



AN ROINN TALMHAIOCHTA AGUS IASCAIGH
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**Synopses of talks given at meetings organised by the
Fisheries Division of the Department of Agriculture
and Fisheries.**

As part of its contribution to EUROPEAN CONSERVATION YEAR, 1970, the Fisheries Division of the Department of Agriculture and Fisheries organised a series of lectures in Dublin and at centres around the country to indicate what work is being carried out in the Division within the conservation field.

The Dublin meetings were opened by reading of addresses by Mr. Jackie Fahey, Parliamentary Secretary to the Minister for Agriculture and Fisheries. The Parliamentary Secretary's addresses and those of the chairman, Dr. A.E.J. Went, D.Sc., M.R.I.A., Inspector of Fisheries and Scientific Adviser and synopses of the talks by the other speakers (all from the Department of Agriculture and Fisheries) are given.

INLAND FISHERIES

Intercontinental Hotel, Ballsbridge on 28 October, 1970
Mr. J. Fahey, Parliamentary Secretary to the Minister for Agriculture and Fisheries.

I am very pleased to have the opportunity of saying a few words about the value of our inland fishery resources and the importance of conserving and developing them.

We in Ireland are fortunate to be living in a country endowed with an abundance of inland waters which, duly developed and conserved, provide excellent fishing for anglers and a valuable source of revenue through angling and commercial fishing. We are also fortunate that we have so far been affected only to a minor extent by the conservation problems posed by modern living, such as urbanisation, industrialisation, agricultural technology and recreational pressures, which have ravaged fishing waters in other countries. These factors should not, however, lull us into complacency. We should recognise that what has happened in other countries can easily happen here and that the conservation of the national values which we possess to-day is vital to the well-being of our own people and to the maintenance of the favourable position we still enjoy, particularly in relation to our tourist potential.

More and more people are becoming interested in fishing, on both the sport and commercial levels, and with modern transport and improved access fishing is becoming more attractive. In looking at recent fishing competitions, particularly sea angling competitions, we have noted with great interest the growing numbers of persons who are joining in sport fishing as family groups.

We know how important it is that all measures be taken to conserve fish stocks to ensure that there will be enough to go round. This is at present being done both through development work and through protection of existing stocks. Development work is geared to improving existing facilities (such as spawning and nursery areas) with a view to increasing the stocks of fish available; providing access to fisheries; erecting fishing stands, and so on. Everything, in short, to make life more pleasant and profitable for the fisherman. Protection measures consist mostly of safeguarding existing stocks of fish and preventing over-exploitation. In the course of this meeting you will hear of the work being done by my Department's biologists on the life history and stocks of our freshwater fisheries and by our engineers on river improvement works.

I take this opportunity of paying tribute to the many bodies involved either directly or indirectly in the development and conservation of fisheries, including the Boards of Conservators, the Inland Fisheries Trust, the Electricity Supply Board, Bórd Fáilte Éireann and angling associations, clubs and individuals throughout the country. While urging these to keep up the good work, I would like to invite others who may be interested to lend whatever support they can in maintaining and enhancing our natural environment.

A Commission on Inland Fisheries was set up recently to examine all aspects of inland fisheries. This will be a wide-ranging inquiry leading, probably, to recommendations

about the tenure, development, management and optimum utilisation of fisheries and about measures to deal with pollution.

The potential of angling tourism, which last year contributed nearly £4½ million to the national economy, is something of which we are all aware. The Fisheries Division of the Department of Agriculture and Fisheries, in conjunction with the Economic and Social Research Institute and Bórd Fáilte Éireann, are at present undertaking an economic evaluation of fishing resources with a view to collecting information on the value of such resources, on the relationship between demand and supply of resources, on the capacity for future development and ultimately a cost benefit analysis in relation to investment. It is possible that some of you may be approached in connection with the survey and I would ask you to co-operate fully. The results of the studies will, I hope, help in framing policies for the future development of fisheries.

In conclusion, may I thank you all for coming here to-night and urge you once again to do everything possible to maintain and safeguard our fishing resources, not just for ourselves but for future generations as well.

Dr. A.E.J. Went (Chairman).

Man has for a very long time recognised the need to conserve fish stocks and close seasons were introduced very many years ago. The idea behind the close season concept was that a fish requires a period during which it could breed without being disturbed in any way. Protection of young fish against capture was another early conservation measure. These measures seem fairly obvious but there are others, as we shall see which are not so obvious.

Our fishery laws in relation to inland fisheries, divorced from the mass of detail, are aimed at providing measures for maintaining or improving the stocks of fish

as a whole - not for any one individual but in the interest of all who fish, whether for profit or pleasure. The term conservation implies something more than letting things remain as they are. Some form of positive management is necessary, based on a knowledge of the life history of the fish, its habits, those of its predators and competitors, how fishing operations affect the fish and so on. Before we can introduce an effective conservation programme we must have an accurate knowledge of the species with which we are concerned.

It is as well to say at an early stage that whilst some people may protect fisheries, that is to say prevent outsiders from participating, this is not necessarily conservation as we really understand the term. The object of protection is to restrict fishing, either to the owner or a limited number of people. If this group of individuals take more fish than would have been the case if a wider circle of persons had fished the conservation effect would be nil. However, in some cases protection may have as a side issue a conservation effect.

Miss Eileen Twomey, M.Sc. and Messrs. C. Moriarty, M.Sc. and D. McCarthy, M.Sc. are engaged on biological researches into various aspects of our inland fisheries and Messrs. M. Dorgan, B.E. D. Murphy, B.E. and P.C. Dolan, B.E. on the engineering aspects. All of them are doing work which fits in with the conservation programme for Irish freshwater fishes.

It is as well to say that of the species of freshwater fishes found in this country salmon and eels are exploited commercially; there is a limited amount of commercial exploitation of brown trout but the salmon, trout, and the so-called coarse fish, pike, perch, rudd, roach, dace, bream, tench and carp are also important angler's fishes providing valuable tourist revenue to the country.

Miss Eileen Twomey, M.Sc. (Inspector of Fisheries) on Salmon.

The salmon is the most prized fish in the North Atlantic to-day and Ireland is one of the leading salmon fishing nations in the area. In addition to a substantial home consumption our exports of salmon are worth about £1 million a year and the income to the State from salmon-angling tourists is reckoned to be between £250,000 and £500,000. The pressures on the stocks of such a valuable fish are very great and much work is needed to ensure that the catch is maintained.

The regulation of the catch by enforcing close seasons must be based on a detailed knowledge of the nature of the stocks. Several lines of investigation are in progress. Tagging of young and adult fish provides information on where they travel and to what extent other nations exploit our stocks. Determination of the ages of large samples of salmon show how there has been a tendency for the numbers of spring fish to decline and grilse to increase since the "twenties" of this century. Examination of the catch statistics indicate that we are enjoying some of the best runs of grilse ever recorded.

Mr. C. Moriarty, M.Sc. (Assistant Inspector of Fisheries) on Eels.

The annual catch of eels is worth about £70,000 which puts them in the 'top ten' of Irish commercial fishes. Research at present is aimed at discovering whether the country is producing as many eels as it can. The method of working is to use a standard set of nets to catch samples of eels in various lakes and rivers so that the stocks of various waters can be compared.

Eels caught in this way are measured and weighed, their ages are determined by examining growth rings on the otoliths (small bones from the skull) and their feeding habits are studied by examining the contents of the stomachs.

The most interesting information to come to light so far is that small eels are virtually absent from the upper waters of our larger river systems. Apparently it takes them many

years to work their ways up. This suggests that it might be possible to increase the national eel population substantially by transporting young eels over land to the higher waters. The study of the food, combined with an examination of the productivity of the lakes in question, should show whether this can be done without risk to the existing stocks of other fish.

Mr. D. McCarthy, M.Sc. (Assistant Inspector of Fisheries)
on Primary Production.

From 1967 to 1970 the Department has been collecting information on juvenile salmon and brown trout, their growth and population sizes in nursery stream areas of poor (acid) and rich (alkaline) river systems. The maintenance and increase where possible of existing salmon and brown trout stocks are of prime importance to-day as increasing inroads are being made on them by pollution, disease and overfishing. Two waters were selected for this work, the River Owenea, which is an acid river located in Co. Donegal and the alkaline Trimbleston River located in Co. Meath.

The work involved the collection of juvenile salmon and brown trout by electro-fishing and examining them for age and growth rate. The food of the fish, i.e. bottom and drifting invertebrates, were also sampled to estimate the available food supply.

The results obtained showed that between three and ten times as much food was produced in alkaline than in acid rivers and this resulted in a bigger size of brown trout. The average size of a four-year-old trout in the alkaline water was 1½ lbs. compared with 4 ozs in acid water. Young salmon in alkaline water also grew faster and the majority migrated to sea as one-year-old smolts compared to 90% migrating to sea as two-year-olds from the acid waters under review.

Mr. M.B. Dorgan, B.E. (Fisheries Engineer) on Civil Engineering Works as an aid to Fish Conservation.

Fish passes can be designed to enable fish to overcome obstructions in rivers which may be natural or man made. A natural obstruction in the lower reaches of a river such as that at Ennistymon Falls in Co. Clare, may prevent fish from entering the system, thus prohibiting natural propagation. Man made obstructions such as that at Ardnacrusha Hydro-Electric Dam on the River Shannon may inhibit fish movement to the spawning grounds and thereby interfere with fish stocks. The provision of fish passes at both these obstructions as well as at many others permits fish movement to continue unhindered.

Hydro-electric dams present special problems because of their height, and the nature of water flow conditions downstream from them. Research into fish movements at dams has led to the development of various kinds of fish passes including the type based on the principle of the ship lock and known as the Borland Pass.

Increasing industrialisation has brought about a rapid increase in water use which usually is abstracted from rivers and lakes. Engineers have designed systems whereby many industries can recirculate process waters and pumping and treatment costs can thereby be reduced substantially. Re-use of process water also means that less is abstracted from the river and interference with fish life is minimised.

Careful treatment of factory wastes is essential to avoid causing damage to fish life. Many industries in this country discharge organic wastes. While these are not in themselves toxic, they would, if discharged into a river untreated, absorb oxygen to the extent that oxygen depletion could occur. Fish would not survive in such conditions. Engineers can design and provide modern methods of treating organic wastes rendering them innocuous before discharge into a river.

Mr. D.F. Murphy, B.E. (Fisheries Engineer) on Electricity and Electronics as an aid to Fish Conservation.

Electricity and electronics can now be applied successfully to problems of conserving stocks of salmon and other important freshwater fishes.

Automatic electronic fish counters, the development of which has received a significant boost by research work carried out in Ireland under the direction of C.J. McGrath, Inspector and Engineer, Department of Agriculture and Fisheries, have been in use for several years on a number of important rivers, recording the numbers of salmon ascending those rivers through fish passes.

Work on the development of these counters is continuing in Ireland and has included in recent years the development of a new type of "wide-gap" counter which shows encouraging signs of being successful but which is still in the experimental stage. When fully developed, this will meet a pressing need in many countries for an arrangement for recording fish movement across the full width of a river channel. All that will be required is to provide a low weir across which salmon can pass at any point. At present it is necessary to avail of existing obstructions to fish movement or to provide artificial ones on which a fish pass can be built and through which the movement of fish can be funneled and in which a fish counter can be installed to record the passage of fish. As such an arrangement is not practicable in the lower reaches of many rivers where fish counting could be carried out most beneficially, success in the development of the "wide-gap" counter will prove a great boon to all engaged in fishery research and fish management, not alone in Ireland but in other parts of the world.

The data recorded by salmon counters gives a clear picture of the time-distribution of the total run in a river, and of the fluctuations in stocks from year to year. Such

information is important for salmon conservation because it indicates when stocks are running low and provides some of the data needed for planning the measures to be taken to remedy the situation. Histograms of salmon runs can be related to various parameters, such as river temperature and flow and light intensity, which influence fish movement, and thus increase knowledge of the dynamics of migration.

Another important tool in fishery management is the electric fish screen which can be used to prevent adult fish from entering waters where their health or life would be endangered.

Electric fishing apparatus, which has been developed to reduce the hardship in fishing and to make it more efficient, nowadays is used as an important aid in biological investigations of fish stocks as well as in ensuring their rational exploitation. Significant developments in this equipment have resulted from research work carried out in Ireland.

Mr. P.C. Dolan, B.E. (Fisheries Engineer) on Civil Engineering Works as an aid to Fish Conservation.

In order that biologists can undertake the research work into the life cycle of salmon, it is necessary that they have complete control of fish movements into and out of river systems and be able to sample fish runs and count fish at will. Special types of installations have to be provided that will enable this to be done without undue interference with the movement of fish or causing them any injury. A typical installation of this nature has been designed by C.J. McGrath, Inspector and Engineer, Department of Agriculture and Fisheries and constructed for the Salmon Research Trust of Ireland at "The Salmon Leap", Furnace, Co. Mayo, which incorporates both a fish pass and a trapping device for upstream and downstream migrant fish.

Disturbance of the river bed by engineering works, such as drainage operations, or interference with river flows such as by hydro-electric development, or water abstraction

for industry or domestic use, can interfere with the natural reproduction of fish species and special provisions have to be made to rehabilitate areas so affected. In some cases, there is need, either short term or long term, to boost fish stocks by artificial means and for this purpose, it is necessary to construct hatcheries and rearing stations. The design of these and the incidental facilities required for the capture and retention of the adult fish without injury, calls for special knowledge of the requirements of the fish at the various stages of development. This also is the case as regards the incubation of the resultant fish eggs and the rearing and liberation of the young fish into the river system where special knowledge is required to cater for their needs and provide adequately for their development.

Abstraction of water can create problems for the fish as well as for the angler by the reduction of river flows and the creation thereby of unfavourable conditions for the fish to live in and for the practice of angling. This can be offset by carrying out special works in the river channel to create the required conditions artificially. These measures include the storage of water for liberation at suitable times to augment the natural river flow; the construction of artificial pools is another method that can be employed.

Measures of this nature can be employed also in natural river courses unaffected by engineering works but where the river flow is "flashy" in nature and there are accordingly long periods of the year with insufficient river flow for fish life. These works provide better conditions for fish life than would otherwise be the case and also extend the range of river flows during which it is possible to engage in fishing.

Natural spawning areas in river channels, both those affected by engineering works as well as those which have naturally deteriorated can be refurbished and brought into full productivity by restoring the permeability of the gravel

and making it suitable once again so that fish will use the gravel and that fish eggs deposited there will hatch out successfully. Special measures can also be taken to prevent over-cutting of spawning redds such as the placing of plastic streamers subsequent to the first use of the spawning redd by the parent fish.

After the reading of the papers questions from the audience were answered by the speakers and Mr. C.J. McGrath, B.E., C. Eng., M.I.E.I. (Inspector of Fisheries and Engineer).

SEA FISHERIES

St. Lawrence Hotel, Howth on 30 October, 1970.

Mr. J. Fahey, Parliamentary Secretary to the Minister for Agriculture and Fisheries.

Earlier this week I opened a symposium on the contribution of our Inland Fisheries to European Conservation Year and I must say that I was very gratified with the excellent papers that were delivered and with the lively discussion that followed. I trust that tonight's programme relating to Sea Fisheries Conservation will prove equally stimulating.

At times measures taken to conserve the stocks of certain species of fish which are available to Irish fishermen appear at first sight to run counter to the programme which has been undertaken for the development of our sea fisheries. This programme envisages a considerable expansion of landings by Irish vessels, and towards the achievement of these targets our skippers have been encouraged to invest heavily in larger and more efficient vessels and to intensify their efforts in the catching of fish. To meet their increased capital commitments these skippers do in fact expand their output and so their initial reaction to any conservation measures that are deemed necessary may be that such measures constitute a barrier to their advancement. This, of course, is not so. Conservation measures are adopted only when the existing level of exploitation of the

stocks is endangering the very existence of the stocks . while they may entail a temporary reduction in the level of catch, the alternative is to allow overfishing to continue until irreparable damage has been done. In the long term, therefore, conservation measures are for the good of all and particularly of the fishermen.

What we must also bear in mind is that, even though our fishermen may exploit a fishery entirely within our exclusive fishery limits, the stocks may be part of a larger fishery which extends to waters being fished by other countries. Should overfishing arise in a situation such as this, remedial action would be an international obligation and we would be expected to play our part in formulating satisfactory conservation proposals and in complying with whatever measures might be agreed upon by all concerned.

Conservation in the sea fisheries context can follow various lines. We have minimum size limits for certain species; for others only nets of prescribed mesh sizes may be used; for some varieties of shellfish there are close seasons, daily hours of fishing, restrictions as to the size of dredge, and so on. These measures are of themselves very effective but at times we have doubts as to the extent to which they are being observed by our fishermen. I have in mind particularly the restrictions relating to size limits of fish and mesh of nets. I am not for a moment inferring that all our fishermen or even a large percentage of them are ignoring this matter of conservation of stocks but I would ask those who are remiss to consider for a moment the results of their action. Undersized fish has little market value, creates a bad image for all of our fish and makes serious inroads into the stocks of future years.

Dr. A.E.J. Went (Chairman).

Most of the marine fishes with which we are concerned in this country are to be found inside and outside Ireland's national fishery limits and, therefore, if conservation measures are to be fully effective as regards many species we must have international action. This has been recognised for a long time and a number of international agencies for this purpose have been set up in recent years. The organisation of importance to Ireland is the North East Atlantic Fisheries Commission, established under the International Fisheries Convention of London of 1959, to provide for regulation of the sea fisheries of the North-east Atlantic.

Two main methods of conservation for marine fish have been used so far, namely control of the mesh size of nets and size limits for fish. If a large mesh size is fixed for nets many young fish as well as some large fish will escape capture, whereas with a small mesh size small fish will be retained by the net and a large proportion will die and not contribute to the reproduction of the stock. A compromise between large and small nets has to be reached, bearing in mind the species which you are seeking.

But we cannot fix proper size limits for either nets or fish without knowing a considerable amount about the species of fish we are interested in, how fishing operations affect it and so on.

Fisheries research in the marine field is directed, amongst other things, at finding out the facts upon which schemes for the national exploitation of the fish stocks can be based. Conservation measures for some species may be obvious but in other species satisfactory measures cannot be suggested at present. Dublin Bay Prawns, for example, are not entirely suitable for size limits or control of mesh size of nets. If conservation measures are needed for this species

they must take some other course. This is the background of the work on Dublin Bay Prawns which will be described later. The Department of Agriculture and Fisheries has been conducting researches over a wide field in the marine sphere and the speakers will be covering many species including herrings, demersal fishes, crustaceans including lobsters and Dublin Bay Prawns, oysters and mussels, indicating what work has been done in recent years to obtain basic information upon which the future can be determined.

Dr. F.A. Gibson, Ph.D. (Inspector of Fisheries) on The background to Sea Fisheries Investigations.

Fish and shellfish are amongst the last animals on earth to be hunted on a world wide scale and fishermen are the last of the "big-time" hunters. As hunters, fishermen have a special responsibility placed upon them to see that the various stocks are maintained at levels sufficient to permit annual renewal and maintain abundance.

Fishing, as opposed to farming, will always remain the means by which most fish are exploited. This is especially true of those types of fish which are normally available in huge numbers such as herrings, sprat, cod, whiting etc. For such species scientists suggest measures which if observed by the fishermen will prevent overfishing. These regulatory measures, some national and some international in character, are designed to maintain fish stocks at levels high enough to ensure future supplies. In many species of fishes, particularly shellfish and flat fish, their future probably lies in organised fish farming.

The fisheries scientist, therefore, carries out research on two broad fronts, one concerned with devising regulations for natural stocks to prevent overfishing and the other with farming techniques. In each case cooperation is necessary between the scientist on the one hand and the fisherman or fish farmer on the other if the future of this rich source of food supply for the world is to be assured.

Mr. J.P. Hillis, B.Sc. (Assistant Inspector of Fisheries) on
Dublin Bay Prawns.

Recent research on the Dublin Bay prawn has included two trawl surveys of their distribution in the Irish Sea (September, 1969 and February 1970), a survey of changes in the catch over the periods of dawn and dusk in November 1969, surveys of the changing distribution of larvae (April/June 1970) and studies of the development in captivity of larvae and post-larval forms.

The trawl surveys showed two main concentrations of prawns in September 1969, in 35-50 fathoms east of that part of the coast from Rush to Laytown, and in 10-19 fathoms, north-east of Clogherhead. By February 1970 the former area had been abandoned by the prawn and the population in the latter had moved slightly deeper.

The "dawn" surveys showed peak catches in various depths at the following times:-

Depth (fathoms)	12	17	22	30
Time (minutes)	-40	-35	+ 5	+25

(- = before dawn; + = after dawn).

Substantial broad-daylight catches were obtained in 22 and 30 fathoms. The dusk experiments, carried out during poorer weather, were less conclusive.

Surveys of larvae showed the "breeding" season to commence early in May, and to still be in progress late in June. A south-easterly movement of larvae with age appears to take place.

Rearing of larval and post larval stages was undertaken in 1969 and 1970 to give information on duration of the larval stages (three in number) and the growth rate after metamorphosis.

The following mean durations of stages in days were observed (numbers of specimens in brackets):

	<u>Larval stages.</u>		<u>Post larval stages.</u>		
	2	3	1	2	3
1969	-	9.7(3)	15.7(3)	18(1)	-
1970	8.6(10)	12(1)	18.4(5)	21.5(2)	18(1)

Mr. D. de G. Griffith, B.A. (Mod.), (Assistant Inspector of Fisheries) on Plaice.

The plaice is one of our more valuable sea fish and 35,000 to 40,000 cwts. are landed in Ireland every year, mainly from the east coast. When the plaice first hatches from the egg it has the same general appearance as the young of other species, but about 45 days after hatching it has become flattened and swims on its left side. It spends the first year of its life in shallow bays and migrates to deeper water as it grows older.

The fisheries biologist bases many of his assessments on the age and growth rate of the fish. The bulk of the Irish Sea commercial catch of plaice consists of 2-year and 3-year old fish. The chief features of this population are that it is made up of fast-growing individuals and that older fish are scarce - an indication of a high intensity of fishing.

Tagging experiments in the Irish Sea have shown that although the migrations of adult fish are largely confined to moving up and down the coast within a belt some 20 miles from shore, individual plaice can travel as far as the Shetland Islands, the Hebrides, and two other points 100 miles south and south-south-west respectively from Mizen Head, Co. Cork, Heavy recapture rates (up to 37% in the first 12 months) from Irish Sea tag releases bear out the assessment of this population as one which is heavily exploited.

Mr. J. Molloy, B.Sc. (Assistant Inspector of Fisheries) on Herrings.

The purpose of research on herrings is to ensure that the best results, from an economical viewpoint, are obtained for fishermen by placing the fishery on a manageable basis. To do this, one must first isolate and identify the stocks in question by comparing various biological characters such as growth rates, age distribution, spawning times and certain other characters. Having done this it is necessary to study the reaction of the particular stock to fishing. This can be done by taking the catch per effort, (whether the effort be number of hours fishing, days fishing etc.) as an index of stock abundance. When this index is compared from year to year it will give an indication of how the stock is reacting to fishing. When it is further related to the yearly age distributions it is possible to establish the annual numbers of fish that have died and this can be split further into those that die naturally and those that die as a result of fishing. This total mortality is proportional to the total effort and thus when related to the numbers recruited annually and their growth rate, the maximum sustainable yield for a fishery can be estimated.

Finally, the total catch at anytime is judged in relation to the maximum sustainable yield which if exceeded necessitates conservation methods, such as closed areas, seasons, reduction of effort, etc. On the other hand, if the maximum sustainable and yield is above the existing catch, a more vigorous fishery can be pursued.

Mr. M. Crowley, B.Sc. (Assistant Inspector of Fisheries) on Mussels.

The mussel industry in Ireland has undergone remarkable progress in recent years (700 tons in 1966 to 1200 tons in 1967, to 2400 tons in 1968 and 2600 tons in 1969). The value of mussels to the fishermen in 1969 was £32,000 and their export value was £87,000. The industry in Ireland is mainly restricted to 5 areas, namely Wexford, Cromane, Omeath,

Dundalk and Mornington. Farming of mussels is not practiced to any extent in Ireland but some progress is being made in this respect at Cromane and Wexford. One might expect 17 tons of mussels per acre per annum on good ground so that on the basis of the 1969 production only a total of 150 acres of ground would be needed. This is a very small area compared with the suitable ground available so there is a vast potential for mussel farming in Ireland. Many suitable estuaries have no mussels at present but are capable under farming techniques of yielding mussels valued at up to £250 per acre per annum. By careful planning and proper mussel farming it is hoped to raise the level of production of mussels in Ireland.

Science can assist the fishermen to achieve their goals. Research will play a major role in seeking out suitable ground, trying out improved methods of farming and supplementing natural by artificial methods, where necessary and possible. For example raft culture, which is already being tried out in a limited way in this country, is used to induce mussels to settle on floating objects where they grow faster and reach maturity quickly (in 14 months or so). This faster growth is attributed to:-

1. Warmer water (the upper layers are usually warmer than those near the bottom);
2. More food;
3. More oxygen;
4. No predators.

Young mussels are highly susceptible to pollution. In the planktonic stage almost any source of serious pollution within an estuary will cause the death of millions of young mussels. Consequently research into sources of pollution must be carried on simultaneously with these or other aspects of the biology of the mussel.

Mr. C. Duggan, B.Sc. (Assistant Inspector of Fisheries) on Oysters.

At one time oysters occurred on all coasts of Ireland, mainly in bays and estuaries. Due to overfishing many

formerly productive areas ceased to have worthwhile stocks of oysters, and only three bays are now dredged for oysters. In the order of their production these are Tralee Bay, Galway Bay and Kilkieran Bay.

Since 1965 the Fisheries Division has monitored the spat settlement in Tralee Bay, as an aid to the conservation of the stock, and in order to increase the spat (young oyster) settlement. This monitoring is done by putting out pairs of unglazed ceramic plates fixed on concrete blocks in selected parts of the bay, from June to September. One plate of each pair is changed weekly, and the number of spat settling on is counted. The other plate is left unchanged until September. These plates show when, where, and how many spat settled, their growth and survival. The best areas are now known, and the spat settlement is increased by putting out mussel shell at the right time, as determined by plankton samples, to settle the oyster spat.

Experiments have also begun on the use of plastic spat collectors, and on the growing of oysters and clams in the warmed cooling water of Tarbert generating station.

After the reading of papers questions from the audience were answered by the speakers.

PROVINCIAL MEETINGS

In addition to the two Dublin meetings the Fisheries Division organised meetings as follows:-

November 5, 1970. Minella Hotel, Clonmel with speakers Miss Eileen Twomey (Chairman), Mr. M. Dorgan and Mr. C.I.D. Moriarty;

November 6, 1970. Vocational School, Waterford with Miss Eileen Twomey (Chairman), Mr. M. Dorgan and Mr. J. Molloy;

November 13, 1970. Intercontinental Hotel, Cork with Dr. F.A. Gibson (Chairman), Mr. D. Murphy and Miss Eileen Twomey;

November 19, 1970. Shamrock Lodge, Athlone with Mr. P.C. Dolan (Chairman), Mr. C. Moriarty and Mr. D. McCarthy;

November 20, 1970. Atlanta Hotel, Galway with Mr. P.C. Dolan (Chairman), Mr. C. Moriarty and Mr. C. Duggan and December 4, 1970. Great Southern Hotel, Sligo with Mr. M. Dorgan (Chairman), Dr. F.A. Gibson and Miss Eileen Twomey.

The talks at these meetings were on similar lines to those at the Dublin meetings.