FBA Translation No. 85

LARSSON, P. (1968): Holopedium gibberum - an indicator of soft-water lakes? Fauna, 21: 130 - 132.

Translated by I.B. Talling.

In fresh waters the planktonic Crustacea are represented mainly by the two large groups, the Copepoda and the Cladocera. Members of the latter group are often generally called daphnias after the commonly found family, Daphnidae. Another family, the Holopedidae, contains the genus Holopedium, which in Europe is represented by one species only : Holopedium gibberum Zaddach (Fig. 1).

A characteristic for recognizing this species is the large Jelly-envelope surrounding the animal itself. A plankton haul from a lake rich in H. gibberum, will be swollen by a clear jelly-like mass. The volume of the gelatinous envelope is c. 8 times larger than the animal itself (Hamilton, 1958). It encloses the animal except for a T-shaped opening, through which it gets water supplied. The long antennae, which are tools for swimming, project from this opening. It is difficult to see the jelly through the microscope, but if stained with, for example, India ink it is easy to recognize. The function of the gelatinous envelope is most likely primarily to increase the buoyancy of the animal in water. The specific weight of the gelatinous mass is less than that of the animal (Freidenfelt, 1920). The advantage of this extra buoyancy is that the animal can use less energy in order to remain drifting at a certain water level. The gelatinous envelope might also protect against predators.

H. gibberum is found throughout the northern half of the globe but its distribution is scattered and irregular. Several workers in this field have tried to determine which factors decide the presence or the absence of H.gibberum (Weiser, 1942; Hamilton, 1958).

Hamilton (1958) made a chemical study of 30 different Scottish lakes, where H. gibberum was present or absent. Differences were not found with respect to phosphorus, magnesium, sodium, potassium, chlorine, silica content and the alkalinity (CO_2) of the water. Temperature, pH and calcium content appeared to be the limiting factors in the distribution. H. gibberum was only found in waters with a maximum temperature below 25°C, a pH of between 4.0 and 7.5, and a calcium content of less than 20 mg Ca/l. Most of the lakes containing H. gibberum had less than 10 mg Ca/l. It was found, in addition, that this species could also be absent from lakes, which fulfilled these conditions and this would indicate some other factors than those measured here to be important. Even though not all possible factors influencing the distribution are known, calcium content and pH are decisive factors. When Hamilton presented his results at the 13th Limnological Congress in Finland, 1956, Prof. Kåre Münster Strøm from Norway drew attention to the fact that H. gibberum had been found in Steinsfjord by Oslo. Here the pH was 7.4 - 7.8 in the summer and the calcium content 18 - 22 mg Ca/l (Strøm 1932).

Wells (1960) has since found H. gibberum in Lake Michigan and according to Hutchinson (1967, p. 606) it must have come from water containing about 32 mg Ca/l.

With the exception of these two cases, I have not been able to find references to the occurrence of the species but in calcium-poor lakes with a pH below 7.5, H. gibberum has held its position as an example of a very calcium-shunning species.

It therefore came as a great surprise to me, while making collections for my main problem, to find H. gibberum in Blankvatn (Blank lake) near Oslo in 1966. During the summer the surface water has a calcium content of about 25 mg Ca/l. It increases with depth to about 36 mg Ca/l at 18 m. pH varies from 7.9 - 8.0 at the surface and to about 4 m. Further down pH decreases to 7.1 at 18 m.

Water samples from varying depths were taken with a 3 l water sampler and sieved through a fine meshed nylon material (size of mesh 45 µ). On 22-6-1966 one individual animal of H. gibberum was found at 1 m depth and here the water contained 25 mg Ca/l and had a pH of 7.9. Later, on 19-7-1966 a single individual was found at 4 m depth and another at 16 m depth, but the calcium content of the water was not determined here.

In spite of the very meagre numbers of H. gibberum, the discovery is interesting from an ecological point of view. One would suppose that the environmental conditions in Blankvatn were unsuitable for the species.

The earlier observations indicated that a high calcium content and high pH were either the prime factors in limiting the distribution or that the true limiting factors were present along with high calcium content and pH.

The latter possibility might give the true explanation, as there are freshwater localities which should satisfy the ecological demands of H. gibberum, but it is absent there; and there are obviously freshwater localities, which do not fulfil these demands, but the species is nevertheless found there.

It is possible that the true limiting factors are less strongly connected to the calcium content and pH values in the Norwegian waters. It would be interesting to find out if there indeed are other lakes in Norway with a comparatively high calcium content and also containing H. gibberum.

SUMMARY

Holopedium gibberum - an indicator of soft-water lakes?

This article is based on literature studies and the author's own observations. Holopedium gibberum Zaddach is found in Blankvatn near Oslo in water containing about 25 mg Ca per. l. and a pH value of 7.9. In literature occurrences of the species under such conditions seem rare.

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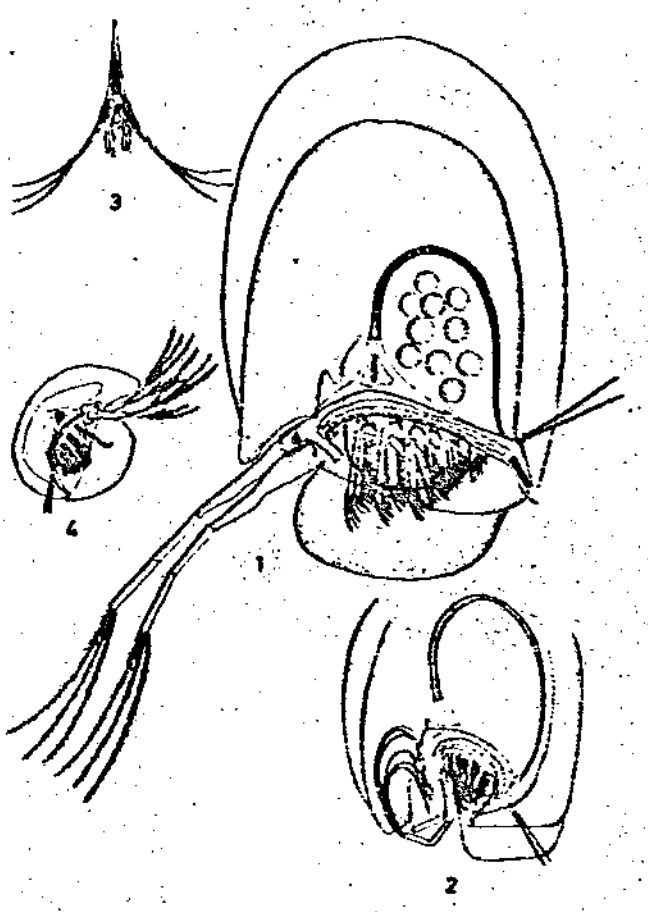

Fig. 1

1. *Holopedium gibberum.*
2. *H. gibberum.* 2. par antenner ligger, når de ikke brukes, innrullet i klokken.
   2nd pr. of antennae lie rolled into the bell shaped capsule when not in use.
3. *H. gibberum* uten gelehylster sett forfra.
   Without jelly capsule, front view.
4. *H. gibberum* hann (*male*). (Etter Wesenberg-Lund, 1952.)

Notice

Please note that these translations were produced to assist the scientific staff of the FBA (Freshwater Biological Association) in their research. These translations were done by scientific staff with relevant language skills and not by professional translators.