THE FAUNA OF THE FRESH WATER LOCHS OF BUTE.

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The lakes in Bute, like other lakes in the Highlands, are probably not of any great age geologically speaking, not older certainly than the glacial period, and it is to glacial action that many of them, no doubt, owe their existence.

For the size of the Island, we have quite a number of inland lochs or tarns varying in size, in depth, in elevation, and varying also in the number and in the variety of animals which they contain. It is not in the largest lochs that we find the richest fauna—on the contrary, it is in the smaller ponds and pools in which weed grows, and from which fish are absent that we find the greatest variety of animal life. For example, if one takes a walk round the shores of Loch Ascog, one is apt to be disappointed in the apparent lack of living and moving things which are to be seen in the water. It is only by stooping down, turning over the stones, and observing carefully that you will find some of the varieties of molluscs and other animals which the loch contains.

On the other hand, in the little pond known as the Vineries, on the top of the hill above Ascog, one has only to stand on the margin and peer into the weedy depths, when countless animals are to be seen pursuing their various occupations, mostly in search of food, and not seldom devouring each other. Newts are found there crawling stealthily and by jerks at the bottom of the pond, and occasionally rising to the surface to gulp down a mouthful of air. Water beetles of various kinds are to be seen swimming actively about, and

constantly coming to the surface to renew their supply of air, which they mostly store at their tails entangled among some hairs. Water scorpions, with large prehensile forelegs, are very plentiful, these mostly clinging to weed near the margin of the pond, lying in wait for their prey. The larvæ of caddis-flies, with their curiously constructed cases of sticks or stones or shells, are there in plenty in the late spring and summer, and are to be seen rolling about everywhere. By the use of a scoop or net dragged judiciously among the weed, or along the bottom of the pond, these and many more animals may be caught and examined at close quarters.

In Loch Fad we have a sheet of water divided by the causeway into an upper deep portion comparatively free from weed and with comparatively little life. The lower portion beneath the causeway is shallow, full of weed, and teeming with all sorts of aquatic life. An evidence of this is to be found in the number of wild duck which are constantly to be seen feeding there in winter.

Another curious feature about Loch Fad is that the south-east shore is much more densely populated especially by molluscs than the north-west shore, and an explanation of this fact is probably to be found in the different formation of rock, the north-west or Woodend side being formed of hard trap rock, the south-east of soft sandstone, which affords a better habitat to living things.

At Greenan we have a shallow weedy loch, an ideal place for a naturalist, and an ideal place also for the wild duck.

Some of the smallest pools such as those left in a disused quarry make admirable hunting ground for fresh water life.

Thus a small pond covered with duck weed on the top of Canada Hill will well repay a visit, a still smaller one on the top of Birgidale Moor used to be very full of life, but in the hot summer of 1901 it dried up and it has never been so interesting since. That pond is the only place in Bute where I have seen the large water beetle, the Dyticus Marginalis.

There are various ways in which aquatic insects make use of this physical law. One of the most noticeable is that whereby an insect living under water supplies itself with a reservoir of air.

Thus the large water beetle has at its tail end a group of hairs, and a flattened space under the wing-covers and in this space a bubble of air is entangled by aid of the hairs to which the surface film adheres. The water spider has its abdomen covered by similar though finer hairs and in the interstices of these, air is imprisoned and is carried down under water, giving the spider an appearance of being covered with silver. Moreover, the spider is not content with merely carrying air about on its body, it weaves a dome shaped web which, being fixed to some water plant, is gradually filled with air and forms a large cell in which the spider lays its eggs and rears its young.

The gnat or mosquito also affords an interesting example of the use that is made of this law. In its larval or first stage it lives in pools of water where it finds its food. It is, however, an air-breathing larva, and the problem is how is it to obtain a constant supply of air from the atmosphere and at the same time a constant supply of food from under the water?

It is managed in this way. The specific gravity of the larva is just a little greater than that of water—that is to say it will sink in water, but it does not take much to keep it afloat.

Its breathing apparatus is placed at its tail end. At the extremity of the spiracles, or air-tubes which open there, you find five little flaps which, when folded, close the end of these tubes, and when opened form a little basin in the centre of which is the opening of the tubes. When the larva pushes its tail above water the flaps open, the surface film adheres to them, and exercises a pull sufficient to counteract the greater specific gravity of the animal, and so it hangs suspended by its tail from the surface and is able to devote its head or business end to the getting of food. When threatened itself by any animal above water it has simply to close the flaps of its air

tubes and thus sink into safety. It reaches the surface of the water again by a few wriggles, and has only to open the valves of its air tubes in order to catch the surface film again.

It so happens that a species of gnat is one of the greatest enemies of mankind, because it conveys to him when biting the organism which is the cause of malarial fever. Now bearing the mode of life of the larva in mind it at once becomes evident how effectively these can be destroyed by the simple plan of covering the surface of the pools which they inhabit, by a thin layer of petroleum. The petroleum forms a skin on the surface of the water which effectively prevents the larva from breathing. This has been largely carried out in our West African Colonies and forms an important part of the warfare against the mosquito.

The eggs of the gnat as well as the larva, require an ample supply of air and this is secured in a very ingenious way. The eggs are each shaped like a cartridge, pointed at one end and flat at the other. These are glued together to a little raft which floats on the water. The eggs are placed close to each other but not touching each other and with the pointed ends upwards. The surface film does not penetrate the interstices between the eggs, so they are always kept surrounded by air and always dry no matter how much the surface of the water may be troubled. The raft of the gnat's eggs was described long ago by Réaumur, the scientist who has given his name to the thermometer which is largely used on the Continent of Europe.

By the aid of the lantern a demonstration was then given of various species of animals living in the Bute lochs.