BRYOZOAIRES
ACTUELS
ET FOSSILES :

BRYOZOA
LIVING
AND FOSSIL

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NOTE ON THE FRESHWATER BRYOZOA OF ISRAEL (PHYLACTOLAEMATA)

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ABSTRACT. – The study of a freshwater Bryozoa collection of the Hebrew University of Jerusalem permitted the identification of the following species: Fredericella sultana and Plumatella emarginata (already recorded), P. casmiana and P. fungosa (new records), P. repens and Lophopus crystallinus (already recorded, but unpublished), Lophopodella capensis (new record). From the taxonomic point of view no evidence was found that F. sultana jordanica or P. auricomis, originally described from sites covered by the present study, would be valuable taxons. The paper closes with zoogeographical considerations.

KEY-WORDS. – Freshwater Bryozoa, Phylactolaemata, fauna of Israel, taxonomy, zoogeography.

RÉSUMÉ. – L’étude d’une collection de Bryozoaires d’eau douce appartenant à l’Université Hébraïque de Jérusalem a permis l’identification des espèces suivantes : Fredericella sultana et Plumatella emarginata (espèces déjà signalées), P. casmiana et P. fungosa (espèces signalées pour la première fois), P. repens et Lophopus crystallinus (espèces signalées, mais non décrites), Lophopodella capensis (espèce signalé pour la première fois). Du point de vue taxonomique, aucune preuve n’a été trouvée à l’appui de la validité de F. sultana jordanica ou de P. auricomis, taxons jadis définis sur la base de matériel collecté dans les sites sur lesquels porte la présente étude. La conclusion de l’article porte sur des considérations zoogéographiques.

MOTS-CLÉS. – Bryozoaires d’eau douce, Phylactolaemata, faune d’Israël, taxonomie, zoogéographie.

INTRODUCTION

In his limnological work on the Syrian lakes BARROIS (1894) gives the first records of freshwater Bryozoa in sites corresponding to the present Israeli territory. Further evidence is given by ANNANDALE (1913). The latest paper on Israeli freshwater Bryozoa is that of HASTINGS (1938). Ever since, an important material has been collected and waiting for determination, a job we readily accepted to do when asked by Drs Heather J. BROMLEY-SCHNUR and Chanan DIMENTMAN, Hebrew University of Jerusalem, Dept. of Zoology, both working on the invertebrate fauna of the lost Lake Hula in northern Israel, drained in the late 1950s, with a view to compiling a comprehensive species list of the fauna once living there.
Text-fig. 1: Sites of freshwater Bryozoa from Israel including the Golan Heights (based on an unpublished sketch by Bromley-Schnur & Dimitman).

Texte-fig. 1: Sites des Bryozoaires d'eau douce d'Israel, y compris le Plateau du Golan (d'apres un croquis non publie de Bromley-Schnur & Dimitman).

1. Birket Ram (+930 m)
2. Birket Bab-el-Hawa (+930 m)
3. Lake Hula (before the drainage) and Hula Nature Reserve (after the drainage in the 1950s) (+70 m)
4. Wadi near En Gev, Lake Kinneret (-210 m)
5. Ha'On, Lake Kinneret (-210 m)
6. Bet Yerah, Lake Kinneret (-210 m)
7. Tantura (0 m)
8. Jerusalem (+770 m)
9. Bet Ha'Arava (-380 m)
10. Solomon's Pools (+790 m)

Table 1: List of the studied samples of freshwater Bryozoa from Israel (collection of the Hebrew University, Jerusalem, Zoology Department).
Tableau 1: Liste des echantillons etudies de Bryozoaires d'eau douce d'Israel (collection de l'Universite Hebraique de Jerusalem, Departement de Zoologie).

| Lake Hula (pre-drainage) | 01. 24.03.1933 | Hul 6 | P. repens |
| | 02. 19.02.1936 | Hul 70 | F. sultana |
| | 03. 21.02.1936 | Hul 80 | P. repens |
| | 04. 21.02.1936 | Hul 90 | F. sultana |
| | 05. 22.03.1940 | Hul 65 - Lo11 | F. emarginata (Fb) |
| | 06. 23.04.1940 | Hul 72 | F. sultana |
| | 07. 25.04.1940 | Hul 88 | F. emarginata |
| | 08. 28.04.1940 | Hul 110 | F. sultana |
| | 09. 06.06.1940 | Hul 128 | F. sultana |
| | 10. 09.06.1940 | Hul "Z" | F. sultana |
| | 11. 09.06.1940 | Hul 146 | F. emarginata |
| | 12. 09.06.1940 | Hul 147 | F. emarginata |
| | 13. 29.06.1940 | Hul 178 | F. sultana |
| | 14. 29.06.1940 | Hul 179 | F. sultana |
| | 15. 27.10.1940 | Hul 207 | P. repens, hyal. |
| | 16. 28.10.1940 | Hul 216 | F. sultana |
| | 17. 28.10.1940 | Hul 223 | F. sultana |
| | 18. 14.03.1941 | Hul 262 | F. sultana |
| | 19. 15.03.1941 | Hul 283 | P. repens |
| | 20. 15.03.1941 | Hul 284 | P. repens |
| | 21. 15.03.1941 | Hul 286 | P. repens |
| | 22. 16.03.1941 | Hul 300 | P. repens |
| | 23. 18.04.1941 | Hul 315R | P. repens, hyal. |
| | 24. 06.09.1941 | Hul 345 | F. cl. emarginata |
| | 25. 07.09.1941 | Hul 353 | F. sultana |
| | 26. 11.09.1941 | Hul 403 | F. sultana |
| | 27. 12.09.1941 | Hul 408 | F. sultana |
| | 28. 01.04.1942 | Hul 424 | Plumatella sp. |
| | 29. 01.04.1942 | Hul 430 | P. repens |
| | 30. 30.3-24.1942 | Hul Reise IX | L. crystallinus |
| | 31. 06.05.1943 | Hul 476 | P. repens |
| | 32. 06.05.1943 | Hul 479 | P. repens |
| | 33. 07.06.1943 | Hul 527 | F. sultana |
| | 34. 07.06.1943 | Hul 528 | F. emarginata |
| | 35. date unknown | Hul 800 | F. sultana |
| | id. | id. | P. repens, hyal. |

Hula Nature Reserve (post-drainage)

| 36. 12.03.1964 | HJJ A9 | L. crystallinus |
| 37. 12.03.1964 | C9 | P. repens |
| 38. 12.03.1964 | V9 | P. repens |
| 39. 12.03.1964 | HJJ B8 | F. sultana |
| | id. | id. | L. crystallinus |
| | id. | id. | P. repens |
| 40. 05.06.1964 | HJJ* | P. cismiana |
| 41. 23.03.1965 | Lo 12 | P. repens |
| | id. | id. | P. fungosa |
| 42. 10.03.1966 | D12 | L. crystallinus |

Bryozoa from other sites in Israel

| 43. 21.03.1933 | Lo 6 (Kin.) | F. sultana |
| 44. 22.03.1933 | Lo 5 (Kin.) | F. sultana |
| 45. 23.03.1933 | Lo 4 (Kin.) | F. sultana |
| 46. 14.01.1941 | Lo 3 (11) | F. sultana |
| 47. 20.04.1945 | LW72 (Kin.) | P. fungosa |
| 48. 16.11.1966 | Lo 9 (6) | F. sultana |
| 49. 01.04.1968 | Lo 10 (6) | F. sultana |
| 50. 12.03.1940 | HJJ Lo1 (8) | P. repens, hyal. |
| 51. 1940s | W78a (8) | P. fungosa |
| 52. 09.07.1967 | HJJ K20 (1) | L. cismiana (Fk) |
| | id. | id. | P. cismiana ** |
| 53. 10.07.1967 | HJJ A21 (2) | L. cismiana |
| 54. 10.06.1961 | Sol. pools (10) | P. repens |

* coll. Margallt; ** previously determined as P. repens; abbreviations: Fb = only floatoblast(s) present; Sb = only sessoblast(s) present; hyal. = hyaline zoarium; (1) - (10) = site number (see: Text-fig. 1); (Kin.) = Lake Kinneret (Lake Tiberias)
MATERIAL AND SITES

The examined material consists of 58 samples preserved in alcohol and corresponding to 54 different catalogue entries: 36 from pre-drainage Lake Hula collected from 1933-1943, 7 from post-drainage Lake Hula (Hula Nature Reserve), collected from 1964-1966, 12 from other sites in Israel. Details are given by Table 1. The localities are indicated on Text-Fig. 1 including a site corresponding to bryozoan material determined by J.-L. d’Hondt and which we have not seen. For details on the studied sites see: BARROIS (1894), WASHBOURN & JONES (1937, 1938), JONES (1940), KUGLER & WOOL (1968), SERRUYA (1978).

DESCRIPTION OF THE IDENTIFIED SPECIES

*Fredericella sultana* (BLUMENBACH, 1779)

*F. sultana* was identified in 27 samples: 21 samples from Lake Hula (site 3) collected in 1936 and 1940-1943 (one date unknown), 5 samples from Lake Kinneret (Lake Tiberias) collected in 1933, 1966 and 1968, one sample from site 4 collected in 1941.

Essentially we found two kinds of zoaria in the studied material. A first type has repent, rather dense zoaria, with occasional limited longitudinal agglutination of the tubes. Some short, more or less erect branches may protrude from the colony. Most of the tubes show a dorsal keel with a furrow, a generally strong incrustation and a light yellow or brown yellow colour. Some colonies may be colourless and transparent. It can be assumed that the colour was altered by the long preservation in alcohol. The substratum is above all constituted by stems or leaves of aquatic plants; two colonies are growing on *Ceratophyllum* and one colony on a stone. Mostly this material was collected from February to April and from September to November (Lake Hula, Lake Kinneret).

A second type of material has a bushier growth with longer free and erect branches; a faint or even absent incrustation, an absent or faint keel without a furrow. The samples were collected without substratum, so that we do not know the basal parts of the colonies. Essentially this material was collected from April to September (Lake Hula, Lake Kinneret). The more luxuriant aspect of this type seems related to the better seasonal growth conditions.

The diameter of the tubes of *Fredericella sultana* ranges from 0.25 - 0.40 mm (average: 0.31 mm). In one case the lophophore was extended (20 tentacles). In two cases *F. sultana* was interwined with a sponge, in one case with a sponge and *Plumatella emarginata*.

Six colonies contain sessoblasts or piptoblasts; their length ranges from 446 to 521 μm, the width from 220 to 291 μm, the average measurements being 475 x 266 μm (5 colonies from site 3, collected in June and September; one from site 5, collected in October).

*Plumatella repens* (LINNÉ, 1758)

(Pl. 1, Fig. 1)

*P. repens* was found in 18 samples: 12 from Lake Hula (collected between 1933 and 1943, one date unknown), 4 from Hula Nature Reserve (collected from 1964-1965), one from site 8 (collected in 1940) and a last one from site 10 (collected in 1981).

The zoaria are repent, branching, closely adhering to the substratum, with occasionally parallel and laterally agglutinate tubes and generally obliquely erected
zooecia. The incrustation is generally faint, the ectocyst often translucent, the colour being yellowish brown, greyish or even whitish; a keel is normally absent. Some colonies are more compact, with mostly opaque tubes and fewer erect branches.

Four samples (3 from Lake Hula, 1 from site 10) had hyaline, not or very slightly incrusted, generally thickened and agglutinate tubes with a marked longitudinal and (or) circular striation of the ectocyst. In one specimen only the tubes locally show a faint keel and (or) furrow. The SEM analysis of the floatoblasts of this more problematic material displaying characteristics somewhat matching Hyalinella punctata or even P. auricomis reveals the typical P. repens floatoblast structure such as defined in our earlier papers (GEIMER & MASSARD: 1986, 1987): reticulated capsule with interstitial tubercles; annulus essentially smooth studded with small nodules visible at high magnification.

The floatoblasts retrieved from the more common type of zoarium revealed just the same characteristics.

In certain colonies numerous floatoblasts were present. The length of the floatoblasts ranges from 316 to 428 μm (average: 345 ± 27.1 μm; median: 335 μm) and the width from 223 to 273 μm (average: 253 ± 13.0 μm; median: 254 μm). The length/width ratio ranges from 1.18-1.56 (average: 1.35 ± 0.08; median: 1.35). A nearly circular floatoblast (diam.: 285 μm) was found in colony No. 32. The biggest floatoblasts (428 x 273 μm) were retrieved from the hyaline colony No. 54 growing on Lemma leaves.

Some sessoblasts were also found (measurements: 403 x 322 μm and 409 x 273 μm; annulus: 43 and 37 μm).

**Plumatella fungosa** (PALLAS, 1768)

(Pl. 1, Fig. 2)

*P. fungosa* was identified from 3 sites: site 9 (Table 1: No. 51), Lake Kinneret (Table 1: No. 47), Hula Nature Reserve (Table 1: No. 41).

The colonies are small. The zoaria are transparent, at the most slightly incrusted, compact, but lacking the typical massive form. The tubes are repent and agglutinate, only the diverging endings of the tubes remaining free. The polypides are brown or yellow-brown. In No. 51 some septa were observed, and in No. 41 an acceptably preserved lophophore with approximately 43-45 tentacles.

Measurements of the floatoblasts (especially abundant in No. 51): 360-391 μm long (average 373 μm), 260-291 μm wide (average 274 μm), average length/width ratio = 1.36 (1.32-1.43). Based alone on these characters the identification would be hazardous, the floatoblasts being fairly small for *P. fungosa*. But the SEM reveals the typical architecture of *P. fungosa* floatoblasts: both capsule and annulus reticulated and tuberculated (GEIMER & MASSARD: 1986, 1987). These small floatoblasts remind us of those we found in *P. fungosa* material collected on Tenerife (Canary Islands).

In order to explain this particularity we ventured the hypothesis that in the Palaearctic region the dimensions of the floatoblasts of *P. fungosa* decrease from North to South (MASSARD & GEIMER, in press).

**Plumatella emarginata** ALLMANN, 1844

*P. emarginata* was identified in 8 samples: 7 samples from Lake Hula (collected between 1936 and 1943), and one sample from Hula Nature Reserve (No. 39) containing one single floatoblast of *P. emarginata*. In No. 7 the species was represented by fragments of branches intertwined with a normally developed Fredericella sultana colony.

The zoaria are repent, sometimes partially or essentially (No. 10) tufted. The tubes normally have a furrowed keel; incrustation is present; the ectocyst is dark and well chitinized; the diameter of the cystids is approximately 400-450 μm.
PLATE 1

Fig. 1. Plumatella repens (L.), No 41: floatoblast (ventral side), capsule with reticulated ridges and interstitial tubercles, annulus essentially smooth although studded with small nodules, X 477. Fig. 2. P. fungosa (PALLAS), No 47: floatoblast (dorsal side), reticulated ridges and interstitial tubercles on both the capsule and the annulus, X 700. Figs 3-4. Lophopodella capensis (SOLLAS), No 53. 3, floatoblast, concave pole, spine with recurved hooks, annulus with reticulation, X 255. 4, floatoblast, rudimentary spine, reticulation above all on the capsule and the inner annulus part, X 127.

PLANCHE 1

Fig. 1. Plumatella repens (L.), n° 41 : flottoblaste (face ventrale), capsule avec crêtes réticulées et tubercules interstitiels, anneau essentiellement lisse, mais parsemé de petits nodules, X 477. Fig. 2. P. fungosa (PALLAS), n° 47 : flottoblaste (face dorsale), capsule et anneau avec crêtes réticulées et tubercules interstitiels, X 700. Figs 3-4. Lophopodella capensis (SOLLAS), n° 53. 3, flottoblaste, concavité polaire, épine à crochets recourbés, anneau réticulé, x 255. 4, flottoblaste, épine rudimentaire, réticulation sur la capsule et la zone intérieure de l’anneau, X 127.
Floatoblasts were found in all the samples. Length: 453-552 μm (average: 494 μm); width: 198-304 μm (average: 261); length/width ratio: 1.69-2.6 (average: 1.92). Three sessoblasts were measured: 540 x 341 μm, 496 x 391 μm, 440 x 341 μm.

The colony No. 24 is somewhat special: zoarium small, adherent, branching, incrusted but translucent; keel indistinct; cystid diameter 275 μm. The most striking feature is an elongated oval floatoblast (434 x 217 μm) with an unusual narrow annulus (total annulus width measured); polar width: 95 μm (dorsally) and 68 μm (ventrally), lateral width: 50 μm (dorsally) and 26 μm (ventrally).

**Plumatella casmiana** OKA, 1907

Two *P. casmiana* colonies were found in sample N° 40 (Hula Nature Reserve); a dense colony with short erect cystids growing on a *Polygonum* leaf and a young colony formed by one branching tube still attached to the leiotblast from which it had originated. The second *P. casmiana* sample (N° 52, site 1) corresponds to fragments of a colony containing 4 leiotblasts. The approximately 550 μm wide tubes are incrusted, but translucent.

In both samples free leiotblasts were present on the outside of the colonies. Measurements of the leiotblasts: length 391-415 μm (average 402 μm); width: 205-223 (average: 215 μm); length/width ratio: 1.80-1.96 (average 1.87). Normal floatoblasts (pycnoblasts) were also present (347 x 248 μm; 366 x 248 μm; length/width: 1.43) as well floatoblasts of the intermediate type (384 x 229 μm; length/width ratio: 1.67).

**Lophopus crystallinus** (PALLAS, 1768)

Several small *L. crystallinus* colonies (diam.: 4-5 mm) were present in Lake Hula sample N° 30 collected in 1942 and two Hula Nature Reserve samples (N° 36 & 42) collected in 1964 and 1966. The zoaria are somewhat shrivelled, but the characteristic spindle shaped floatoblasts are present inside and (or) outside the colonies. Average floatoblast measurements are about 893 x 446 μm; one huge floatoblast has a length of 1800 μm !

**Lophopodella capensis** (SOLLAS, 1908)

(Pl. 1, Figs 3-4)

*L. capensis* occurred in two samples collected on the Golan Heights in 1967 (N° 52, 4 floatoblasts; N° 53, several small, shrivelled yellowish-brown zoaria with floatoblasts inside and outside).

The floatoblasts are elliptical with a distinct concave truncation at the poles out of which protrudes one single flattened spine with a clearly broadening base and a double row of alternating recurved hooklets.

Measurements of the floatoblasts: length (without the spine): 725-837 μm (average: 783 ± 40.7 μm; median: 773 μm; 22 measures); 504-612 μm (average: 565 ± 21.4 μm; median: 564 μm; 22 measures); free part of the capsule (fenestra): 133 x 117 μm; total capsule: 420 x 381 μm; annulus: 333 μm at the pole and 216 μm on the side (4 measures). The length of the spines ranges at best from 62 to 90 μm. The lateral side of the base of the spine is generally concave and ± 60 μm large, whereas the top is ± 12 μm large; diagonally the hooklets measure about 12 μm. The number of the hooklets per row is low but variable (at best 2-6). In many cases the spines are rudimentary and reduced to a large triangular base with some small hooklets on either side. Often there is a great difference between the spines of the opposite poles, one being fairly well developed whereas the other is rudimentary.
The spine consists of a double layer prolonging the narrow flattened suture line which may be somewhat denticulated at the pole. Sometimes processes looking like rudimentary hooklets are seen on the lateral polar part of the annulus suture; they may extend to the initial part of the spine’s base. They resemble the hooklets represented on SOLLAS’ (1908) Fig. 1, considered as inaccurate by KRAEPELIN (1914), whereas such hooklets were also figured by HASTINGS (1929, Fig. 1).

The SEM shows a distinct honey-comblike reticulation on the surface of the floatoblasts: on the annulus (Pl. 1, Fig. 3), or in the central part of the floatoblast, including the capsule, but then almost completely vanishing on the periphery of the annulus (Pl.1, Fig. 4).

Literature indicates the following measurements for the spines’ length: 320 µm (SOLLAS, 1908), about 200 µm [KRAEPELIN, 1914, Fig. 4: Lophopodella capensis (SOLLAS) var. michaelensi, a variety not accepted by LACOURT, 1968], about 170-300 µm (HASTINGS, 1929, Fig. 1), 140-175 µm (LACOURT, 1968), about 130 µm (ODA & MUKAI, 1985, Fig. 3, D).

The floatoblasts we have studied differ from typical L. capensis floatoblasts by their shorter spines and less numerous hooks. But it is well known that Lophopus and Lophopodella are highly variable as far as the floatoblast morphology is concerned. Very convincing evidence is given by ODA’s study on the variability of the statoblast of L. carteri (ODA, 1955). So there is no reason that the features we met in the Lophopodella floatoblasts from the Golan Heights would not fit in the normal variation range of L. capensis. Besides, it ought to be mentioned that at high temperature (up to 30° C) L. carteri produces spindle-shaped floatoblasts with only one or a few spines at both ends, the floatoblasts with one spine at both ends resembling those of L. capensis (see ODA & MUKAI, 1989). However the constant presence of a concavity at both poles (exceptionally at one pole only) and the total absence of any floatoblast with more than one spine excludes the material from the Golan Heights from belonging to a local variety of L. carteri.

**TAXONOMIC DISCUSSION**

_Fredericella sultana jordanica_ ANNANDALE, 1913

The subspecies _F. sultana jordanica_ ANNANDALE, 1913 was defined by material collected in Lake Tiberias (Lake Kinneret) and characterized by the following features: colony without free branches of more than two zooecia; ectocyst usually quite colourless, excepted for old colonies where the covering of some zooecia situated in the oldest parts is often thick and dark; cross-section of the zooecia never circular, always with a strong dorsal keel containing a longitudinal furrow (ANNANDALE, 1913). Later on the subspecies was recorded in the Volga region (ANNANDALE, 1915; BEHNING, 1924; ABRIKOSOV, 1927; WIEBACH & d’HONDIT, 1976) East Persia (ABRIKOSOV, 1927) and Lake Hula (HASTINGS, 1938).

Temporarily ABRIKOSOV considered the form as an independent species: _Fredericella jordanica_ ANNANDALE, 1913 (ABRIKOSOV, 1961). HASTINGS (1938), was “not sure that the Palestinian form is even subspecifically distinct from _Fredericella sultana_." DU BOIS-REYMOND MARCUS (1946) emphasizes that _F. sultana jordanica_ "cannot be separated specifically from _F. sultana_." For TORIUMI (1951) _F. sultana jordanica_ is merely a phenotype of _F. sultana_. LACOURT (1968) proposes “that this variety be dropped”.

The thorough study of Israeli _F. sultana_ material described in the preceding chapter as type 1, collected in the same sites as ANNANDALE’s or HASTINGS’ material, and matching the description of subsp. _jordanica_ the most, gives no evidence that type 1 differs from type 2 or other _F. sultana_ material by taxonomically relevant characteristics. As already pointed out before the differences between type 1 and type 2 seem to be linked to seasonal factors, the recumbent zoaria mostly
corresponding to colonies collected in spring or autumn, when the temperature is lower. In this context it may be worthwhile noting that ANNANDALE collected his material in October. Certainly the substratum and other environmental conditions also have an influence. Moreover clear transitional forms are encountered between the two types we separated in our description for methodical arrangement and without any taxonomic consideration.

On the other hand it was already demonstrated by TORIUMI (1951) that regarding *F. sultana* - characters such as the appearance of the colony, the presence of the keel, the incrustation and the colour of the ectocyst are deeply influenced by the environmental conditions. So, after a thorough examination of material stemming from the very region where ANNANDALE collected his type material, we can only confirm the opinion of other authors: the subspecies or variety *F. sultana jordanica* should be dropped.

**Plumatella auricomis** ANNANDALE, 1913

*P. auricomis* was first described from Lake Tiberias, where it was dredged in the channel of the River Jordan (ANNANDALE, 1913), then from the Volga region (ANNANDALE, 1915; BEHNING, 1924; ABRIKOSOV, 1927); from a *Phragmites* Swamp near Al Almanya (HASTINGS, 1938), a habitat which was part of the complex of the aquatic habitats of Lake Hula; finally from Manchoukuo, a former state created in 1932 by the Japanese in Eastern North China (HÕZAWA & TORIUMI, 1941).

According to ANNANDALE (1913) the species is characterized by a thick, hyaline, stiff ectocyst without a dorsal keel furrow and the yellow colour of the lophophore. There were no floatoblasts in the type-locality material, nor in the material analysed by HASTINGS (1938) and HÕZAWA & TORIUMI (1941). The average measurements of floatoblasts from the Volga were 314 x 170 μm (ANNANDALE, 1915; HASTINGS, 1938).

Granting that the ectocyst is firm in *P. auricomis* and soft in *Hyalinella punctata*, HASTINGS (1938) emphasized the resemblance between the two species and recommended to include *P. auricomis* in the genus or subgenus *Hyalinella*. A thorough taxonomic discussion on the so called *Hyalinella auricomis* was made by WIEBACH (1973); who years before had already considered *P. auricomis* as a doubtful species, probably synonym of *P. repens*, and which should be dropped (WIEBACH, 1964). For LACOURT (1968) *P. auricomis* is a "nomen dubium".

It may be noted that according to LACOURT (1968) ANNANDALE'S *P. auricomis* from the Volga region would correspond to *H. punctata*, and that WIEBACH (1964, 1973) identified as a probable phenotype of the polytypic *P. repens* a specimen collected by BEHNING, in the Volga River, and determined by ANNANDALE as *P. auricomis*. HASTINGS (1938) relates *P. auricomis* to the *P. (Hyalinella) vaibiriae* she had described in 1929 from Tahiti and which belongs to *P. repens* according to WIEBACH (1964) referring to a letter from TORIUMI.

As far as our material is concerned, most of the hyaline colonies fit the main features of *P. auricomis* as it is described by the authors. But fortunately we disposed of floatoblasts and the SEM analysis revealed that this material partly belongs to *P. repens* and partly to *P. fungosa*. We are convinced that the material described by ANNANDALE (1913) and HASTINGS (1938) corresponds to the same type of material, either *P. repens* or *P. fungosa*, probably to young colonies, considering the absence of floatoblasts. The sessoblast figured by ANNANDALE (1913) matches the general pattern of *Plumatella* sp. sessoblasts and has no particular taxonomic value.

**ZOOGEOGRAPHICAL CONSIDERATIONS**

On the base of the present study completed by published records and further information kindly given to us by Drs BROMLEY-SCHNUR and DIMENTMAN the
following list of bryozoan species may be established for Israel including the Golan Heights:


_Plumatella emarginata_ ALLMANN, 1844. – HASTINGS (1938): South Jordan (Lake Hula); present study: Lake Hula, Hula Nature Reserve.

_Plumatella casmiana_ OKA, 1907. – new record: Hula Nature Reserve, Birket Ram (Golan Heights).


_Hyalinella punctata_ (HANCOCK, 1850). – BROMLEY-SCHNUR & DIMENTMAN (in litt.): Tantura, 2.7.1951, Tel Aviv University Catalogue NS 20317, det. J.-L. d'HONDT.


_Lobbidella capensis_ (SOLLAS, 1908). – new record: Golan Heights (Birket (Ram, Birket Bab-el-Hawa).

WOOD (1988) estimates that “it is possible that HASTINGS’ (1938) “Type 2” _Plumatella emarginata_ is actually _P. reticulata_. Collected at Lake Huleh (…) the unusual shape and dimensions of the floatoblasts almost match exactly those of _P. reticulata_ from Ohio”. Essentially _P. reticulata_ WOOD, 1988 is characterized by a sessoblast with a conspicuous pattern of dark reticulated ridges on the front valve and a broadly oval floatoblast with long nearly straight and parallel sides. We encountered similar floatoblasts in a colony of _P. emarginata_, but together with “normal” floatoblasts, and above all we met no sessoblasts matching _P. reticulata_.

_F. sultana, P. emarginata, P. repens_ and _H. punctata_ are cosmopolitan (LACOURT, 1968; BUSCHNELL, 1973). In the “neighbourhood” of the here studied area the following records are known in bryozoan literature: _F. sultana_ in the Lake of Homs in Syria (BARROIS, 1894) and in Egypt near Alexandria (KRAEPELIN: 1891, 1893), _P. repens_ in the swamp marshes of the Oronto River near the Lake of Homs in Syria (BARROIS, 1894: as _P. polymorpha_ KRAEP. var. _caespitosa_ and Turkey (LACOURT, 1968).

LACOURT (1968) states that _P. casmiana_ “is probably cosmopolitan but shows great discontinuities”. Well represented in Asia and North America, it also occurs in Central America. For the Palaeartic region it was long known only from the Volga region, but in the last three decades it was found in different parts of Western Europe listed by GEIMER & MASSARD (1986); a record from the Lüchow-Dannenberg Landkreis in Lower Saxony, FRG, (MARTENS, 1983) has to be added to that list. Concerning Israel the nearest recorded sites – distant of some 1500 to 2000 km – are in Bulgaria and in the Saratov region (including Talovka and Jerusal River) in USSR!

_P. fungosa_ is a boreal species. In addition to a recent record from Tenerife, Canary Islands, (MASSARD & GEIMER, in press) the Israeli records of _P. fungosa_ confirm that the species' distribution area actually extends as far as the southern border of the Palaeartic region. Referring to BARROIS (1894), LACOURT records _P. fungosa_ for the marshes of the Oronto River near the Lake of Homs; this record is erroneous, the _P. polymorpha_ KRAEP. var. _caespitosa_ indicated by BARROIS and
determined by KRAEPelin himself (Barrois, 1894) is synonymous with P. repens, as it is striken by BORG (1930) and WIEBACH (1960). So there seems to be no valuable record for the Asia Minor region and the distribution list in WIEBACH & d’HONDT (1978) as well as the distribution map in BUSHNELL (1973) should be revised in this respect.

According to BUSHNELL (1973) L. crystallinus is "limited to the Eastern Nearctic and Western Palaearctic (principally)". The records nearest to Israel are in the Balkans and Southwestern Russia, as far as the estuaries of the Dniestr and Dniepr (LACOURT, 1968).

Hitherto Lopopodella capensis was considered as an exclusively Aethiopian species, with occurrences only in South Africa (Sollas, 1908; KRAEPelin, 1914; HASTINGS, 1929) and Kenya (JENKIN, 1936; LACOURT, 1968). So its presence on the Golan Heights is quite remarkable. Considering that Israel constitutes a corridor for Eurasian birds migrating to their hibernation areas in the South, it is not excluded that floatoblasts of L. capensis have been imported from the African sites of the species by these very birds returning to Eurasia. The role of birds in the dispersal of Phylactolaemates is well known (BUSHNELL, 1973). By the way, a similar dispersal in the opposite direction could have been imagined for P. casimierana. In fact, BORG (1936) already pointed out that the striking correspondence between the freshwater Bryozooan fauna of northern Europe and the great lakes of Central Africa, the hibernating area of the arctic and boreal birds coming from the North of Europe and the North of Africa, is not merely a coincidence.

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