

Reproduced with the
permission of the
Royal Geographical Society.

www.rgs.org

The Biology of the Lochs of the Ness Basin*

by James Murray

COLLECTIONS of plankton were made in twenty-seven lochs in this basin. With the exception of the lochs in the Great Glen itself, most of these lochs are at a considerable elevation, occupying the high tableland on the east of Loch Ness, or the higher mountainous tract on the west.

The situation of the lochs in two alpine masses, separated by the deep cleft of the Great Glen, gives rise to some peculiarities in distribution, most marked in the species of *Diaptomus* and the more conspicuous plankton desmids.

A number of species were only collected on one side of the Great Glen. These peculiarities are probably due to the fact that the lochs to the east of Loch Ness were surveyed in spring or early summer, when the water was still cold, while those to the west were surveyed after midsummer, when they were about at the maximum temperature.

Diaptomus gracilis was here, as elsewhere, almost universal, but was not seen in several of the eastern lochs.

D. laticeps was in Loch Ness and the other lochs in the Great Glen. It was not seen in any loch to the west, but was frequent in lochs to the east of Loch Ness. In Loch Ness the blue *Diaptomus* (identified by Mr. Scourfield as *D. laticeps*) is somewhat small and pale in colour. In other districts, and especially in hill lochs, it is of larger size and brighter colours—blue or occasionally red. There is some doubt as to the identity in all cases, and naturalists have given different identifications of the Loch Ness animal.

D. laciniatus, in contrast to *D. laticeps*, was only found to the west of the glen, in lochs high above the sea. To the east, though it was not in any of the lochs surveyed, it was in some lochs at a great elevation on Carnahoulin.

Desmids.—The conspicuous plankton desmids, which constitute probably the most distinctive feature of the western Scottish plankton, are not very well represented in the lochs of the Ness basin. There are few species, but they include several of the largest and most beautiful. They show no marked preference for the one side of the glen more than the other, but the greatest number of species is in Loch Aslaich, which lies west of Loch Ness.

Micrasterias apiculata, var. *imbriata*, was in Loch Aslaich, and the var. *brachyptera* was found only once in Loch Ness.

M. radiata, Haas (*M. furcata*).—This very local species was in Loch Aslaich.

Staurastrum furcigerum, Bréb.—In Loch Bran, at Foyers.

S. longispinum (Bail.).—In Loch Aslaich and several neighbouring lochs.

S. ophiura, Lund.—Loch Ness and Loch Aslaich.

S. strangulare (Bulu.).—Loch Garth, near Foyers.

S. brasiliense, Nordst.—Loch Aslaich.

Euastrum verrucosum, Ehr., *Micrasterias papillifera*, Bréb., *Xanthidium antiopum* (Bréb.), *Staurastrum gracile*, Rolfs, *Staurastrum lunatum*, var. *planctonicum*, West, and one of the beaked *Closteria*, which I identify as *C. setaceum*, Ehr., are the most generally distributed desmids in the basin.

Crustacea.—Apart from the Calanidae, a few of the Crustacea appear to be local in the district.

Sida crystallina.—Only seen in Loch Ness and Loch Aslaich.

Diaphanosoma brachyurum.—Only noted in the lochs of the Great Glen and some lochs to the west. The eastern lochs were doubtless surveyed before its season.

Holopedium gibberum.—Noted in scarcely half the lochs, but those on both sides of the Glen and at all elevations.

Leptodora was only seen in the lochs of the Glen and Loch Tarff; *Polyphemus* in the Glen and some lochs to the west; *Bythotrephes* in the Glen and Lochs Tarff and Ruthven to the east.

Rotifera.—*Conochilus unicornis* was generally distributed; *C. volvox* only in Loch Ness, Lsde, and Knockie.

Floscularia pelagica.—Lochs Ness, Oich, and Unagan.

Synchaeta pectinata.—Lochs Oich and Unagan.

Anopus testudo.—Lochs Ness and Unagan.

Triarthra longisetata.—In five lochs on the east side of the basin; apparently a

cold-water species.

Gastropus stylifer.—Loch Ness and five lochs to the east, and Loch Aslaich to the west.

Sarcodina.—*Clathrulina* was not seen except in the lochs of the Great Glen. *Nebela bicornis*, West, though found in Loch Ness, was not got in the plankton, but while dredging in the shallow water of Inchnacardoch bay.

Loch Ness.—Loch Ness was made the subject of a more thorough, though still far from exhaustive, biological investigation than any other Scottish loch. A very large proportion of all the lacustrine organisms known in Scotland have been found in this loch.

The great majority of the species in all the larger groups—Crustacea, Rotifera, Sarcodina—have been got in Loch Ness, the only large group not very fully represented being the desmids. Some of the small groups have hardly been studied, except in Loch Ness, and it is the only loch the abyssal fauna of which is fairly well known.

To give any detailed account of the hundreds of species found in the loch would traverse too much the same ground as the general report on the "Biology of the Scottish Lochs," now in preparation. There will therefore be given here simply an epitome of the biology, and a comparison with the other lochs in the Ness basin.

The Plankton.—The plankton is the average plankton of Scottish lakes, with a very small admixture of the more local species. It is very poor in species, and always very small in quantity. No approach to "flowering" of the water has been noted. The greatest quantity was collected in late autumn, 1903, during the night, when a considerable migration from the deeper water to the surface evidently took place, as the quantity collected during the preceding day was much less. The plankton varies little throughout the year, a fact probably correlated with the low annual range of temperature, which is less than 20°-0 Fahr., while the upper limit of about 60°-0 is rarely touched.

About half the species of Crustacea remain all the year round, those which are absent in winter being *Bythotrephes*, *Polyphemus*, *Leptodora*, and *Diaphanosoma*. *Holopedium* was noted by Mr. Scourfield, but was never found during the systematic investigation afterwards. *Diaptomus laticepe*, Sars., appears to persist all the year round, and was found carrying eggs in March, when the temperature is at its lowest. *Clathrulina* was generally present, and *Folsos* occasionally.

There is a great contrast between Loch Ness and Loch Lochy in the relative abundance of the phytoplankton. Loch Lochy is very rich, and Loch Ness very poor. The two lochs are only some 10 miles apart, and are apparently under almost identical conditions. Loch Lochy, being in an almost uninhabited district, should be purer than Loch Ness, but a slight pollution is generally favourable to vegetable growth.

Littoral region.—Though there are only a few sheltered bays in Loch Ness, where littoral vegetation can establish itself, the microfauna and microflora found among the larger vegetation are very considerable, and constitute, indeed, the chief part of the species in the loch.

A great many of the animals extend downwards to a very considerable depth, and about forty species (exclusive of Rhizopoda), including many Crustacea, Rotifers, Tardigrada, Worms, and the larvæ of many insects, have been collected as far down as 300 feet. Shells of all the Rhizopoda extend to the greater depth, and many live at greater depths than 300 feet.

In Inchnacardoch bay Mr. Scourfield found *Ophryozous gracilis* for the first time in Britain; and the rare *Ilyocryptus agilis*, previously known in several places in England, was got in the same locality.

Abyssal region.—In Loch Ness a large proportion of the littoral species extend to about 300 feet in depth, probably because of the very steeply sloping sides. Those species only are considered as truly abyssal which are generally distributed over the mud, into the deepest part of the loch. A small association of animals is found thus distributed, and the abyssal region, being defined as the bottom where this association is found almost free of admixture, must be considered to begin at about 300 feet. Exclusive of Rhizopoda, there are about a dozen animals constantly found in this region, comprising—1 Mollusc, *Pisidium pusillum*, Gmel.; 3 Crustacea, *Cyclops viridis*, Jurine, *Candona candida*, Müll., and *Cypria ophthalmica*, Jurine; 3 worms, *Stylodrilus gabretz*, Vejd., *Monetus morgiensis*, Du Plessis, and an undetermined Oligochaete; 1 insect, *Chironomus* (larva); several Infusoria, parasites on the Molluscs and Crustacea.

Several other species occur casually at great depths, such as *Hydra*, *Limnæa*, *Lyncæus affinis*, and *Proales daphnicola*.

A small char, *Salmo alpinus*, was dredged at a depth of over 500 feet.

Larvæ of *Tanyptus* and some other diptera are frequent, but less constant than *Chironomus*.

Rhizopoda.—Dr. Penard has identified about forty species and varieties from depths of more than 300 feet. They thus constitute the greater part of the species in our abyssal region, but their presence there is of little special interest, and there are only some half a dozen species and varieties which are doubtfully supposed to be peculiar to deep lakes.

Summary of the Number of Species.

Species.		Species	
Mollusca	5	Dinoflagellata	3
Hydrachnida	1	Phanerozamia	33
Tardigrada	22	Equisetaceæ	1
Insecta	6	Lycopodiaceæ	1
Crustacea	55	Characeæ	2
Rotifera	151	Mosses	6
Gastrotricha	2	Hepatics	2
Worms	12	Floridæ	2
Coelenterata	2	Chlorophyceæ	46
Infusoria	11	Myxophyceæ (Report in prepara-	
Sarcodina	67	tion)	—
Mastigophora	3	Bacillariaceæ	20

We have thus a total of 453 species recorded for Loch Ness, excluding all Vertebrata, blue-green Alge, and some other groups on which no work has been done. The Hydrachnida, Insecta, Worms, Infusoria, Chlorophyceæ, and Diatoms, have all been insufficiently studied, and the lists could be easily increased.