does occur at the margins of the wounds in the Alps where the larch is native. In these higher regions, however, the air is usually dry during periods of active growth and the young fructifications of the fungus are particularly sensitive to drought; consequently, even when many scattered trees are infected, the cups developed at the edges of the wounds are apt either to dry up altogether, or to produce relatively few spores, and these spores have fewer chances of germinating. In fact, the fungus enjoys at best a sporadic existence, chiefly at the bases of trees where the herbage affords a certain degree of dampness.

When the larch was brought down to the plains and valleys, however, and planted in all directions over large areas, the *Peziza* was also brought with it; but it will be clear from the foregoing discussion that the climatic conditions were now proportionally raised in favour of the fungus, and lowered to the disadvantage of the larch. Plantations in damp valleys, or in the neighbourhood of the sea, or of large lakes, were especially calculated to suffer from frost, and the damp air favoured the propagation of the fungus, and the disease tended to become epidemic. The enormous traffic in larch plants also shows how man too did his share in spreading the epidemic; and in fact the whole story of the larch-disease is of peculiar interest biologically, as illustrating the risks we run every day in trusting to the chapter of accidents to see us safely through any planting undertaking, no matter how great the stake at issue, or how ruthless the interference with those complex biological and physical conditions which always play such an important part in keeping the balance in the struggle for existence between all organisms living together.

Let us now very shortly see what are the chief lessons taught us by the bitter and costly experience which the larch-disease brought to foresters. It is evident that the larch should not be planted at all in low-lying situations exposed to late frosts; and even in more favoured valleys experience points to the advantage of mixing it with other trees: large areas of pure larch are planted at enormous risk in the lowlands.

As to the treatment of trees already diseased, it is possible (when it is worth while) to remove diseased branches from trees of which the trunk and crown are healthy, but it hardly needs mention that such diseased branches must be burnt at once. As regards trees with the stems diseased—in those cases where the patches are large, and much resin is flowing from the wounds, experience points to the advisability of cutting them down. In those cases where the tree is already very large, and the diseased wound but small, it may be expedient to let them alone: theoretically they ought to go, or at any rate the diseased tissues be excised and burnt; but it seems to be proved that such a tree may go on forming timber for many years before the wound will spread far enough to reduce the annual increment below the limits of profit, and we all know the view a practical forester will take of such a case. At the same time, it is the duty of the man of science to point out that even such a tree is a possible source of danger to its neighbours.

H. MARSHALL WARD.

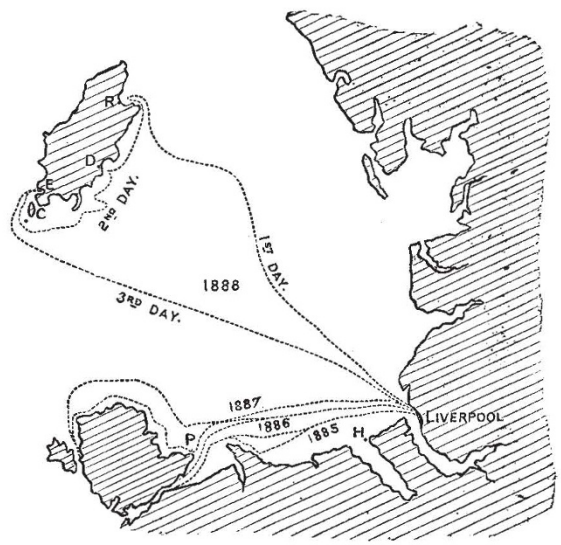
(*To be continued.*)

MARINE BIOLOGY AND THE ELECTRIC LIGHT.

THE Liverpool Salvage Association, with their usual liberality, placed their famous old steamer the *Hyæna* once more at the service of the Liverpool Marine Biology Committee this Whitsuntide, for a three days' dredging expedition. During the three former biological cruises of the *Hyæna* in 1885, 1886, and 1887, the region explored has been the southern part of the L.M.B.C. district, around the coasts of North Wales and Anglesey (see Fig.).

On the present occasion the Committee decided to run a couple of lines of soundings and dredgings between the Mersey and the Isle of Man, and to spend some time dredging round the southern end of that island; the general objects being (1) to get some knowledge of the depths, bottom, and animals, across the eastern half of the Irish Sea, and (2) to investigate the rich fauna living around the "Calf" and south end of the Isle of Man.

About 7 a.m. on Saturday morning, May 19, the *Hyæna* left the Liverpool landing-stage, with a party of nearly twenty biologists on board, and provided with dredges, trawls, tow-nets, sounding-line, deep-sea reversing thermometer, microscopes, and the other necessary instruments, dishes, bottles, and reagents. After the well-known sand-banks round the mouth of the Mersey had been passed, soundings and bottom temperatures were taken occasionally, and several times during the day a stop was made for trawling, dredging, and tow-netting. A fair amount of material, including some interesting larval forms, was obtained, and for the most part preserved for further examination. No greater depth than 23 fathoms



Map of the L.M.B.C. District, showing the course of the *Hyæna* in 1885, 1886, 1887, and 1888. H, Hilbre Island; P, Puffin Island; R, Ramsey; D, Douglas; E, Port Erin; C, the Calf.

was, however, met with; and there was nothing specially noteworthy amongst the animals dredged, so far as could be seen at the time.

It had been intended to anchor for the night in Douglas Bay, but during the dredging and trawling the vessel had drifted so far out of her course that when evening came it was found advisable to run for Ramsey. Here half the party went on shore for the night, the rest staying on board for the electric light experiments which will be described further on.

On the following morning an early start for the south was made, and the rest of the party was picked up at Douglas, and then the work of the day commenced. The *Hyæna* steamed slowly round the east and south coasts of the island to Port Erin, dredging and tow-netting at intervals, with very good results. When a stop was made for collecting, the fullest advantage was taken of it. The sounding-line and deep-sea thermometer were over amidships, and two dredges, a large bottom tow-net and one or more surface tow-nets, were put out astern. The deep tow-net, devised and worked by Mr. W. S. McMillan, was so weighted and buoyed as to work steadily at a

distance of a foot or so above the sea-bottom, and it yielded a large amount of material, which was in some cases conspicuously different from the contents of the surface nets, worked by Mr. I. C. Thompson during the same time.

A large area of the sea-bottom between Port Soderic and Port St. Mary is apparently covered by masses of *Melobesia calcarea* and the dead valves of *Pectunculus glycimeris*, and incrusting Polyzoa are especially abundant upon both the Nullipore and the shells. Mr. J. Lomas, who has charge of the Polyzoa, informs me that amongst a number of other rare forms he has identified *Stomatopora johnstoni* and *S. incrassata*, *Tubulipora lobulata*, *Lichenopora hispida*, *Cellepora dichotoma*, *Membranipora aurita*, and a peculiar variety of *Cellaria fistulosa*.

Towards evening three very successful hauls of the dredge were made, which covered practically all the ground in a line from the southern end of the "Calf" to the northern side of Port Erin Bay, just under Bradda Head. Amongst the material obtained in these hauls the following species were noticed: *Asterias glacialis*, *Solaster endeca*, *Stichaster roseus*, *Porania pulvillus*, *Luidia fragilissima*, *Antedon rosaceus*, *Ebalia* sp., *Xantho* sp., *Pleurobranchus membranaceus*, *Ascidia venosa*, *Ascidia plebeia*, *Corella parallelogramma*, *Polycarpa* sp., *Leptoclinum* sp., and other Compound Ascidians.

In Port Erin Bay after dark the electric light was again used successfully in the bottom and surface tow-nets.

On the third day an early start was again made, with the object of leaving time to run down into the deep water lying to the south of the Isle of Man. Unfortunately, however, a thick fog was encountered, which hampered our movements during the morning and changed all the plans for the day. After passing the "Chicken" Rock, the *Hyæna* steamed slowly for Liverpool, and reached the Mersey about 1 a.m. on Tuesday. A few hauls of the trawl and dredge were taken on the way home, with no great results, and the tow-nets, both bottom and surface, were worked whenever practicable.

The important feature of this cruise, however, was the use which was made of the electric light for collecting after dark. On the first night, in Ramsey Bay, after the shore party had left and the ship was anchored for the night, an electric light of 1000 candle-power was hoisted a few feet above deck, and this allowed work to be carried on almost as comfortably as during the day. Captain Young, of the Liverpool Salvage Association, who was in command of the *Hyæna*, then kindly arranged for me a 60 candle-power Edison-Swan submarine incandescent lamp in the mouth of a tow-net. This illuminated net was carefully let down to a depth of 3 fathoms, and allowed to remain there for half an hour. At the same time, another tow-net without any light was let down to the same depth over the opposite side of the ship. When the nets were being hauled in, as the one with the electric light approached the surface numerous small animals (Crustacea probably) were noticed accompanying it, and darting about in the bright light. This tow net, when emptied into a glass jar of sea-water, was found to contain an abundant gathering, consisting mainly of Crustaceans; while the net in the dark on the other side of the ship had practically nothing.

The two nets were then put out again. The one had the electric light in its former position, but this time it was let down to the bottom at a depth of 6 fathoms; while the other net was placed in the dark at the ship's stern, and also reached the bottom. The tow-nets remained stationary, but were kept distended by the tide. The outline of the illuminated net could be made out indistinctly at a depth of 6 fathoms. After being out for three-quarters of an hour, both nets were hauled in, with the same result as before. The illuminated net contained abundance of Crustacea (chiefly Amphipoda, Schizopoda, and Cumacea), while the dark net again contained practically nothing. These two experiments showed pretty conclusively the effect of the brilliant light in attracting the free-swimming animals, the difference between the contents of the two nets being on both occasions most marked. Consequently, on the second night, in Port Erin Bay, *both* nets were illuminated, and while the one was let down close to the bottom, at a depth of 5 fathoms, the other was kept at the surface of the sea on the opposite side of the ship. This experiment was tried three times, with the same result each time: both the nets were found to contain abundance of animals, but the bottom and surface gatherings differed greatly in appearance and in constitution. The net from the bottom contained mainly large Amphipoda, and some Cumacea, while the gathering from the surface was characterized by the abundance of Copepoda. As Mr. A. O. Walker, who is reporting upon our higher Crustacea, pointed out to me, the Amphipods from the deep net appeared to be chiefly red-eyed species, such as *Ampelisca lævigata* and *Bathyporeia pilosa*. If this, on a detailed examination of the material, turns out to be the case, it may indicate an interesting relation between the colour of the eyes and sensitiveness to the electric light.

Mr. Thompson has already identified the following species of Copepoda from the illuminated surface net: *Calanus finmarchicus*, *Pseudocalanus elongatus*, *Dias longiremis*, *Idya furcata*, *Centropages hamatus*, *Anomalocera patersonii*, *Isias clavipes*, *Oithona spinifrons*, *Harpacticus chelifer*, and *Harpacticus fulvus*. The specimens of the last two species are remarkable for their unusually large size and their abundance.

The various groups of animals collected will as usual be worked up in detail by specialists, and the results will appear in future L.M.B.C. Reports; but the application of the electric light to marine biology, as a bait or attraction in the tow-net worked after dark, seems of sufficient importance to warrant the publication of this preliminary account of the results of the *Hyæna* cruise of Whitsuntide 1888. The obvious extension of this illumination method to deep-water tow-netting and trawling during the day-time I hope, thanks to the kindness of the Salvage Association, to be able to experiment upon in a future expedition.

W. A. HERDMAN.

A REMARKABLE CASE OF FASCIATION IN FOURCROYA CUBENIS, *HAW*

THERE was lately exhibited in this city a plant of *Fourcroya cubensis*, Haw., in which the well-known, tree-like inflorescence had been deformed into what I believe to be the largest fasciation on record. The plant came from Carapa, a small village distant about 4 miles towards the west from Caracas. Its aspect is given in the accompanying figure, engraved after a photograph.

The stem of the plant, covered by the leaves, is about 1 metre in height. From between the upper leaves there branch out two flattened and curiously twisted bodies. The one to the left was soon checked in its growth, so that it forms but little more than a semicircle; whilst the other, after having described a curve somewhat like a very large capital S, rises to a height of about 4 metres from the soil. Both together have in the front view the appearance of a small boat with hoisted sail filled by the wind. The under and lower parts of this deformed flower-stem are covered by numerous bracts, and measure 80 centimetres in their greatest breadth. Towards the top it divides into shred-like branches bearing flower-buds; those of the latter I examined being in every respect of normal structure.

There can be little doubt that, in this case, the malformation is due to some injury done to the young flower-