The Run of Elvers in the River Bann, Northern Ireland.

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ONE of the largest and perhaps the generally best-known elver migration occurs in the Severn. Here for a very long time the migration has been recognized and commercial advantage has been taken of the presence of the little fish. The local population have caught them for their own consumption and for sale in the neighbouring towns and villages.

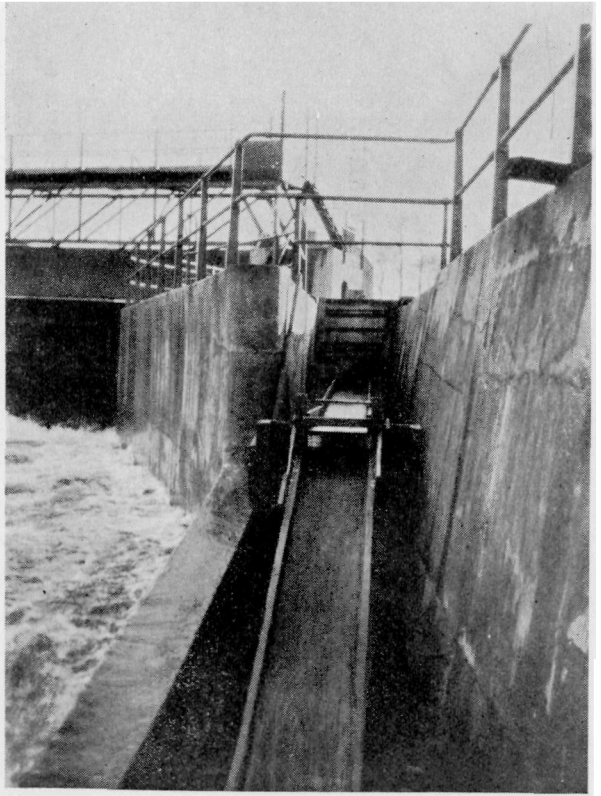
In the river Bann in Northern Ireland, where the most important European eel fishery dependent upon the natural production of the water exists, the presence of the elver run has also been noted. Here, however, the elvers are not captured as in the Severn but their upward progress is guarded and their passage over obstructions (e. g. weirs) assisted by means of passes specially provided for the purpose.

General observations of the run of elvers have been made on the Bann over a very long period of years, and for the past four years a much more exact record of the migration has been obtained.

Since 1860 the lower Bann has been a partially canalized river with a level controlled and regulated, so far as is possible, by weirs for the purpose of facilitating navigation. In the year 1930 the Government of Northern Ireland decided to make extensive alterations in the river channel in the interests of land drainage and it became evident that, in the course of these operations, the run of elvers would necessarily be interfered with.

In 1933 arrangements for the natural migration of the elvers past certain of the works in the middle reaches of the river became exceedingly difficult. It was, therefore, decided to trap the elvers at the lowest obstruction in the river channel and transport them alive by road to a part of the river situated above all the works offering obstacle to their progress.

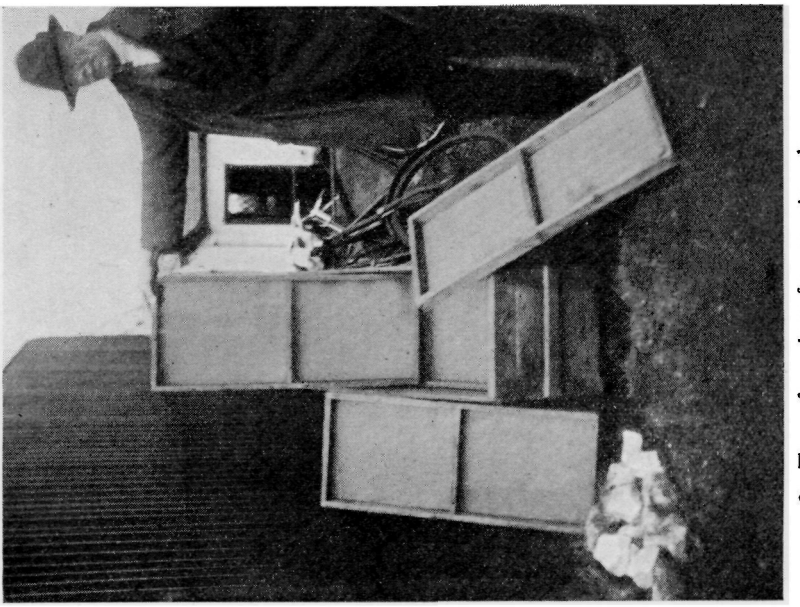
1. Elver slip with straw ropes in position.



2.a. Looking up elver slip with flap closed.
From river side.
No straw rope on chute.

2.b. Elver trap open ready to take out fish.

2.c. Top of elver slip showing trap.



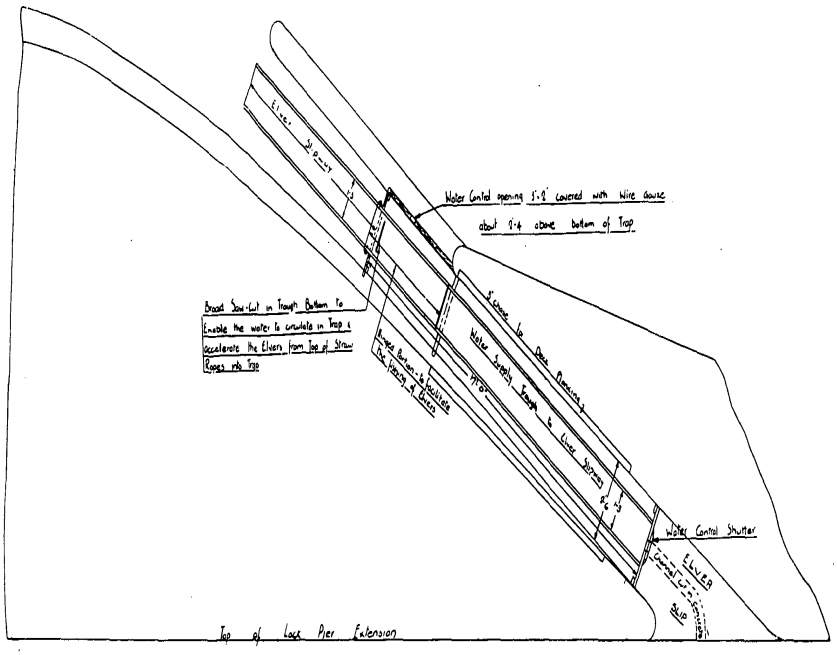
3. Trays from box for carrying elvers.

4. Net used for catching elvers in river Severn.
Photo: L. Hugh Milne.

DETAIL OF ELVER TRAP AT CUTTS.

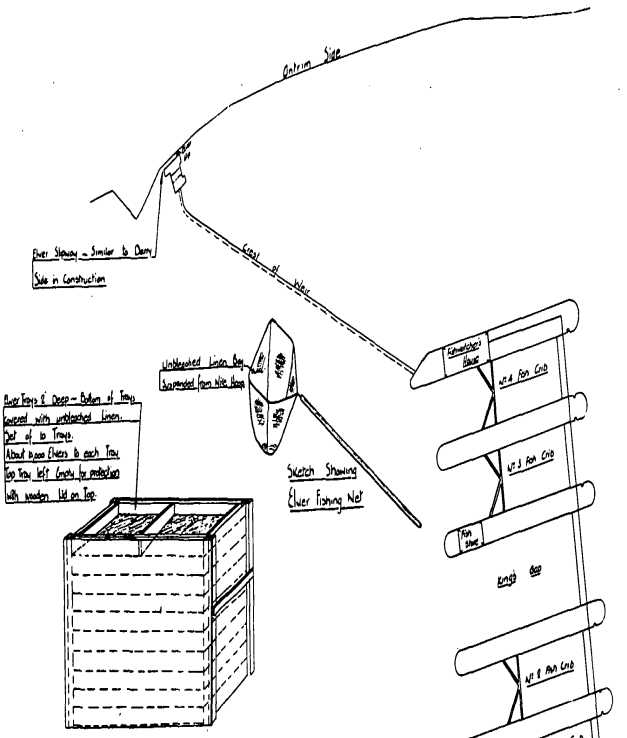
Scales: Key Plan. one inch = 30 feet

Plan & Elevation. 3/8" = one foot



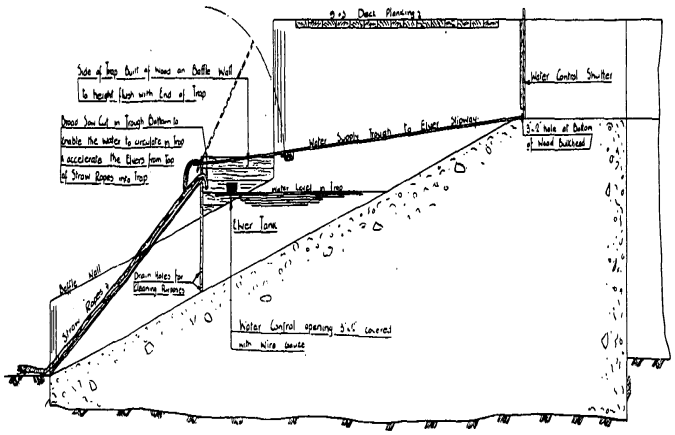
Plan of Elver Trap and Slipway

Scale 3/8" = one foot



Elver Transport Box

3'-6" x 1'-8" x 0'-8" Deep



Section thro Centre of Elver Slipway

Scale 3/8 = one foot

Key Plan Showing Elver Slipp
in Relation to Sluice Gates, etc

Scale 30 feet = one inch

At the top of the tide way, at a place called The Cutts about ¾ mile above Coleraine, a weir about 6 ft. high existed for the control of water level. In the middle of this were situated salmon traps (called cribs) and at each bank an elver pass up which the little fish were able to go.

In the course of the works the weir between the cribs and the left bank of the river was replaced by a line of sluices with a short portion of new concrete weir between the end sluice and the bank. In this new weir a fresh elver pass was made thirty-one feet long, three feet six inches wide and having a uniform gradient of one in four. The old elver pass at the left bank was of similar form. The details are shown on the plan in Fig. 1 and Plate 1.

When elvers are expected ropes, loosely woven of straw, are affixed to the top of, and laid in, the passes and are so arranged that a gentle stream of water flows down them. The elvers always travel close to the side of the river, ascend along the top and underneath the rope, and so pass on to the water above.

At first sight it might appear from an inspection of the plan that the foot of the new pass is situated too far downstream and that the elvers, having gone beyond the pass, might not return to it. This might have been the case had a small amount of water flowed steadily over the top of the sluice. But this is not so. The top of the sluice is normally dry and if the sluice be open from below then the velocity and quantity of water is such as to sweep the elvers downstream. In the latter event the projecting toe of the pass forms an eddy into which the elvers can easily swim and thence gain the passage upstream. Some elvers do go past the pass, when the sluices are closed and dry, as the tide rises but these return again to within reach of the pass as the tide ebbs.

At the time of a big run the whole pass may be a moving, wriggling black mass of elvers which are preyed on by every imaginable creature; adult eels and trout, various gulls and other birds, even rats, take their toll.

The general idea of the trapping arrangement was that after the elvers ascended the pass they should enter not the open river but a simple box trap. However, various difficulties were met with and finally Major M. Mallet, Resident Engineer for the Government of Northern Ireland, devised the plan shown in Figs. 1 and 2 and in Plate 2. At first the chute carrying the water discharged on to the top of the straw rope but it was found that so exact was the affinity of the elvers for running water, and not merely for a damp lead, that they would not follow down the straw into the trap itself until a limited amount of water was discharged through the slit in the chute, so as to fall exactly on top of the rope and thence into the tank.

Once this arrangement was arrived at the success achieved was such that the whole of the run was caught. The velocity of the water through the fish traps (cribs) in the centre of the weir was too great to allow of any elvers ascending by that route and they were

unable to ascend the weir wall or sluices at any point, other than through the passes.

The elvers which enter the trap were periodically removed, weighed, placed in boxes and conveyed by motor lorry to a point on the river, or to Lough Neagh at the head of the lower Bann, where, after consultation with the Toome Eel Fishery Ltd., they are again placed in the water. In this way a very accurate record was obtained of the numbers and the movements of the elvers as they came straight from the sea and ascended the six miles of tidal waters from the mouth of the Bann to the Cutts.

The numbers of elvers were ascertained by counting a sample pound weight, which proved to be 1400 elvers, and then estimating the day to day totals from the accurate weight of the catch and by using the experimental count as the basis of calculation.

The little fish were transported in boxes, three feet six inches by one foot eight inches by two feet high (Fig. 1 and Plate 3) in which are trays having linen bottoms on which the elvers are thinly spread. For these short journeys each tray can take about 10,000 elvers. If put on too thickly they are apt to be choked in their own slime. If the period of detention in fresh air is too long they have to be gradually re-introduced to water by first sprinkling them lightly with a watering can and then gradually increasing the quantity till they are again totally immersed. But for the very few hours detention involved in catching, weighing, and transporting in the Bann operations such precautions were found to be unnecessary.

The first fact which has emerged from the observations is that each run of elvers is coincident with a spring tide period, and that during neap tides no elvers normally arrive in the river. Usually the blank period consists of four or five days but occasionally may be a day shorter. During the three years of observation a real run during the neap tides only occurred twice (May 1935)[1]).

A run does not build up steadily from the time the tides start to increase in height until the biggest tide is reached, but the numbers fluctuate in a rather irregular manner, possibly due to the influence of weather as well as to the state of the sea at the bar at the river mouth. The Bann enters the sea in a straight channel between training walls so that the state of the sea might be expected to have a considerably greater influence than in, for instance, a wide estuary such as Lough Foyle (next to the Bann) or as the Severn.

The elvers arrive by day and by night indifferently although in the Severn estuary they seem to travel more by night, or during the hours of darkness are more subject to capture by the small hand nets, resembling oblong landing nets, (Plate 4) which are used for the purpose.

The only definite deterrents which apparently exist to a run once it has commenced are a cold northerly wind or, to a still greater

[1]) And again in 1936.

degree, a frosty night. Both these factors, or the temperature factor which they imply, are quite decisive in putting the elvers down and even causing those which may be on the ropes in the passes to take cover either beneath or actually within the straw bands. The largest runs occur with south, south-west and west wind, with warm showers or moist weather. No matter how great the run might be, if the wind moves to the north, they immediately disappear and the run stops. This result may possibly be accentuated by the situation of the Cutts which face the north, so that the north wind blows upstream, and the elver slips are very much exposed to it.

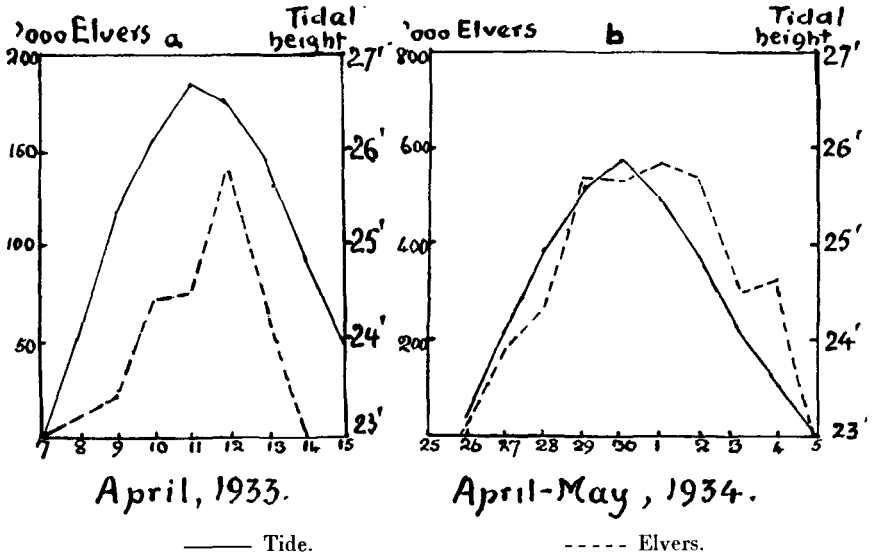


Fig. 3.

As an illustration of the very close connexion between the tidal heights and the elver runs I give two pairs of curves (Fig. 3) showing the relationship between the two. The exceptional conditions which prevailed in 1935 when the elvers ran during a neap tide and not to the usual extent in the following spring tide I also illustrate (Fig. 4).

In 1913 Dr. Bowman of this Board published a paper (1) recording the position and date of captures of elvers in the open sea round the coasts of Scotland. He found the *leptocephalus* stage off the west and north-west of Lewis, and north of the Shetlands, in July and August, and the glass elver stage off the east coast from November to March. He had a particularly good series in and off the Firth of Forth in December to March and in the upper firth in April. Norwegian observers had at that time found the same stage in the North Sea in March and April as had also Danish scientists close to their own coast.

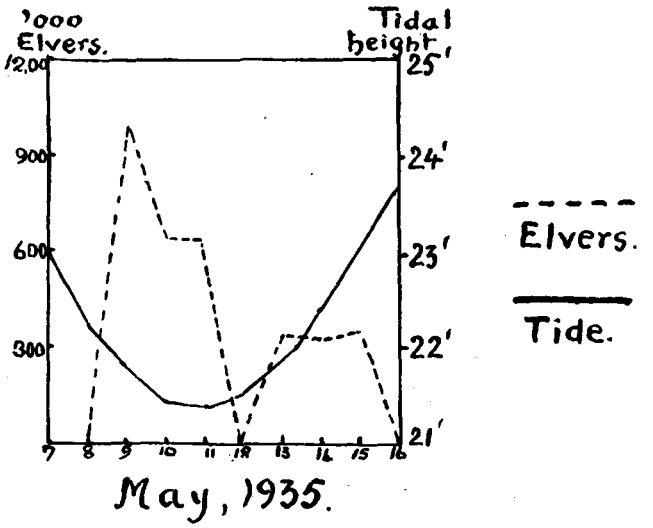


Fig. 4.

Later (1922) Professor S c h m i d t (2) announced his classic researches and showed that the *leptocephali* arrive off the coastal banks of Europe in their third summer and during the succeeding autumn and winter undergo the retrograde metamorphosis which converts them, at a shorter length, into glass elvers. I (3) have found elvers in the glass elver stage in the stomachs of trout caught in the estuary of the Howmore river (South Uist, Outer Hebrides) in February 1927.

No elvers have been found in the Bann so early in the year. The first arrivals at the Cutts are in April but in the first spring tide of that month the numbers are meagre (1933 and 1935) or none may come at all (1934).

Large numbers of elvers may come in the second spring tide in April (1933 and 1935) although the catch in that month in 1934 was much smaller than in either of the other years. May is usually the most important month although June, when the majority of the catch are taken in the first half of the month, follows it closely. Only a few elvers, quite unimportant stragglers, arrive at the beginning of July and the run then ceases. The proportion of the catch taken in each month in the three years in question is as follows: —

Percentage of Catch.

	1933	1934	1935
April	35.	12.5	38.
May	33.	48.	45.
June	29.	39.	15.
July	3.	.5	2.
Total.....	100.	100.	100.

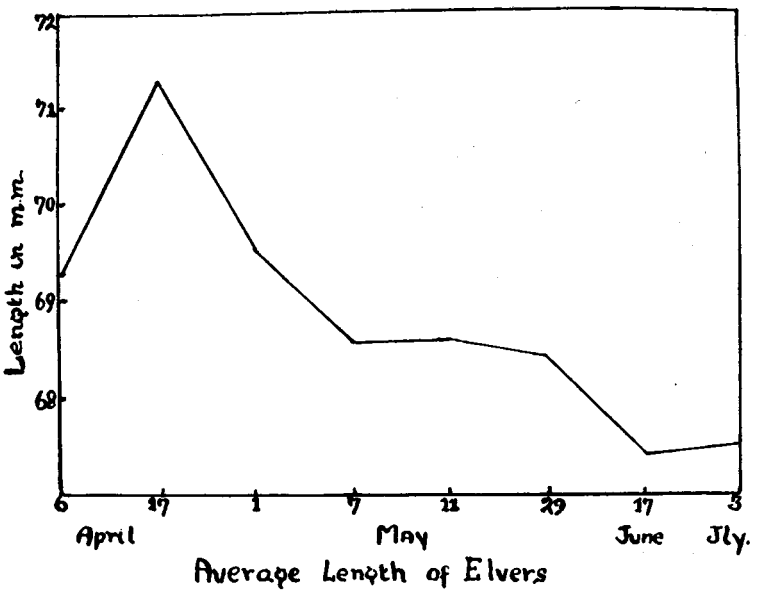


Fig. 5.

The actual numbers dealt with may be of interest. They are given in the following table in round figures.

Numbers of Elvers.

	1933	1934	1935
April	3,500,000	1,900,000	7,700,000
May	3,300,000	7,500,000	9,100,000
June	2,900,000	6,100,000	3,000,000
July	300,000	100,000	500,000
Total ..	10,000,000	15,600,000	20,300,000

The largest catch in the 24 hours consisted of 1,440,000 elvers on 10th May 1934. The elvers in the earlier part of the run are not strongly pigmented but the amount of colouring matter quickly increases and those in the later part of the migration are fully developed in this respect.

Professor S c h m i d t also found (2) that during the metamorphosis of the larvae they not only lose a substantial part (75 %) of their weight but also a material portion of their length. Thus while the leptocephalid larvae of June 1905 averaged 75 mm. in length the glass elvers of May 1906 were only about 66 mm.

The 49 glass elvers recorded by Dr. B o w m a n *(loc. cit.)* averaged 68.4 mm.

During 1935 I caused samples (consisting of 100 elvers each) to be taken and preserved at intervals throughout the run. Eight such samples were taken and these 800 elvers on their way up the Bann average 68.8 mm. in length.

Of the individual samples the average lengths have also been calculated. These do not show (Fig. 5) a progressive increase in length as might be expected but a decrease of almost four millimetres during the season. The later fish also are obviously thinner and these facts would suggest that the process of deterioration indicated at the metamorphic stage is, at least to some extent, progressive until the little fish reach fresh water.

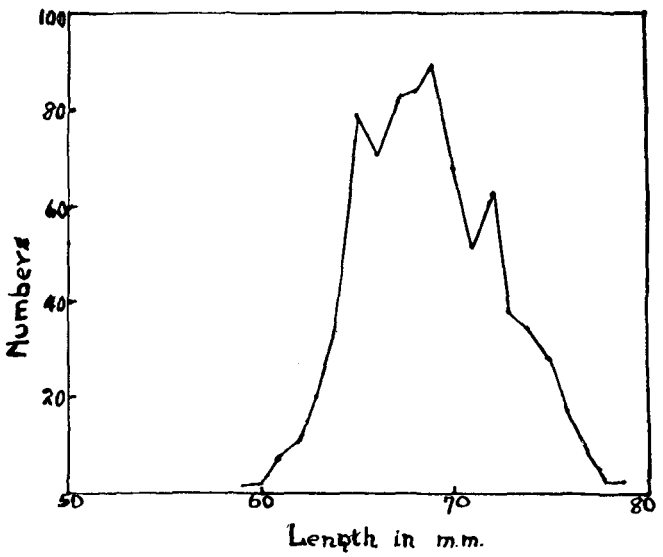
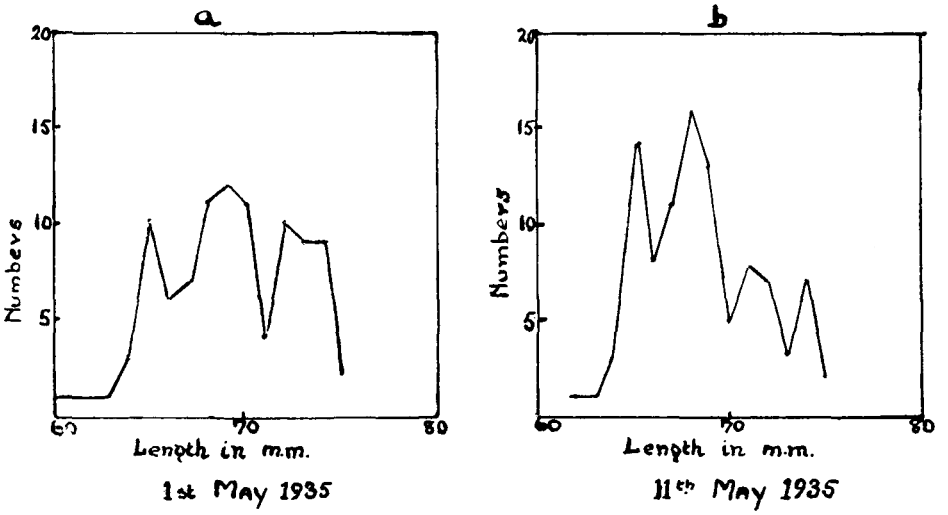


Fig. 6

Figure 5 shows that after an increase from the first sample (taken on the day when a very small number of elvers first appeared at the Cutts and which may not have been representative of the general body) there is a steady decline in the average length until the end of the season. Throughout the whole time the averages are greater than the size given by Professor S c h m i d t, but the general average is very close to that of Dr. B o w m a n.

A curve of the length frequencies (Fig. 6) does not demonstrate a quite homogeneous sample although it must be complicated to some extent by the progressive decrease in size. Curves of the individual samples e. g. 1st May and 11th May (Fig. 7, a and b) similarly are somewhat erratic and suggest a bi-cuspid distribution.

Bearing in mind the known difference in the lengths of the sexes in the adult stage it seemed possible that this same variation might be observable even at this very early period in the life of the fish.



(a) Fig. 7. (b)

Dr. John Berry kindly undertook to look into the possibility of determining the sexes of the elvers and with the permission of Professor W. Rae Sheriffs the work was done in the latter's laboratory at University College, Southampton. Unfortunately it was found to be impracticable to determine the sex at this early period of life.

The design of the elver trap and the supervision of the work of trapping were undertaken by Major Maurice Mallet, Resident Engineer for the Government of Northern Ireland and the actual work of handling and transporting the elvers was successfully carried out by Sergeant Henderson, late Royal Ulster Constabulary; throughout they worked in as close collaboration as possible with the lessees of the eel fishery, the Toome Eel Fisheries Ltd.

Bibliography.

1. Bowman, Alexander, D. Sc., "The Distribution of the Larvae of the Eel in Scottish Waters" — "Fisheries, Scotland, Sci. Invest., 1912, 2".
2. Schmidt, Johs., D. Sc., "The Breeding Places of the Eel" — Philosophical Transactions of the Royal Society of London, Series B., Vol. 211, 1922.
3. Menzies, W. J. M., "The Common Eel and its Capture" — "Fisheries Scotland, Salmon Fish., 1932, VI".