emarginata ALLMANN

Plumatella repens (L.)

Plumatella casmiana OKA

Plumatella fungosa (Pallas)

Plumatella fungosa f. *coralloides* KRAEPELIN

Both *Plumatella fruticosa* ALLMAN and

Lophopus crystallinus (PALLAS) are represented only by one single floatoblast so far.

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A PLUMATELLA CASMIANA OKA (BRYOZOA) ELŐFORDULÁSA A BALATONBAN

Sebestyén Olga

Összefoglalás

Magyarország vizeinek mohaállat-faunáját rendszeresen még nem kutatták. Ez áll a Balatonra is. Hazánkban VÁNGEL (1864—1918) óta nem foglalkozott senki behatóan Bryozoákkal. A meglevő előfordulási adatokat országos vonatkozásban VÁNGEL (1897b), újabban SEBESTYÉN (1959) foglalta össze.

A mohaállatok a belvizek anyagforgalmában nem játszanak lényeges szerepet. Telepeikben sok állat búvóhelyet és másodlagos alzatot talál, az élőbevonatot „legelő” állatok polipocskáikat is bekebelezik. Egyes fajok mesterséges víztározók erre alkalmas szakaszaiban rendkívül nagy tömegben léphetnek fel.

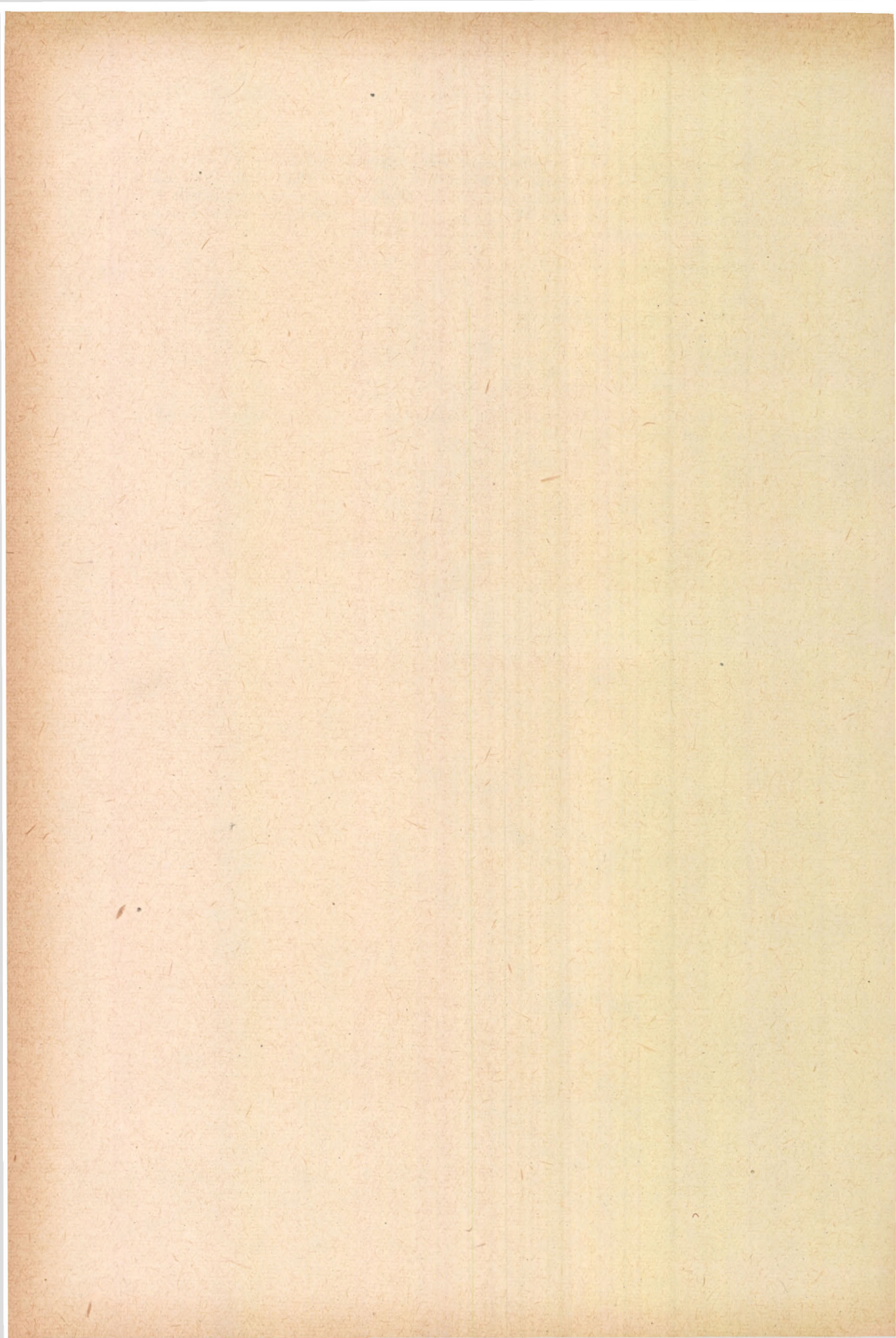
A *Plumatella casmiana* OKA faj Európából eddig nem volt feljegyezve. Elterjedése szórványos és PENNAK szerint „talányos” (Japán, Észak-Amerika, Jáva szigete, Szovjetunió). 1960 nyárutóján a Balatonból *Elodea*-ból kerültek elő vékonyfalú úszó statoblastból (thin walled floatoblast, ROGICK) fejlődött egy polipocskás úszó egyedei és *Elodea* levélre rögzült fiatal telepek, melyek csöveiben a vékonyfalú statoblastok mellett közönséges úszó statoblastok (floatoblast of the ordinary kind, ROGICK) is voltak. Ezek mérete és arányai közelállanak az Amerikából leírt példányokéhoz (ROGICK, 1941).

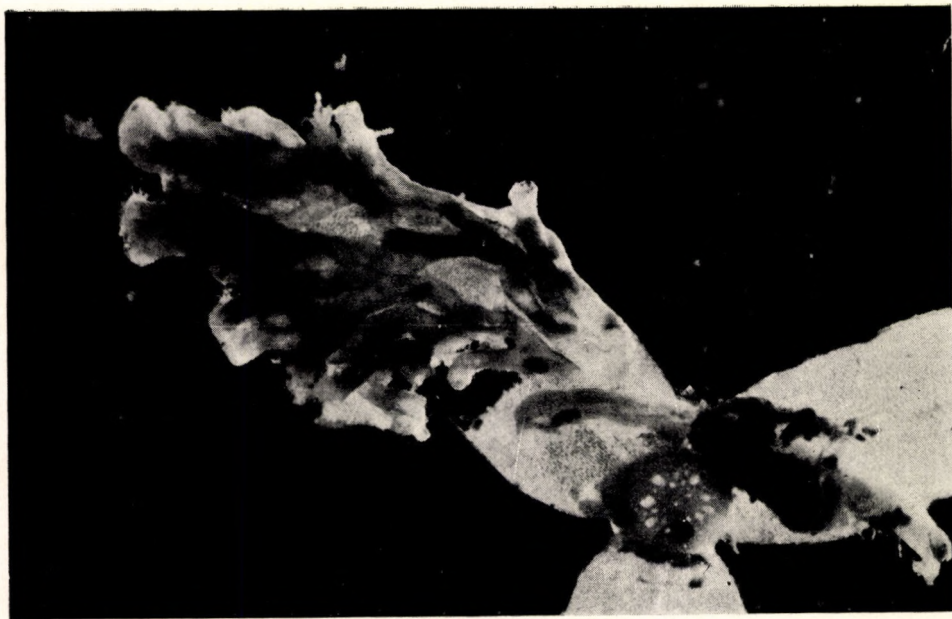
*Elodea canadensis*ssel való behurcolással véli magyarázni BREHM a *Cupelopagis* (*Apsilus*) *vorax* LEIDY előfordulását egyes európai vizekben (1930, 100, 107). Ez a szesszilis Rotatoria a Balaton szerény kiterjedésű *Elodeás*-aiból még nem került elő. Más hazai vizüinkből sincs feljegyezve. (VARGA L. in litt.) A *Plumatella casmiana* *Elodeas*-ból való előkerülése még nem bizonyítja a mohaállat *Elodeá*-val való terjedését, de nem is cáfolja.

A Balatonból ma ismeretes Bryozoák a következők :

Fredericella sultana BLUMENBACH
Plumatella emarginata ALLMANN
Plumatella repens (L.)
Plumatella casmiana OKA
Plumatella fungosa (PALLAS)
Plumatella fungosa f. *coralloides* KRAEPELIN.

A *Plumatella fruticosa* ALLMANN és a *Lophophus crystallinus* PALLAS fajt eddig egy-egy flottoblast képviseli tavunkban.





1



2

Fig. 1 *Plumatella casmiana* colony on *Elodea*-leaf. On few individuals the tentacular crown is shown. Conserved material. Photo: E. SZABÓ et I. TÖLG

1. ábra. *Elodea*-levél tövéből eredő *Plumatella casmiana*-telep túlnő a levéllemezen.
A tapogatókoszorú egyes polipocskákon látszik. Rögzített anyag
Foto: SZABÓ E. és TÖLG I.

Fig. 2 Base of young colony originated from a thin walled floatoblast. k = keel. v = remains of the statoblast. Photo: E. SZABÓ et I. TÖLG

2. ábra. Vékonyfalú flottoblastból (v) „csírázott” fiatal telep töve. k = hosszanti él.
v = a statoblast üres héja
Fotó: SZABÓ E. és TÖLG I.