THE SALMON AND TROUT ASSOCIATION

London Conference, 1960

THE VALUE OF STOCKING RIVERS WITH TROUT

by Lancelot R. Peart

In Britain the total number employed in trout culture probably does not exceed one hundred persons and the delicate machine responsible for stocking our waters has always been and still is in the hands of very few men. We have no chemists, biologists, psysiologists, statisticians or other highly qualified and highly paid professionals in the industry. We are probably too busy with practical things and somewhat exposed to the risk of failing to see the wood for the trees.

Accordingly this is not a scientific paper, nor, perhaps, a particularly practical one. The stocking of running water with trout is obviously a more complicated and uncertain process than stocking lakes and other static waters, about which reliable and advantageous data can more readily be assembled. I raised this point with Mr. Barclay, Honorary Secretary of the Salmon and Trout Association, but he thought it best to steer clear of all lakes, gravel-pits and reservoirs and concentrate upon the stocking of rivers with trout, with particular emphasis upon the *value* of such operations.

For anything to be of value it must be worth seeking. There must be a need for it. Production without demand would obviously be pointless. To breed and rear trout would be quite meaningless were there no demand for them: a desire to possess them on somebody's part. But since trout culture began about a century ago, and most of the trout farms in this country have been operating more or less continuously (apart from the war years) for 50–80 years, presumably the supply and demand for trout has also been continuous: sometimes more, sometimes less, and certainly changing in one respect or another as the years have passed.

In a lecture at the Royal Institution, Albemarle Street, on April 17, 1863, Frank Buckland, the famous naturalist, stated: "The culture of fish is just now beginning to attract public notice in this highly-favoured and densely-populated island, and it will be my aim to show you both its theory and practice, whereby those of you who have no opportunity of carrying it out, may reason upon its scientific phenomena: those who have fisheries, ponds and other waters, may actually develop the theory into practice. But in order that you may rightly understand why fish should be cultivated by artificial means, and why it is so necessary to do so, I would beg you to examine—first the causes of their scarcity; and secondly to point out the means whereby these causes may be avoided, so that your painstaking and care may be rewarded fourfold."

Frank Buckland wrote thus nearly one hundred years ago and it is evident that in his view, at any rate, the stocking of waters had great potential value, even in those days when fishermen were relatively few and wild trout far more numerous than they are at present, or are ever likely to be in the future.

But, unfortunately for the anglers of today, the dreams and ideas of men like Frank Buckland—and there were a number of them—did not prove to be so simple or straightforward as early expectations had given grounds for supposing. In fact there were far more complications than any of these pioneers, primed as they must have been with boundless energy and enthusiasm, ever imagined.

For the early conception of fish culture was founded upon the belief that all you had to do was to take the eggs from a fish, hatch them off and enlarge the resultant fry in streams and rivers, for remarkable increases in the adult stock, both of trout and salmon, automatically to accrue. The strange thing is that many fishermen and others went on believing this for at least a generation. Ova from trout and salmon were hatched in tens of millions in many countries, duly released, and as surely perished in their tens of millions. Yet few of these old-timers appear to have been dismayed at apparent, or even obvious, failures. Such successes as there were —and in the acclimatization field, some of these successes were quite dramatic— seem merely to have acted as spurs to greater efforts to produce in greater and still greater quantity.

There remain, of course, advocates of fry stocking even today. But few of them are practical men, few who have sufficient faith to put the matter to the test, and even fewer, who having stocked with fry, can claim any significant results. A majority now accepts (if many accept it only with sorrow and resignation) that the early ideas of stocking with great numbers of very small trout were highly wasteful and often quite unnecessary.

Derisley Hobbs (Trout Fisheries in New Zealand, 1948), whose researches achieved considerable publicity, evidently had a very poor opinion of all hatchery work and produced a great deal of supporting evidence to back that opinion. He was able to show convincingly that the natural production of fry in the types of water with which he was dealing was at least as good, if not better than that obtained by hatching ova artificially. He pointed out, quite correctly, that only an insignificant proportion of the total available ova from wild trout is handled in hatcheries and, accordingly, that results would have to be very much better in the hatchery, by comparison with natural spawning, to achieve any significance. He writes: "So far man has introduced trout to a multiplicity of environments. From seed sown long ago stocks have developed well or poorly according, very largely, to the suitability of these environments. Today, in most waters, differences in density of stocks reflect dissimilarities of the environments and also of the intensities of exploitation of their products."

Fishery biology has been described, I cannot recall by whom, as the study of the life and death of fishes. A trout can be killed but once. That is really the core of the matter. Fishermen have killed so many trout—Hobbs, in the rather cumbrous jargon of the scientists, calls it "the intensities of exploitation of their products"—and while trout have been slain and reduced in numbers, anglers have multiplied exceedingly.

In some rivers it may not be too much of an exaggeration to suggest that the number of wild trout is exceeded by the multitude of anglers in pursuit of them. It should never be forgotten that success in angling is a potent factor increasing trout mortality and leading inexorably towards their eventual extermination.

Man must surely be the primary enemy of the trout, even when not actively or consciously hostile? In the guise of the fisherman he is certainly the most intelligent marauder of the species, guilefully protecting trout from lesser foes, so that he, the angler, may enjoy the privilege of being the trout's last enemy, if not the first.

Our rivers do their best, of course, to produce more trout, regardless of what the angler does to jeopardize production. But many trout are caught when they are growing at their maximum rate. Those surviving a little longer—and in many waters survivors seem to be all too few—are the very trout that anglers are most eager to catch, comprising, of course, the largest specimens and the cream of the breeding stock.

What have we actually achieved if we take a worthwhile, indigenous trout from our favourite stream? We have provided ourselves with something to admire, possibly with something with which to delude ourselves into imagining that we are better fishermen than we are. Certainly we have gained a breakfast: and there may be something in the notion that by winning a trout for breakfast we are releasing food to sustain and enlarge the lesser trout that we hope will furnish us with other breakfasts in days to come.

Yet, one cannot escape the belief that our interference with the life of the truly wild trout has been, and will continue to be, all too frequent. Nor can one ignore the opinion that the gradual eclipse of the untamed trout of our open rivers has largely been due to the enterprise and skill of anglers.

As I have written in other words above (and I fear that this paper may suffer considerably from repetitions) the fisherman is a very efficient predator: much more efficient than any other animal. Surely Nature, having already ranged a legion of enemies against the trout, never intended man to fish by way of the kind of sport that trout fishing has become today? The wild trout is liable to persecution from the day it is deposited as an egg, firstly by natural predators and then, as it approaches a size likely to interest the angler—and a trout of surprisingly few inches is large enough to galvanize some anglers into action—by man himself. For fishermen are very persistent and seldom give up. Sooner, rather than later, a trout of sizeable dimensions is marked down, harried, caught and killed. And a sizeable trout takes three or four years for even our finest rivers to produce. But an angler can kill a trout in less than five minutes. That, I believe, is the problem we are really up against.

Some people believe that this problem—the problem of over-fishing—is to be solved entirely by conservation. Now conservation, which means protecting and preserving, is a fine thing; and but for its wide adoption, many creatures, particularly the larger, more conspicuous ones, would have disappeared for ever from the face of the earth. There is no doubt that, with one proviso, realistic conservation would succeed in maintaining a bountiful stock of trout in any natural trout stream. But that one stipulation would certainly prove to be extremely painful to the angler. Fishing would either have to cease entirely, or be severely limited.

Mere conservation, however, is unlikely to be enough, if men are still to be allowed to fish. There is hardly a well-known stream left in England—certainly very few in the Midlands or South Country—where wild trout make more than a token contribution to the annual bag of the angler. Even in Scotland, Wales and Ireland, the practice of restocking is extending rapidly in waters where the annual catch of fish exceeds the capacity for natural replacement. The demand for fishing and the inadequate supply of trout streams have together caused a concentration of anglers along our rivers far greater than can fully be served merely by conservation.

To put the matter in the crudest possible way, it follows that the requirements of fishermen can only be satisfied (these needs can seldom be fully met, since fishermen are not readily satiable) by bulk additions of living trout-flesh. There is no other way of doing this except by raising trout artificially and injecting them into our hard-fished streams and rivers so as to increase the over-all weight of trout to a level several times greater than can be produced by natural processes, aided though these be by the fullest possible measures of conservation.

Research and practice by trial and error, overwhelmingly support the view that for any tangible success in stocking waters *already holding natural stocks* (and particularly when they are heavily fished) it is usually essential to carry trout on to later stages, in some cases turning out but one trout where previously a thousand tiny ones had been thought to be the proper number.

That is not to suggest that stocking with trout is anything like a perfect process today. It certainly is not. But there is an element of success in much of the present-day stocking; and though it is considerably haphazard, it can produce some tangible results; it does have some value; and thousands of fishermen are quite dependent upon it.

For angling has become so popular. The motor-car takes fishermen so speedily to waters (if not always of their preference) where trout can still be caught. Fishermen have wonderful tackle and many have learned to use it most effectively. They have more leisure at the end of the week and holidays every year. They want to relax and fish.

The effect of all this has inevitably resulted in a scarcity of good water; less water per rod and a simultaneous reduction of stocks of trout. In a majority of hard-fished waters, the main constituent of the bag consists of trout that have come from a hatchery, either as small fish, or more probably, as bigger ones.

The free-swimming life of the trout begins at the spawning-redds with many hundreds, sometimes many thousands, of other little trout, perfect down to the last fin, four-pounders in miniature and lacking only in inches and bulk to take their place on a platter beside the most exalted trout a man could ever hope to catch. But it is that very length and thickness, magnitude if you wish, that remains for most anglers and all but a small minority of trout, the unattainable. For while the few, the fittest, or the most fortunate (whichever way you care to look at it) are battling their way through to survival and avoirdupois, the multitude is withering away, lost and forgotten as though they had never been, the many being reduced to the few, along the many roads to death.

So, when you are lucky, or skilful enough, to capture a truly wild trout of acceptable size for any particular water, remember the struggles that fish has endured in living sufficiently long to provide you with such rare and splendid sport and pleasure. Remember, also, the thousands of tiny trout that started the same journey, but lagged and weakened, were starved and slain and arrived at journey's end but prematurely.

I am sure I have taken too long in reaching a stage where a consideration of the merits of different sizes and ages of trout for stocking streams might be attempted. Yet, on reflection, I think that some caution is justified since, in my view, a satisfactory pattern for stocking any water cannot be reached without examining the following points:

(1) The character of the stream or river concerned.
(2) The way in which the stream is fished, or will be fished in the future.
(3) The level or quality of fishing available or intended.
(4) The practical and economic actions involved; and what further measures will be necessary in attempting to achieve a particular set of results.

There is no need for me to point out to a gathering largely composed of anglers, how greatly the streams and rivers of the British Isles vary from one another—the becks and brooks and burns, the meandering lowland rivers, the chalk and limestone streams, the great salmon rivers and all the rest—or how any one stream can vary enormously in character up and down its course. All are endowed with variable qualities such as size, depth, flow, bottom materials, colour and turbidity, stability and many interacting chemical and physical characteristics which, subtly blended together, give to each stream its individuality. Accordingly, each stream, or length of stream, should be carefully appraised and classified, its possibilities and limitations adequately recognized. Needless to say, all this is much more easily said than done.

Again, it does not follow that because a stream, or part of a stream, is suitable for fishing in a certain way, that that is the way it is fished. For few streams or rivers are owned by one proprietor. Usually there are many riparian owners. These owners, being as individualistic as the streams (or portions of stream) they own, treat them in different ways. Some are indifferent; some ignore them completely; some retain exclusive rights; some let all-comers fish; a majority let their waters to associations, clubs, syndicates, or fishing tenants. All these people will certainly hold a variety of opinions and have quite dissimilar purposes.

Think for a moment, if you will, of almost any river, or considerable part of a river, that you know quite well. Not only is it likely to vary appreciably in character up and down its length; it is also probable that the uses made of it—the way it is fished and tended—will vary almost as widely.

Here, perhaps, we find a mile or so belonging to a busy farmer, seldom fished and almost certainly left to its own devices, yet much sought after by the farmer's fishing friends; and very good fishing, too.

Further down the river, a hotel rents the fishing rights. Nothing much is done in the way of maintenance apart from occasionally trimming back an offending tree-branch. The stream is hard-fished by a continual succession of hotel visitors, but sport is meagre and red-letter days understandably few.

The next two miles is fished by a syndicate keepering it themselves and doing odd jobs about the riverside at weekends when not fishing. They also fish the river heavily and consider it necessary to do some modest annual restocking, mainly with smallish trout, but also with sizeable ones for luck.

Next comes a large estate with several miles of river running through it. The owner does not fish himself, but has friends who fish occasionally. A professional river keeper looks after the water and, as it is lightly fished, is nearly always able to show good sport to his employer's guests. No stocking is carried out, but the keeper carefully nurses the stock of native trout and conscientiously pursues the pike and other vermin.

The next stretch is fished by a club with thirty or so members paying a high subscription. By virtue of the considerable membership the water is heavily fished; but in view of the high subscription a superior level of sport is expected and heavy stocking with takeable trout has become essential in order to achieve it.

And so, all down a stream, you will find a different set of circumstances, making it very difficult to lay down hard and fast suggestions for general stocking or re-stocking. Advice can only be given with any prospect of success when all the facts (or as many of them as possible) have been ascertained.

That brings me to the third and fourth points in our consideration of a stretch of river with a view to stocking it with trout. We already know something about its character and general possibilities. The likely degree of fishing has also been decided. The next important decision, so it seems to me, is to budget for results, both practically and economically.

Here, again, there is a very wide margin as to the way things may, or may not, be achieved. Is the fishing for one, for a few, or for many? Is it to be run at minimum cost, or is the cost of little consequence? The answers to such questions—and there are a number of others like them—appear to me to be highly relevant.

Of equal relevance is what the one, the few, or the many, will consider a satisfactory number and size of trout to have to show for a season's fishing. And is that hope, or intention, a reasonable one in regard to all the resources available?

Obviously I have not the space to develop this theme, or to have done more than to reveal the bare bones of a method of going to work that seems likely to give superior results than a purely random or ingenuous approach.

I think it is now becoming clear that in the early days of trout culture—and the early trout farmers achieved an astonishing amount in quite a short time—which had been conceived and developed as human populations increased and fish populations simultaneously declined, that a fundamental error in deductive reasoning was made. It had been assumed, quite wrongly, as recent researches tend to show, that the natural reproduction of trout was inefficient: that by assisting the trout to produce more fry from a given number of ova, adult stocks would automatically increase and the problem of over-fishing be solved for ever.

The more likely supposition seems to be that trout are no less able to reproduce themselves, granted the opportunity and a congenial environment, than any other creature. Given an adequate breeding stock, suitable spawning areas and a sufficiency of nursery waters, there seems little doubt that any trout stream is perfectly capable of maintaining, quite unaided, an optimum number of trout of all ages. Indeed, the forces at play will automatically be directed, not only towards the maintenance of the stock, but to increase it should any favourable condition intervene.

But the whole process is surely put out of gear by the presence of man and all his works and their general effect upon the trout's environment? Added to misfortunes and vexations such as pollution, water abstraction, impoundment of spawning areas and all the complicated side-effects of civilization, we have the charming sport of fishing. And fishing places an unnatural overload upon the trout's capacity to reproduce itself.

Not only does fishing react unfavourably upon current breeding stocks, since it is the adult or maturing fish that chiefly interest the angler, but the effect is cumulative and likely to be disastrous for the future.

It seems that an omission was made by failure fully to realize that the trout production of every stream is limited, some streams being rich and some being poor, but that neither rich nor poor can be overfished for any length of time without causing stocks to dwindle.

But there is hardly any reason to suppose that these hard-fished waters, where trout are now decidedly scarce, would not quickly recover their former excellence (subject to similar water conditions prevailing) if fishing were to lose its present popularity, or drastically to be curtailed. Protection from anglers would seem to offer the greatest hope of saving the wild trout from eventual extinction.

Sanctuary is the condition perhaps most needed to preserve the trout. Support for this belief is not hard to find. Whilst I have been typing these notes, I have glanced up from time to time to watch a trout in the river outside the window, less than six yards from where I am sitting. He has been there, usually poised a couple of yards above the waterfall, for at least three weeks. That he is still there is entirely due to the fact that I have resisted the temptation to go outside and catch him, which even I could probably do quite easily. If I catch a trout today, or a number of trout, in a certain place, it surely increases the probability that I shall catch fewer trout, or none at all, tomorrow?

We have a little stretch of river here which is very seldom fished except for a week or ten days during the mayfly season. It has never yet failed to produce a number of excellent trout, ranging from 2—4 lbs., with occasionally a very much larger one. The fact that trout are always present—and usually inclined to rise and take more freely than on any other stretch nearby—is surely because it is jealously guarded and very lightly fished? The place is virtually a fish-sanctuary; and it is the scarcity of sanctuaries, indeed the almost total lack of privacy, that makes wild trout (and big trout in particular) so rare today; or so it seems to me.

Looking back through what I have written, I appear to have wasted a great deal of paper largely in an attempt to put the blame for a scarcity of trout and an inadequacy of trout streams fairly and squarely upon the shoulders of the fishermen, a fact that a majority (particularly the middle-aged and elderly) doubtless fully realize, though shrinking perhaps from any such admission. The angler is, of course, no more blameworthy for creating a scarcity of trout, than is a starving man for feeling hungry in a poor and over-populated country. The angler is only to blame because he wants to angle with a fishing-rod. And who can blame him for that?

I am also very much aware that Mr. Barclay's instructions—to stress the *value* of stocking rivers—have largely been ignored, except no doubt by implication.

Now, although I am a trout farmer, have lived on a trout farm for considerably more than forty years, have worked on a trout farm most of my working life and most of my leisure, too, when it comes to selling trout I am, by nature, a most reluctant salesman. I derive my greatest pleasure from the trout themselves—the occupational disease of most reputable trout farmers has always been, of course, an obsession with the job itself—and hope that such trout as I succeed in rearing will subsequently sell themselves.

To be quite honest, the trout farmer somewhat infrequently has much influence upon the number or size of trout to be released in a stretch of stream or river and he really does not wish to be consulted too often in this connection. For one thing, he is usually too fully occupied with day-to-day routine to be able to give sufficient time and thought to customers' management uncertainties. A great deal of time is usually necessary to size up a new stretch of water properly; to get to know a river really well it is necessary to live by it for years. For another, the advisory field does not readily harmonize with work that is primarily productive and dependent upon the sale of that production for its continuation.

The trout farmer is, in any case, by no means an expert on every stocking problem. He is, of course, in a stronger position than some to draw conclusions. But, in general, it is the customer who sets the pace. It is the customer who glances down a price-list and orders what he fancies. The regular buyers of trout have mostly worked out stocking systems for themselves by trial and error over the years.

The trout farmer can never really be sure about anything until his customers have shown some kind of reaction, whether of pleasure or of disappointment. Customers do not have to do what is best for them; they do not have to be logical or consistent; but they do not continue to be customers if they find your produce regularly lacking in value. And so, I say, it is the purchasers of trout, the trout farmers' customers, who are the real experts, at any rate for the waters that they know and have to deal with. But a majority have only become expert the hard way. The tendency is for newcomers to start by turning in little trout—apparently remarkably cheap—and proceeding, as time goes by, to larger, relatively expensive, sizes, costing a great deal more per fish, but often providing more and cheaper trout, both immediately, and in the long-run.

But I will add this. It is probably true that too many purchasers of trout, particularly those who have never stocked before, are apt to order trout without asking themselves the most important question of all: "How many trout will eventually be caught as a result of this? And does the answer make sense?" That seems to be the true criterion of all trout stocking: to provide the angler with sufficient trout at the lowest possible cost, relative to the standard of sport expected.

If any form of stocking is to be of value, it must, at least, be partially effective. The more effective it is the more valuable will it obviously be. It cannot be denied that a great deal of ineffective trout stocking still takes place, largely due to inexperience with particular stretches of stream or river, or through under-estimating the magnitude of what is being attempted. Experience can only be derived from trial, use, practice, or a series of observations. Whether you obtain experience by making mistakes, or whether you try to buy it from experts, it all costs money.

In most suitable waters all over the world the acclimatization stage has ended and trout stocking is largely used to augment stocks of trout reduced by over-fishing. The value of it must be measured against such benefits proceeding directly or in-directly from such stocking as may be done. Some of these benefits may be detailed thus:

(1) Stocking makes more trout available per angler per mile of fishable water.
(2) Stocking enables more anglers to fish in a given length of stream.
(3) By stocking a greater average size and a greater annual bag of trout can be taken from a water.
(4) Waters denuded of trout by former pollution, or deprived of natural breeding facilities by various works, may be repopulated.
(5) Waters stocked with trout become immensely more valuable to sell or to let. Higher prices for fishing may readily be charged. Indeed, stocking with trout provides the key to all commercial development of trout fisheries.

It is almost certainly true that, but for restocking, many trout fisheries would be unable to continue on present lines. Syndicates would break up. Clubs would close down. Rents and values would fall. The fishing tackle industry would languish. And fishermen would grumble as never before. The trout farmer would be in very straitened circumstances, too!

But, fortunately, unless our rivers are all contaminated as a result of some disaster, unless they are pumped away for irrigating farmers' fields, or irresponsibly laid hold of for domestic or industrial use, none of these things will happen. Fishermen will continue to increase in number. Syndicates and clubs will prosper. Rents and values will rise. The fishing tackle industry will go on producing more and even finer instruments for catching trout. Fishermen—for it is bred in the bone—will continue to grumble from time to time. Stocking with trout will become widespread, more effective, and the trout themselves more beautiful than ever. And the trout farmer, even if not affluent, will certainly have work to do.

But the day of cheap, unbridled, or completely free fishing, such as is still found in many parts of these islands, will gradually come to an end. Excluding some remarkable technical achievement in the art of raising trout, or in conservation methods, trout fishing is likely to increase in cost, particularly in areas and waters still at what is virtually the backwoods stage.

For, it cannot be denied, I fancy, that fishing, in a majority of waters, is far too cheap at present. Anyone caring to glance through a recent copy of *Where to Fish* (The Field Press) can hardly fail to be arrested, as he turns the pages, by what appear to be absurdly low charges for trout fishing. This is particularly so in the West Country and Welsh streams, over much of the north of England and in Scotland. Two guineas is quite a normal charge for a season's trouting even in 1960. Day tickets are usually 5*s.*, 3*s.* 6*d.*, 2*s.* 6*d.*, or even less. One Welsh entry I turned up quite by chance—I will not mention where it is to spare it from a rush of anglers early next season—shows a charge of only 12*s.* 6*d.*, for the season, with day tickets at 3 *s.*; and, in parenthesis, there is a note that trout are plentiful, of reasonable size, and that the best the previous year was 3½ lb.!

Obviously there is a limited demand for trout fishing where annual subscriptions range from £150–£500 and day tickets (if available at all) are £4 or £5. Nevertheless, I believe it to be true, that waters in this category, which depend largely, or entirely, upon artificial restocking for results, are nearly always fully booked with Rods, at any rate where value for money is being given.

I think it can be accepted that those who have had the good fortune, by birth or residence, to fish in areas blessed by plentiful and inexpensive trouting, will have to put their hands in their pockets more deeply as time goes by and as natural stocks of trout become still further depleted.

I have few figures to guide me, but am fairly sure that currently a great deal more is spent by fishermen upon items of tackle, than upon licences, rents, tickets, restocking and all the other costs of fishing put together. This is on a national average basis and obviously does not apply to members of the more expensive clubs and associations, or to those who own their own waters, to whom the purchase of tackle is a relatively minor part of their total fishing expenditure.

Licence fees charged by river boards also appear to be too low. This is doubtless a controversial point. But with larger funds from increased licence revenue (few fishermen would be financially crippled were such charges to be doubled or even trebled) the river boards could afford to employ more scientific and fishery staff, improve upon the present level of conservation and carry out enlarged and more effective stocking programmes.

As I mentioned earlier, the trout farming industry in Britain—probably one of Britain's smallest industries—has no research organization whatsoever. We have to paddle our own canoes and pick what brains we can as we drift along. Indeed, very little scientific work *exclusively* for the benefit of trout fisheries has ever been undertaken over here. I am not forgetting Brown Trout Research (now the Freshwater Fisheries Laboratory), the Freshwater Biological Association, research by Ministry of Agriculture and Fisheries' scientists, work by our own Association's past and present biologists, the pre-war Avon Biological Research, or the numerous and diverse papers scattered through many scientific publications.

There has also been, of course, a fairly continuous spate of inspired writing in the angling press, mostly by enthusiastic amateurs, but occasionally by scientists. But if there have been many scientific papers or pronouncements by British scientists upon such subjects as trout management practices, survival of stocked fish, the general effectiveness of trout stocking over here, or how to obtain *more* trout fishing for *more* anglers, I seem to have missed them.

I am not a qualified scientist myself, but at an elementary level I think I understand scientists fairly well. I certainly exploit their findings to the limit of my ability and am duly grateful whenever they tell me anything I can put to practical use. But it seems to me that research connected with trout is still at a rather basic stage.

That is not to imply any criticism of our scientists who, given the necessary time and money, would assuredly be able to tell us a great deal more, particularly if prodded occasionally by practical men. But scientists are largely men of thought and as thinkers are sometimes apt to regard the doers as stupid. The doers, on their part, are liable to be impatient with the thinkers because they appear to move too slowly towards the solution of practical and urgent problems.

The Director of the Freshwater Biological Association, in his report for the year ended March 31, 1959, commenting upon observations made by Dr. Winifred Frost and Mr. Le Cren, did, however, write the following: "Results . . . indicate that other factors, such as natural survival of the stocked fish, the seasonal distribution of angling pressure and the luck and skill of the fishermen, may also play a part in determining the proportion of a stocking that is caught. The stocking experiments . . . suggest that to obtain the best return in terms of both money and sport, it is necessary to catch as many as possible of the fish in the first year after stocking by means of intensive angling throughout the season." Perhaps I should add that these remarks applied to Wise Een Tarn in the Lake District and not to a stream or river at all. Nevertheless, they appear to have considerable general relevance.

In view of the above account I opened the 1960 report from the Freshwater Biological Association with even greater interest than usual, only to discover to my sorrow that Wise Een Tarn appears to be overstocked with trout! I infer from this that the natural breeding is effective, that the food supply is rather sparse, the fishing effort more restrained than it is in most places and that Wise Een Tarn itself may scarcely be an ideal water for experiments in stocking.

In the same report the Director sums up some extremely interesting tests conducted by Mr. Le Cren upon trout fry survival, in these words: "Whatever these mechanisms are, there is little doubt that they play a part in the natural regulation of the trout population, and may in some situations render excessive artificial stocking not only unnecessary but positively harmful to the resultant stock of adult trout."

Statements of this kind, while arousing curiosity to know more and admiration for Mr. Le Cren's industry—one of the things he discovered was that "the specific growth rate for the first six weeks was almost inversely proportional to the logarithm of the population density"—hardly appear to go very far towards solving the really urgent problems of where to fish and what to catch. For, in my view, trout fishing, in most waters, has passed the stage where a study of population dynamics, for example, will greatly benefit the angler before he has grown too old and stiff to fish.

The Americans, with all their vast resources, have naturally been able to go faster and further. Many of their deductions—provided you have sufficient practical experience to evaluate them properly—may certainly be applied to trout waters over here. The picture that inescapably emerges from the copious stream of American trout research is this:

(1) Stocking with fry and fingerlings has almost everywhere been a failure except in waters devoid of trout and other fish.

(2) A general realization that stocking with sizeable trout—a seven-inch trout is usually considered sizeable—is quite essential for hard-fished waters, even though its effectiveness varies greatly.

(3) The survival of all sizes of trout from one year to another is apt to be low.

(4) The survival of wild trout is usually higher than that of hatchery trout under similar conditions.

(5) In order to provide the highest possible return of stocked fish it is desirable to release trout in the spring and encourage the angler to catch them as quickly as possible.

This is not a very inspiring picture and my own view is that the picture over here is hardly more encouraging. Yet, on reflection, it would have been surprising—too good to be true, for this world, in fact—had trout stocking turned out to be easier, less expensive and more effective than it actually is.

A farmer cannot combine a field of wheat, sack it up and sell it and, at the same time, enjoy the pleasure of watching it rippling in the breeze. He cannot send a pig to market and retain the privilege of leaning over the sty to poke it in the ribs. Nor can the fisherman kill a trout and hope to see it rising again the following day. In other words, none of us can have our cake and eat it.

To put the matter in another way, it is impossible to spend both income and capital indefinitely and retain liquidity or solvency. Each river, capable of supporting a stock of breeding trout, may be said to have a certain income: so many pounds of trout produced per annum according to the quality of that river's particular larder and its other specific characteristics. The destruction of trout, in excess of a river's natural productivity, involves dipping into its capital resources.

And this, so it seems to me, is where trout stocking comes to the rescue of the fisherman and salvages his sport from bankruptcy by a timely injection of fresh capital in the form of living trout. For this new capital—these additional trout, arriving suddenly out of the blue—is equivalent to an amount of trout production quite beyond the means of the river to provide; and limited only by available funds. So, though the picture may be a rather depressing one, it can scarcely be described as other than true to life.

I had intended at the beginning not to give you any statistics. But, on second thoughts, I feel that it may be useful to set down a few simple figures and facts relating to stream and river stockings carried out during 1960. These details have been taken from one hundred consecutive deliveries to streams and rivers in the southern half of England and, with very few exceptions, were initiated entirely by the purchaser. I hope they have some significance:

Private Owners	43
Clubs	31
Syndicates …	22
River Boards … …	3
Hotels … … …	1
	100

The trout bought by these various persons and organizations ranged in size from fry to quite large fish of several pounds in weight, some purchasers taking several sizes of trout at once. For convenience I have divided them up as under:

1. *Fry*

Clubs … … … …	2
	2

2. *Yearlings*

Private Owners	8
Syndicates …	6
Clubs … … … …	5
River Boards … …	2
	21

3. *Two-year-olds (not for immediate sport)*

Private Owners	12
Syndicates …	5
Clubs … … … …	3
	20

4. *Sizeable, takeable, or legal-sized trout for immediate fishing, regardless of actual size*

Private Owners	34
Clubs … … … …	25
Syndicates …	17
River Boards … …	3
Hotels … … …	1
	80

It does not seem to be necessary to comment upon these figures which are, to a large extent, self-explanatory and reveal a marked preference for the medium-sized and larger trout in every sector.

Unfortunately I do not know to what extent any of these transactions were successful or abortive. It may be that there are persons attending this Conference able and willing to tell us how many (and what sized) trout they usually buy and the percentage they succeed in catching from each consignment.

For, as I mentioned earlier, in Britain it is the customer, the purchaser of trout, who has worked out for himself, over the course of years, the method of stocking that appears to suit his particular water and his individual objectives best. What the trout farmer thinks is really quite irrelevant. The trout farmer is only in the picture to try to meet a public demand. Whether he likes it or not he is forced to supply what the public requires or to give up raising trout.

Accordingly the production of trout is geared to satisfy the general trend of demand. And the trend towards larger, more catchable, sizes of trout in Britain, as elsewhere, seems to be unmistakeable. From my experience I am quite convinced that this trend will continue and that the angler will obtain the best value for money as a result. At the other end of the scale I am sure that to stock fry and fingerlings is only of real value in exceptional circumstances. To fill the gap between these extremes I believe that the value of stocking increases in proportion to the size of the trout released.

MADE AND PRINTED IN GREAT BRITAIN

THE SALMON AND TROUT ASSOCIATION

London Conference, 1963

LECTURE ON SALMON RIVER MANAGEMENT

KNOW YOUR RIVER

By H. F. B. Foster

The following are the specific points which the Secretary has asked me to deal with in discussing the management of a salmon fishery:

1. General management on a salmon river.
2. Improving the capacity of the water to hold taking fish.
3. Improving the anglers' chances of catching fish.

Before dealing with these questions in detail, I would like to stress the importance of diligent and continuous management in salmon fishing. Since the war proprietors have become increasingly aware of the value of salmon fishing as an asset, but many have still to realise that like a farm, a business, or any other asset, it must be cared for and delevoped if it is to maintain and, if possible, increase its value. Neglect a salmon fishing and it can rapidly lose its stock and its value, and since the salmon is a migratory fish the neighbouring bank and the whole river can in due course be affected. A proprietor owes a responsibility not only to himself but also to his neighbours and to the river at large. If he himself is not sufficiently interested he should select a capable and energetic agent and good tenants to see that this responsibility is discharged, and he should make sure that the District Fishery Board is active and has his full support.

No salmon river can be managed successfully, however, unless there is a large measure of harmony and co-operation among all interests on the water from source to mouth, and there is a general willingness to work together towards that end. Energetic District Boards, properly run, can go a long way to assist the cause if they have the backing of all proprietors. Under present legislation, these Boards do not have all the powers they really require to enable them to do their job properly but they should be furnished with information about catches so that they can assess productivity and plan future policy.

The increase in value of salmon fishings is due partly to the enhanced popularity of fishing and partly to scarcity value. Why is this so? Firstly, due to Hydro-Electric development and extraction, many rivers that were fishable are now lochs. Where the waters still flow there is, except at the weekends, an unpredictable daily rise and fall in level caused by the fluctuating demands of industry for electricity. This denies any chance of suitable conditions for fishing. Secondly, we have pollution which in many rivers has had a deplorable effect on salmon stocks. Thirdly, land drainage, which still increases annually, resulting in bigger and quicker floods and a quicker "run off". This has again been increased by the cutting of forests during the war, which has had the effect of accentuating the rise and fall and prevents a river holding its height as of old. Since the war replanting has been done and in future years this should show an effect on rise and fall. It is well known that trees hold the moisture. Fourthly, water extraction, whether agricultural or industrial, unless controlled, will have a detrimental effect. At the moment District Boards have no power to control this in Scotland. Fifthly, many proprietors do not look after their banks as they should, and, as a result, rivers such as the Aberdeenshire Dee are shingling up in parts.

The first three conditions are having an adverse effect on salmon stocks; Hydro-Electric, by depleting the number of spawning areas, upsetting river levels, and thus impeding migration; pollution, by the killing of young stock, and particularly by smolt losses which in some cases are very high in the "brackish" water where we are led to believe smolts remain for three weeks acclimatising themselves to their sea journey. Lastly, land drainage, which causes the loss of spawning beds at the ova and eyed stage due to excess flooding and banks bursting. In one year on my beat on the Dee over 400 salmon parr were returned to the main river from puddles along the road beside the river.

How can river management help? By it we must try and preserve what is left. To begin with by containing the river and preventing it from becoming wider. I have seen some of the best beats in Scotland ruined by no action having been taken over a period of years to keep the banks in even moderate order. It must be appreciated that if a river is allowed to widen or spread, islands are formed in the main stream and as a result it becomes shallow and pools are lost. This increases 10-fold the movement of shingle, which will affect all salmon beats lower down the river and, with a little attention in the first place, the damage could have been prevented or, at least, controlled and not allowed to get out of hand. In many cases this has occurred through lack of knowledge, indifference, and the attitude of taking all and not being prepared to contribute finance to what can only be termed a diminishing asset.

We come now to what can be done if bank maintenance is carried out every year, which is the only way of meeting this problem. Whether one bank or both banks are owned, the same applies. It is essential to try and keep the deep water on your side, i.e., whether you own one bank or both banks you must contain the river. Cattle should be fenced off the river banks at all times. In many cases this has started bank erosion in the first place. By treading, cattle kill the grass fibre roots, and also by burrowing and sand dusting against flies. Vegetation should always be encouraged for reinforcing the banks, but should be cut annually in July near the water to make it easier for fishing. Trees should not be cut down near the bank's edge. They can be trimmed, but if cut the root rots and eventually carries away large sections of the bank. Rabbit burrows on and at the water's edge should always be blocked up immediately with stones. How else do we protect our banks? We must realise that we have a very short season for bank maintenance, June and July, and in some years even less.

Bank building: first excavate 12″–18″ below summer level on your gauge, but down to solid foundation on water bed which may require boulders to act as a buttress if clay or soft gravel is found. The procedure is to fill bags with concrete and place in a dry state, intermediately building and bonding with special reinforcing spikes driven through the bags every second course, which contain concrete in the dry state, by the suction of water in the material, thus binding and forming a mass of concrete foundation. Thereafter build in clean quarry rubble or old building stones filled at the back of the wall with concrete. The last course of rubble is filled at the joints thus binding the top course. Do not forget that when constructing these walls it is essential to build about 10–15 degrees off the perpendicular leaning towards your bank. A concrete mixer is essential for this type of work.

Another more economical way than this first description can be done in dry stone. To get a secure foundation after building by this method, the top layer of dry stone must be secured with a grout of cement. Yet another alternative is to get Swedish or Italian mesh netting, each case being filled with dry stone and spiked to the river bed. This is not as lasting as the previous constructions as at water level the wire rusts between the air and the water, and the rubble will slip into the river as the rusted wire weakens, if sufficient growth has not occurred. A fourth method is to build with rubble overlaid with mesh then spread with earth and sow grass seed over it. Grass fibre and vegetation are thus of tremendous strength if not interfered with by cattle or otherwise. Yet another method: by revetting banks with clay and 10 ft. or 12 ft. 2 in. *hardwood* boards, approximately 10″–12″ wide, cut rough from oak or beech. Place behind 4″ × 4″ larch posts driven into bed of river and tied back with wire deep into the bank. This is economical, and if you have the trees they supply all the material necessary. During all these operations it is necessary to have a skilled operator, but all other labour can be unskilled. These methods should improve your fish holding capacity. Croys may also be built for directing the flow of water and for making it easier on occasion to cover your water from a fisherman's point of view. If only one bank is owned, permission should be got from the proprietor on the opposite bank. The positioning has got to be very carefully done. I have seen the opposite effect happen with the building of croys which were not sited correctly. This applies also to the placing of large boulders to make lies for fish. Lastly, trees. Salmon like shade. On the north bank conifers are best as a wind break; on the south bank, deciduous for shade later in the season, e.g., sycamore, beech, etc. Conifers on the south bank make a pool too cold in the early part of the season for fishing. Trees allow an angler to fish a pool earlier in the evening. A setting sun down a pool makes a poor chance.

The last problem is how to improve an angler's chance of catching fish;

1. By keeping up your river banks.

2. By having good approaches to your pools. Much time is wasted by having to walk long distances in long waders. Stiles should be provided over barbed wire fences.

3. By periodic inspection and the removal of snags in the river, preferably at the early part of the season. It will sometimes be necessary to use a boat and tube glass.

4. By the control of fishing. The number of rods at high and low water, and how often pools should be fished. An angler should be given sufficient water to fish to avoid fishing the same beat twice in a morning. Two or three rods fishing the same pool, one behind the other, is wrong. Much harm is done by over-fishing; there are times of the day when salmon take best. These are the best times to fish.

5. By refraining from too much thoughtless wading near the fish and disturbing them. Salmon are very sensitive to vibration, which is often the reason why anglers complain that the fish rise on the opposite side of the river to them. If you can see salmon lying in the water, they can see you.

6. There are far too many anglers today who are able to fish bait and unable to fish fly properly. Greater success is got by fixing a stipulated date to go on to fly only, whatever the height of the river. In this way fish are allowed to settle.

7. Co-operation and help should be given at all times to river watchers to control poaching. A pool netted by poachers early in the season does not fill up again. Salmon like company. Stones of not less than 5 cwt. should be so placed to stop unauthorised netting. To prevent poachers netting river bed, cleeks can be put in. These should be in a stone or cement base of not less than 4½ cwt., with a double hook sunk into the base. The base should be placed where most fish congregate . The cleeks should be examined from time to time.

8. Control of trout, eels, black backed gulls, goosanders, mergansers, which are all predators. Last, but not least, seals in the sea.

9. Help should be given to an angler to show him his beat, i.e., lies, how far in to wade, size of fly and cast, and to make it easier for him.

10. Record of fishing. A careful record of water height and temperature, places fished and lure used, with details of fish landed and times of capture, is most important, both as a guide to future fishermen and as an indicator of the progress of your own management. Books of record forms should be kept in the fishing huts and all particulars recorded when fish are brought in. The particulars should there-

after be entered in permanent, loose-leaf or bound records kept in the house or office. A specimen of a suitable record sheet is as follows:

Date	Catcher	Salmon	Sea Trout	Wght.	Lure	Ht. of Water	Pool	Time	Temp.	Remarks

I also use charts and graphs to supplement and illustrate the ordinary book records.

11. There must be few fishermen, when only one bank is owned or leased, who, when wakening up in the morning, have not had the thought of what the other side is going to do. Both sides may be fishing too many rods and there may be no control of bait and spinning, and the fly fisher may see his water baited by the time he starts. This can be avoided by both sides coming to an amicable agreement. The rod opposite may be a slow fisherman, who dwells at spots where he has caught and feels he should again catch a fish. This can be avoided, of cousre, if the beat is long enough to give him manoeuvrability, i.e., to go to another pool which is vacant. There must be "give and take" on both sides.

I would like to end with two stories that were told me this year. One rod, having caught a fish, was asked by another rod on the opposite bank what fly he had caught it on. The reply: "I am sorry, but that is a question I never answer!"

On another occasion, a rod fishing the pool on the other side saw a man and a boy come down to fish. He could hear their conversation. The man said he was going to fish the pool below. When the boy asked what he should do, he was told to start fishing in front of the rod on the other bank! There is a moral to these stories which needs no explanation!

In general, there should be a much greater degree of co-operation between salmon fishing owners. The only way in which all can enjoy better sport and improve the value of their fishing is to increase the stock of the river, and if this is appreciated the management of the river can be organised as a whole for the benefit of all.

SALMON AND TROUT ASSOCIATION

LONDON CONFERENCE, 1966

THE ATLANTIC SALMON A VANISHING SPECIES?

ANTHONY NETBOY

The Conservation Foundation

I am greatly honoured to be invited to address the Salmon and Trout Association and humble too, for many of you know a great deal more about many of the aspects of the subject than I do. In fact, I am deeply indebted to various members for considerable help in preparing my book on which this talk is based, especially Mr. Menzies, Mr. Pentelow, Dr. Went, and others, but the views expressed are entirely my own.

It was my good fortune to enlist the support of The Conservation Foundation in undertaking what is the first attempt to study the Atlantic salmon in all the countries throughout its range on both sides of the Atlantic Ocean. My study of the world's most harried fish took me to ten countries in Europe and involved a journey of about 15, 000 miles. Needless to say, the pursuit of the salmon was a delightful experience, for there is something about *Salmo salar* which makes comrades of all the people associated with it. This comradeship cuts across national lines and creates a kind of international brotherhood.

My study encompassed not only the current status of the resource in the various lands but its history. I tried to discover how the nations have dealt with this fishery in the past in order to show the contrast with its present status, a contrast that is usually quite enlightening. It is somewhat surprising that relatively little work has been done in tracing the history of the salmon fisheries, an opportunity which professional historians seem to have totally neglected. What historical studies we have are the work of biologists like Dr. Arthur Went in Ireland and Roger Bachelier in France of enthusiastic fishermen like Augustus Grimble.

Origin of Salmo Salar

The Salmonidae family to which the species belongs may be traced to a common ancestor in the Pliocene epoch when modern plants and animals developed. The later Pleistocene (or Great Ice Age), dating from about a million years ago, is believed to have been especially propitious for the evolution of salmonid fishes into anadromous species. Being cold water animals, the salmonids thrived during the Ice Age when an ice cap covered most of the northern hemisphere. When the glaciers began to retreat and vast quantities of fresh water poured into the northern seas, creating rivers and lakes, the salmonids adapted themselves to the new conditions. It is believed that it was in this epoch that the salmon formed the habit of going from the sea to the rivers to spawn; thereafter to return to the salt water to feed.

In this epoch the Baltic, the North Sea and the Irish Sea were still immense glacial valleys and diluted waters from the polar regions even washed the shores of southern Europe. As the glaciers melted in the Alps, Apennines, Balkan and Atlas mountains, the salt content of the Mediterranean was reduced. The salmon and other anadromous fishes gradually moved southward and became inhabitants of all the great European rivers—not only those which flow into the Atlantic Ocean but the Ebro, Rhone and Po which empty into the Mediterranean.

In time the glacial waters departed from parts of Europe as warm equatorial waters advanced. This happened in the Mediterranean, which ultimately became too warm for cold water fishes like the salmon. Only remnants of the stocks remained, and their descendants are now landlocked in various lakes in Italy, Albania and Algeria.

In North America Salmo salar once probably inhabited rivers as far north as the tundra zone. Now it is confined to roughly latitudes 45 to 60 degrees north.

Era of Abundance

Salmon makes its appearance in history in Magdalenian times, about 12,000 to 15,000 years ago, as we learn from fish bones found in caves inhabited by man in southern France and from carvings of the fish on reindeer bone unearthed at Altamira in northern Spain. The first written record of the species is in the *Natural History* of Pliny the Elder, in the first century A.D. The Roman colonizers of Britain, Gaul and the Iberian peninsula probably appreciated the savoury fish as much as we do. I have stood on a little bridge over the River Sella in Spain built by the Romans, from which some of Caesar's legionnaires perhaps angled for salmon. The fish still run in that stream, but not in such numbers as in Roman times.

We know a great deal about the fishery during the Middle Ages in parts of Europe. This was the era of abundance. The rivers were pellucid and pure, and their migratory routes were protected. Freshwater fish were highly prized and salmon was usually the largest species in the river. At a time when meat was scarce and expensive, fish were important sources of protein food. In time of famine, when the grain harvest failed, the abundant salmon, eel, and other freshwater fishes saved the people from starvation in some localities.

The wealth of salmon in various countries is recorded by many medieval writers. The fisheries were valuable properties to the nobles, monastic establishments, and others who owned them. Medieval rulers issued laws from time to time designed to protect the stocks. The earliest British legislation dates from the reign of Malcolm II in Scotland, in 1030. It established a closed season for taking "old salmon" from about the end of August to November 12, and for taking fry from mid-April to June 24. Punishments were severe, for violators were to have their gear burned; a second offence could bring six months in prison and a third a year's confinement; and each succeeding conviction doubled the penalty.

Scottish salmon acts were probably the most rigorous in Europe. Robert III issued an edict in 1400 which stipulated that three convictions for slaughtering "redd" fish (that is, spawners) constituted a capital offence. I have not been able to ascertain how well this legislation was enforced, and if the extreme penalty was ever inflicted. This is but one area where historical research is needed.

Magna Charta (1215) stipulated that all fish weirs placed by the King or his agents in the Thames and Medway, "and throughout all England except the sea shore," shall be removed and free passage assured. The first English act dealing specifically with salmon seems to have been promulgated by Edward I in 1285. It decreed that salmon shall not be taken in the waters of the Humber, Ouse, Trent, Dove, Aire, Derwent, Wharfe, Nidd, Swale, Tees, Tyne, Eden and other rivers from September 8 to November 12. It also forbade taking young salmon from mid-April until June 24. Punishments were on an incremental basis, similar to the Scottish laws.

In succeeding centuries there was a steady flow of such statutes in England. Usually they contained a preamble lamenting the decline of the fishery.

Abuse of the fishery and flaunting of the laws, however, were not unknown, as we learn from Leonard Mascall's interesting work, *The Booke of Fishing*, published in 1590, one of the earliest of English angling books. He laments that England does not have "more preservers, and less spoilers of fish out of season and in season; then we should have more plenty than we have through this realm." He wishes that "all stop nets, and drags with casting nets, were banished in all common rivers throughout this realm for three months: as in March, April and May, wherein they take fish out of season." Further, he informs us that water bailiffs appointed to guard the rivers shut their eyes to the use of illegal small-mesh nets while the proprietors are equally indifferent, because the fishermen say that since they pay high rents they must take whatever they can. At the end of this peroration Mascall says, "So I leave, wishing that careful men were put in office, and such as favours the common wealth, and all other put out that seeks for their own profit only. Then should we have within few years, much plenty of river fish."

Salmon was an important item of domestic as well as international trade in some countries during the Middle Ages. Rhine salmon, a favourite among the epicures of France, was shipped long distances and fetched high prices. Norway developed a thriving commerce in salmon with neighbouring countries and the Kings of

Norway derived considerable revenue from taxes on salmon and herring catches. In Norway there are records of exploitation of the salmon fisheries going as far back as the 3rd century A.D.

Along with wool and hides, salted salmon was a staple of Scottish exports by the 13th century, when Aberdeen, Perth, Berwick and Glasgow were already centres of this trade. French, German and English merchants used to come to Scotland to purchase fish and brought in exchange cloth, velvet, silks, spices and wine. There was a market for Scottish salmon also in England, but the feuds between the two nations sometimes made commerce difficult.

There are many accounts by travellers of British and Irish rivers teeming with salmon in the 16th, 17th, and 18th centuries. The fish was so cheap that it was frequently served to servants and apprentices by their masters until sometimes they rebelled and refused to work unless the ration was reduced to two or three times a week. Probably they were often treated to tasteless, spawned-out kelts. This story, which is heard in every salmon-producing country in Europe and North America, has usually been regarded as a myth, but it can now be documented for at least England, Scotland, and Sweden, and perhaps other countries.

Era of Scarcity

With the growth of population, spread of agriculture, and especially the advent of the industrial revolution, man increasingly encroached upon the salmon's habitat, and an era of scarcity set in. The leaping fishes found it increasingly difficult to survive in many of their immemorial haunts. Rivers were defiled by poisonous effluents, blockaded by mill dams, impassable weirs, and power dams, and robbed of their flows by abstractions for industrial or agricultural purposes. Overfishing was encouraged by rising demand and high prices, and by improved methods of transportation and preservation. Thus by the beginning of the 19th century we rarely hear of salmon gluts. Instead salmon became increasingly scarce and expensive, and as industrialization proceeded and cities bourgeoned the stocks declined or disappeared in one river after another.

The plight of *Salmo salar* is dramatized by the roll call of famous rivers it has deserted. The last naturally-produced salmon was caught in the Thames in 1833 and legend says it was sold to King William for a guinea a pound. The species no longer comes up the Seine; the Rhine (probably the most productive river in Europe); the Gudenaa (Denmark's largest waterway); the Douro which flows across northern Portugal and a large part of northwestern Spain; the Miño, Lerez, Nalón and Nansa in Spain; the Elbe and Weser in Germany; the Kemi, Kokemaen and other great rivers in Finland. Salmon have disappeared from the Oder and now enter only two of the uppermost tributaries of the Vistula. Several of Sweden's prime salmon streams have been blockaded and natural runs supplanted with artificially-produced stocks.

Salmo salar has vanished utterly from Portugal, Switzerland, and Holland, and is almost extinct in Denmark and the United States.

In North America *Salmo salar* has deserted such well-endowed rivers as the Connecticut, Penobscot, Merrimack and Kennebec, not to mention many waterways of lesser renown in New England and the Canadian Maritime provinces. The hordes of salmon which used to come up the rivers flowing into Lake Ontario and Lake Champlain vanished in the 1880's or 1890's. In fact, no nation frittered away its salmon wealth more wantonly than the United States. Despite some attempts to restore a half dozen rivers in Maine, the aggregate catches are now no more than 400 or 500 fish yearly, about as much as would have been taken in a day on the Penobscot or Connecticut River by one or two men in the 18th century.

Yet hope remains. In 1965 Congress passed the Anadromous Fish Act which provides matching funds to the states for restoration of the anadromous fisheries. If Maine, the only state involved, is willing to increase its appropriation for the Atlantic Sea-Run Salmon Commission, the runs may be increased.

It may be instructive to glance briefly at the salmon resource in some of the countries where it is hard pressed, as in France and the Baltic, and also where it is in a relatively flourishing state, as in Iceland, Norway, Scotland and Ireland.

Most of the French rivers emptying into the Atlantic once harboured stocks of anadromous fishes. The Kings of France issued wise ordinances in the Middle Ages regulating the fishery and designed to keep the streams open and pure. The age of abundance lasted until at least the French Revolution.

Dissipation began about this time as decrees of the Legislature and the Convention abolished the exclusive rights of the Crown, Church and nobility to fish and hunt on the lands of the kingdom. Free fishing for all citizens was proclaimed, and pillaging of the waters began. Under the Consulate riparian owners recovered their rights but the habit of looting the streams persisted.

Industrialization, construction of mill dams which blockaded the rivers, pollution, poaching, and worst of all, remorseless netting by the naval veterans (called "Inscrits Maritimes") who have a monopoly on the right, granted them by Colbert, to fish in the rivers to the end of tidewater, conspired to diminish the stocks. A law of 1865 required mill and factory owners to provide fish ladders at all impoundments, but it did not stipulate that adequate streamflow should be maintained, nor did it apply to dams already in existence. This law was not well enforced, so that the rivers were dotted with dams without fish passes, especially small hydro-electric dams. Poaching, which became a veritable industry after World War I, also helped to destroy the salmon fishery. Authorities were lax in punishing offenders who were caught, and fishery legislation was feebly enforced if at all.

An important factor in the French disaster is the fact that supervision of the inland fisheries is divided among the Navy which controls the estuaries and rivers to the end of tidewater; the Bureau of Bridges and Roads which supervises canalized waterways; and the Bureau of Waters and Forests which controls the rivers above tidewater. The Hydraulic Service licenses hydro-electric projects, while Electricité de France, the national power agency, seems to be autonomous and beholden to no other bureau. These agencies have rarely agreed on measures to safeguard the fisheries. Meanwhile one river after another became sterile.

Only a small number of productive salmon rivers are left in France, including a dozen small Breton streams, a few in Normandy, parts of the Adour system, and the Allier, a tributary of the Loire. Total catches are believed to be at a low ebb, though figures are not obtainable, owing to the well-known French fisherman's reluctance to reveal the extent of his catch. The government does not keep records of much value.

The salmon in the Baltic countries present a jigsaw puzzle the key to which is held mainly by Sweden. The major obstacle to maintaining the runs is rapidly expanding hydro-electric development, a situation that is met by the nations in either of two ways: the fish are sacrificed to kilowatts, or attempts are made to have fish and power, too.

Finland has taken the first and easiest way out. Well-wooded and well-watered, hardly any part of Finland is more than ten miles from a river or lake. The waters of the central plateau find their way to the coastal strip in a series of rapids or waterfalls which are prime sources of power in a country that has no coal, natural gas or oil.

Major Finnish rivers like the 300-mile Kemi, one of the richest salmon producers in the Baltic region, have been systematically harnessed without any consideration for the fish. Power development is moving at such a fast rate, says the Finnish biologist Seppe Hurme, that "all our rivers will be full of these dams in the next ten to twenty years."

Finland has only two good salmon rivers left, the Ii and Torne, and the latter it shares with Sweden! The rest have been made uninhabitable for salmon by impassable dams, pollution, and other factors; in some instances they have been overfished.

The fate of the salmon in Sweden is much brighter than in Finland. Sweden is one of the few countries in the world where 90 to 95 per cent of the electricity is generated by water power. Eighty per cent of the hydro-electric potential is found in the rivers of Norrland which is also the major source of the salmon supply.

Until World War II the demand for electricity could be met without encroaching very much on first-rate salmon waters. Since the war, the insatiable thirst for power has brought a number of northern rivers under control; on waterways whose upper reaches were already dammed even the lower stretches have been harnessed. As more dams were built the pattern became clear: each new project would destroy an additional section of the river until finally all natural production of salmon would cease. The Swedish power planners were thus faced with a dilemma: they could either abandon the salmon runs, as Finland, France and Spain have usually done in similar circumstances, or find some means of replacing them.

At this point their decision was simplified by the Swedish State Water Courts, acting under a Water Law that is unique in Europe, who would not approve requests by the state or private companies to build hydro-electric dams unless the natural runs were replaced with an equivalent number of hatchery stock. Thus, in rivers which have lost all or a portion of their natural runs normal production is being maintained by the planting of artificially-bred smolts. It is predicted that in the not too far distant future only two Swedish rivers, the Torne and Kalix, will be free of dams and possess natural runs. The rest will be artificially sustained.

The fate of the entire Baltic salmon fishery is closely related to the successful Swedish smolt-rearing programme. About 15 per cent of all the salmon now caught in the Baltic sea, which accounts for the major portion of total Baltic catches, originate in Swedish hatcheries. There is little indication that Poland, Germany, or Finland, all of whom participate in the fishery, will undertake sizeable restocking programmes in their rivers.

In contrast to France, Spain, Portugal, and some of the Baltic nations, the resource has more or less prospered in the present century in Iceland, Norway, Scotland, and Ireland, and to a degree in Canada.

Iceland took a vital step in protecting its salmon by removing all the nets from rivers about fifty years ago. Fishing is now closely supervised by the government and has become an important economic asset thanks to the boom in salmon angling. There are few polluted rivers. While catch statistics are not fully available, it is believed that the tide of depletion was halted around World War II and is now at probably at a peak of about 200 tons annually.

Salmon catches have increased in Norway since World War II. This record is due to an extensive programme of opening up spawning rivers, a sound and comprehensive fishery code that seems to be well enforced, and a reduction of netting in the rivers. About one hundred waterfalls have been laddered in the rivers of the three northern counties of Troms, Nordland, and Finnmark since the war. Nature has also come to the assistance of the Norwegians. Since the climate has somewhat ameliorated in the past fifty years and glaciers have receded, the salmon have ascended rivers where they were never found in the last century. A waterfall laddering programme is being launched in southern Norway.

Despite the impressive increase in catches, Norway like other countries cannot be complacent about its salmon resources. It is heavily dependent on hydro-electric power. Ninety-nine per cent of the population has access to electricity and average consumption is the highest per capita in the world, owing to the heavy use by electrometallurgical industries. Formerly, only the upper reaches of the rivers were harnessed while the lower, where the salmon are mainly found, remained unmolested. Now the flow of some watercourses is being tapped almost down to the sea, so that little spawning territory is left. Since only one-fifth of Norway's hydro-electric potential has been developed, many additional salmon rivers will be dammed. The threat of over-fishing is also present; at least, sports fishermen complain that there are too many nets in the fjords and in some of the rivers. The drift netters operating offshore catch many salmon, and take an excessive toll of the migrants.

Scotland now produces almost as much salmon, on the average, as any other European country but the harvests are considerably below those of 100 to 150 years ago. Some of the most fruitful rivers were ruined by pollution in the 19th century, particularly the Clyde, Forth, parts of the Tweed (probably in its pristine state the richest salmon river in the British Isles), Leven and Nith. The Tweed and other rivers were mercilessly poached and overfished.

The first modern fishery legislation for Scotland were the Tweed Acts of 1857 and 1859. In 1862 and 1868 came comprehensive fishery laws for all Scottish rivers north of the Tweed but they were weaker than their English counterparts. The Tweed Acts were regarded as failures because, as Fishery Commissioners Spencer Walpole and Archibald Young said in their report for 1877, they curbed neither pollution nor wholesale poaching. Scotland was not provided with a strong anti-pollution law until 1965.

The Tweed lost the great bulk of its stocks during the 19th century. For example, about 175,000 salmon and grilse were caught in the Tweed in 1816, and probably as many in 1820, and catches were certainly higher fifty years earlier, though statistics are lacking. As late as 1850, there were years when 100,000 salmon and grilse were still being taken in the Tweed, but by the end of the century the average annual harvest was only around 16,000 fish. Since 1900 Tweed catches have risen but they do not begin to approach the levels of 150 years ago.

Next to the Tweed, the Spey and Tay were probably the most prolific Scottish salmon rivers in the early 19th century. In the 1850's the Duke of Richmond's waters on the Spey yielded an average of 57,000 salmon and grilse per year; catches on the Tay averaged 60,000 to 70,000 fish annually from 1830 to 1846, reaching a peak of about 100,000 in 1842. On the Duke of Sutherland's rivers flowing into the Moray Firth and Pentland Firth catches aggregated almost 60,000 salmon and grilse a year between 1864 and 1876, while the North Esk recorded catches of 25,000 to 30,000 in the 1870's, the Dee about 12,000, and the Don over 10,000.

In contrast, catches of salmon and grilse in all of Scotland in the last decade have totalled about 400,000 annually, or only one-third more than was taken in the Tweed, Spey, and Tay around 1850. One can only conclude from these statistics that Scotland has suffered an immense loss of its salmon stocks since about 1800, although not, proportionately, as much as England and Wales. The salmon runs have fared worst in industrialized parts of Scotland. Scottish catches have been at a fairly steady level since the 1890's, a record that is not equalled by many countries. Nevertheless, there is no room for complacency. Summing up, we may say that Scotland has been fortunate in that most of her major salmon rivers lie in parts of the country which do not attract the industrialist.

Ireland on the whole has an impressive record of salmon conservation in the past century. The Republic (not including Northern Ireland) has jumped to third or fourth place among salmon-producing European nations in recent years. If we add the output of Northern Ireland, the achievement is even more outstanding. Like Scotland, Ireland is munificently endowed with salmon rivers. What records we have indicate that the resource was not as greatly abused as in Scotland or England and Wales. This relative good fortune is due mainly to the drastic reduction of fixed gear in the rivers and along the coast as a result of the Salmon Fisheries Act of 1863. The measures initiated by the Republic in recent years, including the rehabilitation of derelict stretches of rivers and large-scale planting of salmon eggs and fry in suitable streams, has helped to sustain the stocks. Poaching is no longer the menace it was in the last century. Owing to the lack of industrialization, few rivers suffer from pollution.

According to Dr. Arthur Went, Irish salmon stocks are greater today than they were a century ago. Next to Norway and Scotland, Ireland now offers the most ample opportunities for salmon angling in Europe.

The harnessing of the Shannon, Lee, Erne and other rivers for power generation, however, has created serious fishery problems which the national power agency, the Electricity Supply Board, seems to be tackling with vigour and acumen. Certainly Ireland belongs to the small group of nations—among which Iceland must be included—that is determined to have fish and power, too.

Canada has managed to preserve a large portion of its Atlantic salmon fishery largely because many of its magnificent rivers lie beyond the reach of industry, in the wilds of Quebec province, Labrador and Nova Scotia. Where industrialization has crept in, as in lower Quebec and New Brunswick, with its accompaniments of pollution (especially from pulp mills) and power dams, the fishery has suffered. However, the spirit of conservation is strong, and public opinion highly vocal, so that inroads into the habitat of the salmon are vigorously opposed. Currently the conflicts rage on two fronts: (1) sports versus commercial fishing, with the anglers, especially in the province of Quebec, demanding more public fishing and fewer reserved rivers; and (2) fish versus dams, as in New Brunswick's St. John River which will be virtually blockaded when the large Mactaquac hydro-electric dam is built. However, the province, which will construct the dam, plans to compensate for the loss of the salmon by means of a large smolt-rearing programme on the Swedish model.

England and Wales have not been as fortunate as Ireland or Scotland, although until about the opening of the 19th century their salmon stocks were on the whole still unimpaired; the rivers ran clear and pure, with some exceptions in south Wales where the effects of coal mining and metal smelting were observed in the later 18th century. For instance, the *Driffield Angler* listed as prime salmon rivers in 1806 the Thames, Severn, Mersey, Trent, Medway, Exe, Usk, and Wye, all of which were held in high repute in Tudor and Elizabethan days. But the spread of mills and factories, growth of cities, and disregard for the environment that characterized the early industrial revolution, spread ruin in some of the inland and esturial waters. The process was usually inexorable and irreversible, and the spirit of the times condoned it.

If the countryside was blighted by ugly cities swarming with people dwelling in miserable slums, if foundries and mills night and day poured plumes of smoke into the atmosphere and flushed their wastes, as the towns did, into the nearest watercourses, if rivers ran black with dirt from mines, or yellow with chemical refuse, so that fish life could not exist—this was regarded in the Victorian era as only the concomitant of progress. Industrialists could destroy the environment with impunity. In fact, few of them gave any thought to the matter. "They made their money and left their muck," someone said. The pride in natural beauty and solicitude for the environment, including the rivers, which had animated pre-industrial England, seemed to vanish.

Pollution of the waterways was a major cause of the decline of salmon stocks in the 19th century. For example, in 1877 Archibald Young, Inspector of Salmon Fisheries, listed 25 salmon rivers of note that were seriously affected by various kinds of pollution. Among them were the Tyne, Trent, Tees, Wye, Ribble, Severn, Taw and Torridge, Usk, Eden, Axe, Dart and Exe. Very few of these were purified or restored as fish habitat.

About the middle of the 19th century a ground swell of protest arose against the destructive effects of the industrial revolution. Concern for the salmon generated a Royal Commission of Inquiry and resulted in passage of the salmon Fisheries Acts of 1861 and 1865 and the Rivers Pollution Act of 1875. This legislation and the creation of Salmon Fisheries Inspectors and Boards of Conservators for England and Wales, however weak, served to stave off greater disasters.

Pollution was not in many instances the most important factor in the depletion of splendid streams. High on the list was the construction of weirs or dams to divert water for mill races, or for domestic or industrial consumption, which interfered with the flow needed to sustain fish life, or prevented fish from reaching their spawning grounds. For example, the Fishery Act of 1714 names 17 rivers on which it was expressly forbidden to erect impoundments that impaired fish passage. In 1868 every one of them was either partly or substantially blockaded by weirs or dams, or damaged by pollution.

Overfishing also contributed to the drastic reduction of salmon populations. It is difficult to comprehend today the extent of netting and and other methods of commercial fishing in some of the estuaries and rivers, the flagrant disregard for closed periods, and the absence of effective regulation. The riches of the Severn, Tyne, Wye, Usk, Ribble, Hampshire Avon, and Devon Axe, were among others, sacrificed to the greed of fishermen before any real curbs could be imposed. Canalization also helped to ruin some of the fisheries, most prominently that of the Thames.

By the opening of the 20th century numerous English and Welsh rivers were derelict; anadromous fishes could not live in them.

Since the First World War governmental authority over the salmon fisheries has been strengthened in England and Wales through the river boards (now river authorities) and the battle against pollution has made some headway. What does it all add up to?

Many rivers in England and Wales, including some of the most potentially productive, are barren, and others are greatly depopulated. Only two score salmon streams are left south of the Scottish border, not counting their tributaries. Such rivers as the Tyne, Tees and Trent, once known for their opulent runs, are almost sterile, and in fact are hardly recognizable as waters that could hold migratory fish.

On the credit side is the fact that many rivers have either not retrogressed or have actually produced improved catches in recent decades, thanks to the ability of proprietors and river authorities to restore or maintain their purity, to facilitate fish migration by keeping them free of obstructions, and in some instances to bolster the stocks with plantings of ova or fry. In this category belong the Hampshire Avon, Conway, Eden, Exe, Lune, Welsh Dee, Tamar, Dart, Coquet, Dovey in Wales and Taw and Torridge. All these are outside the main manufacturing districts of the country.

Balancing the credits and debits, and taking a broad perspective, it becomes clear that, despite the legislative bulwarks and conservation efforts of the past century, England has permitted the largest portion of its salmon resource to be frittered away. In 1872 the nets in the River Tyne alone captured about 130,000 salmon, or roughly two or three times as many as the total taken in *all* the principal English and Welsh rivers annually in the 1950's and 1960's.

A century ago, in a good year, the Severn, Tees, Usk, Ribble and Dart plus the Tyne yielded a total of about 185,000 salmon. In contrast, total catches in the principal English and Welsh rivers in 1960–64 averaged 45,000 fish. Thus we may conclude that salmon stocks of England and Wales are now probably no more than one-fourth of what they were a hundred years ago, and at that time they were already considerably attenuated from the populations of a century earlier.

Can the Salmon Be Saved?

Once upon a time the Atlantic salmon roamed over half the northern hemisphere, in the numerous straits, gulfs, bays and fjords of the Arctic and Atlantic Oceans, both in Europe and North America. The fish has a long history of human association for it was familiar to the Lapps of northern Scandinavia, the Eskimo of western Greenland and Labrador, and the Indians of the Connecticut and Lake Ontario region long before these people set eyes on the white men.

The salmon has provided man with food at least as far back as the Old Stone Age, longer probably than cattle or sheep or other domesticated animals. It has served man well but now, it seems, man is bent upon exterminating it, at least in some parts of its withered range. Indeed, in some lands the salmon has been pursued so relentlessly and so many barriers have been strewn along its migratory routes that the fish, so to speak, has said, "Hail and farewell!" and is seen no more.

There is no possibility of the salmon's return to the rivers of Portugal, Finland, Poland, West Germany, Holland or Switzerland, even if there were any desire on the part of the people to restore them. In other lands the runs have been reduced to a trickle because the inhabitants did not care enough to save them. Even where substantial stocks remain, as in Norway, Sweden, Russia, the British Isles, and Canada, there is no assurance of their continuation, for new problems and dangers constantly arise. The encroachment of civilization constantly reduces the spawning and rearing areas available to anadromous fish. Apart from the difficulties of keeping rivers inviolate, the fishes' life in the sea is now threatened by the discovery of at least part of their feeding haunts in Greenland waters.

Yet while the tide of depletion continues, there is a counter movement of conservation. A great deal of research and investigation has enabled man to save large remnants of the stocks in various countries. Still the question is asked: how can the future of the species be assured? The answer is not easy but a few suggestions may be ventured.

It seems that the nations which have fared the best in retaining their salmon have followed certain principles of conservation—and those which have fared the worst have basically ignored these principles.

Conservation requires first of all conservative exploitation of the runs in order to assure a perpetual crop. This is the guiding principle of the management agencies on the Columbia River, where all the salmon are counted as they cross a series of high dams and regulation of the catch can be based on more scientific data than is available anywhere else in the world.

Secondly, rivers must be kept clean and free of impassable obstructions. This requires a ceaseless war on pollution and rigid control of impoundments, especially hydro-electric dams, in order to assure fish passage by means of ladders, lifts, or the like. Nations like France and Spain and the United States (in the 19th century) which paid little heed to what was happening on their rivers have seen their salmon stocks dwindle away.

Thirdly, the quantity and quality of streamflow must be safeguarded in order to meet the requirements of the sensitive salmon. For instance, the abnormal raising of the temperature of the water in summer, as occurred in the Columbia River a few years ago, can create an epidemic of columnaris that is fatal to the salmon. (Cold-water columnaris has recently infected salmon in some Irish rivers, with lethal consequences.) Serious drawdowns of flow for agricultural purposes or power generation must be averted. Fish passes must not be permitted to run dry. All this means that competing uses for water require careful adjudication and fishery interests must have an effective voice in the management of a river.

Fourth, we know that salmon runs can be increased by opening up new spawning territory through the laddering of waterfalls and removal of natural or man-made obstructions. Norway has been outstanding in this endeavour.

Fifth, it is now recognized that artificial production is an invaluable tool of fishery management. The Swedish smolt-rearing programme has proven successful in bolstering the populations of salmon in the Baltic, thus assuring good harvests in the sea as well as the rivers, and plans are under way to build Swedish-type hatcheries in Norway and Canada and possibly Finland. In the Columbia River, where very high dams and pollution have jeopardized an exceedingly valuable fishery, the runs are being partly sustained by the output of twenty hatcheries, each producing hundreds of thousands of fingerlings each year.

Continuous research is essential for perpetuation of the species. There is still much to be learned about its life history and migrations, about the techniques of artificial production, and especially about getting both the adults and smolts safely past hydro-electric dams. Scotland, England and Sweden are conducting impressive research programmes; Ireland is doing important work and Russia too, so far as can be learned. Outside of these countries there is little interest in salmon research in Europe. I met no fishery biologists in Spain and the few I encountered in France had given up the study of the salmon because there was seemingly no point in working on a resource that was reaching its end. In North America, Canada has made important scientific contributions to our knowledge of *Salmo salar*. While no research on this species is being conducted in the United States, the enormous number of investigations of the Pacific salmon (*Oncorhyncus* species) by the United States Fish and Wildlife Service, the Oregon Fish Commission, the School of Fisheries of the University of Washington, and others, has been of great benefit to the management of Atlantic salmon as well. The Fisheries Research Board of Canada also has an extensive programme of research on Pacific salmon.

So far we have discussed the measures that have been taken to save the salmon during its riverine phase of existence—its premigratory and post-feeding stages over which man has some control. What happens to the fish in the ocean remains mostly a mystery although some of its secrets have been pierced. However, man cannot control the salmon's wanderings any more than he can alter, however much he would like to do so, its inflexible habit of returning to spawn in the river where it was born or released as a juvenile. Ironically, the more we learn about the fishes' life in the sea the greater becomes the danger to their survival, as the upsurge of the Greenland fishery proves.

The preservation of the salmon rests almost entirely with man. He alone can exterminate the species or help save what is left of the rivers and the stocks. This is a truism.

It may be noticed that the species has fared best where there has been a partnership, or at least an *entente cordiale,* between the exploiters of the fishery and the management agencies; between the governments, proprietors, commercial and sports fishermen, hydro-electric agencies and others who have a vested interest in the rivers. Where there has been no such partnership, alliance, or even *entente* and anarchy as reigned, or where there has been an absence of what Aldo Leopold called "the conservation ethic," as in the United States during the 19th century, the resource has been grossly abused or destroyed.

It is clear that while conservation in the river is essential to the species' survival, there must also be conservation in the sea. The next step therefore involves ocean fishing. Some restrictions on the catch during the salmons' feeding years is needed if the stocks in the rivers of Europe and Canada are not to decline further.

The convention of March 1, 1966 signed by the Baltic nations to limit and prescribe conditions for taking salmon in the Baltic Sea offers a model to be followed anywhere in the world where salmon may be caught. At the present time our eyes are on Greenland, in whose waters hundreds of thousands of fish, mostly immature, belonging to the United States, Canada, Ireland, Britain and Sweden, are being taken each year. Unless some kind of curb on this incredible slaughter is put into effect, the investment in conservation in these countries may prove to be largely valueless. An international agreement is urgently needed, for the probability is that the Greenland high-seas and offshore fishery will not only continue but increase rather than decrease.

SALMON AND TROUT ASSOCIATION

LONDON CONFERENCE, 1966

SALMON FISHERIES AND THE DEVELOPMENT OF HYDRO-ELECTRIC POWER

W. J. M. Menzies

The basic requirements of hydro electric schemes involve the control, diversion and, in many cases, storage of water. In consequence such schemes must interfere with salmon and other fisheries. The interference may be for ill or for good and may involve at least salmon, sea trout and brown trout as well as eels.

The interference may concern the stock of salmon because spawning grounds and feeding areas are involved: it may concern salmon angling because former rivers are inundated by impoundments or because water flows are restricted or are subject to comparatively rapid, and relatively considerable, variation in quantity.

Hydro-electric operations take three main forms. The first is a simple dam or barrage which diverts water for use in an adjoining watercourse or in another catchment area. The second is also a simple dam, normally considerably larger and higher than the diversion dam, integral with which is a generating station. Through the turbines water then passes from the head pond created above the dam directly to the river channel immediately downstream of the dam. The third form involves a more complicated system of waterways leading from a storage reservoir to a generating station situated at some distance from the reservoir. The object is to obtain for the turbines the maximum economical head.

The promoters of a proposed hydro-electric scheme have in the first stage to consider, among other matters, the fisheries implications of the works suggested by their engineers. On these fisheries implications they normally seek expert advice. When the final outlines of the scheme have been settled the fisheries aspect of prime importance must obviously be the preservation, and if possible improvement, of the existing stock of salmon. The works may inevitably, and seriously, interfere with, or even destroy, salmon angling situated within the ambit of the operations. But, if the stock of fish be harmed, then rod fishing and net fishing alike, even netting in the sea, far removed from reservoirs and generating stations, may be damaged.

If salmon angling water be submerged in a reservoir then obviously nothing can be done to salvage it. But otherwise every consideration must be given to the feasibility of providing water for angling and to any possible alterations of a river channel which may help the angling outlook.

Many fisheries problems are common to all three types of hydro-electric works. Facilities may have to be provided for the ascent over a dam of adult salmon and sea trout; if so the descent of kelts and smolts must also be safeguarded. Consideration must be given to the effect of the operations on the spawning and parr feeding areas upstream of a dam. A flow of water in the channel downstream of the dam must be provided at all times. Smolts must be excluded from the water intakes of the higher head stations and clean ascending fish must be kept away from the blind alley attractions of tail-races.

This is not the place to consider all the details of the fishery problems which arise. Some at least of these have been dealt with in technical publications. But some general indications of the approach required will help to clarify the position.

The first essential is the provision of water and facilities to enable ascending salmon to reach a fish pass and descending kelts and smolts to proceed on their way to the sea.

When a generating station is integral with a dam ample water is available when the station is on load. Most hydro-electric stations are off load, or on small load, for quite considerable periods during most weeks of the year. During such times a defined flow of water will have to be discharged. This flow will be at least adequate in quantity safely to maintain fish life or, in greater quantity, to ensure satisfactory angling conditions. During the winter months fisheries are sufficiently safeguarded by a much smaller flow than during the summer months.

At higher head stations, situated at some distance from the point of origin of the water, a flow for fisheries has to be provided down the river channel between the dam which diverts the water into the tunnel or headrace, and the point where the water is returned through a tailrace to the river.

Such stretches of river are supplied solely with a regulated flow and that flow normally is completely under control. The steady flow of the warmer months may be reduced in the colder months because it is not then required for either small feeding parr or large upstream migrating salmon. When angling is involved the comparatively large flow may be greater during the day than during the night. The quantity required during the angling season would be merely a waste of water, valuable for the production of electricity, during the remainder of the year.

During the summer period, whether angling be involved or not, the steady flow is supplemented from time to time (normally on one day per week) by a rise in water level (a "freshet") to induce fish to move freely and generally to improve conditions throughout the stretch of river.

The need for a fish pass for ascending fish at a dam depends upon the extent of spawning ground left available above the head pond or storage reservoir. If there be no spawning ground then obviously a fish pass is superfluous. If little be left then its value must necessarily be contrasted with the cost of an expensive fish pass in the dam structure. In either event supplementary, or alternative, arrangements will have to be made for the maintenance of the stock of salmon in the river concerned.

At dams with an integral generating station ascending salmon are led, automatically as it were, to the foot of the dam by the water discharged from the turbines. The downstream end of a fish pass has then to be situated where the fish, attracted by the discharge from the draft tubes, will find it most easily.

When water is discharged from a generating station and returned to the river through a tailrace two routes for ascending fish may be possible. They may be allowed up the tailrace and then ascend to the reservoir above by means of a fish pass at the generating station. If it be possible this arrangement forms the most satisfactory solution. It is provided at Mucomir on the River Lochy, at Cwn Rheiodol on the Rheidol and at Arnacrusha on the Shannon. If a fish pass at the generating station is not possible fish have to be prevented from entering tailraces by means of mechanical or electrical screens. In this event the screens have to be so aligned, and the river bed so adjusted, that fish are led from the downstream side of the tailrace screen up the main river channel. Such screens are to be found at Inveran (Shin), Culligran (Farrar), and many other places.

The design of fish passes has formed the subject of intensive study from time to time in Great Britain and elsewhere. It was revolutionized by the evolution of the fish lock by the late J. H. T. Borland after the Second World War. In recent years this design has been universally adopted for hydro-electric schemes in both Great Britain and Eire.

Descending smolts can safely pass through larger turbines with a head of water up to at least 100 feet. These heads normally occur at stations integral with dams where most of the water passes through the turbines. Even at such stations, however, smolts may also go down the fish pass. At Pitlochry, which is typical of this type, large numbers of smolts are observed descending the fish pass annually.

At such stations kelts have to be restrained by simple bar screens from entering the turbines where they would be harmed or killed. They also descend down the fish pass.

At higher head stations both smolts and kelts have to be kept out of the aqueduct by suitable screens aligned so as to direct them to the upstream end of the fish pass.

Statements have been made that kelts are unduly reluctant to enter the Borland type of fish pass. The Conon District Fishery Board have usually netted the kelts above Torr Achilty dam and have transferred them directly into the fish pass. In so doing in the years between 1955 and 1965 inclusive they have handled between 217 and 1,082 kelts annually. In 1957 the kelts were not netted and 458 voluntarily entered, and descended, the Borland pass. In most years an additional, but unknown, number of kelts may have passed over the dam during times of spill. On 13th May, 1966 550 kelts descended in three hours the Borland pass at the Aigas dam on the Beauly.

One of the chief repercussions on the stock of salmon resulting from the creation of hydro-electric reservoirs may be the partial destruction, or total obliteration, of spawning and, equally important, parr feeding grounds upstream of the reservoir. As already stated, if sufficient spawning grounds remain a fish pass at the dam will be necessary. Hitherto virgin territory may also be made available in the upper waters by rendering passable obstructions which up to that time have been impassable or difficult for salmon. Similar remedial measures may be carried out at obstructions downstream of dam sites or in tributaries in the same catchment area.

If the spawning and feeding facilities remaining above a dam do not justify the construction of a fish pass ascending adults may be trapped at a convenient point, held until ripe and the fertilised ova placed in hatcheries. The resulting fry are then planted in suitable feeding areas not available for fry produced naturally. By this means the stock of salmon in the Inverness-shire Garry has been maintained and very successful results have been produced in the Blackwater (Conon). In the Blackwater between one and one and a half million fry have been planted in about ten miles of river above a trap which stops all ascending fish. These ten miles of river contain very little natural spawning ground but they are eminently suitable for parr feeding. Over recent years these fry have produced from 2,000 to 4,500 adult salmon and grilse annually at the trap situated at the downstream end of the planted area. Although available figures are not so extensive or complete similar planting of fry in the Orrin (Conon) appears to have produced equally satisfactory results.

Another successful fry planting arrangement has been carried out in the Bran (Conon). Here half to three-quarters of a million fry were planted annually and Dr. D. H. Mills has estimated that the smolts produced represented about 2.4 per cent. of the fry. For two years Dr. Mills also carried out experimental trapping of smolts in the Bran and their transport by road, past the predators and other dangers in three lochs, to the lower Conon. These experiments, and the return of adult fish from the tagged smolts, were so satisfactory that in 1966 a full scale trap was brought into operation. In spite of minor teething troubles at the trap 9,000 smolts were captured and transported by road about eighteen miles to the lower Conon with the loss of only 9 smolts.

The Lochay (Tay District) provides a modest example of what can be achieved by planting fry, and to a small extent under-yearlings, in waters previously inaccessible to salmon. In 1957 the North of Scotland Hydro Electric Board constructed a Borland fish pass at the previously completely impassable Falls of Lochay, as well as pool passes at two smaller falls upstream. In 1963 145 salmon and grilse, in 1964 157 salmon and grilse and in 1965 277 salmon and grilse ascended to spawn in the eight miles of small river above the falls.

For successful results from the planting of fry in open waters an adequate supply of natural food is obviously essential. Equally essential is the planting of the fry at the right stage when they are ready to start to feed. They must be suitably spread to cover the water without too much wastage and streams conveniently adjacent to a vehicle track facilitate the operation. Helicopters can, however, be employed, as is done in Scotland, to reach desirable, but more remote, streams. Planting along appropriate shores of lochs should also theoretically be successful. However, predation by even quite small trout is an obvious hazard and so far it has not been tested.

The planting of under-yearling parr reared in hatchery ponds has been advocated. But so far results from controlled planting of these young fish are not available.

The planting of fry in small lochs completely cleared of other fish has been undertaken with considerable success on an experimental scale.

The rearing in ponds of fry and parr to the smolt stage would appear to be a complete answer to the problems arising from the loss of spawning and rearing areas. But this procedure is not without its difficulties and misfortunes and it is expensive. The general experience is that such smolts may cost about 3/6d. each even in Sweden where rearing is a large scale, highly mechanised and controlled operation with already a considerable history of experience behind it.

To cover this cost at least 6 per cent. of the smolts would have to return as adult salmon and grilse of an average weight of 10 lbs. Owing to the special conditions in the Baltic returns of up to 20 per cent. and even higher have been achieved from smolts reared in Sweden. From salmon which feed in the Atlantic returns from tagged natural smolts have normally been less than 4 per cent. Tagged hatchery smolts have generally given a considerably smaller proportion of adult fish than natural smolts although the longest hatchery smolts, which form a small proportion of any year's stock of hatchery smolts, have resulted in the return of up to 5.1 per cent. as adult salmon and grilse.

Practically nothing is known of the migration through natural lochs of smolts hatched and grown in rivers and burns under ordinary conditions. They must, however, progress with some success, though with unknown delay and rate of mortality, through Loch Ness (23 miles long), Loch Tay (15 miles long) and Lough Derg (25 miles long). They also pass with success through smaller hydro-electric impoundments such as Loch Faskally (Tummel-Garry: $2\frac{1}{2}$ miles long), Torr Achilty (Conon: 2 miles long) and Loch Dundreggan (Garry-Moriston: $1\frac{1}{2}$ miles long).

In certain hydro-electric reservoirs, and quite possibly in some natural lochs also, where pike and larger trout are plentiful, losses among migrating smolts may be very heavy. These losses may occur throughout the length of the loch or, perhaps to a greater extent, at the upstream side of the dam while the smolts are shoaling and seeking the way downstream. This has been particularly noticeable in Loch Luichart and in Loch Tummel where the losses have been estimated to be as high as at least 80 per cent. Both hold considerable populations of pike and larger trout. They are specially mentioned because fairly reliable estimates are available for them. Loch Luichart is now by-passed by the smolt transport experiment mentioned above.

The same conditions would no doubt apply to water supply and river regulating reservoirs where salmon can ascend over the dams, or fry are planted in the upper waters, and populations of pike and larger trout exist.

An advantage of a hydro-electric, or indeed any other, dam over which salmon have to ascend by means of a fish pass, is that a reasonably exact count of the number of travelling fish can be made. Only figures accumulated over a period of years, however, can provide information of real value. Even so such information has its limitations because direct comparison with the stocks of salmon in similar rivers, unaffected by hydro-electric or other works, is not possible. Conclusions drawn from statistics from one river, collected in isolation, can be misleading.

In the Schedules attached to the Salmon Fisheries (Scotland) Acts 1862 and 1868 eighty seven districts are listed as salmon fishery districts on the mainland of Scotland. Hydro-electric works, of a major or minor nature, have been constructed in fifteen of these districts.

Hydro-electric works exist in two catchment areas in Wales: neither of these areas is of great fishery importance. A limited number of very small schemes of little or no fishery importance also exist in England.

Of the five catchment areas affected in Eire three are of considerable fishery importance.

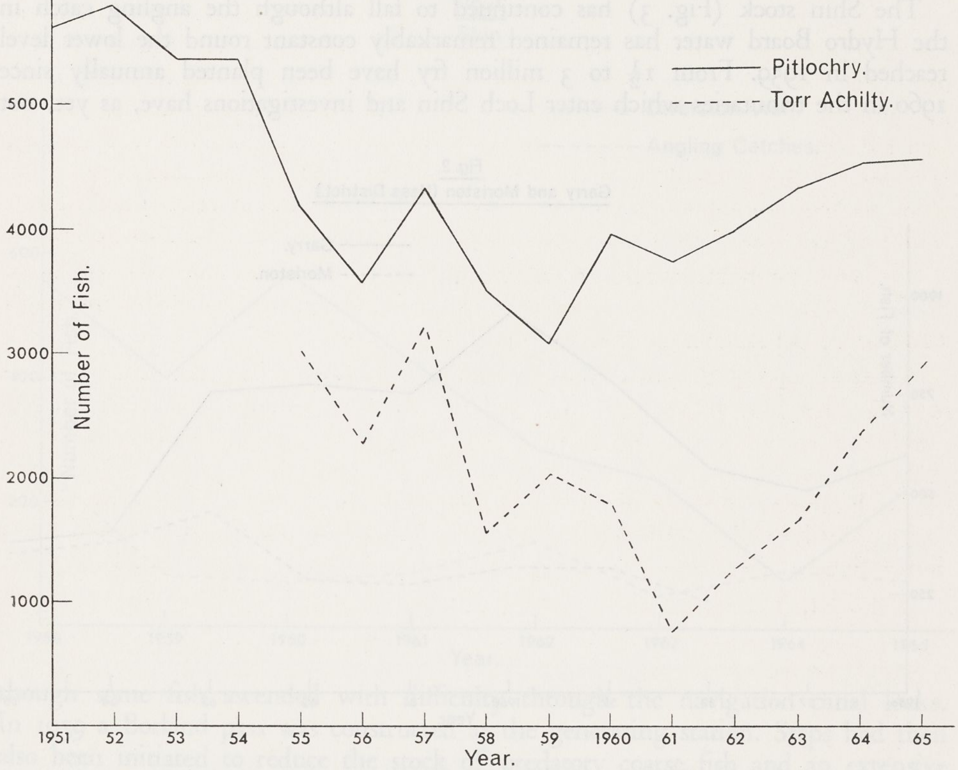
Representative counts of ascending salmon over a series of years are available in two major rivers and three rivers of less importance in Scotland and in two rivers of major importance in Eire.

The Scottish rivers are the Tummel at Pitlochry and the Conon at Torr Achilty as well as the Shin at the Diversion Dam downstream of Lairg and, in the Ness district, the Garry at Loch Garry and the Moriston at Dundreggan.

The Irish rivers are the Shannon at Thomond Weir and Ardnacrusha and the Erne at Cathleen's Fall.

Fig. 1.

Pitlochry (Tummel) and Torr Achilty (Conon.)

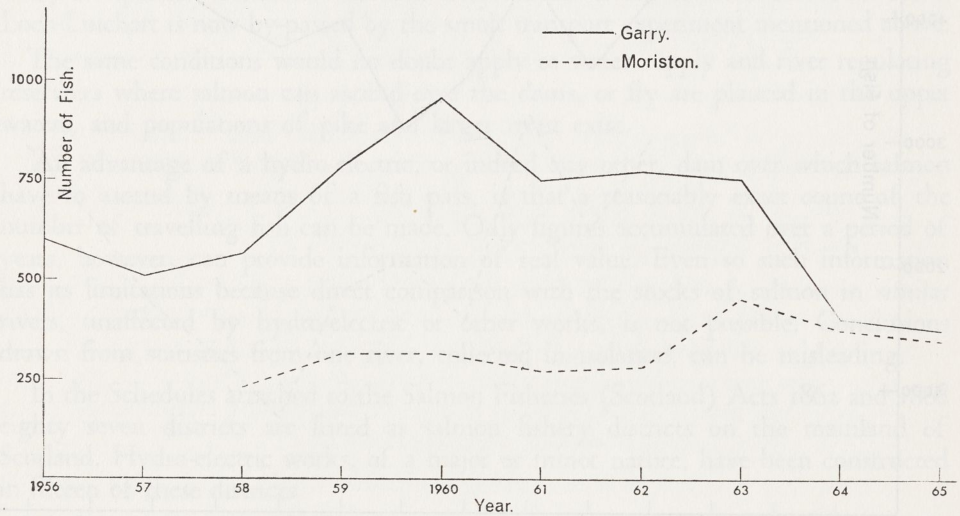


At both Pitlochry and Torr Achilty (Fig. 1) an initial stock stable for three or four years is followed by a recession and then by a recovery towards the original stock level. This cycle in the stock of Atlantic salmon in similar circumstances has been reported in Baltic Russia. An explanation for it is not apparent.

The stocks in the Garry and Moriston (Fig. 2) have not followed the same pattern. In the Garry, after three very even years, the stock increased during the following five years but, in 1964 and 1965, it has declined to below the original level. The programme for the planting of fry has continued in the same pattern and indeed has been improved by the use of a helicopter to reach the remote areas of the main available tributary in Glengarry, the Kingie. The stock here consists exclusively of early fish. Whether the recent decline is part of the general decline in the stock of early fish or whether it is a temporary variation is not yet clear. The stock in the Moriston consists of later fish and, after five very level years, the numbers have increased during the past three seasons.

The Shin stock (Fig. 3) has continued to fall although the angling catch in the Hydro Board water has remained remarkably constant round the lower level reached in 1959. From $1\frac{1}{2}$ to 3 million fry have been planted annually since 1960 in the tributaries which enter Loch Shin and investigations have, as yet, not

Fig. 2.
Garry and Moriston (Ness District.)



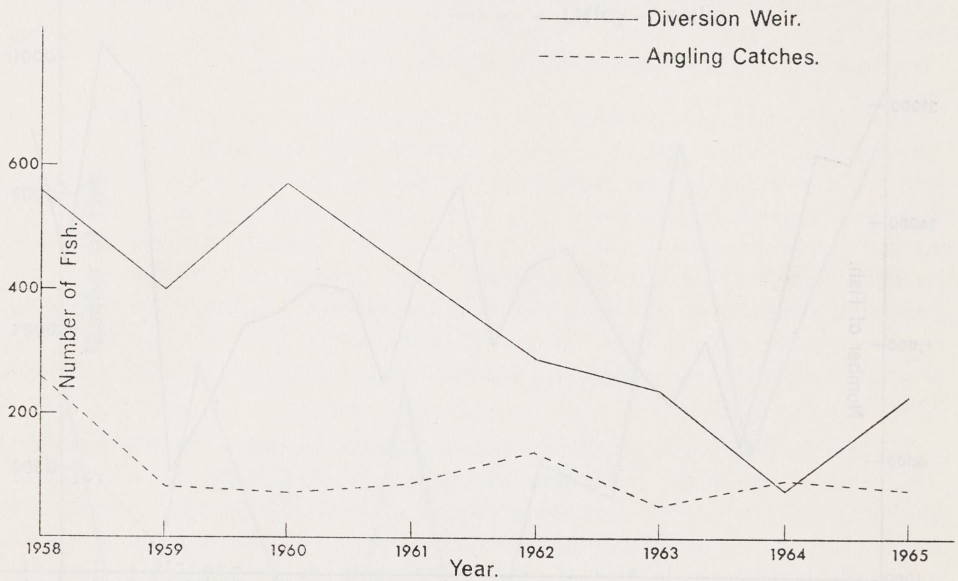
disclosed the reasons for the shortage of returning adult fish. Spring fish have always formed an important part of the Shin stock. As in the Garry, whether the general decrease in the proportion of spring salmon is a factor in the position is not yet clear.

Because of force of circumstances, or of lack of experience of the repercussions on fisheries, fully adequate steps in certain instances may not have been taken originally fully to protect the stock of salmon. This was noticeably so in the

Shannon in Eire and the Galloway Dee in Scotland. Nevertheless supplementary protective measures taken at a later date can produce encouraging results.

On the Shannon the greater part of the flow is diverted at the head of the main river through Ardnacrusha Generating Station commissioned in 1927. It is returned through a long tailrace to the main river above Thomond weir. As a screen is not possible at the downstream end of the tailrace the latter provides the main attractive flow for ascending salmon. At Ardnacrusha generating station a pass was omitted

Fig. 3.
Shin.



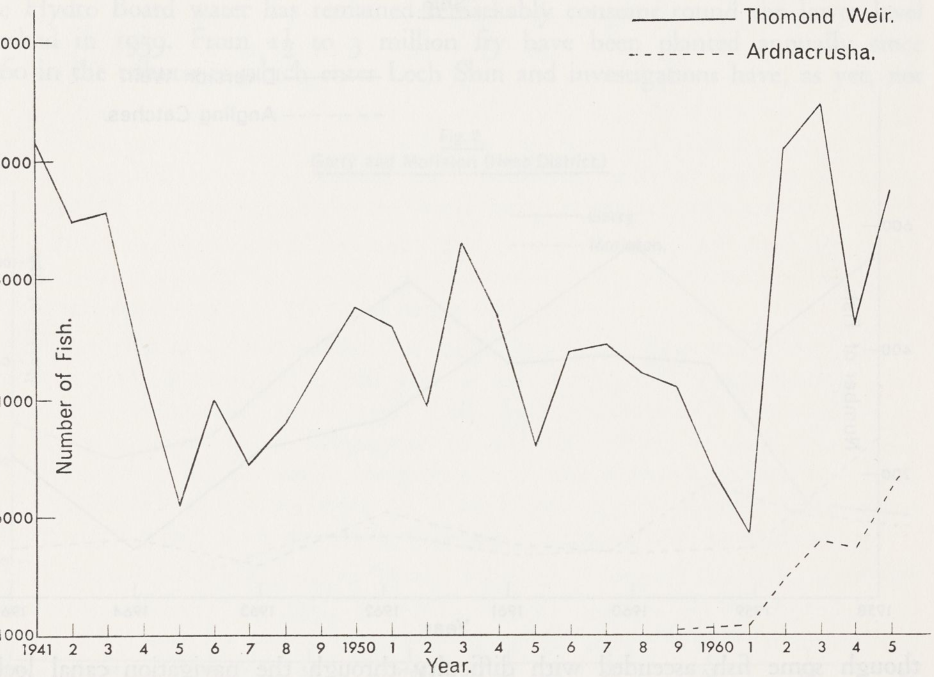
though some fish ascended with difficulty through the navigation canal locks. In 1959 a Borland pass was constructed at the generating station. Steps had then also been initiated to reduce the stock of predatory coarse fish and an extensive programme for rearing under-yearling parr and smolts had been undertaken.

Alone among the rivers of Great Britain and Ireland a complete census of all ascending salmon is made at Thomond Weir near the head of the tide on the Shannon. The counts made here and at the new pass at Ardnacrusha (Fig. 4) show a very material improvement after the additional protective measures have become effective. In addition to the greater numbers of ascending fish the catch by nets in the long estuary of the Shannon is now three or four times the pre-1960 figure.

The Galloway Dee is fully developed for electricity generation with four dams, three fish passes and a restricted spawning area. The fish passes, brought into operation in 1936, are of rather small dimensions. They were the first to be constructed at any major hydro-electric dam and were the originals of the pool with submerged orifice type. In 1961 the fish passes were improved. An attack was also started on the large pike population in Loch Ken: over 11,000 pike have been

Fig. 4.

Shannon.



killed in the last six years. A limited amount of planting of salmon fry was also undertaken and a very small residual amount of netting was stopped completely. Up to 1961 it was known that the stock of salmon had declined from its original level quite materially in spite of serious restriction of the pre-scheme netting effort. A count of ascending fish was not, however, made. In 1961 an electronic counter was installed in the Tongland pass just upstream of the tidal waters. As the following table shows the count here indicates a very considerable improvement in the stock of fish:

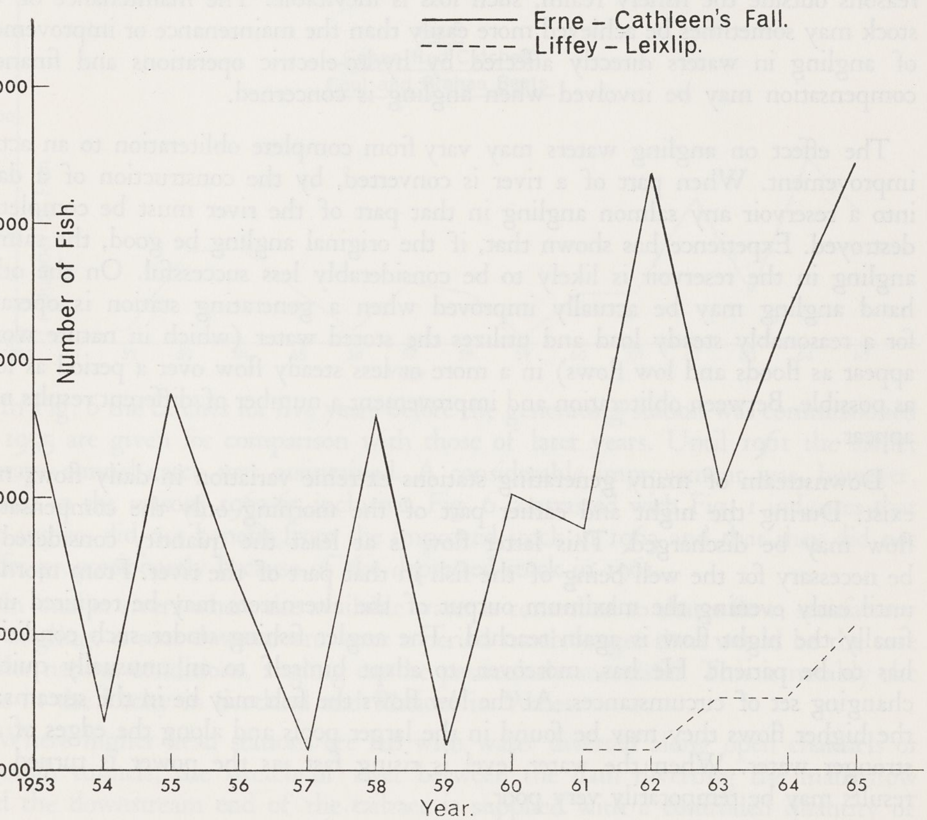
Galloway Dee–Tongland

Number of ascending salmon and grilse.

1962	2,408
1963	4,696
1964	6,031
1965	6,536

Fig. 5.

Erne and Liffey.



The Erne and Liffey in Eire provide other instances where the stock has been maintained or improved (Fig. 5). On the Erne netting in the estuary was restricted in 1960–62 until 3,000 salmon had ascended the pass. On the Liffey, where the generating station was commissioned in 1949, a regular count was not started until 1961. A limited amount of stocking has been done in the Liffey and, so far as possible, the main flow from the turbines has been delivered during the spring months. Angling downstream of the Leixlip dam, which is heavy because of the presence of a large urban angling club, is reported to have been excellent during the past four years.

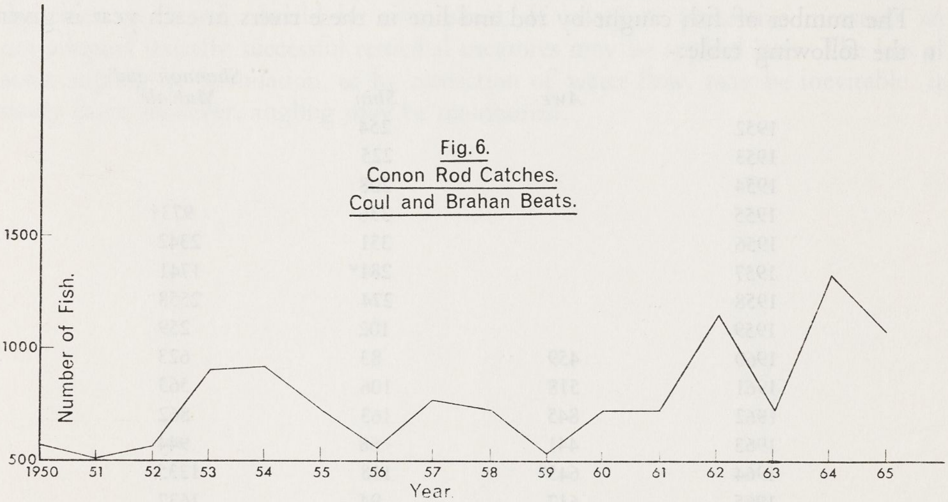
As stated earlier in this paper the maintenance and, if possible, improvement of the stock of salmon must be of primary importance. Finance cannot be an adequate recompense for the loss of a natural stock unless, for major policy reasons outside the fishery realm, such loss is inevitable. The maintenance of the stock may sometimes be achieved more easily than the maintenance or improvement of angling in waters directly affected by hydro-electric operations and financial compensation may be involved when angling is concerned.

The effect on angling waters may vary from complete obliteration to an actual improvement. When part of a river is converted, by the construction of a dam, into a reservoir any salmon angling in that part of the river must be completely destroyed. Experience has shown that, if the original angling be good, the salmon angling in the reservoir is likely to be considerably less successful. On the other hand angling may be actually improved when a generating station is operated for a reasonably steady load and utilizes the stored water (which in nature would appear as floods and low flows) in a more or less steady flow over a period as long as possible. Between obliteration and improvement a number of different results may appear.

Downstream of many generating stations extreme variation in daily flows may exist. During the night and earlier part of the morning only the compensation flow may be discharged. This latter flow is at least the quantity considered to be necessary for the well being of the fish in that part of the river. From morning until early evening the maximum output of the alternators may be required until finally the night flow is again reached. The angler fishing under such conditions has to be patient. He has, moreover, to adapt himself to an unusually quickly changing set of circumstances. At the low flows the fish may be in the streams: at the higher flows they may be found in the larger pools and along the edges of the stronger water. When the water level is rising fast, as the power is turned on, results may be temporarily very poor.

That successful angling can be conducted downstream of a station operated in this way, is shown on the Coul and Brahan beats of the Conon below Torr Achilty Generating Station and the Beaufort beats of the Beauly downstream of Kilmorack Generating Station.

The angling catches on the Conon illustrate the point (Fig. 6). The Coul beat is on the left bank only and immediately downstream of the dam. It has the full impact of the variation in the water flow from the generating station. The Brahan beats are from the junction with the Blackwater down to Conon Bridge: they are subject to the variation in flows from the run off into the Blackwater as well as from Torr Achilty Generating Station.



In Fig. 6 the catches for five years before the generating station was commissioned in 1955 are given for comparison with those of later years. Until 1961 the earlier average annual catch was maintained. A considerable improvement was, however, shown in the seasons 1962-65 inclusive. Fig. 6 contrasted with Fig. 1 indicates that the anglers did not benefit from the improved stock in 1963 and that they did not suffer proportionately because of the depressed stock in 1961.

In smaller rivers where the available water is controlled so that a flow, satisfactory for angling, is sent downstream, over a period much longer than would be the case under natural conditions, angling can be particularly successful. This is notably the case in the Lochy in Scotland and Rheidol in Wales.

Where higher head stations are fed with water diverted along open channels or through tunnels, the stretch of river between the dam diverting the main flow and the downstream end of the tailrace is supplied with a controlled quantity of water. Some of such river channels are regarded as an integral part of the fish pass in the dam and the quantity of water may be regulated solely in the interests of the movement of fish. When, however, the channel is of sufficient size and fishery importance a greater quantity of water, adequate for angling, may be discharged.

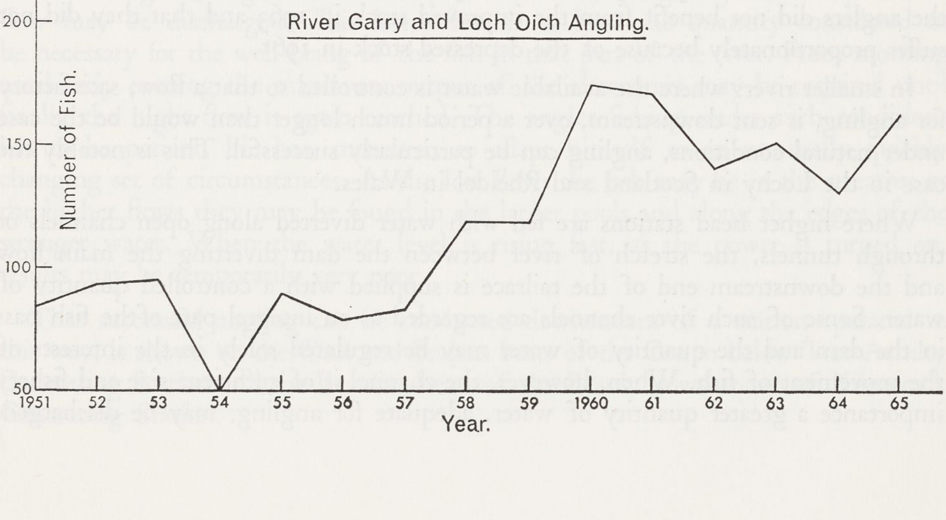
That a completely controlled flow down a stretch of river can provide very good angling has been shown in the Awe but as yet for only two seasons. Results on the Shin have not been so successful although the catch has not declined in proportion with the number of fish ascending into Loch Shin (Fig. 3). The catch on the Shannon, and its main lower tributary the Mulcair, has varied considerably but has improved, steadily and very considerably, since 1959.

The number of fish caught by rod and line in these rivers in each year is given in the following table:-

	Awe	*Shin*	*Shannon and Mulcair*
1952		254	
1953		225	
1954		208	
1955		336	973†
1956		331	2342
1957		281*	1741
1958		274	2558
1959		102	259
1960	459	83	623
1961	518	106	563
1962	845	163	862
1963	441	68	944
1964	645*	118	1335
1965	617	94	1632

* Year generating station commissioned.
† Generation commenced 1927.

Fig.7.
River Garry and Loch Oich Angling.



In the river Garry and Loch Oich the catch by rod and line since 1960 has remained relatively high (Fig. 7) although the stock ascending into Loch Garry has fallen (Fig. 2). The Invergarry Generation Station was commissioned in 1956.

In conclusion experience has shown that, provided adequate protective measures are adopted when a hydro-electric scheme is planned, and provided they are operative when, or even before, a scheme is commissioned the stock of salmon in the river concerned, should be maintained. If adequate protective measures are not adopted initially successful remedial measures may be applied later. The loss of some angling by inundation, or by restriction of water flow, may be inevitable: in many cases, however, angling may be maintained.

SALMON AND TROUT ASSOCIATION

LONDON CONFERENCE, 1966

THE WORK OF THE INLAND FISHERIES TRUST WITH PARTICULAR REFERENCE TO BROWN TROUT

T. J. Beausang

The Inland Fisheries Trust was set up by the Irish Government in 1951 to tackle the problem of developing and maintaining brown trout fishing on a national scale. It came into being largely as a result of suggestions made by the Trout Anglers' Federation to the Minister in charge of Fisheries' and since its inception it has worked in close co-operation with the Angling Associations.

While the Trust's initial task was to undertake development of brown trout fisheries, it became clear, as soon as a preliminary assessment was made of the angling potential of various parts of the country, that coarse fishing and sea angling ought also to be taken into account. The Trust co-operated with Bord Failte (The Irish Tourist Board), with local development groups, and with the Irish Federation of Sea Anglers, in the organisation and promotion of coarse fishing and sea angling as a tourist attraction. The Trust's Memorandum of Association was formally expanded in 1957 so as to embrace the development and exploitation of these forms of angling as a national amenity and as a tourist attraction.

On the sea angling side, the Trust is concerned with the surveying and charting of shore and offshore sport fishing, technical advice to local clubs and development groups, and technical liaison with the Tourist Board. The question of fishery management, in the biological or technical sense, does not, of course, arise—so far, fortunately, no one has suggested that the Trust should undertake the stocking of the Atlantic Ocean!

On the coarse fishing side, the Trust was, at the beginning, concerned primarily with carrying out a general survey of angling potential; with making waters in some areas more easily fishable; and with technical liaison with the Tourist Board and with local development groups. For the past three years, however, it has been engaged in basic research on the biology of Irish coarse fishes, in order to obtain data needed to frame and implement programmes for technical management of coarse fisheries, as and where necessary.

The problems involved in the management of coarse fisheries are, in general, quite different from those involved in the management of trout fisheries; whereas trout are, relatively, short-lived, quick growing and produce very few eggs, coarse fish are long-lived, slow-growing and extremely prolific. These management problems can be assessed and tackled only in the light of detailed knowledge of the habitat requirements, food, growth, spawning and early development of the different coarse fish species. Information is also needed about the effects of competition within species, and between different species. The data now being obtained will make it possible to decide the kind or kinds of coarse fish best suited to various types of waters; the combinations of species that do, or do not, get on well with one another; and the levels of population that provide the most satisfactory fishing, having regard to the size and basic productivity of different lakes or rivers.

Right at the beginning, the Trust was confronted with the problem of classifying Irish waters according to the kind of fishing offering the best possibilities for development. Having to consider the country as a whole had–and still has–its disadvantages in that, on research side, there was little opportunity to undertake the kind of detailed ecological studies which are possible where a limnological station is located on a particular lake or river, in which continous and long-term investigations can be made.

It has, however, some compensatory advantages, in that Trust workers gain a wide experience of many different types of water; from the small bog lake to the big limestone lake, and from the little rocky wet fly stream to the big, slow-flowing bream river. Also while no permanent limnological stations, as such, have been set up, development work has been in progress for from ten to fourteen years on a number of major trout lakes. A by-product of the development work has been the accumulation of a large amount of data about the waters concerned, most of which was roughly processed for the immediate purpose of practical application of the information afforded; and much of which is now being processed in more detail for the sake of the more fundamental biological information that can be extracted from it.

The initial classification of Irish freshwaters was, of necessity, on a rather broad and somewhat empirical basis. Several primary categories were recognized, namely:

(1) Salmon rivers.

(2) Sea trout rivers and lakes.

(3) Waters unlikely to produce anything other than small brown trout, and unsuitable for development for migratory salmonids.

(4) Good or potentially good brown trout waters.

(5) Waters best suited to coarse fish.

The Trust was not concerned with the first and second categories of waters–

save to the extent that possibilities for the development of waters for migratory fish sometimes came to notice when waters suggested for brown trout development were being investigated. In two such cases, in fact, the Trust opened up the waters to migratory fish–in one case by the provision of a fish pass, and in the other by blasting natural rock falls so as to make it possible for fish to get over them. Neither water had much potential for brown trout development.

Waters where brown trout are unlikely to grow to any size have a limited potential for development and had, perforce, to receive but limited attention as compared with the good or potentially good trout waters, most of which were in need of technical development.

The major brown trout lakes, and several limestone trout rivers, obviously come within the category of good trout waters in need of development, and were earmarked for, and received, attention almost from the start. But as development work began on what might be termed the self-evident trout waters, surveying of other waters also began, and this survey work has been intensified in recent seasons. It was this survey work which had suggested originally that many waters were not particularly suited to development for trout but had excellent possibilities for exploitation as coarse fisheries, As surveys were continued, and data from waters under development began to build up, the preliminary sorting of waters into "trout" and "coarse fish" categories was replaced by a more detailed system of classification, which is being continously reviewed as more information about the biology of coarse fish, as well as trout, is obtained. Since the ultimate management objective is to develop most Irish waters to best advantage according to their real potential, so the ultimate research objective is to discover just what this potential is. This means, within realistic limits of accuracy, being able to recognize lakes and rivers as being of such and such a type from the ecological viewpoint.

Some fairly detailed ecological studies of certain trout streams have been made in co-operation with University College, Dublin; much information as mentioned, has been obtained about the major trout lakes on which development work has been in progress for many years; and in connection with the coarse fish work, a number of waters of diverse character were selected for special attention. Elsewhere, surveys have been less detailed, and have been directed towards obtaining a general picture of conditions in as wide as possible a range of waters. In the case of small lakes, for example, the depths are roughly plotted in by running a series of transects with a recording echo-sounder. The types of bottom material are generally ascertained, together with the types and distribution of weed. The electrical conductivity of the water is determined to get an idea of total dissolved mineral content, and the calcium bicarbonate content of the water is also ascertained. A qualitative survey of the fauna is made, and the abundance of the different types roughly assessed, Samples of fish are collected for age analysis, stomach examination, and examination for parasites; and by using the same types of nets in the same type of way in different lakes, some idea of the relative abundance of fish can be gained. Tributaries are examined for spawning facilities or obstructions to movements of fish, where development for trout may be considered. The ease or otherwise with which the water can be fished is taken into account, and notes are made of any work that might have to be done to make the water more easily fishable.

Some of the waters surveyed in this way may prove to have little potential for development for any kind of fishing. Others may seem promising from an ecological viewpoint, but there may be practical difficulties in the way of indicated development work. The best way to tackle some others may depend on the outcome of research or experiments still in progress. Others, again, may lend themselves to immediate development along tried and proven lines.

Trout waters on which development work has become a matter of standard practice are of three main types;-

(1) Large limestone lakes with fair to good natural spawning facilities.

(2) Small lakes, suitable for trout, but with inadequate spawning facilities, or none.

(3) Limestone rivers of moderate depth and moderate to brisk flow.

Typical of the big limestone trout lakes are waters such as, Lough Corrib; Lough Mask; Lough Sheelin and Lough Ennell. These lakes are rich in food. Spawning streams run into them, but the spawning facilities are rather limited in relation to the area of lake involved. Coarse fish are present in all these lakes.

The object of development work in these lakes is the obvious one–to increase the stocks of trout. These waters are, in general, too big for artificial stocking on an economic scale to make any significant difference to the density of trout in the lake—quite apart from the fact that stocking, by itself, is simply an expensive way to feed predators. Development work is therefore directed firstly, towards increasing the output of naturally-spawned trout from the feeder streams; and secondly, towards increasing the survival rate of these trout when they enter the lake.

First, as regards the development work in tributary streams where spawning grounds are limited. This is remedied by rehabilitating natural accumulations of spawning gravels which have become consolidated, silted or overgrown and, in some cases, by the introduction of new gravel of suitable size and texture at suitable points in the streams. Intelligently done, this spawning ground improvement has proven very successful, and new as well as rehabilitated gravel has been extensively used by the trout.

The number of trout a stream produces depends not so much on the amount of actual spawning gravel available, but on the amount of nursery ground available to the young, growing fish. Care is therefore taken to maintain an adequate nursery ground to spawning ground ratio, and to improve nursery conditions where necessary.

Small tributary streams, rich in food, have been found to produce on average one yearling trout per square yard. From many such streams, the majority of the trout migrate when a year old. In some, however, appreciable numbers remain into the second year. The presence of such 1 + trout in any numbers reduces the output of young trout, not only because the older fish prey on the post-alevins, but because the 1 + trout need much more food and living space than the under-yearlings, with which they are in competition. Where spawning and nursery areas are limited, and consist, in the main, of quite small streams, it has been found an advantage to crop the streams by electrical fishing and to move the 1 + fish to the lake. The yields of under-yearling trout have been found to increase sharply as a result, and the displaced 1 + trout have survived well and have shown little tendency to return to the tributaries until mature.

Measures to increase the survival of young trout in the lakes have proven to be of major importance, and must be taken before any spawning stream improvements are carried out. Pike are the main predators on the trout, and several methods are used to reduce and control the numbers of pike. One of the principal methods of pike reduction is the use of gill-nets at spawning time. Originally, the gill-nets used were 35/3 flax twine of 5″ stretched mesh. In recent seasons synthetic nets of $3\frac{1}{2}$″ and 4″ stretched mesh have been largely employed, and frequently nets of smaller mesh still are used inside the larger meshed nets, to take small pike on the actual spawning grounds. On the larger lakes, when pike reduction operations are begun, even allowing for variations in mesh size, the dominant year classes of pike in the catch are four to six year old fish. As reduction work continues, two and three year old pike begin to make up the bulk of the catch, and the catch per unit effort begins to decline also. The reduction in the populations of pike is invariably followed, first by an increase in the numbers of small trout in the lake (as evidenced by anglers' catches and seine net hauls), and later by an increase in the numbers of larger trout, through growth.

Floating lines, carrying ten or more hooks with small pike or perch as live-bait, prove effective towards the end of the pike spawning season and for some time after it. While the numbers of pike they take are small compared with the gill-net catches, the average weight of pike taken on lines is high. They are particularly deadly for big pike which have managed to avoid the nets for a number of seasons.

Wire traps, of the type used in Windermere for perch, are used extensively on the Irish lakes to catch small pike–mainly O-group fish. They yield best results from October to May, when set in shallow water along stony shores. Because of the enormous fecundity of pike, reduction in the number of spawning adults by gill-netting makes little difference to the numbers of yearling pike produced, since decreased density of pike fry means increased percentage survival. The traps help to a large extent to cope with this problem by catching very big numbers of young pike–up to 10,000 or more per annum in some lakes. In the larger lakes, where the young pike feed mainly on Gammarus, Asellus and insect nymphs, the traps reduce their numbers before they have begun to prey on trout, which is an additional advantage.

In recent seasons, the attack on the pike stocks has been intensified by spot-treatment of the pike spawning and nursery areas with rotenone. If this can be done when spawning is completed, but when the baby fish are still in the shallow marshy backwaters, enormous kills can be made.

These four methods combined–gill-nets, long lines, traps and spot-rotenone treatment keep pike populations in the big lakes at levels at which the trout have a decent chance to survive.

There is some predation by perch on the smaller sizes of trout descending from the tributary streams, though as predators, perch are a much less serious problem than pike. However, perch feed extensively on the young stages of many of the more important Ephemeroptera, caddis and chironomids, and thus tend to reduce the hatches of fly. Also, for a period during the summer, perch fry tend to become the exclusive food of trout, to the detriment of fly fishing. There is abundant evidence that, in the limestone lakes, trout can make fast and substantial growth on the abundant invertebrate food available. Perch fry are therefore, from the trout angler's point of view, an unnecessary and wasteful link in the food chain of the trout.

Measures to reduce and control the perch populations are therefore taken also. On some lakes, heavy catches of perch are taken by means of seine nets, in calm and warm weather when they are shoaling in the shallows. The bulk of the perch catch, is, however, taken in wire traps in April and May, when the fish are spawning. In addition bundles of brushwood are anchored in the lakes. These are attractive to spawning perch, which deposit their eggs on them. Very large quantities of spawn are collected from these bushes each year and destroyed. Finally, shoals of perch fry moving into shallow backwaters during calm warm weather with a slight onshore breeze are sprayed with rotenone. At night, lamps have been used successfully to attract perch fry within reach of dip nets or seine nets, but this technique is still in the trial stage.

Small lakes with limited or no spawning facilities are a different proposition from the big lakes. Some of these lakes hold no coarse fish, and either a small natural stock of trout or none. If the feeding conditions are good, management then involves no more than annual stocking at a rate dependent on the productivity of the water, the amount of natural reproduction if any, and the fishing intensity. Even if the water is only moderately rich, quite fair fishing can often be provided by keeping stocking levels reasonably low. Indeed, artificially stocked lakes of moderate productivity may yield trout of much better size than other lakes in the same area, which are physically and chemically similar but have good natural spawning facilities–and consequently many more trout to the acre.

Many of the richer small lakes in which depths and oxygen levels are suitable for trout, contain coarse fish–usually pike and perch A small lake, for its area, has more perimeter than a big lake. Because a small lake is relatively sheltered, much of the perimeter is weedy. Weedy margins are pike nurseries. Consequently the small lake usually holds a super-abundance of small pike. In the absence of spawning tributaries the small trout must be stocked directly into the lake–a relatively confined space swarming with pike. Small pike and small trout are bound to meet, sooner rather than later–and that's the end of the small trout.

In the special conditions of the small lake, control of the small pike population by means of nets and traps is inadequate to give the trout a chance to survive. Radical treatment is the only solution, and this means rotenone treatment.

Eradication of coarse fish by means of rotenone is practicable only where a lake is either isolated, or is the top lake of a system from the lower lakes of which coarse fish will not too quickly re-invade the cleared lake. It is obviously important, too, that the outflow from the treated lake shall not directly discharge into an imporant fishing water unless it is so diluted or dispersed that it will not prove lethal.

Rotenone is preferred by the Trust to other fish eradicants because it is harmless to warm-blooded animals, has only a limited and transient effect on the fish food organisms, and breaks down quickly, so that stocking can be safely carried out within at most a few months of treatment. While liquid preparations may be more convenient to use, powdered derris is cheaper and, with practice, gives satisfactory results. Portable motor pumps are used to spray a mix of suitable strength over the surface of the lake. The mix is diluted with lake water as it is pumped by means of appropriate hose connections and valves. Rotenone is also pumped down to deeper levels, in case thermal layering should delay diffusion. Test fish confined in traps are spotted about the lake to check the efficiency of the treatment.

Special attention is paid to marshy areas and backwaters where pike fry are likely to be. Even when this precaution is taken, however, some pike fry nearly always survive the treatment, even when a complete kill of older pike and of perch is achieved. This means, in practice, that an operation has usually to be repeated within two years to achieve a virtually complete kill.

In the ordinary course of events, the standard dosage is $1\frac{1}{2}$ lbs. of derris powder of a minimum of 5% rotenone content, per acre-foot of water. Where it is economically feasible, and the discharge is unlikely to do damage elsewhere, this dosage rate could, with advantage, be doubled in special cases.

Where a small lake contains no fish, or where it has been cleared with rotenone, the question arises as to what type of trout to stock–browns or rainbows. Over the past ten years, the Trust has carried out experimental stockings of both browns and rainbows, in a variety of small Irish lakes and has analysed the results. These will be published at a later date. Several different factors are involved which have a bearing on the choice of species of trout, and it is not possible here to go into detail. Essentially, however, the situation is this. Rainbows stocked as Autumn fingerlings survive in large numbers to the end of the following season (1+), but survival to 2+ is small. Browns, on the other hand, have a very high survival to 2+, 3+ and even 4+, whether they are stocked alone, or in combination with rainbows. Against this, the rainbow grows faster than the brown trout. What this means, in practice, is that in rich waters where rainbows become big fish at 1+, they are an excellent proposition and give a high yield to anglers. Where, however, trout need two seasons' growth to attain a decent size, the somewhat slower growing brown, because of its high survival rate over a number of years, is much the better fish to stock.

It may be mentioned in passing, that in one of the first lakes stocked with rainbows by the Trust, namely, L. Na Leibe, at Ballymote, in County Sligo, the rainbows are now spawning naturally in adequate numbers to maintain stocks. This is a small, spring-fed limestone lake, with a small outflow leading to a swallow-hole. The rainbows spawn in the outflow, and on the stony lake shore in its vicinity. This is a rather special case, where survival conditions appear better than usual, and where there are spawning facilities. In most of the lakes in which rainbows have been stocked, there are no spawning facilities, and it is settled policy of the Department of Agriculture & Fisheries not to allow stocking when access to other waters is possible.

The third chief category of trout waters on which the Trust is working is the limestone trout stream–the Irish equivalent of the chalk stream. Except in the Munster Blackwater area, there are no dace or roach in the Irish limestone streams, and, of course, there are no chub, bleak or grayling. Management involves, therefore, essentially the same two things as on the big lakes–spawning stream improvement and maintenance, and predator control. In the streams, predator control is carried out by electro fishing. While pulsed, D.C. equipment is used for survey work and cropping in small streams, pike removal from the larger streams is carried out with alternators of $1\frac{1}{2}$ and $2\frac{1}{2}$ K.V.A. capacity, which are operated from flat bottomed marine plywood punts. A special unit deals with this work operating as a specialist team from April to October.

In the course of electro fishing for pike, which is carried out annually on the rivers controlled by the Trust the numbers of trout encountered are also studied to assess the density and distribution of the trout stocks. Where the density of trout is below the obvious carrying capacity of the section, whether as a result of heavy angling pressure or distance from spawning streams, or other reasons, stocking is carried out.

Except in the case of initial stocking of virgin waters, or following the completion of drainage schemes, unfed fry are seldom used, because there is little point in putting them into running streams already containing the young fry of wild trout. "Put-and-take" fishing is neither desirable, nor necessary, under Irish conditions, and the hatchery production of large trout is, in any event, a very expensive business. Over a long period of years, brown trout stocked as Autumn fingerlings running thirty or forty to the pound have been found by the Trust to have a consistently high survival, whether stocked in lakes or in rivers, and whether or not wild fish were present. Whether this is due to Irish ecological conditions or to the conditions under which the fish are reared, or both, is not quite clear; but the fact is that the Autumn fingerling brown trout gives a good return for the money invested in rearing it–and it is a "wild" fish in quality and behaviour by the time the angler catches it.

The Trust operates three rearing stations at which brown trout fingerlings are produced, for stocking waters under development by the Trust, and for sale to Angling Associations. These are at Mullingar, Co. Westmeath; at Ballinlough, Co. Roscommon; and at Roscrea, Co. Tipperary, where rainbow trout for stocking are also reared. Production this season was nearly one million brown trout fingerlings, in addition to big numbers stocked out as summerlings.

These fish are only planted when and where it has been established that they are likely to be of value, the main emphasis of the Trust's programme being on increasing natural reproduction and increasing the survival of naturally spawned trout.

There are many incidental aspects of the Trust's work which cannot be dealt with here. These include ad hoc co-operation with Boards of Conservators, Angling Associations and other organisations in salvage operations or the like in times of crisis; co-operation with Universities in the supply of material for ecological, biochemical or pathological studies, and such diverse lines of investigation as studies of fly life in relation to the feeding habits of trout, and studies of the growth and feeding habits of brown trout in salt-water impoundments.

A point which should be made clear is that the Trust is primarily a development body. When it commenced operations it had to deal with a number of waters where the problems were obvious, and the remedies equally obvious–it was a question of doing what was necessary, rather than finding out what it was necessary to do. As more and more waters, of more and more varied types, began to appear on its agenda, research and experiments became increasingly important, in order to provide a foundation for future development work. The results of this research and these experiments will be published in due course.

The work of the Trust on trout fisheries now embraces some 150,000 acres of lakes and over 1,000 miles of rivers. Fishing is free on many of these waters. On the remainder the fishing is controlled by the Trust and is open to its members or permit holders. Trust membership is available to all anglers. The yearly subscription is £1 or £10 for life membership. Present membership stands at about 6,000, some 1,200 of whom are from outside the country—mainly from Great Britain.

The work of the Trust is mainly financed by a State Grant provided by the Department of Agriculture & Fisheries and amounts to £95,000 in the current year. Its income is supplemented by members' subscriptions, donations and sales of fish to Angling Associations.

The Trust is governed by a Council of seven members. Four of these are nominated by the Minister for Agriculture & Fisheries, Mr. C. J. Haughey, who takes a keen personal interest in the work of the Trust. Three members of the Council are elected every three years by the members of the Trust.

SALMON AND TROUT ASSOCIATION

Second Supplementary List 1969/70

New Members: 1st April, 1969 to 30th April, 1970

BEDFORDSHIRE

Boyce, Dr. D. S., Ph.D., 7 Vicarage Road, Silsoe.
Gloag, Major R., Riseley Lodge, Riseley.
Hart, E. W. S., 27 Beacon Avenue, Dunstable.
Hatch, R. C., Tamar Court, Milton Ernest.
Moore, Mrs. A. M. H., Corn Close, Felmersham.
Smith, E., c/o The Railway Hotel, Linslade, Leighton Buzzard.

BERKSHIRE

Barbour, R. D., Shortheath House, Solhamstead, Reading.
Harvey, R. W., Elm Close, Kingston Bagpuize, Abingdon.
Hathaway, D., 15 Bolton Avenue, Windsor.
Langford, A. J., Old Victoria, North Moreton, Didcot.
Stone, E. V., 24 South View Avenue, Caversham, Reading RG4 0AD.

BUCKINGHAMSHIRE

Brown, H. B., Cleeve House, Woburn Sands, Bletchley.
Cross, Mrs. I. E., West Hill, Fulmer Rise, Fulmer.
Haworth, Miss F., Chetwode Priory, Buckingham.
Haworth, Mrs. M., Chetwode Priory, Buckingham.
Haworth, R. F., Chetwode Priory, Buckingham.
Heber Percy, Lt.-Col. C. H. R., Pophlets, Radnage.
McNair, G. R., "Molins", Halfacre Hill, Chalfont Heights, Gerrards Cross.
Murckhardt, J. A., 4 St. Michaels Green, Beaconsfield.
Redman, Dr. V., The White House, Sycamore Road, Amersham.
Vandervell, G. C., Nightingales, Chalfont St. Giles.

CAMBRIDGESHIRE

Arnold, R. C., Harston Manor, Harston.
Millar, T. I., 4 Hawthorn Way, Burwell.
Wesley, D. T., 22 Whitmore Street, Whittlesey.
Wyatt, A. W., The Willows, Landbeach, Cambridge.

CHANNEL ISLANDS

Hornung, Lt.-Col. G., Castel House, Les Rohais De Haut, Guernsey.
Phipps, Major G. C., Les Homets, La Rocque, Grouville, Jersey.

CHESHIRE

Ashton, N. G., Stonemill Cottage, Rainow, Nr. Macclesfield.
Beaumont, D , B.Sc., Cooper Nutrition Products, Victoria Hill, Wincham, Northwich.
Clough, G. F. G., Allmeadows Farm, Wincle, Macclesfield.
Couttie, E., Dunham Massey Lodge, Altrincham.
Deeley, J. H., 5 The Royal, Stanley Road, Hoylake, Wirral.

Grimke-Drayton, L. W., M.A., Lower Hampton, Malpas, Cheshire.
Kenyon, P. W., B.Sc., c/o Cooper Nutrition Products Ltd., Victoria Hill, Wincham, Northwich.
King, P. G., The Whins, Caldy Road, Caldy, Wirral.
Martindale, J. R. L., Heather Lea, West Kirby.
Runciman, H. L. I., Bexton Lodge, Knutsford.

CORNWALL

Angel, R. E., Boswyn, Launceston.
Stuart, N. C., B.A., B.Sc., MRCVS., Gwealhellts House, Church Hill, Helston.

CUMBERLAND

Anderson, R. W., Glentore, Scotby, Carlisle.
Brown, G. W., 8 Old Harker, Blackford, Carlisle.
Bunting, F. (Chairman Egremont & Dist. Anglers' Assoc.), 69 North Road, Egremont.
Castelvecchi & Priestley Ltd., 2 The Crescent, Carlisle.
Coulthard, M. H., Roewath, Dalston, Carlisle.
Delsaux, C. J., High Field, Brampton.
Fisher, Captain C. (Sec., Egremont & Dist. Anglers' Assoc.), 69 North Road, Egremont.
Greenwood, P. J., 28 Beech Grove, Houghton, Nr. Carlisle.
Hall, S., 79 Warwick Road, Carlisle.
Harrison, J., 20, Coniston Avenue, Seascale.
Howard, J., Wood House, Warwick Bridge.
Lowther, J. R., Oakdene, Corby Hill, Carlisle.
Manaley, J. R., "Belmont", Cairn Crescent, Corby Hill, Carlisle.
Mawson, J. A. M., 2a, Chiswick Street, Carlisle.
Nixon, W. N. (Hon. Sec., Calder Angling Association), 1 Yottenfews, Calderbridge, Seascale.
Routledge, J. W., 12 Holmrook Road, Carlisle.
Smith, F. M., High Field, Brampton.
Tiffen, W. T., 25 Norfolk Road, Carlisle.
Wren, Major L., The Lawn, Castle Carrock, Carlisle.

DERBYSHIRE

Averty, A. A., Izaak Walton Hotel, Doverdale, Ashbourne.
Booth, R., Sunny Bank, Sawmills, Ambergate.
Bridel, D. G., Auburn House, Youlgreave, Bakewell.
Colyer, Miss J. E., Littlemoor Brook, Riber, Matlock.
Derbyshire County Council Angling Club, Clerk's Dept., Derbyshire County Council, County Office, Matlock, DE5 3AG.
Fraser, J. R., Haddon Barns, Bakewell.
Hillyard, T. W., Laburnum House, Great Longstone.
Horrocks, H. M., The Beeches, Rowsley, Matlock.
Kenning, G., Longstone Hall, Bakewell.
Litchfield, L., Raenstor Close, Youlgreave, Derby.
Littleton, H. L., Moor Edge, Hydro Close, Baslow, Bakewell, DE4 1SH.
Luckraft, Capt. A. W., Fellside, St. Anedge Road, Bakewell.
Mathew, Dr. G. G., The Glead, 2a Louvain Road, Derby.
Olivier, Lt.-Col. W. H., T.D., D.L., J.P., Ashford Hall, Nr. Bakewell, DE4 1OA.
Pitts, W. E., Burre Close Cottage, Burre Close, Bakewell.
Rodger, A. C., M.B.E., Stanton-old-Hall, Stanton-in-Peak, Matlock.
Roe, L. N., Lathkill Lodge, Over Haddon, Nr. Bakewell.
Shipman, A., Hallfield Hall, Shirland.
Stoker, Dr. A. D., Winster, Matlock.
Sutton, D. O., B.V.Sc., M.R.C.V.S., Granby Croft, Bakewell.
Thompson, Sir Edward, Colland Hall, Brailsford.
Usher, Mrs. A. M., J.P., The Old Hall, Netherseale, Burton-on-Trent.

DEVON

Adams, N. C., M.P., Middletown, Sampford Courtenay, Okehampton.
Duthie, D. J., Flete, Ermington, Ivybridge.
Egginton, H., Luareston Lodge, Wolborough Hill, Newton Abbot.
Farrell, F., Bourne, Down Road, Tavistock PL19 9AG.
Gay, Rear-Admiral G., 29 Whiteford Road, Mannamead, Plymouth.
Hederman, Dr. P. A., Silverton House, Silverton.
Hoare, D. J., Luscombe Castle, Dawlish.
Jackson. F. E. J. B., 1 Mill Street, Torrington.
McGregor, B. H., "Montana", Abbotsfield Close, Tavistock.
Mitchell, D., Sidaway, Old Totnes Road, Newton Abbot.
Moore, J. A., Post Office, Buckfastleigh.
Pringle, H. A., Melstock, Torrington.
de La Rue, Charles, Greystones, Whistley Down, Yelverton.
Saunders, K. G. W., O.B.E., F.R.C.S., Notash, Yarnscombe, Barnstaple.
Scott, W. G. G., "Penpol", Horslett Hill, West Clawton, Holsworthy.
Skelton, R. L., Monks Cottage, Zeal Monachorum, Crediton.
Smalley, Major J. M., Lower Week, Zeal Monachorum, Crediton.
Todd-White, Dr. D. S., The Grove, Horrabridge, Yelverton.
Tremlett, Major-General E., C.B., T.D., Clapham Cottage, Clapham, Nr. Exeter.
Weedy, K. C., "Longfield", Bantham, Nr. Kingsbridge.

DORSET

Benson, Lt.-Col. J. R. E., Cheselbourne Manor, Dorchester.
Charnley, J. H., 4 Cleals Buildings, South Street, Bridport.
Chilton, Lt.-Col. R. G. R., Butlers, Donhead St. Mary, Shaftesbury.
Corless, E. A., "Highcroft", 29 Spencer Road, Canford Cliffs, Poole.
Crick, J. E., 3 Mellstock Avenue, Dorchester.
Floyer-Acland, Brigadier S. N., C.B.E., The Manor House, West Stafford, Dorchester.
Foot, K. E., 18 Great Western Road, Dorchester.
Gallia, G. E. H., Nether Cerne Manor, Dorchester.
Marshall, K. I., 26 West Allington, Bridport, Dorset.
Pope, C. J. R., Little Wrackleford, Dorchester.
Radclyffe, Mrs. A., Owermoigne Moor, Dorchester.
Ricardo, P. W., M.B.E., Myrtles, Puddletown, Dorchester.
Vere-Hodge, N., F.R.C.S., "Silverwood", Arrowsmith Road, Canford Magna, Wimborne.

DURHAM

Bell, G., The Bungalow, Quebec Village.
Fleming, W. N., J.P., B.Sc.(Agric.), Roseneath, Tudhoe, Spennymoor.
Hird, L., 2 Church Street, Coundon, Bishop Auckland.
Kirkup, Thomas, M.B.E., Hadrian Lodge, Fieldhouse Lane, Durham City.
Land, J., 32 Durham Road, Aycliffe.
Luxmoore, M. J., Staindrop Hall, Staindrop, Darlington.
McLellan, A. G., 29 John Street, Sunderland.
Ranken, C. F., 1 The Close, Church Lane, Whitburn.
Scanlan, R., 17 The Broadway, High Barns, Sunderland.
Strachaan, D., 1 Coppice Walk, Darlington.
Weightman, A. S., West Farm, Butterwick, Sedgefield, Teesside, Co. Durham.

ESSEX

Block, S. E. H., Castlings Hall, Boxford, Colchester.
Blyth, D. F., The Farm, Walton-on-Naze.
Daintry, Commmander G. M., R.N. (Retd.), Heath House, Ardleigh, Nr. Colchester.
Earl, E. S., "Highfield", 188 Lodge Lane, Grays.
Fordham, E. R., Rectory Farm, Little Chesterford.
Fordham, Mrs. O. M., Little Chesterford.

ESSEX—*continued*

Greene, L., 96 Hudson Road, Eastwood, Leigh-on-Sea.
Haddock, P. M., "Kingsthorpe", Great Easton, Dunmow.
Haddock, Mrs. P. M., "Kingsthorpe", Great Easton, Dunmow.
Ingleton, K. N., Fullbridge Quay, Maldon.
Jameson-Till, Mrs., Colne Ford House, Earls Colne, Halstead.
Newsholme, C. M., 136 Broomfield Road, Chelmsford.
Pattinson, G., Kiln House, Great Horkesley, Colchester.
Reygate, W. F., 45 Newlands Road, Woodford Green.
Thompson, R. A., 14 The Hylands, Hockley.
Twist, S. E. M., 14 Newland Street, Witham.
Young, W. C., Fremnells, Downham, Billericay.

GLOUCESTERSHIRE

Chapel, Dr. A. J., South Point, Somerford Road, Cirencester.
Cooper, E. R., Priory Croft, Easton in Gordano, Bristol BS20 0PA
Danks, J. F., The Coigne, Minchinhampton, Nr. Stroud.
Ellerington, Miss Valerie, 19 Richmond Terrace, Clifton, Bristol 8.
Gibb, Miss J. E. A., Cotswold Park, Cirencester.
Godman, D., Great Rissington Manor, Cheltenham.
Jack, W. J., Huntington Court, Kington.
Johnson, E. G., Redhill Pig Farms Ltd., Lydney.
McQuade, Dr. I. A., "Inchagoill", Naish Lane, Barrow Gurney.
Roberts, H. R., Brookside, Ewen, Nr. Cirencester.
Unwin, R. D., The Corner House, Longdon, Tewkesbury.
Wills, Major M. T. N. H., Ewen Manor, Cirencester.

HAMPSHIRE

Allnutt, R. M., 48 High Street, Old Portsmouth.
Andrew, R. C., 42 Bassett Dale, Southampton.
Andrews, D. A. B., Threeways, Rockbourne, Fordingbridge.
Bournemouth & District Water Company, The, Alderney Waterworks, West Howe, Winton, Bournemouth BH11 8N8.
Cairns, M. A., D34 San Remo Towers, Sea Road, Boscombe, Bournemouth BH5 1JU.
Carter, L., 16 Cedar Avenue, Northbourne, Bournemouth BH10 7EF.
Deverell, Major J., Pitlands Farm, Ramsden, Basingstoke.
Dobson, A. C., Bransbury Mill, Barton-Stacey.
Edgar R. R., Newton Valence Place, Nr. Alton.
Edgar, Mrs. R., Newton Valance Place, Nr. Alton.
de Fontenne Sleeman, Brigadier J. C., C.B.E., Braishfield House, Braishfield, Nr. Romsey.
Furniss, J. W. M., Colyford, Springvale Road, Kingsworthy, Winchester.
Hargreaves, J. H., Boldre, Lymington.
Harris, Lt. M. G. T., R.N., c/o Lloyds Bank Ltd., 43 West Street, Fareham.
Haynes, D. F., 114 Hamilton Road, Bishopstonke, Eastleigh SO5 6AR.
Hogg, Sir John, The Red House, Shedfield, Southampton.
Hutchinson, D. T., 19 Regent's Park Road, Southampton SO1 3PH.
Learmond, Lt.-Commander P. A., R.N. (Retd.), Anvil Cottage, Conford-nr.-Liphook.
Lowndes, P. G., Roke Farm, Bishops Waltham.
Mackenzie, Commander D. J., R.N., Heathfield, Street, Petersfield.
Morris, Air Commodore R. J. A., Glenmore, Knights Enham, Andover.
Muriel, Colonel J. B., O.B.E., Bramblette, Headley, Bordon.
Nicholson, C. H., Tadley Place, Baughurst, Nr. Basingstoke.
Oliver, D. J., 30 Station Road, Overton, Nr. Basingstoke.
Oram, A. B., Bourne House, St. Mary Bourne, Andover.
Phipps, Major-General H. C., Dalton House, Hurstbourne Tarrant, Andover.
Pitt, P. F., M.A., Robin Hill, Itchen Abbas.
Pownall-Gray, J. W., O.B.E., The Manor, Abbotts Ann, Andover.

HAMPSHIRE—*continued*

Redgrave, R. A. A. W., Zouch Manor, Tidworth.
Schwind, Major F. L., Poplar Dene, Chilbolton, Stockbridge.
Sharp, S. H., Bere Hill, Whitchurch.
Standish, P. R. C., Bramshott Meadows, Liphook.
Uvary, Major A., R.E. (Retd.), "Kitwalls", Kitwalls Lane, Milford-on-Sea.
Witt, Dr. R. C. Shortlands, Avenue Road, New Milton.

HEREFORDSHIRE

Armishaw, A., 45 Kings Acre Road, Hereford.
Bossom, Lady Barbara Joan, Parsons Orchard, Eastnor, Nr. Ledbury.
Chambers, G. H. Arrow Bank, Eardisland, Leominster.
Clay, J. P. F., Fawley Court, Nr. Hereford.
Constant, H., Wyeside, Hampton Bishop.
Dereham, S. W. B., Sapness Farm, Wool Hope, Nr. Hereford.
Evershed, Miss L. May, Hagley House, Ivington, Leominster.
Gaskell, J. S., Paddocks Farm, Coughton, Ross-on-Wye.
Glazebrook, P. N., Lynch Court, Eardisland, Leominster.
Herford, O. H. M., Hawkhurst, Bromyard.
Levick, D. R., Barrow Leasowe, Bearwood, Pembridge, Nr. Leomister.
Morgan-Jones, Messrs. Morgan-Jones & Son, Sugwas, Swainshill.
Morris, V. W. F., New Wier, Nr. Hereford.
Neville-Clarke, Brigadier E. N., Hephill, Lugwardine, Hereford.
Peatt, J. N., M.R.C.V.S., Copper Beeches, South Street, Leominster.
Pickett, R. T., "Frith Haven", Whitchurch, Ross-on-Wye.
Seymour, A., Lisstombury, Nr. Leominster.
Stockwell, A. T., Red Lion Hotel, Bredwardine.
Trafford, J .L., c/o Knight, Frank & Rutley, 14 Broad Street, Hereford.
Whitlock, Mrs. N. D., Sheepwash Cottage, Ballingham, Holme Lacy.

HERTFORDSHIRE

Davies, J. D., 73 West Common, Harpenden.
Margrave, G., 19 Cowper Road, Berkhamsted.
Merrie, A. H., 24 The Broadway, Wheathampsted.
Noblett T. J., Heath Cottage, Marshall Heath, Wheathampstead.
O'Brien, Michael, 30 Magnaville Road, Bushey Heath.
Reeves, P. J., 30 Lindsey Road, Bishops Stortford.
Robson, David Maclean, 54 Newberries Avenue, Radlett.
Rowland, L. J., Hill House, Albury, Much Hadham.
Ruth, C. M., 35 Bembridge Place, Lindon Lea, Leavesden.
Tritton, A. M., Crown House, Sheering, Bishops Stortford.
Watkins, C. J., Breakspear Post House, Hemel Hempstead.
Weaving, Lt.-Commander M. R. V., R.N.R., V.R.D., M.A., Holly Cottage, Ayot St. Peter, Welwyn.
Wingate, R. W., 48 Stonycroft, Hemel Hempstead.

HUNTINGDONSHIRE

Thorndike, J., 257 Eastfield Road, Peterborough.
Tutt, C. P., 219 Broadway, Peterborough.

ISLE OF MAN

Bates, J. N., Austvane, Lezayre.
Cullen, J. B., C.B.E., Thie Vane, Ballasalla.
Davison, Mrs. J. P., Cronk Ghennie, Bowring Road, Ramsey.
Harris, Colonel R., Rathforkar, Port Lewaique Close, Port Lewaique, Nr. Ramsey.
Spence, M. B., Barrule Cottage, Maughold.

KENT

Astor, The Hon. Gavin, Hever Castle, Edenbridge.
Baldwin, P. E. J., 2 Downsview Road, Sevenoaks, Kent.
Black, W. H. G., Surlingham, New Barn Road, Longfield.
Bowley, A. P. W., White House, Eastry, Sandwich.
Bradshaw Finn, Mrs. Alice, Parsonage Farmhouse, Nackington, Canterbury.
Burroughes, R. A., 55 Hayesford Park Drive, Bromley.
Cottrell, N. H. T., Whitecraigs, Darkfield, Sevenoaks.
Dafforn, I. J., 180 Goodhart Way, West Wickham.
Glover Long, R., Dark Farm, Higham, Rochester.
Granville-White, P., Spindlewood, Hopgarden Lane, Sevenoaks.
Hodges, A. E., "The Pines", 32 Tile Kiln Lane, Bexley (Thames Angling Preservation Society).
MacEwen, I. L., Riverside House, Yalding.

LANCASHIRE

Ashworth, H., Lee House, Back Lane, Heath Charnock, Nr. Chorley.
Brock Angling Association, 69 Garstang Road, Preston PR1 ILB.
Bunker, E. W., (Lancashire River Authority), 48 West Cliff, Preston.
Coar, B. A., 26 Vicarage Lane, Wilpshire, Blackburn.
Cradcock, T. W., Dockber Farm, Sawley, Nr. Clitheroe.
Dyson, A. T., 34 Freshfield Road, Formby, Liverpool.
Etherington, J., 36 Drake Street, Rochdale.
Finney, J., New Inn, Gisburn, Nr. Clitheroe.
Hastie, N. I., "Park View", 24 Alder Road, West Derby, Liverpool 12.
Lloyd-Jones, E., Ennersdale, St. Georges Road, Huyton, Nr. Liverpool.
Lowry, A. L., c/o John Lowry, No. 4 Avenue, Wholesale Fish Market, Manchester M4 1HR.
Patterson, R. D., M.I.P.S., 10 Moorland Avenue, Sunnyhurst, Darwen.
Pickles, A. F., South Farm, Kirkham, Nr. Preston.
Price, J., c/o Martins Bank Ltd., Silver Street, Bury.
Roughsedge, F., Caloocan, 29 Southport Road, Formby.
Sutcliffe, H. T. W., "Priorylea", 16 Thurleigh Road, Didsbury, Manchester M20 0DJ.
Temperley, H., "Carrickmore", 69 Red Lees Road, Cliviger, Burnley.
Tourney, R., 53, Regent Road, Widnes.
Vandome, M., F.R.I.C.S., 132 Church Road, Leyland.
Wood-Johnson, E., Highlands, Arnside, Carnforth.

LEICESTERSHIRE

Allen, B. A. J., 5 Beachcroft Road, Leicester.
Beardsley, R. C. B., New Quorn House, 5 Loughborough Road, Quorn.
Birmbeck, E. H., Skeffington Hall, Leicester.
Boleman, Dr. F. T., 337 London Road, Leicester.
Brutnell, A., 38 Sherwood Drive, Melton Mowbray.
Burgess, J. H., 79 Woodfield Road, Oadby, Leicester LE2 4QH.
Candlish, L. C., Rockside, The Drive, Woodhouse Eaves, Loughborough.
Ellis, S. R., "White Wings," Southmeads Road, Leicester.
Ferens Batty, Dr. A. M., 1008 Melton Road, Syston, LE7 8NL.
Hartridge, J. S., "Richmond", The Ridgeway, Rothley.
Hilton, M. C., 99 Gartree Road, Oadby, Leicester.
Malcolm, H. M., 80/81 Woodgate, Loughborough.
Parlby, J. K., "Windover", Portsdown Road, Leicester.
Rayson, G. N., Belvoir House, Harrogate Drive, Birstall.
Smith, A. E., 5 The Fairway, Oadby, Leicester.
Smith, W. H., "The Moorings", Gaddesby Lane, Rearsby, Leicester.
Southwood, J. G., The Grove, Somerby, Melton Mowbray.
Street, H. E., 60 Shanklin Drive, Leicester.
Todd, D. McLaren, 41 Broad Street, Syston.
Ward, Dr. G. L., V.R.D., D.S.C., Heather Lodge, 87 Gartree Road, Leicester.

LINCOLNSHIRE

Burgess, T., 89a, Humberston Avenue, Humberston.
Chapman, F., 21 Weelsby Road, Grimsby.
Gooseman, J., 90 Bargate, Grimsby.
Grant, D. J., Craigallachie, Chapel Road, Habrough.
Harriman, F., 2 Cornwall Terrace, Woodhall Spa.
Nichols, E., Langton Grange, Spilsby.
O'Donoghue, Dr. L. M., County Hospital, Lincoln.
Pinney, W., Hough Manor Farm, Alford.
Rawlins, L., The Spinney, Horncastle Road, Woodhall Spa.
Riches, P., Bishops House, Eastgate, Lincoln.
Scholey, Dr. J. W., West Lodge, Leasingham, Sleaford.
West, J. H., The Old Rectory, Coleby, Lincoln.
Westlake, Group-Captain G. H., School Farm House, Castle Bytham, Nr. Grantham.

LONDON

Barnett, G. C., c/o Barclays Bank Ltd., 1 Pall Mall, S.W.1.
Batterbury, G. W., Germaine Monteil (UK) Ltd., 2 Old Bond Street, W.1.
Beard, Major D. P. C., c/o Messrs. Glyn, Mills & Co., Holts Branch, Kirkland House, Whitehall, S.W.1.
Beckwith, W. J. M., 64 Airedale Avenue, W.4.
Berry, J. V. F., The Old Vicarage, Boughton Monchelsea, Nr. Maidstone.
Bostock, Miss M., 12 Chelsea Lodge, 58 Tite Street, S.W.3.
Bowie, E., 24 Cawdor Crescent, W.7.
Brain, Dr. A. T., 15 South Close, Highgate, N.6.
Bridge, C. C. C., 22 Finch Lane, E.C.3.
Brookes, M. C., 11 Crescent Place, S.W.3.
Brunning, K. P. C., Zu Hause, 85 Essex Road, Leyton, E.10.
Chambers, Dr. R. M., 37 Beaconsfield Road, Blackheath, S.E.3.
Chapman, W. C., c/o Benchairs Ltd., Sentinel House, Southampton Row, W.C.1.
Clark, G. T., 1 Bank Buildings, Princes Street, E.C.2.
Clarke, Dr. J. O., 1 King Street, E.C.2.
Davison, R. S. D., M.B.E., F.C.C.S., 50 Elfindale Road, Herne Hill, S.E..24.
Dent, R. J., 28 Montpelier Square, Knightsbridge, S.W.7.
Dring, R. G., 80 Cricklade Avenue, S.W.2.
Farmar, H., Drapers Hall, E.C.2.
Farrer, A. M., 66 Lincoln's Inn Fields, W.C.2.
Finch, The Rev. B. M. P., 20 Page Street, S.W.1.
Glover, J. H., 40 St. Mary Axe, E.C.3.
Goold, H. E. W., 120 Dale View Crescent, Chingford, E.4.
Gordon, J., Army & Navy Club, Pall Mall, S.W.1.
Grant, Mrs. P., 54 Harley House, Marylebone Road, N.W.1.
Guinness, E. F., 3 South House, Rosemoor Street, Chelsea, S.W.3.
Harrison, N., c/o G. Street & Co., Ltd., Streets House, Lawrence Lane, King Street, E.C.2.
Hayes, Brigadier H. A., 9 Wadham Gardens, N.W.3.
Henderson, M. E., 14 Devonshire Place, W.1.
Hill, J. M. M., 9 Crediton Hill, Hampstead, N.W.6.
Holland-Martin, R. G., 28 St. James's Place, S.W.1.
Huttenbach, C. F., 56 Cathcart Road, S.W.1.
Inge, G. P. F., 83a Oakwood Court, W.14.
Inge, J. E. M., 62a Princes Gate, Exhibition Road, S.W.7.
Innes, M. A., 55 Ovington Street, S.W.3.
Jamieson, C. W., M.B., F.R.C.S., 50 Tarnwood Park, Court Road, Eltham, S.E.9.
Kenney, S., 7 Petersham Place, S.W.7.
Larken, Captain W., R.N. (Ret'd), 30 Chester Square, S.W.1.
Lees Ferguson, J. H., M.B.E., F.R.C.S., 1 Upper Harley Street, W.1.
Leggatt, H. F. J., 30 St. James's Street, S.W.1.
Lisburne, The Earl of, 22 York House, Kensington Church Street, W.8.
Luke, A. F., 6 Radley Lodge, Inner Park Road, S.W.19.
Maby, Mrs. C. G., 13 Launceston Place, W.8.

Macdonald, D. E., 33 The Terrace, S.W.13.
McMullen, J., 63 Eaton Square, S.W.1.
Matthews, J., 141 Princes Gardens, W.3.
Medlam, W. G., 51 Merthyr Terrace, S.W.13.
Montgomery, M. N., 15 Conduit House, Hyde Vale, Greenwich, S.E.10.
Moore, P. J. T., 59 Drax Avenue, Wimbledon, S.W.20.
Moyers, W. G., 19 Trevor Place, S.W.7.
O'Brien, Major R., M.V.O., T.D., 68 South Audley Street, Grosvenor Square, W.1.
O'Hanlon, K. L. M., 17a Cannon Place, N.W.3.
Pantall, C. R., c/o H. T. Easdale, 14 Gt. Castle Street, W.1.
Part, Mrs. B. M., 24 Luttrell Avenue, S.W.15.
Part, J., 24 Luttrell Avenue, S.W.15.
Pearson, J. H., 27 James Street, W.1.
Phillips, Lt.-Col. H. P., 15 Grosvenor Square, W.1.
Ponsonby, A. C. G., 120 Cheapside, E.C.2.
Roberts, Dr. C. J., 2 Woodville Gardens, Ealing, W.5.
Rowland, P., 39 Cheyne Court, S.W.3.
Rowntree, Dr. R. S., 26 Cumberland Mansions, George Street, W.1.
Schulman, C. J., 3 Oakwood Mansions, W.14.
Tory, P. G. H., 84 Napier Court, Hurlingham, S.W.6.
Ware, J., 10 Gunter Grove, Chelsea, S.W.10.
Wigram, A. F., 7 Gloucester Square, W.2.
Willis, R., 116 Pall Mall, S.W.1.
Wolfe Murrary, Lt.-Col., **D. K.**, F.R.S.A., 118 Holland Road, W.14.
Wolff, R. S., Suite 472, Savoy Hotel, W.C.2.
Woroniecki, J., 24 Stanford Crescent, Cornwall Gardens, S.W.7.

MIDDLESEX

Fisher, L. A., 80 Warham Road, Harrow Weald (Thames Angling Preservation Society).
House, P., 102 Broadfield Avenue, Edgware.
Jeremiah, A. G. P., 11 Moor Mead Road, St. Margarets, Twickenham.
Jeremiah, R. M., 53 Heathfield South, Twickenham.
Voss-Bark, Conrad, 5 Avenue Road, Teddington.
Woolley, J. H., St. Christophers School, 207 Uxbridge Road, Hayes.

MONMOUTHSHIRE

Bebb, E. I., 132a High Street, Blackwood.
Perry, Dr. Alastair, The Surgery, New Market Street, Usk.
Pomfret, R., c/o Digby Turner & Co., 18 Monk Street, Abergavenny.
Rossiter, A. F. G., 14 Beaufort Road, Newport.
United Usk Fishermen's Asscn., 32 Monk Street, Abergavenny.
Waller, Major P. J. R., M.B.E., Wyastone Leys, Monmouth.

NORFOLK

Bagnall-Oakeley, R., Brinton Hall, Melton Constable.
Bird, T. G., Lammas, Newgate Green, Cley, Holt.
Boardman, M., Coltishall, Norwich.
Bradfield, D. J., Birch Lawn, White Street, Martham, Gt. Yarmouth.
Bunkhall, J. D., T.D., The Bridge House, Setch, King's Lynn.
Buxton, Captain R. G., Wiveton Hall, Holt.
Feilden, B. M., O.B.E., F.R.I.B.A., F.S.A., A.A. DIPL. (Hons), 6 The Close, Norwich, NOR 16P.
Fitt, J., 100 Colman Road, Norwich (Norfolk Flyfishers' Club).
Graham, B. R., C.B.E., Pentire, Bears Lane, Hingham, NOR 23X.
Hay, Mrs. M., Woodrising Hall, Norwich, NOR 22X.
Miller, Major J. E., Broad Cottage, Surlingham, Norwich.
Savory A., Brundle, Norwich.
Smith, K., 77 Keswick Road, Cringleford, Norwich, NOR 60D (Norfolk Flyfishers' Club).
Stephens, J. P., M.Chir., F.R.C.S., Bergh Apton, Norwich, NOR 38W.
Sykes, P. H., Blofield House, Blofield, Norwich, NOR 84Z.

NORTHAMPTONSHIRE

Fitzwilliam, The Earl W. T. G., Milton, Peterborough.
Goodliffe, A., 85a Centre Parade, Kettering.
Jeffery, Col. R. C., T.D., D.L., The Old Rectory, Streat Addington, Nr. Kettering.
Jones, O. M., Bleachments, Great Brington.
Leach, J., "Jim Knight" Tackle Shop, 1 Church Parade, Rushden.
Mumby, C. E. G., The Old Rectory, Church Brampton, Northampton.
Mumford, D. R., Farthingstone, Towcester.
Pember, J. E., Home Farm, Creaton.
Richmond-Watson, R. N., Wakefield Lodge, Pottersbury.
Stockdale, H. M., Hill Farm, Mears Ashby.
Sturrt, Col. A. G., Nobottle, Nr. Northampton, NN7 4HJ.
Woodrow, S. B., Duckmire, Wollaston, Wellingborough.

NORTHUMBERLAND

Allsop, M. J., 28 Highside Drive, Sunderland.
Anthony, M. D., 26 Frank Street, Wallsend.
Barnett, R. A., Lincoln Hill, Humshaugh, Hexham.
Bell, Colonel M. A., Staward Manor, Langley-on-Tyne, Hexham.
Benson, Major J. E., Chesters, Humshaugh, Hexham.
Blackett-Ord, J. C., Whitefield Hall, Hexham.
Hardy, D., Northolme, Lesbury.
Hardy, J. L., P.O. Box 3, Alnwick.
Johnson, M., Woodbine House, Barrasford, Hexham.
Hamilton, A. D. C., Stable Green Cottage, Mitford, Morpeth.
Milton, A. D. C. H., Stable Green Cottage, Mitford, Morpeth.
Pearson, C. E., Shenley, Middle Drive, Woolsington, Newcastle upon Tyne.

NOTTINGHAMSHIRE

Aitken, A. A., B.Sc., 1 First Avenue, Beeston.
Ford, K. S., Old Mill House, Bleasby.
Gregory, A., The Cable, 6 Baulk Lane, Stapleford.
Pearson, M., Bulcote Lodge, Burton Joyce.
Peech, N. M., Park House, Firbeck Nr. Worksop.
Taylor, H. W., 2 Willoughby Close, The University, Nottingham.
Varlow, A. J., 218 Ruddington Lane, Wilford.
Vine, P. M., Mountside House, 23 Lucknow Drive, Mapperley Park, Nottingham, NG3 5EU.

OXFORDSHIRE

Bull, M. A., Box Grove, North Stoke.
Darling, The Hon. R. J. H., The Bothy, Eynsham Park, Witney.
Fielden, Colonel P. B., M.C., Hooknorton Manor, Banbury.
Karck, R. L., Mount Farm, Farnborough, Banbury.
Meredith-Owens, A., The Manor House, King's Sutton, Banbury.

SHROPSHIRE

Ballenden, Dr. W. B., Whitehall, Pontesbury, Shrewsbury.
Bayley, J., Church Farm, Astley, Hadnall, Shrewsbury.
Boycott, C. A., Tinkers Hill, Ludlow.
Dixon, A. T., Wood Green, St. Georges, Oakingates.
Gough, T. R., Wigley, Ludlow.
Groves, C. W. (Salopian Flyfishers' Assoc.), 3 The Villas, Coalport Road, Madeley, Telford.
Newbold, A. E., 12 Lillehurst, Sheriffhaes, Shifnall.
Thompson, J., Stanley, Bridgnorth.
Walker, D. M., 90 Highfields, Preston Street, Shrewsbury.

SOMERSET

Duckham, G. W. B., Washers Farm, Stockland, Bridgwater.
Falcon, K., F.L.A.S., Estate Office, Withypool, Nr. Minehead.
Fradgley, P. G., Easthay Farm, Thorncombe, Chard.
Fulton, Colonel H., Robin Hill, Laverton, Broadway.
Institute of Fisheries Management (Hon. Treasurer—M. Amey Esq.), 39 Mendip Gardens, Bath.
Nicholson, L., Fishing Tackle, High Street, Dulverton.
Quilter, D. C. T., Milton Lodge, Wells.
Shaw, C. J., 3 George Street, Bathwick Hill, Bath.

STAFFORDSHIRE

Carder, G. H., 8 Upper Crescent, Harfields, Stoke-on-Trent.
Grewcock, D. M., Greycroft, Barr Lane, Barton under Needwood.
Legge, M. F., Broadway, 67 Codsall Road, Tettenhall, Wolverhampton.
Moon, A. M., Chartley, The Highfields, Wightwick, Wolverhampton.

SUFFOLK

Allenby, Lt.-Commander R. M. P., R.N., The Hays, Monks Eleigh, Ipswich.
Barclay, J. C., Desuage Lodge, Higham, Bury St. Edmunds.
Bartlett, Dr. M., Newby House, Cumberland Street, Woodbridge
Bird, J., "Newlyn", 27 Norbury Road, Ipswich.
Bixley, R. T., Floodgates, Gt. Henny, Sudbury.
Brown, G. W., Mayfield, Acton, Sudbury.
Jones, R. M. A., The Old Rectory, Oulton, Lowestoft.
Lang, J. A. B., B.15 Brick-kiln Park, Barrett's Lane, Needham Market.
Macrae, Miss M. M. P., Hatchery House, Barrow.
Parlane Granger, Dr. Ian, Naughton Hall, Bildeston, Ipswich.
Simpson, Col. R. A., O.B.E., The Old Rectory, Creeting St. Peter, Ipswich.

SURREY

Beck, R. I., Patchan, Fairoak Lane, Oxshott.
Bowen, D. A., 33 Court Hill, Sanderstead.
Bradshaw, Col. A. A., Melven, Blackheath, Guildford.
Brough, E., Far End, The Great Quarry, Guildford.
Chapman Pincher, H., Lowerhouse Farm, Ewhurst, Cranleigh.
Cliff, H. D., Longways, Glade Spur, Kingswood.
Edgerton, J. D., 35 Acacia Drive, Woodham Park Way, Weybridge.
Fitzgerald, J. C., Threshers' Dean, Headley, Epsom.
Foster, C. N., Besborough, Heath End, Farnham.
Gardiner, Dr. M. F., Gort House, Petersham, Richmond.
Hall, Brigadier R. C. S., Whitwell Hatch Hotel, Haslemere.
Harwood, R. E., Combpyne, Warren Hill, Epsom.
Hillard, Dr. K. A., North Chase, Salt Box Road, Worplesdon, Guildford.
Langdale-Kelham, M. A., Bleasby Lodge, 7 Brendon Drive, Esher.
Leiberman, Dr. David M., M.R.C.P., 27 South Park Hill Road, South Croydon.
Mallock, Major A. R., 46 Castle Street, Farnham.
Messervy, R. G. C., Pastures, Leigh Hill Road, Cobham.
Mitchell, H. A., Calluna, Beech Road, Reigate.
Peter, A. E., Pinetrees, Woodland Way, Kingswood.
Post, G. P., 73 Easter Way, South Godstone.
Stevens, Major P. F., Cornmongers, Runwick, Farnham.
Trew, Commander A., D.S.C., S.A.N. (Ret'd), 1 Templemere, Oatlands Drive, Weybridge.
Vines, M., Reston Lodge, Petersham.
Wells, L. E., St. Agnes, Middle Hill, Englefield Green.
While, H. A. A., 18 Matham Road, East Molesey.
White, C. H. H., Fell Garth, Farley Green, Albury.

SUSSEX

Booth, J. W., Park House, Easebourne, Midhurst.
Dawson, T., Coldharbour Cottage, Wivelsfield Green, Haywards Heath.
Dowling, G., 27 Graham Crescent, Mile Oak, Portslade, BN4 2YA.
Etherington, R. C., Goddens, Upper Easebourne, Midhurst.
Gough, Colonel C. F. H., M.C., T.D., Weaver's Lodsworth.
Hartley, Sir Christopher, Frog Hole Farm House, Petworth.
Hebditch, J. O., Pigeon Hill Farmhouse, Redford, Nr. Midburst.
Hill, Major C. F., 13 Paston Place, Brighton.
Hoyle, C. F., 95 Junction Road, Burgess Hill.
Lennox, Lt.-Com. M. C. G., R.N., Rishers Hill, Iping, Midhurst.
Molesworth, M., Broadoak, Copthorn.
Williams, Lt.-Col. J. R. P., Bunces, Blackboys, Uckfield.
Yarrow, C., B.Sc., M.F., A.S.For., 14 King Henry Road, Lewes.

WARWICKSHIRE

Andrews, B., 25 Somerville Road, Sutton Coldfield.
Andrewes, E. D. E., Tube Investments Ltd., T. I. House, Five Ways, Edgbaston.
Beard, P., "Trade Winds", Collingham Lane, Long Itchington, Rugby.
Bloomer, N. T., The Paddock, Warwick Road, Stratford-on-Avon.
Bramwell, Dr. J. B., The Close, Clifford Chambers, Stratford-on-Avon.
Brown, R. G., 6 Ladywood Road, Four Oaks.
Cobham, R. H., 61 Selly Park Road, Birmingham 29.
Curtis, W. J., Long Meadow, Burton Green, Kenilworth.
Du Boulay, H. C. H., 11 St. James Road, Edgbaston.
Feilding, J. S., Manor Farm, Pailton, Nr. Rugby.
Haynes, H. E., 22 Blakeland Street, Birmingham 9.
Hemus, R. K., Drayton Bassett, Tamworth.
Humphreys, G., 21 Stonehouse Lane, Coventry, CV3 HEH.
Kerr-Muir, R. J., O.B.E., T.D., Priors Field, Kenilworth.
Maddocks, W. M., 67 Kenilworth Road, Coventry.
Stockdale, T. H., Moor Hall Farm, Wixford, Alcester.

WESTMORLAND

Morris-Barker, W. D., George Hotel, Orton.
Naylor, T. P., The Clock House, Far Sawrey, Ambleside.

WILTSHIRE

Beckett, M., The Old Rectory, Everleigh, Nr. Marlborough.
Borthwick, J., Mills Platt, Box, Nr. Chippenham.
Buckley, J. W., Ashton House, Ashton Keynes, Nr. Swindon.
Cridge, M. H., River Keepers Cottage, Lake, Nr. Salisbury.
Harford, A. H., The Old Rectory, Easton Grey, Malmesbury.
Heald, Lt.-Col. V. A. G., C.V.O., D.S.O., M.B.E., M.C., The Malt House, Semley, Shaftesbury.
Morrison, The Hon, C. A., M.P., Fyfield Manor, Pewsey.
Smith, D. S., "Wesdene", Dinton Road, Fovant, Salisbury.
Stephens, J. T., Acacia Cottage, Shewton, Nr. Salisbury.
Wheatley-Hubbard, E. R., Boyton, Nr. Warminster.

WORCESTERSHIRE

Adams, E. W., 6A, Joinings Bank, Oldbury, Warley.
Barnett, J. F., The Orchards, Rushwick.
Buck, F. G., 144 Northwick Road, Worcester.
Butler, D. C., 1 Halesowen Road, Halesowen.
Crane, E. N. G., Oakhampton, Stourport-on-Severn.
Dundan, Dr. J. McW., Mill House, Kempsey.
Hardy, W. M., Woodstock, 19 Christchurch Road, Malvern.
Herman-Smith, R., Halfpenny Manor, Halfpenny Green, Bibbington, Stourbridge.
Hodges, W. J. A., Pigeon House Farm, Leigh.

Ingram, A. J., 17 Ogilvy Square, Worcester.
Lunt, S., Love Lyne Farm, Hunt End, Redditch.
Mills, Dr. C. T., Glebe Cottage, Callowend, Worcester.
Mucklow, A. J., Redlake, Redlake Road, Stourbridge.
Stephenson, W. F. A., Longfield, Upper Wick, Rushwick.
Thomas, Captain T. B., The Arrow Bridge, Grange Lane, Alvechurch.
Williams, H., 41 Norton Road, Stourbridge.
Williams-Thomas, Lt.-Col. R. S., Yew Tree Cottage, Lawnswood, Wordsley, Stourbridge.

YORKSHIRE

Ambler, Mrs. V. O., Branton Court, Farnham, Knaresborough.
Arnold, W. M., Foxwell Grange, 25 Park Drive, Heaton, Bradford 9.
Bacon, P., 34 Morris Avenue, Monkwood, Rawmarsh, Nr. Rotherham.
Bailes, C. J., 121 Hartington Terrace, Lidget Green, Bradford 7.
Beaumont, Miss J. M., 1 Throstle Nest Drive, Harrogate.
Binns, E. E., Brook Royde, Weeton, Nr. Leeds.
Bond, L. G., 14, Grosvenor Road, Linthorpe, Middlesbrough, TS5 5PT.
Boston Deep Sea Fisheries Ltd., St. Andrew's Dock, Hull.
Bown, H. G., Dore Moor Court, Dore, Sheffield.
Boyd, G. A., Pippins, Hunsworth, Cleckheaton.
Brier, Rex, 1 Treherne Road, Rotherham.
Briggs, M. G., 14 Doncaster Road, Leeds 16.
Broadbridge, M. H., The Old Candle House, Mill Lane, Church Street, North Cave.
Brocklehurst, C. M., District Bank House, Settle.
Brook, J. C., 10 Dingle Road, Huddersfield, HD1 4HY.
Brown, A. G., Estate Office, The Brown Group of Companies, Armthorpe, Doncaster.
Burton, L. W., Flat 4, Inglesby Manor, Ingleby Greenhow, Middlesbrough.
Butterfield, N. H., 14 Villa Grove, Bingley.
Cabley, J. L., The Manor, Flinton, Sproatley, Hull.
Carter, C. D., 12 Brough Road, South Cave.
Chambers, G. H., T.D., 31 Quay Road, Bridlington.
Chattaway, E., 9 Victoria Street, Wilsden, Bradford.
Chilton, M. H., 58 Sunny Bank, Hull.
Clarkson, H. S., Rose Cottage, Myton on Swale, Helperby.
Clarkson, Major T. W., 66 Roman Road, Linthorpe, Middlesbrough.
Constant, Major A. H., Park Lodge, Aisla by Whitby.
Cruickshank, G. L., The Lonnin, Kirby in Cleveland.
Cumming, P. G., Watergate House, Knaresborough.
Dalton, Major E. L., Crimple Cottage, Crimple Lane, Harrogate.
Diram, D., 83 Beampton Road, West Melton, Nr. Rotherham.
Dixon, J. H., Beech Hill House, Carleton, Skipton.
Drabble, D., 34 Harold Street, Leeds 6.
Dunn, R. W., Merrywick, Hedon, Hull.
Everett, R. H., "Highbury", 113 Osbaldwick Lane, York.
Eyre, E. E., 47 Old Retford Road, Handsworth, Sheffield, S13 9Q7.
Farmer, S. A., 92 Fitzwilliam Street, Swinton, Mexborough.
Fenton, J. H., Cottingley Hall, Bingley.
Forsyth, F., "Oakbank", Farnhill, Nr. Keighley.
Foster, R., Winder House, Sedbergh School, Sedbergh.
Gilbert, R. C., Garth House, Kirklands, Kenston, Ilkley.
Gorwood, H., Oasis Garage, Colton Lane End, Tadcaster.
Grainger, F., 8 Grange Avenue, Allerton, Bradford.
Grice, J., 69 Broom Avenue, Rotherham.
Gwynne, A. M., Red Gables, Hooton Roberts, Nr. Rotherham.
Hand, G. W., Stonecroft, Froggatt, Calver, Nr. Sheffield.
Heath, W. H., 3 Brewery Lane, Ripon.
Hopkins, S. B., Glaphay Manor, Ripon.
Howden, F., 44 High Green, Thornaby High Green, Thornaby-on-Tees.

Howe, Dr. J. A., Church Lane House, Ridgeway, Sheffield, S12 3XX.
Hudson, F. T., "Silverton", Stockingate, South Kirby, Nr. Doncaster.
Hutchinson, J. M., 99 Crosby Road, Northallerton.
Ibbotson, A., 5 Byrley Road, Kimberworth Park, Rotherham.
Inman, H., 1, Nursery Mount, Leeds 10.
Jones, Cyril, Partridge Green, Forest Lane, Kirkleavington, Yarm.
Killingbeck, G. H., 1 Woodland Rise, Dewsbury Road, Wakefield.
King, P. G., 32 Park Drive, Heaton, Bradford.
Kirkup, Major R. B., Royal Oak Hotel, Great Ayton, Nr. Middlesbrough.
Kitchen, M. K., Lekkby Palace Farm, Asenry, Thirsk.
Lane, D. M., 382 Hollingwood Lane, Horton Bank Top, Bradford 7.
Leach, B. P., 102 Southmere Drive, Bradford 7.
Lean, G. K., 12 Boston Road, Wetherby, LS22 5HA.
Lloyd, R. I. T., Northfield, Park Road, Menston, Ilkley, Yorks.
Lockyer, T., Fox & Hounds Inn, Shafton, Nr. Barnsley.
Loy, J., Croft Cottage, High Hoyland, Nr. Barnsley.
Lupton, W. A., A.Comm.A., "Tor Brae", South Drive, Tranmere Park, Guiseley.
Lynes, M. L., 60 Alexandra Road, Horsforth, Leeds.
McAlastair Furse, W/Comd. R., 6 Westwood, Bawtry, Doncaster.
Marsden, J. C. F., High Roans Farm, Strensall, York.
Morrish, A., 6 Admirals Court, Sowerby, Thirsk.
Mortimer, P., 35 Elmete Hill, Roundham, Leeds 8.
Nattriss, D. F., Lowlands Farm, Helperby.
Nixon, J. K., 38 Eckington Road, Coal Aston, via Sheffield.
North, A., Hunters Close, Carperby, Leyburn.
Northrop, J. 560 Allerton Road, Bradford.
Oglesby, Mrs. G. E., 9 Oatlands Drive, Harrogate.
Palmer, D., 69 Mount Crescent, Thornes Road, Wakefield.
Parkin, B. B., Foster Beck Mill, Pateley Bridge, Nr. Harrogate.
Peasegood, Major J. A., Regis Villa, Hall Road, Rotherham.
Petch, G. B., 5 Park Square, Great Ayton, Middlesbrough.
Pickles, H., 19 Fernbank Drive, Leeds.
Pidgeon, C. M. F., Thompsons Garth, Hampsthwaite, Harrogate.
Phillipson, A. C., 15 Alwoodley Lane, Leeds 17.
Porter, H. L., 16 Fairway Drive, Upper Poppleton.
Potter, L. E. L., Hillside Baldersby, Thirsk.
Pratt, A. E., 49 Pannal Ash Drive, Harrogate.
Rawson, Dr. M. D., 8, Davenport Avenue, Hessle.
Read, N. H., 3 Eden Road, Romanby, Northallerton.
Reynolds, Major T., M.C., Spencer House, Melsonby, Nr. Richmond.
Rhodes, D. M., "Sundridge", Fulwith Grove, Harrogate.
Roberts, C. E. H., Belvedere, Church Street, Boston Spa.
Robinson, The Rev. John W., 66 Gerard Road, Rotherham.
Ruffer, Mrs. D. M., J.P., Stokesley House, Stokesley, Middlesbrough.
Rundle, J. R., 111 Skipton Road, Ilkley.
Rusby, L., 19 Lidgett Park Grove, Leeds 8.
Savage, J. E. G., 4 Treecrest Rise, Hall Bank, Barnsley.
Saville, P. H., 44 Duchy Avenue, Heaton, Bradford 9.
Scholey, Dr. J. R., Cridling Park, Knottingley.
Shepherd, J., 19 Broom Place, Belle Isle, Leeds 10.
Shield, C. F., Getas Ghyll, Moulton, Richmond.
Slattery, Dr. D., Birley Hay, Ridgeway, Nr. Sheffield.
Sparks, G., 69 Kingsway, Garforth, Nr. Leeds.
Swales, Dr. D. A., The Green, Gringley on the Hill, Nr. Doncaster.
Taylor, C. R., Oakleigh House, West Lane, Baildon, Shipley.
Taylor, H., 25 Farrar Lane, Adel, Leeds 16.
Terry, B. J., 86 Union Road, Liversedge, Heckmondwike.
Terry, F., 24 Marsh Street, Bradford 5.
Thomas, G. R., 1 Blaycourt, Endike Lane, Hull.
Turner, N., 13 Highfield Crescent, Baildon, Shipley.
Twynholm-Mason, Dr. G., Symcroft, Gill Lane, Yeadon.

Village, M. R., Whitegates, Curbar, Calver, Nr. Sheffield.
Waite, Mrs. D., Park House, Wensley, Leyburn.
Walby, R., Trout Beck, Harmby, Leyburn.
Walker, A., Lower Barnbow Farm, Crossgates, Leeds.
Walley, R. E., 517 Herringthorpe Valley Road, Rotherham.
Walmsley, R., South View Garage, Carlton, via Leyburn.
Watson, A., Wensley, Leyburn..
Whitaker Holmes, Col., Wensley Hall, Wensley, Leyburn.
Whitelock G. L., Greenroyd Lodge, Apperley Bridge, Nr. Bradford.
Whittington, T. A., Manor Lodge, Scarcroft, Nr. Leeds.
Winter, W., Marrow House, Worsbrough Bridge, Nr. Barnsley.
Womersley, A. H. D., Holly Hill, Well, Bedale.
Wood, S. R. B., The Grange, Tadcaster.
Wyatt, D. H., Croft House, Trip Lane, Linton, Wetherby.
Yewdall, W., 2 Thorpe Road, Thornton, Bradford.

NORTHERN IRELAND

Hamilton, Lord James, M.P., Barons Court, C. Tyrone.
Kee, G. E., 17 Bridge Street, Coleraine, Co. Londonderry.
McComb, T. J. A., "Stalheim", 8 Belfour Avenue, Whitehead, Co. Antrim.
McCormick, Dr. W. O., c/o Windsor House, Belfast City Hospital, Belfast.

IRELAND

De Freyne, Lord, K.M., Corke Liddle, Bray, Co. Wicklow.
Ganly, D., 18 Ushers Quay, Dublin.
Hilliard, P. C., Woodford House, Killarney, Co. Kerry.
Hutton, W. M., Ballybride, Shankill, Co. Dublin.
Moore, Dr. Ian, 20 Temple Gardens, Dublin 6.

SCOTLAND

ABERDEENSHIRE

Foster, J. L. W., Park House, Drumoak, Aberdeenshire.

ANGUS

McIntyre, D., 1 Burghill Road, Brechin, Angus.

ARGYLLSHIRE

Inglis, J. D., D.S.O., M.C., J.P., Raera, By Oban, Argyll.
Wilks, S. B., Glenegedale, Port Ellen, Isle of Islay, Argyll.

AYRSHIRE

Kennedy, B. B., Doonholm, Ayr.

BANFFSHIRE

Rickards, Lt.-Com. A., R.N. (Ret'd.), Kirkmichael Old Manse, Ballindalloch, Banffshire.
Rickards, The Hon. Mrs. Arthur, Kirkmichael Old Manse, Ballindalloch, Banffshire.

CAITHNESSSHIRE

Campbell, A. D., Sibster Halkirk, Caithness.

DUMFRIESSHIRE

Nicholson, J., Hollows Hill, Canonbie, Dumfriesshire.

EAST LOTHIAN

Brown, F. A., Greenacre, Athelstaneford, North Berwick, East Lothian.
Tweedie, J. D., Edradour, North Berwick, East Lothian.

FIFE

Mitchell, T. N., J.P., Clentrie, Kirkcaldy, Fife.

INVERNESSHIRE

Duncan, Mrs. N. M., Allt-A-Bhruais, Spean Bridge, Inverness-shire.
Highlands & Islands Development Board, 6 Castle Wynd, Inverness.

KINCARDINESHIRE

Campbell Adamson, Lt.-Col. W. J., T.D., F.L.A.S., Careston Estates Ltd., Brae of Pert, Laurencekirk, Kincardineshire.

KINROSS-SHIRE

Randall, J. B., C.B.E., Nether Tillyrie, Milnathort, Kinross-shire.

KIRCUDBRIGHTSHIRE

Griffith, R. A. D., The White Cottage, Twynholm, Kirkcudbright.

LANARKSHIRE

Bryant, Rear Admiral B., Pines, Symington, Biggar, Lanarkshire.
Melvill, Lt.-Col. M. E., The Old Manse, Symington, Biggar, Lanarkshire.
Pinkerton, Dr. H. H., 10 Kinellan Road, Bearsden, Glasgow, Lanarkshire.
Richmond, G. A., Culter House, Biggar, Lanarkshire.

MIDLOTHIAN

McLaren Jenkins, Dr. A., 2 Moray Place, Edinburgh.
Nimmo, I. A., "Glenesk", Eskbank, Dalkeith, Midlothian.

PERTHSHIRE

Fraser, W. I. R., (The Hon. Lord Fraser). Tullybelton House, Bankfoot, Perthshire.

RENFREWSHIRE

Marcroft, J. T., F.R.C.S., 1 Forsyth Street, Greenock, Renfrewshire.

ROSS AND CROMARTY

Cromartie, The Earl of, M.C., T.D., J.P., Castle Leod, Strathpeffer, Ross-shire.

ROXBURGHSHIRE

Fildes, Mrs. M., Thirlestane, Kelso, Roxburghshire.
Kennedy, Ludovic, The Old Manse, Makerstoun, by Kelso, Roxburghshire.
Maitland, The Viscountess Helena, Park House, Makerstoun, Nr. Kelso, Roxburghshire.

SUTHERLAND

Freir, D. S., M.A., Wester Lonemore, Dornoch, Sutherland.
McLaren, C., F.H.C.I., Altnaharra, by Lairg, Sutherland.

WIGTOWNSHIRE

Nicholson, Mrs. R. M., Claymoddie, Whithorn, Newton Stewart, Wigtownshire.

WALES

Aylward, W., Wynnstay Hotel, Machynlleth, Montgomeryshire.
Barstow, Col. J. A. T., Chapel House, Builth Wells, Brecon.
Beaumont, Lt.-Col. The Hon. R., Plas Llwyngwerh, Machynlleth, Montgomeryshire.
Bradley, G. C., Min-Yr-Afon, Garth Road, Builth Wells, Brecon.
Brown, R. H. S., Beaver Grove, Betws-y-Coed, Caernarvonshire.
Cavenagh, R. Q., Rhydywernen Fach, Brecon.
Cooper, A. C. G., N.P., Bank House, Trelawny Square, Flint, Flintshire, CH6 5NN.
Cresswell, Lt.-Col. R. S., Loan Riavach, Llangorse, Brecon.
Davies, Lord David, Plas Dinam, Llandinam, Montgomeryshire.

WALES—*continued*

Down, G. L., "Mona House", Penseynor, Cilfrew, Neath, Glamorgan.
Down, N. C., "Mona House", Penseynor, Cilfrew, Neath, Glamorgan.
Fishing Association, The, O. W. Jones, 5 Britannia Terrace, Portmadoc, Caernarvonshire.
Grant, T. H., "Noddfa", Llan-Talyllyn, Brecon.
Hopley, Mrs. David, Byton Rectory, Presteigne, Radnorshire.
John, D. T. (Secretary, Afan Valley Angling Club), 108 Lingfield Avenue, Aberavon, Port Talbot, Glamorgan.
Lewis, H. E., Castle House, Trawsfynydd, Merionethshire.
Lisborne, J. H., Glan-Nant, Crickhowell, Brecon.
Lowe, W. D., Peterstone Court, Brecon.
Mitchell, J. E., M.B., F.R.C.S., Gors Cottage, Caswell Bay, Gower, Swansea.
Richards, J. G., Penybank, Builth Road, Builth Wells, Brecon.
Richardson, W. G. M., Viaduct House, Struet, Brecon.
Smith, R., "Belmont Home" (Regd), Pentywyn Road, Deganwy, Caernarvonshire.
Venables-Llewelyn, Sir M., Bt., Llysdinam, Newbridge on Wye, Radnorshire.
Williams, G. V. (Vice-President Afan Valley Angling Club), 104 Western Avenue, Sandfields Estate, Port Talbot.
Williams, R. E., Dollynwydd, Builth Wells, Brecon.
Williams, Dr. W. O., 208 Derwen Fawr Road, Sketty, Swansea.

COMMONWEALTH AND FOREIGN COUNTRIES

Aikman, T. S., P.O. Box 312, Nairobi, Kenya.
Akers, W. T., Jr., 514 Hampshire Road, Akron, Ohio, 44313, U.S.A.
Appling, J. B., 1406 Maberry Street, Midland, Texas, U.S.A.
Aylward, W. P., Underberg Hotel, Underberg, Natal, S. Africa.
Bolger, Vice-Admiral J. F., U.S.A. (Ret'd.), Box 782, East Hampton, N.Y. 11937, U.S.A.
Bouey, H. L., 8219–99 Avenue, Edmonton, Alberta, Canada.
Buck, R. A., Committee on the Atlantic Salmon Emergency, Old Dublin Road, Hancock, New Hampshire 03449, U.S.A.
Campbell, D. N., B.D.S., 486 Dean Street, Albury 2640, New South Wales, Australia.
Cooper, J. W., Jr., 1230 Van Ness Avenue, San Francisco, California 94109, U.S.A.
Crowe, Ambassador Philip K., American Embassy, Oslo, Norway.
Doheny, D., 19 Aberdeen Avenue, West Mount, Montreal, Canada.
Donnelley, E., 2223 South King Drive, Chicago, Illinois 60616, U.S.A.
Eipeltauer, Norbert, A–1040 Wien, Kuhnplatz 3, Austria.
Fenety, J. T. H., 742 MacLaren Avenue, Fredericton, N.B., Canada.
Fraser, H., P.O. Box 65141, Benmore, Sandton, Transvaal, S. Africa.
Haraldsen, O., Kronprinsesse Märthas pl. 1, Oslo 1, Norway.
McIntyre, A. J., Jr., 90 Palisades Road, Atlanta, Georgia, 30309, U.S.A.
Mackenzie, I., P.O. Box 3437, Johannesburg, S. Africa.
Malik, G. M., M.S.C., Hons., Director of Fisheries Jammu & Kashmir, 7 Gupkar Road, Srinagar, Kashmir, India.
Matthews, Lt. J. W., Officers' Mess, The Blues and Royals, B.F.P.O. 41.
Pedersen, Morten Carsten, Ellebaekvej 1, 2820 Gentofte, Copenhagen, Denmark.
Pitcher, P. B., Q.C., Advocate, Suite 720, 800 Victoria Square, Montreal 115, Quebec, Canada.
Savage, L. K., P.O. Box 4580, Nairobi, Kenya.
Semple, R. B., 304 University Place, Grosse Pointe, Mich. 48230, U.S.A.
Sjöquist, Olle, P.O. Box 90, 28601 Örkellyunga, Sweden.
Troup, Dr. W. J., 401 Halldon Place, Ottawa 14, Canada.
Wilmerding, P. R., Guard Hill Road, Bedford, N.Y. 10506, U.S.A.
Wingate, Professor M. B., 620 Cambridge Road, Bala Cynwyd, Pennsylvania 19004, U.S.A.
Worthington, A., Box 161, New Hope, Pennsylvania, U.S.A. 18939.
Cross, F. J., 43 Queens Road, Craigy-y-Don, Llandudno, Caernarvonshire.

Jour. Fish. Biol. - rainbow trout

called: Fisheries Management

Inst. Fish. Mgt.

SALMON AND TROUT ASSOCIATION

First Supplementary List 1971/72

New Members: 1st May, 1971 to 30th April, 1972

BEDFORDSHIRE

Aiken, P. J., Fairview House, Tring Road, Edlesborough, Dunstable, Bedfordshire.
Parker, R., Thatch Cottage, Tetworth Hall, Nr. Sandy, Bedfordshire.
Woodin, A. J., 50 Haylands Way, Bedford, Bedfordshire.

BERKSHIRE

Allum, A., 2 Blackberries Close, School Lane, Burghfield Common, Reading, RG7 3EX, Berkshire.
Anderson, Maj.-Gen. Sir John, The Cottage, Broad Layings, Woolton Hill, Newbury, Berkshire.
Chance, Dr. E. M., 3 Duchess Close, Whitchurch, Pangbourne, Reading, Berkshire.
Craven Settled Estates, The Trustees of the, The Craven Estate, Hamstead Marshall, Newbury, Berkshire.
Grenville-Grey, Mrs. M., Hall Barn, Blewbury, Berkshire.
Henderson, J. D., Brimpton Lodge, Brimpton, Nr. Reading, Berkshire.
Hill, S., The Old Golf House, Streatley-on-Thames, Berkshire.
Hughesdon, M. C., Queensbury, Priory Road, Sunningdale, Berkshire.
Lister, V., c/o Berkeley & Co., 23 Marlow Road, Maidenhead, Berkshire.
Mais, The Hon. Sir Hugh, Ripton, Streatley-on-Thames, Berkshire.
Maitland-Jones, J. H., Greentree Holyport, Berkshire.
Pollard, B. J., Monkspiece, Brightwell cum Stowell, Wallingford, Berkshire.
Poole, Lt.-Col. R. D., West Hendred, Wantage, Berkshire.
Powell, J. B., Cresta, Queens Hill Rise, Ascot, Berkshire.
St. Helens, Lord, Marchfield House, Binfield, Berkshire.
Samuel, H. I., Royal Oak Inn, Portway, Wantage, Berkshire.
Thompson, J. W., Court Farm, Dorney, Windsor, Berkshire.
Thursby-Pelham, Brig. M. C., Ridgeland House, Finchampstead, Berkshire.
Walters, J. H., Farthingdown, London Road, Blewbury, Berkshire.

BUCKINGHAMSHIRE

Bartlett, G., Landrecies, Oxford Road, Gerrards Cross, Buckinghamshire.
Bazzard, E. G., Manor Farm House, Little Missenden, Buckinghamshire.
Etheridge, P. D., "Darwin", 35 School Lane, Gerrards Cross, Buckinghamshire.
Ferrier, Lt.-Col. K. W., 20 Wilton Park, Beaconsfield, Buckinghamshire.
Forestier-Walker, H. A. C., Holmer Ridings, Holmer Green, Nr. High Wycombe, Buckinghamshire.
Hewitt, J. K., Lindum, 65, Fulmer Drive, Gerrards Cross, Buckinghamshire.
Howland, Maj. J. C. D., The Barn Cottage, West Lane, Bledlow, Aylesbury, Buckinghamshire.
Leigh, S., Priory Cottage, Ickford, Aylesbury, Buckinghamshire.
Le Neve Foster, H. C., Abbots Lea, Chalfont St. Giles, Buckinghamshire.
Long, Comd. N. S., USNR (Ret.), Little Close, Camp Road, Gerrards Cross, SL9 7PE, Buckinghamshire.
Ranball, C. R., O.B.E., The Rookery, Aspley Guise, Bletchley, Buckinghamshire.

Rawlins, D. G., Casita, Hollow Way Lane, Chesham Bois, Buckinghamshire.
Romaine, R., 2 Gayton Close, Amersham, Buckinghamshire.
Simpson, E. G., c/o Foreign and Commonwealth Office, King Charles Street, London, S.W.1.
Taylor-Gill, J. D., The Whitney Box, Maids Moreton, Buckingham, Buckinghamshire.
Thelwell, J. T., Odanah, Copthall Lane, Chalfont St. Peter, Buckinghamshire.
Whitaker, Maj. G. E. D., Wolverton Park, Buckinghamshire.
Winship, F. J. W., "Meads", 22 The Queensway, Gerrards Cross, Buckinghamshire.
Wyatt, D. J. L., Church Hill, Gt. Horwood, Nr. Bletchley, Buckinghamshire.

CAMBRIDGESHIRE

Goodchild, T. G., 75 Low Road, Burwell, Cambridgeshire.
Hawkes, D. H., 11 The Causeway, March, Cambridgeshire.
Waring, M. H., M.A., Sedgwick Museum, Downing Street, Cambridge.
Watson, J. E., 1 Crown Avenue, Christchurch, Wisbech, Cambridgeshire.
Woolston, S., 7A Botolph Lane, Cambridge, Cambridgeshire.

CHANNEL ISLANDS

Aisher, T., Belle Vue, Mont de la Rozque, St. Aubin, Jersey, Channel Islands.

CHESHIRE

Beavan, G., Sandiway, St. Margarets Road, Hoylake, Cheshire.
Black, J. M., Stanley, Rappax Road, Hale, Altrincham, Cheshire.
Booth, L. G., "Little in Sight", Winmarith Drive, Hale Barns, Cheshire.
Bradbury, A. D., 33A Hale Road, Altrincham, Cheshire.
Bragg, A. L., Fox Heys, Tiverton Heath, Tarporley, Cheshire.
Clarke, J. H., Two Mills House, Hope Road, High Kinnerton, Chester, Cheshire.
Day, Mrs. M., Rowton, Nr. Chester, Cheshire.
Farr, Maj. U. C. E., The Beeches, Saughall, Chester.
Humphry, C., Butterbache Farmhouse, Huntingdon, Chester.
King, L., 21 Elizabeth Crescent, Queens Park, Chester, Cheshire.
Lowe, C. F. P., Holford Lodge, Plumley, Nr. Knutsford, Cheshire.
Morris, R. J. L., Clifford Lodge, Waverton, Nr. Chester, CH3 7PB, Cheshire.
Munslow, R. H., Burton Springs Farm, Saltersford, Rainow, Nr. Macclesfield, Cheshire.
Pilling, J. B., The Cottages, Davenport Park, Nr. Congleton, Cheshire.
Riddell, Lt.-Col. J. L. E., Thornton, Penyffordd, Chester, Cheshire. (Wrexham Anglers' Association)
Sharp, J. H., Bellfields House, Appleton, Nr. Warrington, Cheshire.
Vernon-Jones, E. S., Ivy House, Christleton, Nr. Chester, Cheshire.
Wade, D. F., Elms Farm, Mollington, Chester, Cheshire.
Wallace, H. G., Heath Wood, Heath Lane, Willaston, Wirral, Cheshire.
Ward, A. H., 46 Bredbury Green, Romiley, Nr. Stockport, Cheshire.
Warrington, P., Springfield, 22 Lache Lane, Chester, Cheshire.
Westbrook, D., 84 Woodlands Drive, Hoole, Chester, Cheshire.

CORNWALL

Banks, S. C., Simulator Squadron, R.A.F. St. Mawgan, Newquay, Cornwall.
Gardner, P. D. H., Rod Builders & Dealers in Fishing Tackle, Southgate Street, Launceston, Cornwall.
Miller, Mrs. A., Reeds, Poughill, Bude, Cornwall.
Wheeler, M. A., Roseland House, Roseland, Liskeard, PL14 3PQ, Cornwall.

CUMBERLAND

Boustead, P., Hope House, Lazonby, Penrith, Cumberland.
Bryson, J., Greta Haven, Keswick, Cumberland.
Daines, A. L., Willow House, St. Andrews Close, Botcherby, Carlisle, Cumberland.

Forster, W. E., "Hardbanks", How Mill, Carlisle, Cumberland.
Graham, G., 17 Brow Nelson, Dalston, Carlisle, Cumberland.
Henderson, H. C., Garth Marr, Castle Carrock, by Carlisle, Cumberland.
Knight, D., The Parsonage, Talkin, Brampton, Cumberland.
Parkinson, N. L., "Bold Venture", Cumwhinton, Carlisle, Cumberland.
Wills, J. R., White Scaur, Bassenthwaite, Nr. Keswick, Cumberland.
Wingate, N., Bridge End House, Cockermouth, Cumberland.

DERBYSHIRE

Cooper, Gordon P., Windy Ridge, 29 Barden Drive, Darley Abbey, Derby, DE3 2AL, Derbyshire.
Leach, M. H., Park Gate Farm, Baslow, Nr. Bakewell, DE4 1PN, Derbyshire.
North, D., Green Farm, Curbar, Derbyshire.

DEVON

Athorpe, J. C., Laployd Barton, Bridford, Exeter, Devon.
Brownlee, Michael L., Glazebrook House, South Brent, Devon.
Bryant, J. D., Torlands, Yelverton, Devon.
Crookshank, Col. R. F. A., 6 Parkside Road, Pinhoe, Exeter EX1 3TN, Devon.
Edwards, Dr. A. J. B., 12 Ellerslie Road, Barnstaple, Devon.
Hellings, Gen. Sir Peter, The Leys, Milton Combe, Nr. Yelverton, Devon.
Long, P., C.B.E., Q.P.M., 127 Underlane, Plymstock, Plymouth, Devon.
Lovegrove, S. J. F., Moorlands House, Marldon Cross, Paignton, Devon.
Mills, G. S., Strode Farm, Ermington, Ivybridge, Devon.
Pine-Coffin, Lt.-Col. T. J., O.B.E., West Dydon, Fairy Cross, Bideford, N. Devon.
Richards, R. C., Kingford Mill, Pancrasweek, Nr. Holsworthy, Devon.
Ruscoe, J. D., Walkham Terrace, Horrabridge, Yelverton, Devon.
Square, Capt. J. J. E., 4 Queens Gate, Lipson, Plymouth, PL4 7PW, Devon.
Trahair, Mrs. P. E., West Park, Ivybridge, Devon.

DORSET

Byers, R. H., Blakes Cottage, Carraway Lane, Marnhull, Sturminster Newton, Dorset.
Carter, A. G., The Willow House, 83 South Court Avenue, Dorchester, Dorset.
Charrington, N. D., Vine House, Sturminster Newton, Dorset.
Gardner-Clayton, Lt.-Col. V., Spring Cottage, Chetnole, Sherborne, Dorset.
King, S. N., The Old Rectory, Winterborne Zelstone, Blandford, Dorset.
Thompson, Dr. J. H., "Pellys", Sturminster Newton, Dorset.
Walton, Brig. B. B., C.B.E., Moyons House, Hammoon, Sturminster Newton, Dorset.
Wright, J. P. E., Green Bay, West Lulworth, Dorset.

DURHAM

Buffey, Capt. T. G., Moor Edge, Snaisgill, Middleton in Teesdale, Barnard Castle, Co. Durham.
Caris, A. G., Hollyhurst, Howorth Road, Washington, Co. Durham.
Farrell, J. E., 2 Cumby Road, Newton Aycliffe, Darlington, Co. Durham.
Firth, J. M., Cross View, Nevilles Cross, Durham City, Co. Durham.
McKay, Dr. M., "Northumbria", Lowland Road, Brandon, Co. Durham.
Vale, D. R., 22 Langley Road, Newton Hall, Durham, Co. Durham.
Webster, P., 24 Brunton Street, Darlington, Co. Durham.
White, K. G., 33 Hartford Road, Darlington, Co. Durham.
Williams, D. J., 18 North Crescent, North End, Durham City, Co. Durham.

ESSEX

Balls, J. H., F.C.A., Old Rectory Farm, Stapleford Abbotts, Essex.
Bennett, I. P., Penthouse One, Queens Court, Kings Parade, Holland-on-Sea, Essex.

Bragg, S. E., The Forge, Groton, Colchester, Essex.
Collier, G. A., Cosgrove, Prince of Wales Road, Gt. Totham, Nr. Maldon, Essex.
Connell, R. J. R., 6 Clover Way, Ardleigh Reservoir, Nr. Colchester, Essex.
Dicks, S. J., Russets, 8 Parkland Close, Chigwell, Essex.
Eaton, W. H., Penters Farm, Little Totham, Maldon, Essex.
Jewell, C. F. P., The Old Rectory, Langford, Maldon, Essex.
McDermott, G. J., Avenue Road, Ingatestone, Essex.
McManus, J., Fishery Superintendent, Essex River Authority, Rivers House, Springfield Road, Chelmsford, Essex.
Palmer, A. E., "Arcadia", 74 Stock Road, Billericay, Essex.
Pennington, Christopher C. E., Oak House, Sible Hedingham, Halstead, Essex.
Pennington, G. C., Oak House, Sible Hedingham, Halstead, Essex.
Pryce-Lewis, A. G., Langtons, Sandpit Lane, South Weald, Nr. Brentwood, Essex.
Shadforth, R. M., 41 Western Road, Billericay, Essex.
Stevens, F. C., 1 Blythwood Gardens, Stanstead, Essex.
Thorpe, D. J., "Ranworth", Straight Road, Boxted, Essex.
Treble, R. H., Rentaplay, Basildon, Essex.
Turner, G. H., 2 Sussex Avenue, Harold Wood, Essex.

GLOUCESTERSHIRE

Barnes, C. E., Belmont House, Joyford Hill, Nr. Coleford, Gloucestershire.
Carne, Col. J. P., Stonebank, Cranham, Gloucester, GL4 84P, Gloucestershire.
Clowes, T. W., The Cedars, Kingscote, Tetbury, Gloucestershire.
Cockburn, Col. John C., D.S.O., M.B.E., The Garden House, Westonbirt, Tetbury, GL8 6QQ, Gloucestershire.
Davidson, Maj. W. H., K.O.S.B., Whitehall, Nailsworth, Gloucestershire.
Dunn, Brig. K. F. W., C.B.E., D.L., Bencombe House, Uley, Dirsley, Gloucestershire.
Farquhar, A., Harford Farmhouse, Naunton, Gloucestershire.
Goodenough, F. R., Broadwell Manor, Lechlade, Gloucestershire.
Kerr-Jarrett, Ian A., Wardlaw, Berkeley Road, Cirencester, Goucestershire.
Milne, W. G., Glebe House, Turkdean, Nr. Cheltenham, Gloucestershire.
Price, N. V., Reservoir Farm House, Westonbirt, Gloucestershire.
Shelley, S., Huntley Court, Huntley, Gloucestershire.
Thompson, M., F.R.I.C.S., The Ernest Cook Trust, Fairford Park, Fairford, Gloucestershire.

HAMPSHIRE

Allen, J., "Meadowview", Humphries Bridge, Christchurch, Hampshire.
Bray, Comd. R. W. D., R.N., The Malthouse, Ropley, Hampshire.
Bryans, A. J. G., The Malt House, Droxford, Nr. Southampton, Hampshire.
Close, M. S., Holybourne House, Alton, Hampshire.
Collins, Master L. M., "Sheep Pond", Droxford, Nr. Southampton, SO3 1QZ, Hampshire.
Cotterell, Lt.-Col. R. J., T.D., F.R.I.C.S., Little Bushey, Steep, Petersfield, Hampshire.
Crosbie-Dawson, Maj. R. C., Northington Farm, Overton, Basingstoke, Hampshire.
Cunliffe, P., The Cott, Kilmeston, Alresford, Hampshire.
Douglas-Pennant, The Hon. Miss Gillian, Dean Farm, Bishops Waltham, Southampton, SO3 1FX, Hampshire.
Douglas-Pennant, The Hon. Miss Rosemary, Dean Farm, Bishops Waltham, Southampton, SO3 1FX, Hampshire.
Duke, T. J. N., Curdridge Croft, Curdridge, Nr. Southampton, Hampshire.
Dunning, Maj. M. L., Broadmead, Middle Wallop, Hampshire.
Davis, R. G., Testcombe, Chilbolton, Hampshire.
Evans, J. W., Derrydown Farm, St. Mary Borne, Andover, Hampshire.
Evans, Mrs. P. D., Derrydown Farm, St. Mary Borne, Andover, Hampshire.
Gregory, P. C., Graylings, Preston Candover, Basingstoke, Hampshire.
Hartley, Maj. T. M., Twyford Lodge Cottage, Twyford, Hampshire.

Hastings, M., Browns Farm, Old Basing, Hampshire.
Hazell, R., Old Pollard Moor, Candam, Southampton, Hampshire.
Hennessy, Comd. Robert, M.V.O., D.S.C., R.N. (Ret.), Millers Cottage, Droxford, Nr. Southampton, Hampshire.
Hudson, Maj. M., The Priors Farm, Mattingley, Basingstoke, Hampshire.
Jones, Capt. D. R., The Rod Box, Winchester, Hampshire.
Kerr, G., Upperfold, Liphook, Hampshire.
Kerr, O., Upperfold, Liphook, Hampshire.
King, G. E., Swallowfield, Abbots Ann, Andover, Hampshire.
MacKenzie, K. A. D., Sherborne Cowdray, Sherborne St. John, Basingstoke, Hampshire.
Morris, P. L., Standen House, Hannington, Nr. Basingstoke, Hampshire.
Ogden, J. W., Abbots Worthy Estate, Winchester, Hampshire.
Oliver-Bellasis, C. A. J., Wootton House, Wootton St. Lawrence, Basingstoke, Hampshire.
Palmerino, C. C., West Wellow Stores, Salisbury Road, Romsey, Hampshire.
Palmerino, L. H., 20 Tadfield Road, Romsey, Hampshire.
Parker, Rear-Admiral D. G., High Meadow, Walhampton, Lymington, Hampshire.
Paterson, Col. D. R., Harlington, Milford-on-Sea, Lymington, SO4 0RQ, Hampshire.
Pegg, A. D., The Garden House, Emery Down, Lyndhurst, SO4 7DZ, Hampshire.
Rowntree, T., M.S., F.R.C.S., The Dolphin, Old Bursledon, Hampshire.
Smees, A. T., Fairacre, Havant Road, Horndean, Hampshire.
St. Aubyn, T. E., Tangier House, Wootton St. Lawrence, Basingstoke, Hampshire.
St. Clair-Ford, Capt. Sir Aubrey, Bt., D.S.O., R.N., Corner House, Sandle Copse, Fordingbridge, Hampshire.
Sommer, J. P., Upperfold, Hewshott Lane, Liphook, Hampshire.
Tremlett, R. A. E., The Well House, Oakley, Hampshire.
Walsh, Col. S. W., Glen Avon, Fordingbridge, Hampshire.
Webster, F. J., Greenwood, Westborne Crescent, Southampton, Hampshire.

HEREFORDSHIRE

Brown, A. E., Cornerstones, Buckfield House, Green Lane, Leominster, Herefordshire.
Curtis, Maj. E. P., Cwm Bach Lodge, Glasbury-on-Wye, Via Hereford, Herefordshire.
Evans, Dr. J. A. F., 41 Bodenham Road, Hereford, Herefordshire.
Hazlehurst, Capt. C. P., Broomy Court, Wormelow, Herefordshire.
Howorth, Lt.-Col. P. J., Hill House, Kingsthorne, Hereford, Herefordshire.
Lambert, Col. D. de G., The Stone House, Fownhope, Hereford, Herefordshire.
Ransford, Dr. J. H., Overcourt, Sutton St. Nicholas, Nr. Hereford, Herefordshire.
Reed, Dr. A. J., East Wilcroft, Bartestree, Hereford, Herefordshire.
Thompson, V. C., F.R.C.S., Vicarage House, Llowes, Hereford, Herefordshire.

HERTFORDSHIRE

Dickinson, H. T., 38 Windsor Road, Barnet, Hertfordshire.
Forward, D. E. E., Stainforth, Grove Road, Tring, Hertfordshire.
Gray, A. A., Rainhill Spring, Stoney Lane, Bovingdon, Hertfordshire.
Harvison, E., 10 Sandy Lodge Road, Moor Park, Rickmansworth, Hertfordshire.
Kirkup, P., F.I.P.H.E., 7 Linnet Close, Bushey, Watford, WD2 1AX, Hertfordshire.
Lyons, R. H. C., The Manor House, Much Hadham, Hertfordshire.
O'Malley, A. M., 53 Kingsfield Road, Oxhey, Watford, Hertfordshire.
Parsons, B. R., The Squirrels, Cock Lane, Hoddesdon, Hertfordshire.
Tatham, M. K., Highfield Lodge, Hoe Lane, Ware, Hertfordshire.
Wallace, P. V., The Hill, Much Hadham, Hertfordshire.
Whitbread, H. C., Greenaway House, Rose Lane, Wheathampstead, Hertfordshire.
Whitehead, K. E., 9 Heaton Court, Cheshunt, Hertfordshire.

HUNTINGDONSHIRE

Seebohm, Mrs. P. M., Rainbow Cottage, West Perry, Huntingdonshire.

ISLE OF MAN

Kerruish, W. D., Quinton Lodge, Silverburn, Ballasalla, Isle of Man.

ISLE OF WIGHT

Johnson, J. G. M., 4 Altofts Gardens, Ventnor, Isle of Wight.

KENT

Baker, G. L., 38 Whitehill Lane, Gravesend, Kent.
Beale-Collins, W., 5 Rutland Gate, Westmorland Road, Bromley, Kent.
Calver, J. B., High Warren, 13 White Hart Wood, Sevenoaks, Kent.
Clarke, B. J. C. S., The Farm House, Darenth Park Hospital, Dartford, Kent.
Daniell, Capt. P. J., Oak Lodge, Hythe, Kent.
Farage, M., Roundwood, Billet Hill, Ash, Nr. Sevenoaks, Kent.
Farage, Mrs. U., Roundwood, Billet Hill, Ash, Nr. Sevenoaks, Kent.
Hay, P. B., Lodge House, Brabourne Lees, Ashford, Kent.
James, Dr. J. D., 62 Beckenham Place Park, Beckenham, Kent.
Jerome, D. R., Weybread, Common Road, Ightham, Nr. Sevenoaks, Kent.
Levack, P. A., 29 Hillingdon Road, Gravesend, Kent.
Mackinlay, Mrs. S. I., Priory Oast House, Hildenborough, Kent.
Mauduit, A. W., Seaton House, Ickham, Canterbury, Kent.
Reep, Maj. R., c/o Gooch, Windy Ridge, The Avenue, Kingsdown, Nr. Deal, Kent.
Sawyer, L., Bough Beech Reservoir, Bough Beech, Nr. Four Elms, Kent.
White, M. L., 371 Singlewell Road, Gravesend, Kent.
Zurcher, L. P., 6 Alexander Road, Bexleyheath, Kent.

LANCASHIRE

Addison, T. N., Vale House, Sparkbridge, Nr. Ulverston, Lancashire.
Ainsworth, T., 35 Wheatley Lane Road, Barrowford, Nelson, Lancashire.
Beaden, Robert J., 39 Chapel Road, Penketh, Warrington, Lancashire.
Croft, D. C., 2 Yewlands Avenue, Fulwood, Preston, PR2 4QR, Lancashire.
Dalton, E., "Northwood", Knoll Lane, Little Hoole, Nr. Preston, Lancashire.
Dawson, H., 44 Greystock Avenue, Fulwood, Preston, Lancashire.
Dobson, D. T., Shuttleworth Arms, Broughton, Nr. Preston, PR3 5HE, Lancashire.
Field, R., 35 Lightfoot Lane, Fulwood, Preston, Lancashire.
Gorse, S., 15 Ecclesfield Road, Eccleston, Nr. St. Helens, WA10 5LU, Lancashire.
Graham, W. H., Forton Lodge, Forton-in-Preston, Lancashire.
Harris, Dr. G. S., B.Sc., Ph.D., Room 439, Department of Zoology, The University, P.O. Box 147, Liverpool, L69 3BX, Lancashire.
Haworth, R. A., New Hall, Waddington, Nr. Clitheroe, BB7 3HU, Lancashire.
Hill, E. J., B.Sc., Bridge End, 444 Whalley Road, Shuttleworth, Ramsbottom, Bury, Lancashire.
Hinchliffe, R., 32 Beech Road, Sutton Weaver, Via Warrington, Lancashire.
Irwin, Dr. D. T., "Orta", Stuart Road, Ribbleton, Preston, Lancashire.
Jones, B., Noonsun, Horsforth Lane, Greenfield, Nr. Oldham, Lancashire.
Litt, M. G., Clock House, Lea Road, Lea, Preston, Lancashire.
Markland, G., 14 Cleveland Avenue, Fulwood, Preston, Lancashire.
Milne, A. D., Ashburne, 346 Garstang Road, Fulwood, Preston, Lancashire.
Morris, W. P., 502 Chorley New Road, Bolton, BL1 5DR, Lancashire.
Neville, J. P., 81 Oxford Road, St. Annes-on-Sea, Lancashire.
Parkinson, P. J., Abbey Cottage, Crook-o-Lune, Caton, Nr. Lancaster, Lancashire.

Rahim, M. A., Zoology Dept., Liverpool University, P.O. Box 147, Liverpool, Lancashire.
Riley, D. S., 51 Clarence Road, Grappenhall, Nr. Warrington, Lancashire.
Rowntree, A. T., 11 Merlin Road, Blackburn, Lancashire.
Taylor, P. J., 28 Whalley Road, Lango, Nr. Blackburn, Lancashire.
Turner, J., The Dingles, Highgate Close, Fulwood, Preston, Lancashire.
Turner, J. C., Crooklands Farm, Goosnargh, Nr. Preston, Lancashire.
Winterbottom, D. J., 34 Kilworth Height, Fulwood, Preston, Lancashire.

LEICESTERSHIRE

Bates, C., The Croft, Upper Broughton, Melton Mowbray, Leicestershire.
Bent, A., Field House, East Langton, Leicestershire.
Brankin-Frisby, M. J., Keythorpe Court, Tugby, Leicestershire.
Brown, C. H. T., Long Gable, Ratcliffe-on-the-Wreake, Leicestershire.
Marston, S. J. S., 30 Ashby Rise, Great Glen, Leicestershire.
Norman, W. R., Pickwell Manor, Melton Mowbray, Leicestershire.
Poyner, F. J., 162 Evington Lane, Leicester, Leicestershire.
Smith, Hugh, S., Two Ways, Toller Road, Leicester, LE2 3HP, Leicestershire.
Townsend, J., Manor House, Shangton, Leicester, LE8 0PP, Leicestershire.
Waudby, Mrs. H. P., Littlethorpe House, Littlethorpe, Leicestershire.
Winterton, C., Merton Farm, Barkby, Leicestershire.

LINCOLNSHIRE

Borrill, R. D., Little Hill, Marsh Chapel, Grimsby, Lincolnshire.
Davis-Jones, The Rev. N. J., Amcotts Rectory, Scunthorpe, DN17 4AL, Lincolnshire.
Fitzwilliams, Maj. C., Hazeldene, 28 The Avenue, Healing, Grimsby, Lincolnshire.
Glover, Capt. M. G., Little Limber Grange, Limber, Grimsby, Lincolnshire.
Gunton, W. S., Holly Lodge, Pinchbeck Road, Spalding, Lincolnshire.
Hyde, G. R., Flat 3, 385 Grimsby Road, Cleethorpes, Lincolnshire.
Irving, J. B., Armagh, Antons Gowt, Boston, Lincolnshire.
Ryan, H. C., J.P., Barrowby House, Barrowby, Grantham, Lincolnshire.
Rands, A. H., Eastfield House, 71 Eastfield Lane, Ryland, Welton, Lincoln.

LONDON

Arnott, P. T. W., c/o The A.N.Z. Banking Group Ltd., 20 Grafton Street, London, W.1.
Arnott, T. H., 20 Grafton Street, London, W.1.
Baker, W. H. K., M.P., House of Commons, London, S.W.1.
Barraclough, A. N., 58 Jubilee Place, London, S.W.3.
Beale, Sir William, O.B.E., 70 Cadogan Square, London, S.W.1.
Birdsall, S. E., 97 Harley Street, London, W.1.
Blackett, Capt. J. B., Ashdown (Leadenhall) Ltd., 23/24 Leadenhall Market, London, E.C.3.
Bomford, R., 1 Erskine Road, London, N.W.3.
Bowden, J. E., 15 Sunderland Terrace, London, W.2.
Bowen, R. C., 37 Chepstow Place, London, W.2.
Boxer, Sir Alan, 19 Queen's Gate Place, London, S.W.7.
Brown, Dr. C. H., M.R.C.P., No. 2 Albert Mansions, Albert Bridge Road, London, S.W.11.
Buck, Daniel R., 21 Ormonde Gate, London, S.W.3.
Buckley Sharp, D., 6 Clorane Gardens, Hampstead, London, NW3 7PR.
Buckley Sharp, Mrs. J., 6 Clorane Gardens, Hampstead, London, NW3 7PR.
Burford, D. M. P., 66 Woodside, Wimbledon, London, SW19 7AF.
Burnett, G. D. (National Westminster Bank Flyfishing Association), General Manager, Business Development Division, National Westminster Bank Limited, 41 Lothbury, London, EC2P 2BP.
Cardross, Lord, 24 The Little Boltons, London, S.W.10.

Chown, W. T., 20 Rutland Gate, London, S.W.7.
Cohen, Dr. J. D., 33 Elsworthy Road, London, NW3 3BT.
Cousins, C. M., 59 Ennismore Gardens, London, S.W.7.
Dallmeyer, C. W., c/o Vivian, Gray & Co., 10 Throgmorton Avenue, London, EC2N 2DJ.
Dearling, A., c/o Eden Fisher & Co. Ltd., 6–8 Clements Lane, London, E.C.4.
Drummond, D., 18 Draycott Avenue, Chelsea, London, S.W.3.
Evans, V. S., 15 Warner House, Abercorn Place, St. John's Wood, London, N.W.8.
Formby, Mrs. P. S., 98 Campden Hill Road, London, W.8.
Fraser, A., 9 The Common, Ealing, London, W.5.
Gardner, G. J., 4 Priests Bridge, London, S.W.15.
Glass, Sir Leslie C., 6 Marquess House, Marquess Road, Canonbury, London, N.1.
Goldman, M., 17 West Heath Avenue, London, N.W.11.
Halsted, Maj.-Gen. J. G., c/o Lloyds Bank Limited, Cox and Kings Branch, 6 Pall Mall, London, S.W.1.
Hamilton, A. P., 12 Narborough Street, London, S.W.6.
Harris, G. W., The Willows, Chiswick Mall, London, W.4.
Kelly, E. R., 52 Ullswater Crescent, London, S.W.15.
Kewley, R. A., 5 Eddiscombe Road, Fulham, London, S.W.6.
Lloyd Evans, D. G., 120 Woodsford Square, London, W14 8DT.
Lotery, H. J., 55 Campden Hill Gate, Duchess of Bedfords Walk, London, W.8.
Marr, A. G. H., 16 Ballast Quay, Greenwich, London, S.E.10.
Marshall, A. R., 32 Lennox Gardens, London, SW1X 0DH.
Miller-Stirling, J. D. B., c/o Coutts & Co., 440 Strand, London, W.C.2.
Newman, F. D. O., 52 Cumberland Terrace, Regent's Park, London, N.W.1.
Odgers, P., 66 South Edwards Square, London, W.8.
Peek, Dr. I., 112 Gloucester Terrace, London, W.2.
Perkins, T., 19 Hocroft Avenue, London, N.W.2.
Poulter, R. J., 17 De Vere Gardens, London, W.8.
Radclyffe, W. A. R., 11 Cranleigh Court, Leinster Gardens, London, W.2.
Roberts, R. S., 83 Horn Park Lane, Lee, London, SE12 8A5.
Seys, J. A., 54 Gilpin Avenue, East Sheen, London, SW14 8QY.
Smaile, I., 31 Highfield Road, N. Acton, London, W.3.
Stanley, E. R. W., 47 Flood Street, London, S.W.3.
Strong, M. C., 441 Fulham Palace Road, London, S.W.6.
Sturman, Miss W., 14 Steeds Road, Muswell Hill, London, N.10.
Swanscott, G. C., 92 The Cottages, Rosendale Road, London, S.E.24.
Taylor, L. A., 59 Annerley Park, London, S.E.20.
Tweedie, Miss M., 8 Burton Mews, South Eaton Place, London, S.W.1.
Varley, H. H., 41 Limerston Street, Chelsea, London, S.W.10.
Wallace, D. H., 59 The Ridgeway, Chingford, London, E.4.
Warwick, J. O., (National Westminster Bank Flyfishing Association), National Westminster Bank Limited, 114 High Holborn, London, WC1V 6JP.
Westropp, G. V., 226 Latymer Court, Hammersmith Road, London, W.6.
Whyatt, A. A., Deansway, Abbotswood Road, Streatham, London, S.W.16.
Yerbury, J. P., 6 Church Street, London, W4 2PD.

MIDDLESEX

Cooke, S. J., 9 Cranbourne Drive, Pinner, HA5 1BX, Middlesex.
de la Poer Monsell, J. H. A., 11 Linkway, Pinner, Middlesex.
Ebelthite, P. R. C., Flat 6, 19 St. Georges Road, St Margarets, Twickenham, Middlesex.
Galvin, J. C., 5 Woodridge Way, Northwood, Middlesex.
Grindley, R. J., 1 Whitehall Road, Harrow, Middlesex.
Hunter, A. M., 1 Eyot Lodge, Cross Deep, Twickenham, Middlesex.
Ivey, R. C. H., 129 Sylvia Avenue, Hatch End, Pinner, Middlesex.
Lucas, W. G., 40 Woodstock Drive, Ickenham, Middlesex.
Nials, H. A. E., 10 Gilbert Grove, Burnt Oak, Edgware, HA8 0HL, Middlesex.
Rhodes, P. S., 3 Hughes Road, Ashford, Middlesex.
Seward, R. A., 13 Ilmington Road, Kenton, Harrow, Middlesex.
Sheppard, C., 34 Brendon Way, Bush Hill Park, Enfield, Middlesex.
Waring, G., 4 Hall Farm Close, Stanmore, Middlesex.

NORFOLK

Barclay, J. J., Old Rectory, Aldborough, Norfolk.
Combe, R. H., Glandford Mill, Glandford, Holt, Norfolk.
Downing, C. G., 21 St. Davids Road, Heathersett, NOR 42X, Norfolk.
Harrison, Mrs. C., Knoll House, Aylesham, NOR 07Y, Norfolk.
Macrae, A., 56 High Street, Blakeney, Norfolk.
Millar, Dr. J. I., 59 Wroxham Road, Sprouston, Norwich, NOR 77P, Norfolk.
Nichols, F. G., 2 Willow Way, Willows End Estate, Martham, Nr. Gt. Yarmouth, Norfolk.
Parker, M., Goodustone Manor, King's Lynn, Norfolk.

NORTHAMPTONSHIRE

Barron-Clark, B., Orchard Cottage, Tansor, Peterborough, Northamptonshire.
Harkness, Dr. J., "Dunelm", The Village, Orton Longueville, Peterborough, Northamptonshire.
Henderson, R., Brockhall, Flore, Northampton, Northamptonshire.
Hodgson-Jones, Dr. I., Little Harrowden House, Wellingborough, Northamptonshire.
Powley, R. E., 30 Queens Road, Old Fletton, Peterborough, PEZ 8BP, Northamptonshire.
Rogers, S. H., Casanene Badby, Daventry, Northamptonshire.
Wiles, L. J., 47 London Road, Peterborough, Northamptonshire.

NORTHUMBERLAND

Angus, J. I. (Wansbeck Angling Ass. Social Club), 15 Abbots Way, Morpeth, Northumberland.
Bookless, W. M., 83 Middle Drive, Darras Hall, Newcastle upon Tyne, NE70 9DW, Northumberland.
Burton, R. (Wansbeck Angling Ass. Social Club), 7 Tenter Terrace, Morpeth, Northumberland.
Constable, Dr. F. L., 17 Roseworth Avenue, Gosforth, Newcastle upon Tyne, NE3 1NB, Northumberland.
Kuhnbaum, R., 40 Bolbec Road, Fenham, Newcastle upon Tyne 6, Northhumberland.
Milburn, Sir John, Bt., Brainslaugh, Acklington, Morpeth, Northumberland.
Morton, W. W., 11A Ashfield Grove, Whitley Bay, Northumberland.
Murphy, K., 35 Woodvale Gardens, Wylam, Northumberland.
Simpson, J., 2 Priory Gardens, Corbridge, Northumberland.

NOTTINGHAMSHIRE

Booth, F. A., 137 Main Road, Watnall, Nottingham, NG16 1HF, Nottinghamshire.
Marriott, E. G., 29 Groveside Crescent, Clifton Villiage, Nottingham, NG11 8NT, Nottinghamshire.
Marston, R. W., 154 Loughborough Road, West Bridgford, Nottingham, NG2 7JE, Nottinghamshire.

OXFORDSHIRE

Allen, R. G., Thame Cottage, Warborough, Oxfordshire.
Elsey, W. G., National Westminster Bank Ltd., 3 Cornmarket, Thames, OX9 3DS, Oxfordshire.
Kildare, The Marquess of, Langston House, Chadlington, Oxfordshire.
Maggs, F. H. N., Whitchurch Lock, Whitchurch, Nr. Reading, Oxfordshire.
Nicoll, P., Cornbury Park, Charlbury, Oxfordshire.
Nosworthy, M., 6 Elton Crescent, Wheatley, Oxfordshire.
Phillimore, Col. The Hon. R. G. H., The Mill House, Shiplake, Oxfordshire.
Sands, Lt.-Col. M. C., Old Rectory, Godington, Bicester, Oxfordshire.
Thoughton, C. H. W., C.B.E., M.C., T.D., Woolleys, Hambleden, Henley-on-Thames, Oxfordshire.
Wallis, B. J., The Grange, Chalgrove, Oxford, Oxfordshire.
Wright, D. G. H., D.S.C., The Riverside House, Shillingford, Oxfordshire.

SHROPSHIRE

Albrecht, J. H. C., Temple Garth, Weston Rhyn, Oswestry, Shropshire.
Andrew, Dr. R., Edgmond House, Newport, Shropshire.
Arnold, C. J., Glentana, 26 Dawley Road, Wellington, Telford, Shropshire.
Bailey, R., 53 Broomfield Road, Admaston, Telford, Shropshire.
Bland, J. P. R., Cound Lersowes, Cressage, Shropshire.
Bovill, A. S., Bathcott Hall, Church Stretton, Shropshire.
Hoyland, G. R. (Weston-under-Lizard Angling Club), The Sytch, Weston-under-Lizard, Shifnal, Shropshire.
Inglis, Lt.-Col. J. C., The Glebe House, Hanwood, Shrewsbury, Shropshire.
MacKenzie, Dr. A. V., Meole Cottage, Meole Brace, Shrewsbury, Shropshire.
Malins-Smith, N. A., 25 Humber Way, Donnington, Telford, Shropshire.
Peters, S., 37 York Road, Harlescott Grange, Shrewsbury, Shropshire.
Philbrick, Col. G. E. H., Bycroft, Shrewsbury Road, Church Stretton, Shropshire.
Roberts, Sir Walter, Leaton Lodge, Bomere Heath, Shropshire.
Snook, H. G., 46 Leamore Crescent, Belle Vue, Shrewsbury, Shropshire.
Vale, Mrs. B. H., Rectory Cottage, Chetton, Bridgnorth, Shropshire.
Wakeman, Mrs. O. D., Peverey House, Bomere Heath, Nr. Shrewsbury, Shropshire.

SOMERSET

Brown, Miss J. B., Wood Mead, Chew Magna, Nr. Bristol, Somerset.
Bryan, Miss G. J., 7 Hurle Road, Clifton, Bristol 8, Somerset.
Clitherow, Mrs. P. Stracey, 9 St. Michaels Court, Monkton Coombe, Somerset.
Dyer, S. R., "Fairacres", Wentwood Drive, Bleadon Hill, Weston-super-Mare, Somerset.
Hanson, N. B., Roadwater Fishery, Watchet, Somerset.
Kimmins, Lt.Gen. Sir Brian, Lamb Cottage, South Petherton, Somerset.
Lowry, P., The Talbot Inn, Mells, Frome, Somerset.
McMahon, B., 9 Ellacombe Road, Longwell Green, Bristol, Somerset.
Mallam, W. E. C., Lemons Ground, Yenston, Templecombe, Somerset.
Milbourne, K. I., Wrafton, Lodge Hill, Bristol, BS15 1LW, Somerset.
Neale, G. J., 13 Julian Road, Bristol, BS9 1JZ, Somerset.
Northover, S. R., 21 Over Lane, Almondsbury, Bristol, BS12 4BL, Somerset.
Ogilvie, D. J., The Old Parsonage, Cricket St. Thomas, Chard, Somerset.
Roberts, K. F., Whitegates, Chew Magna, Bristol, BS18 8RW, Somerset.
Tetton Estate (Hon. Mrs. M. E. Herbert), Tetton House, Taunton, Somerset.
Wogan, B., "Hillside", Station Road, Blagdon, Nr. Bristol, Somerset.

STAFFORDSHIRE

Adams, Jonathan, Churnet Croft, Longsdon, Stoke-on-Trent, ST9 9QB, Staffordshire.
Ball, S. J., 8 Coniston Way, Cannock, Staffordshire.
Bickley, S., 91 The Oaks, Sneyd Lane, Essington, Wolverhampton, Staffordshire.
Clenton, A., 12 Gloucester Road, Brookhouse Estate, Walsall, Staffordshire.
Emery, R., 70 Union Street, Bridgtown, Cannock, Staffordshire.
Hill, J. M., 120 Birches Barn Road, Wolverhampton, Staffordshire.
Hobbs, G., 49 Hospital Lane, Coseley, Nr. Bilston, Staffordshire.
Lawrence, P., Newfield Sawmill, Marchington, Uttoxeter, Staffordshire.
Murden, A. J., 21 Monaco Place, Newcastle, Staffordshire.
Rhodes, G., The Quarry, Biddulph Park, Biddulph, ST8 7ST, Staffordshire.
Smith, W. H., 15 Burntwood Road, Norton Ganes, Cannock, Staffordshire.
Stoppard, K. F., Southgate, 18 Stockwell Road, Tettenhall, Wolverhampton, Staffordshire.
Yates, J., 54 Lime Lane, Pelsall, Nr. Walsall, Staffordshire.

SUFFOLK

Booth, R. R. T., Chapel Farm House, Bildeston, Ipswich, Suffolk.
Fenton, N. C., Greenacre, Whelp Street, Preston St. Mary, Nr. Sudbury, Suffolk.

Lewis, Lt.-Col. P. J., Thedwastre White House, Thurston, Bury St. Edmunds, Suffolk.
Sladen, A. E. L., Horsenden House, Little Bealings, Woodbridge, Suffolk.
Stewart, C. J., 149 Henley Road, Ipswich, IP1 4NU, Suffolk.
Tollemache, Lady D. S., Helmingham Hall, Stowmarket, Suffolk.

SURREY

Austin, C. H., "Little Weybourne", Stoke Road, Cobham, Surrey.
Barfoot, Mrs. A., 116 Reddown Road, Coulsdon, CR3 1AL, Surrey.
Barfoot, J. A. T., 116 Reddown Road, Coulsdon, CR3 1AL, Surrey.
Barrow, K. J. K., Marchants Farm, Churt, Surrey.
Bassett, J. K., 7 Primrose Way, Sandhurst, Camberley, Surrey.
Bond, M. J., 15 Waverley Lane, Farnham, Surrey.
Burns, J. M., The Cleeve, Boxgrove Road, Guildford, Surrey.
Bushby, R. M., The Gate House, Worplesdon Hill, Woking, Surrey.
Cooke, M. T., c/o M. Cooke, Brooke Hall, Charterhouse, Godalming, Surrey.
Davidson, J. C., 6 Heathside Gardens, Woking, Surrey.
Denton-Miller, Capt A. (Ret.), 11 Bloxham Road, Cramleigh, Surrey.
Drysdale, A., Ferriers Grange, Horley, Surrey.
Fawkes, Brig. L. V. F., Lanvean, Churt, Surrey.
Forbes, D. N., East Copse, Icehouse Wood, Oxted, Surrey.
Foster, A. H., 69 Keswick Drive, Lightwater, Surrey.
Foster, I. S., Leigh Mill House, Godstone, Surrey.
Fraser, P. H. C., Wey Road, Weybridge, Surrey.
Hampton Stewart, J., The Running Horses, Mickleham, Dorking, Surrey.
Hicks, Dr. A. R. H., Pippins, 106 Balcombe Road, Horley, Surrey.
Hunter, A. D. W., Lucas Green Manor, West End, Chobham, Surrey.
King, Mrs. A. L., "Cobbetts", Forest Green, Dorking, Surrey.
Lankester, S. F., Yew Tree Cottage, Newdigate, Surrey.
Monk, D. E., Shimma, 63 Pelhams Walk, Esher, Surrey.
Naef, C., Rowley Cottage, 77 Epsom Road, Guildford, Surrey.
Percy, R. H., M.B.E., Little Polsted, Compton, Nr. Guilford, Surrey.
Ritchie, Capt. R. D., C.B.E., M.V.O., Seale House, Reigate, Surrey.
Stabbins, P. J., 4 Durfold Drive, Reigate, RH2 0QB, Surrey.
Welch, J. J., Lords Hill, Shamley Green, Surrey.
Yorke, G. L., Windle Hey, The Drive, Belmont, Sutton, Surrey.
Young, H. S., Wytchwood, Summersbury Drive, Shalford, Guildford, Surrey.
Ziegler, F. H., Rissington, Farnham Lane, Haslemere, Surrey.

SUSSEX

Ayscough, Mrs. C. A., Oakwood House, East Chiltington, Lewes, Sussex.
Ayscough, J., Oakwood House, East Chiltington, Lewes, Sussex.
Davies, F. E., M.INST.B.E., Wakehams Green Farm, Copthorne Road, Worth, Sussex.
Goulden, M. R. R., Horam Manor Farm, Heathfield, East Sussex.
Grinsted, E., Field Cottage, Lynwick Street, Rudgwick, Nr. Horsham, Sussex.
Harman, S. C., Fincham Farm, Upper Hartfield, Sussex.
Jessup, J. R., 41 Combe End, Crowborough, Sussex.
Wheeler, Air Marshall Sir Neil, Boundary Hall, Cooksbridge, Lewes, Sussex.

WARWICKSHIRE

Anderson, M., 27 Shakespear Avenue, Warwick, Warwickshire.
Aylesford, The Rt. Hon. The Earl of, Packington Hall, Meriden, Nr. Coventry, Warwickshire.
Bevan, N., 51 High Street, Welford, Rugby, Warwickshire.
Brown, J. R., 131 Erithway Road, Finham, Coventry, Warwickshire.
Collins, M., 56 Farquhar Road, Birmingham, B15 3RE, Warwickshire.
Denbigh, The Earl of, Pailton House, Nr. Rugby, Warwickshire.

Dunn, Lt. Comd. R. W., R.N. (Ret.), (Rugby Joint Water Board), The Wardens House, Draycote Water, Kites Hardwick, Nr. Rugby, Warwickshire.
Hawley, S. A., 8 Hamilton Avenue, Harborne, Birmingham, Warwickshire.
Knight, R. H., 26 Barlows Road, Edgbaston, Birmingham, B15 2PL, Warwickshire.
Partridge, P. H., 211 Leamington Road, Coventry, Warwickshire.
Woolison, W. P., 106, Station Road, Hatton, Nr. Warwick, Warwickshire.

WESTMORLAND

Coates, W. E. (Grizedale Angling Club), Grizedale, Hawkshead, Ambleside, Westmorland.
Grant, W. (Grizedale Angling Club), Grizedale, Hawkshead, Ambleside, Westmorland.
Kenyon, G. B., "Conifers", Brough Sowerby, Kirkby Stephen, Westmorland.
Willoughby, Dr. L. G., Freshwater Biological Association, Ambleside, Westmorland.
Zair, G. S., Whinfell, Woodhouse Lane, Heversham, Nr. Milnthorpe, Westmorland.

WILTSHIRE

Beckwith, Mrs. E. L., The Keepers Cottage, Great Wishford, Wiltshire.
Berkley-Matthews, J., Samaki Trout Farm, Wolverton, Warminster, Wiltshire.
Bright, Dr. E. B., R.A.F. Hospital, Wroughton, Wiltshire.
Browne, Mrs. M. R., Avon Close, Pewsey, Wiltshire.
Collins, W. J., Manor Farm, Codford, Wiltshire.
Crombie, F. G., Greenbank, Easton Royal, Pewsey, SN9 5LY, Wiltshire.
Curwen, D. C., 22 St. Johns Street, Devizes, Wiltshire.
Harris, Mrs. E. L., Wedhampton Manor, Devizes, Wiltshire.
Hemming, J. H., 24 High Street, Hindon, Wiltshire.
Howes, Rear-Admiral P. N., C.B., C.B.E.; Sutton Parva House, Heytesburn, Wiltshire.
Mayes, Mrs. E. A., Little Kent End, Ashton Keynes, Swindon, Wiltshire.
Mileham, Col. J. G., Bridge Cottage, West Dean, Nr. Salisbury, Wiltshire.
Power, R., The Yews, Netheravon, Salisbury, Wiltshire.
Spicer, Capt. Frank F., Spye Park, Chippenham, Wiltshire.
Stratton, W. J., Coppice, Bowden Hill, Chippenham, Wiltshire.
Wardle, Maj. L. D., Court House, Gastard, Corsham, Wiltshire.
Williams, T. P., The Old Vicarage, Swindon Road, Malmesbury, Wiltshire.

WORCESTERSHIRE

Arbuthnott, H., Winterford House, Chaddesley, Corbett, Worcestershire.
Bridgewater, J. A., Harborough Hall, Blakedown, Nr. Kidderminster, Worcestershire.
Lawrence, J. A., Eastgate, Bittell Lane, Barnt Green, Worcestershire.
Martin, F. H., Carraig, Earls Common Road, Stock Green, Redditch, Worcestershire.
Whyment, Dr. W. H., Balgay, Grange Lane, Alvechurch, Nr. Birmingham, Worcestershire.

YORKSHIRE

Allcott, J. G., Bracken Hill, Woodhead, Burley in Wharfedale, LS29 7AY, Yorkshire.
Allen, M. H., 106 Brincliffe Edge Road, Sheffield 11, Yorkshire.
Arnett, D. B., 49 Templars Way, Bradford 8, Yorkshire.
Asher, A. M., 11 Harcourt Drive, Harrogate, HG1 5JA, Yorkshire.
Bagshaw, J., 214 Poplar Grove, Bradford, BD8 4JT, Yorkshire.
Baker, J. I., 3 Holbeck House, 24 Holbeck Hill, Scarborough, Yorkshire.

Bardsley, J., Aldburgh Hall Estate Co., Orchard Cottage, Aldburgh, Masham, Yorkshire.
Belt, J. A., South View Nursery, 88 Gipsy Lane, Marton, Middlesbrough, Teesside, TS7 8NH.
Benn, D., 6 Prospect Row, Ovenden, Halifax, Yorkshire.
Braithwaite, R., 50 Wetherby Road, Harrogate, Yorkshire.
Brooks, G., "Shirley", King Street, Pontefract, Yorks.
Carey, M., 67 Listing Drive, Liversedge, Yorkshire.
Cariss, D. G., 45 Heath Grove, Pudsey, Yorkshire.
Clarkson, B., 1 Flockton Crescent, East Bowling, Bradford 4, Yorkshire.
Cross, Dr. T., 75 St. Richards Road, Otley, Yorkshire.
Crossman, Mrs. G. S., Borrowdale, Carthorpe, Bedale, Yorkshire.
Dales, A. J., 2 Burniston Road, Bricknell Avenue, Hull, Yorkshire.
Denby, J., "Cherry Farm", Hag Farm Road, Burley in Wharfedale, Yorkshire.
Dent, J. G., Sunnyside, Halton East, Skipton in Craven, Yorkshire.
Dibb, R., The Mount, West Burton, Leyburn, Yorkshire.
Dickinson, G., The Uplands, 96 Beverley Road, South Cave, Brough, HU15 2BB, Yorkshire.
Duckworth, K. J., 93 Leeds Road, Idle, Bradford 2, Yorkshire.
Emmerson, R., "Brooklands", The Homestead, Menston, Nr. Ilkley, Yorkshire.
Farrar, G. A., Albion Inn, Halifax Road, Bridghouse, Yorkshire.
Flemington, R. F. M., Quinney's Lodge, Carlton Green, Pontefract, Yorkshire.
Gale, R. H, 26 Copley Road, Doncaster, Yorkshire.
Goodenough, E., 1 Prospect Walk, Windhill, Shipley, Yorkshire.
Gooder, R. W., Marr House, Scagglethorpe, Malton, Yorkshire.
Graham, Dr. F. O., J.P., 60 Meadowfield, Stokesley, Middlesbrough, Teesside, TS9 5HH.
Grainger, H. J., 8 Grange Avenue, Allerton, Bradford, BD15 7RN, Yorkshire.
Grant, S. G. S., Beckermonds, 5 Creskeld Crescent, Bramhope, Nr. Leeds, Yorkshire.
Haigh, G. G., Sunningdale, Dorchester Road, Fixby, Huddersfield, Yorkshire.
Hamer, H., The Hollies, Greetland, Halifax, HX4 8AX, Yorkshire.
Harrison, A., Harbeck House, Harbeck Drive, Harden, Bingley, Yorkshire.
Hartley, K. F., 37 Leyburn Grove, Shipley, Yorkshire.
Hartley, M., 14 Maple Creek, Masham, Ripon, Yorkshire.
Hatfield, K. T., Postgraduate School in Biological Sciences, University of Bradford, Bradford, Yorkshire.
Hawitt, J. O., 73 Reeth Road, Richmond, Yorkshire.
Hesp, A., Overdale, Thornborough Crescent, Leyburn, Yorkshire.
Hill, W. T., Holly Bush Hotel, Skelton, North Yorkshire.
Hinchliffe, R., 57 Canterbury Road, Wheatley, Doncaster, Yorkshire.
Holliday, J. M., 26 Dale Park Avenue, Leeds 16, Yorkshire.
Ingham, G., 7 Field Way, Clayton, Bradford, Yorkshire.
Jobbings, S. H., Greenways, 18 Old Lane, Bramhope, Nr. Leeds, Yorkshire.
Jobling, R., Rake Farm, Glaisdale, Whitby, North Yorkshire.
Keighley, C. O., Lea Ridge, Norr Hill, Lee Lane, Bingley, Yorkshire.
Kirkup, E. S., Royal Oak Hotel, Great Ayton, Middlesborough, Teesside.
Kitching, Col. H. E., Ayton Firs, Great Ayton, Middlesbrough, Yorkshire.
Knowles, S. W., Ash Grove Cottage, Elland, Yorkshire.
Law, B., Mawcroft, Nether Yeadon, Nr. Leeds, Yorkshire.
Lees, A., 25 Windsor Road, Linthorpe, Middlesbrough, Yorkshire.
Lewis, D. E., 5 Church Lane, Swainby, Northallerton, Yorkshire.
Lindop, J. G., 17 Imperial Road, Huddersfield, Yorkshire.
Lloyd, J. B., 83 Birkby Lodge Road, Huddersfield, Yorkshire.
McBurney, R., 8 The Wend, Carleton, Nr. Skipton, Yorkshire.
MacKenzie, Dr. R. M., Benetra, Lynton Way, Northallerton, Yorkshire.
Marshall, E., 9 The Slayde, Spital Farm, Yarm-on-Tees, Yorkshire.
Maud, W/Comd. J. M., 35 Mallorie Park Drive, Ripon, Yorkshire.
Meadowcroft, P., Hollycroft, Church Hill, Easingwold, Yorkshire.
Milling, B., Carlton Manor, Yeadon, Nr. Leeds, Yorkshire.
Moorhouse, S. E., Upper Halstead, Thurstonland, Huddersfield, Yorkshire.
Muir, C. C., 7 Carlton Drive, Bradford 9, Yorkshire.
Musson, J., 3 Westfield Road, Balby, Doncaster, Yorkshire.
Neal, J. T. G., 202 Bawtry Road, Bessacarr, Doncaster, DN4 7BZ, Yorkshire.
Oliver, C., 53 Grange Crescent, Marton, Middlesborough, Teesside.

Osgerby, M. W., Field House Farm, Routh, Nr. Beverley, East Yorkshire.
Padgett, J. M., 36 Tranfield Avenue, Guiseley, Nr. Leeds, Yorkshire.
Petch, R. B., 32 Guisborough Road, Great Ayton, Middlesbrough, Yorkshire.
Phizacklea, A., Welland House, 43 Quaker Lane, Northallerton, Yorkshire.
Pleasance, G. A., 18 Garibaldi Street, Thornbury, Bradford, BD3 8NE, Yorkshire.
Powell, G. H., 130 Tadcaster Road, Dringhouses, York, YO2 2LU, Yorkshire.
Poxon, H. R., Ring Gates, 19 Newland Avenue, Driffield, East Yorkshire.
Raw, R. L., Market Place, Masham, Ripon, Yorkshire.
Rhodes, S. H., 3 Ellercroft Avenue, Lidget Green, Bradford 7, Yorkshire.
Richardson, D., 16 Robin Drive, Eccleshill, Bradford, Yorkshire.
Rimington, D., 4 Meadow Drive, Harrogate, Yorkshire.
Russell, T. M., 13 Effingham Road, Harden, Bingley, BD16 1LQ, Yorkshire.
Schofield, S. (Kirkby Fleetham & District Angling Club), 1 Colstan Road, Northallerton, Yorkshire.
Simonard, P. E., Holme House, Denton Road, Ilkley, Yorkshire.
Smith, M., 23 Sun Street, Stanningley, Pudsey, LS28 6DJ, Yorkshire.
Smith, R. B., "Stonecroft", 40 Hawksworth Lane, Guiseley, Leeds, Yorkshire.
Thompson, G., 19 Lees Lane, Northallerton, Yorkshire.
Thompson, K., 12 Aireville Crescent, Silsden. Keighley, Yorkshire.
Thorpe, T. P., The Post Office, Wigglesworth, Skipton, Yorkshire.
Upsall, L., 74 Linden Road, Northallerton, Yorkshire.
Vickers, T., 8 Queenshill Approach, Stonegate Road, Leeds 17, Yorkshire.
Walker, Lt.-Col. K., 36 Dikelands Lane, Upper Poppleton, York, YO2 6JB, Yorkshire.
Wallace, F., 10 Baddeley Gardens, Thackley, Bradford, Yorkshire.
Welburn, W. F., 734 Beverley High Road, Hull, Yorkshire.
West, L. A., Woodlands, Sinnington, Yorkshire.
Weston, F., D.F.C., B.Sc., 2 Birklands, Beadlam, Nawton, York, Yorkshire.
Williams, E. G., 103 Brecksfields, Skelton, York, YO3 6YE, Yorkshire.
Wilson, C. F., "Isalee", 56 Hollins Lane, Hampsthwaite, Nr. Harrogate, Yorkshire.
Wood, Robert, Preston under Scar, Leyburn, Yorkshire.
Wray, J. M., 66 Cambridge Road, Middlesbrough, Yorkshire.
Wykes, J. G., Alne Croft, Alne, York, Yorkshire.

SCOTLAND

ABERDEENSHIRE

Carson, Graham, 162 Midstocket Road, Aberdeen, Aberdeenshire, Scotland.
McCance, Dr. C., Avondon, Milltimber, Aberdeenshire, Scotland.

ANGUS

Gibb, C. R. A., Inshewan House, By Forfar, Angus, Scotland.
Johnston Smart, G. N., Kinnaber House, By Montrose, Angus, Scotland.

DUNBARTONSHIRE

Mann, W. S. (Cove & Kilcreggan Angling Club), Clydebank, Kilcreggan, Dunbartonshire, Scotland.

DUNDEE

Craven, D. R. J., 33 Lorne Crescent, Monifieth, Dundee, DD5 4DY, Scotland.

INVERNESS-SHIRE

McNeil, Col. J. A., M.C., 83 Aird Bernisdale, Isle of Skye, Scotland.
Walker, A. D. M., 24 Torlundy Road, Caol, Fort William, Inverness-shire, Scotland.

KINCARDINESHIRE

Woodroffe, Lt.-Col. J. W. R., Phesdo House, Laurencekirk, Kincardineshire. Scotland.

KIRKCUDBRIGHTSHIRE

Arthur, Lt.-Col. J. N. S., Newbarns, Colvend, Stewartry of Kirkcudbright, Scotland.

LANARKSHIRE

Copland, L. H., 26 Westminster Terrace, Sauchiehall Street, Glasgow, C.3., Lanarkshire, Scotland.

MIDLOTHIAN

Dobson, J. H., 3 Burgess Terrace, Edinburgh, Midlothian, Scotland.
McClure, A. L., Harmony, 53 Barnton Avenue, Edinburgh 4, Midlothian, Scotland.
Mills, Dr. D., Dept. of Forestry and Natural Resources, University of Edinburgh, Kings Buildings, Edinburgh, Midlothian, Scotland.

PERTHSHIRE

Brennand, J. K., F.R.C.S., 1 Brompton Terrace, Perth, Perthshire, Scotland.
Collins, Capt. M. R., Meall Ruidh, Carie, by Rannoch Station, Perthshire, Scotland.
Gardiner, R., B.Sc., Freshwater Fisheries Laboratory, Pitlochry, Perthshire, Scotland.
Gardner, Dr. M. L. G., Dun Donnachaidh, 9 Knockard Road, Pitlochry, Perthshire, Scotland.
Liversedge, D. B., Dalruchill, Comrie, Perthshire, Scotland.
Mansfield, The Earl of, Scone Palace, Perth, Scotland.
Misselbrook, D., Cloichfoldich, Strathtay, Perthshire, Scotland.

ROXBURGHSHIRE

Freyer, K., Merlin Cottage, Kershopefoot, Newcastleton, Roxburghshire, Scotland.

WIGTOWNSHIRE

McNeil, M., Shennanton, Kirkcowan, Wigtownshire, Scotland.

IRELAND

Caledon, The Earl of, Caledon Castle, Caledon, Co. Tyrone, Northern Ireland.
Cooper, C. P., Marree Castle, Collooney, Co. Sligo, Eire.
Foster, G. B., The Laurels, Main Street, Cullybackey, Ballymena, Co. Antrim, Northern Ireland.
MacKeown, J. A., 57 Leeson Park, Dublin 6, Eire.
Magill, Norman K., 10 Mount Michael Park, Saintfield Road, Belfast, BT8 4JK, Northern Ireland.
Martin, T. A. D., 84 Strand Road, Portstewart, Co. Derry, Northern Ireland.
Moses, L., "Cleveland", 12 Woodbine Road, Blackrock, Dublin, Eire.
Smith, D. G., The Rapids, Ballisodare, Co. Sligo, Northern Ireland.

WALES

Arkwright, D., Kinsham Court, Presteigne, Radnorshire, Wales.
Baston, Brig. F. W., Cui Park, Talybont-on-Usk, Brecon, Wales.
Best, A. A., Briar Bank, 10 Beach Road, Penarth, CF6 2AQ, Glamorgan, Wales.
Brabner, S. G., Gliffaes Country House Hotel, Crickhowell, Brecon, Wales.
Burch, K. J., The Firs, Garth Road, Builth Wells, Brecon, Wales.
Crewe-Read, Col. R. O., M.C., Glan-y-Cafn, Govilon, Abergavenny, Monmouthshire, Wales.
Davies, E. T., Aberdwr, Tregaron, Cardiganshire, Wales.
Davies, The Hon. I. E. E., Berthddu, Llandinam, Montgomeryshire, SY17 5AX, Wales.
Davies, T. E., School House, Llanwendg, Llanybydder, Carmarthenshire, Wales.
de Figueiredo, E. W., Marian, Talwrn, Llangefni, Anglesey, Wales.
Desmond, L. A., Gwynfa, Tresaith, Cardiganshire, Wales.
Evans, W. D. D., Ffrwdgrech, Brecon, Wales.
Franks, G. I., 132 Oak Drive, Acton Park, Wrexham, Denbighshire, Wales. (Wrexham Anglers' Association)
Greener, H. L., Plas Gwyn, Aberedw, Builth Wells, Brecon, Wales.
Hanbury-Tenison, R., Bryngwyn Manor, Raglan, Monmouthshire, Wales.
Hughes, A., O.B.E., 1 Colchester Avenue, Cardiff, Glamorgan, Wales.
Irfon Fishing Association, W/Comd. F. D. Pryce, Hon. Sec., The Lake Hotel, Llangammarch Wells, Brecon, Wales.
James, P. A. E., Holmlea, I Rhosnesni Lane, Wrexham, North Wales.
John, D. D., Pant-y-Scallog Fach, Nr. Sennybridge, Brecon, Wales.
Jones, A., Siop-y-Jones, Llandyssul, Cardiganshire, Wales.
Lloyd, W. R., Abercynrig, Brecon, South Wales.
Middleton, J. C. A., 42 Avenue Road, Abergavenny, Monmouthshire, Wales.
Jones Powell, D., Fenni Fach, Brecon, Wales.
Storer, E. G., "Brundall", Llanbedr, Nr. Conway, Caernarvonshire, Wales.
Thomas, Comd. A. V., Tretower House, Crickhowell, Brecon, Wales.
Thomas, J. E., Brynhyfryd Saron, Llandysul, Cardiganshire, Wales.
Tyler, N. O., Coedspoil, Builth Wells, Brecon, Wales.
Vernon-Roberts, Dr. M., 17 Oldway, Bishopston, Glamorgan, Wales.
Voelcker, Lt.-Col. D. C., The Walled Garden, Knill, Nr. Presteigne, Radnorshire, Wales.
Williams, R. E., Dol-Llyn-Wydd, Builth Wells, Brecon, Wales.
Williams, D. W. P., 39 Westport Avenue, Mayals, Swansea, Glamorgan, Wales.

ABROAD

Bahnson, F. F., 803B Woodland Avenue, Chapel Hill, N.C. 27514, U.S.A.
Bickison, N. V., 21 W. Collingswood Avenue, Oaklyn, N.J. 08107, U.S.A.
Fletcher, S., P.O. Box 16, Naromoru, Kenya, E. Africa.
Hemingway, J., Field Editor, Field Stream Magazine, Box 387, Sun Valley, Idaho 83353, U.S.A.
Jansen, C. David, 3797 White Bear Avenue, White Bear Lake, Minnesota 55110, U.S.A.
Montague, J. T., 225 Winton Road, P.O. Box 262, Fairfield, Connecticut 06430, U.S.A.
Orndorf, Dr. John R., 3200 Dempster Street, Des Plaines, Illinois 60016, U.S.A.
Punter, R., Police Headquarters, P.O. Box 41, Zomba, Malawi.
Rosenberger, D. M., 226 Stirling Avenue, Orange, New Jersey, U.S.A.
Saabye, S., Stenlose, 5260 Hjallese, Denmark.
Turbayne, James T., O.B.E., Apt. 4C, 151 East 83rd Street, New York, New York 10028, U.S.A.
Wiets, C., 3 Parjlaon, 1960 Sterrebeck, Belgium.

Reprinted from *Proceedings of the N.Z. Ecological Society*, No. 11 1964 Pages 10–16.

BROWN TROUT *(SALMO TRUTTA)* IN THE HINDS RIVER

E. D. LANE

Fisheries Laboratory, Marine Department, Wellington

This paper deals with data on the ecology of the brown trout collected during two visits to the Hinds River in 1962. Electric fishing and gill netting were used to capture 2,325 brown trout. Brook trout *(Salvelinus fontinalis)*, quinnat salmon *(Oncorhynchus tschawytcha)*, Eleotridae, Galaxiidae, Retropinnidae, torrent fish *(Cheimarrichthys)*, and eels were also captured.

The River

The Hinds River is a small stream rising as two branches in the foothills at the western edge of the Canterbury Plains. These branches converge at Mayfield and from there the river flows south west across the plains to the sea 12 miles south of Ashburton. At the mouth there is a small lagoon. From the confluence at Mayfield to the mouth the gradient is even and slight (Table 1). There are pools, runs and flats in approximately equal proportions, but no falls, stickles or cascades. (Definitions from Allen, 1951.) Both the branches are similar to the main river but with a steeper gradient and a few cascades; in the South Branch there is one man-made fall of 3 feet. The small tributary streams and ditches contain all the types of water listed above, although no falls are higher than 15 feet. The gradient of the tributary streams and ditches is often quite steep.

Table 1. *Summary of the river and tributary gradients.*

	A *Fall* (ft.)	*B* *Length* (miles)	*Ratio A:B* *(slope)*
Main River	900	27	1:160
North Br.	1100	17	1: 80
South Br.	1100	12	1: 60
Limestone Cr.	800	8	1: 50
Cravendale Cr.	600	4½	1: 40

All the tributary streams examined, the North Branch, and the main river, flow throughout the year. The South Branch has periodic dry periods, except at its headwaters and immediately below the entrance of Limestone Creek.

The bed of the main river and of both branches is shingle throughout, with small areas of boulders and, in the pools, sand. Mud is common along the banks. The bed of Limestone Creek is of similar composition to that of the main stream. The other small tributaries have large amounts of mud and little shingle.

The channel in the lower portion of the main river has been straightened by the Catchment Board. Bulldozing for shingle has modified areas of the main stream and the North and South Branches.

Cover consists almost totally of bank cover. There is one small backwater where filamentous green algae provide cover for the trout and some areas have sunken snags and willows along the bank affording underwater cover. The bank cover is summarized in Table 2.

TABLE 2. *Bank cover in the Hinds River system.*

Area	*% cover*	*Type*
Main Stream	35	Willow, gorse, broom, grass.
North Branch	35	Willow, gorse, broom, grass.
South Branch	10	Willow, gorse, broom, grass.
Limestone Cr.—Upper	10	Flax and grass.
—Lower	90	Flax, grass and willow.
Cravendale Cr.	100	Flax and grass.
South Br. Headwaters	100	Flax and grass.

The normal flows are summarized in Table 3. The figures do not include flood conditions.

TABLE 3. *Flows in the Hinds River system.*

Area	*Flow—(cusecs)*
Main Stream*	15–120
North Branch	15–100
South Branch	0– 15
Limestone Creek—Upper	2– 5
—Lower	5– 20
Cravendale Creek	0.25– 1
South Branch Headwaters	0.25– 0.5

* Four irrigation races enter the main stream (Fig. 1). These add 180 cusec to the river at their times of maximum flow. The irrigation water generally enters the river intermittently during the summer dry periods.

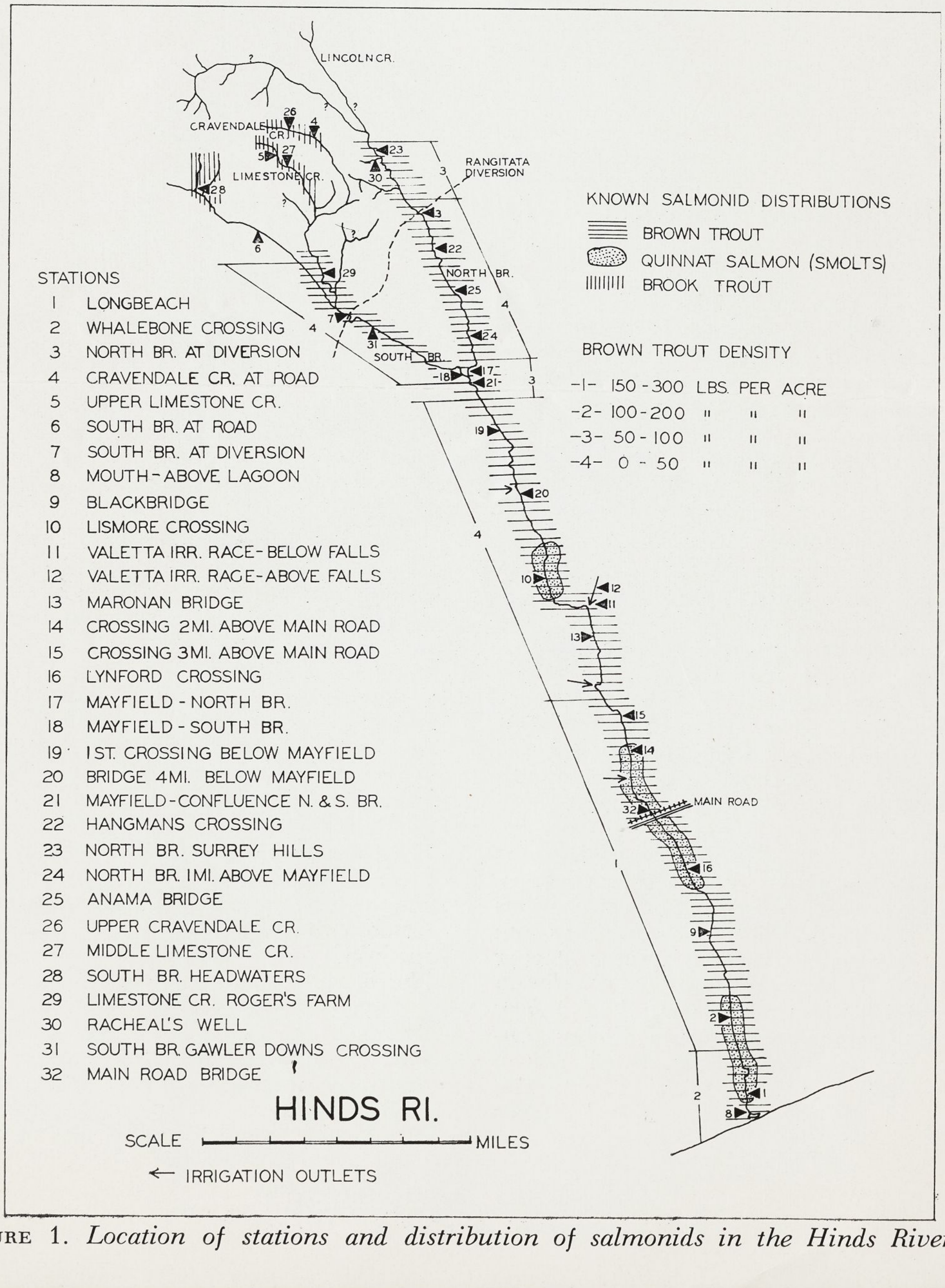


FIGURE 1. *Location of stations and distribution of salmonids in the Hinds River.*

The water is clear throughout the system except during the summer when silty irrigation water enters and causes it to become cloudy.

Water temperatures were recorded at each station at the time of visit. Daily maximum and minimum temperatures were also recorded at the highway bridge near Hinds township and at the top bridge on the North Branch. At the main highway bridge the average over five days gave a daily range of 3.5°C. to 8.5°C. during the winter, and 13°C. to 20°C. during the summer. The lowest temperature recorded was 2°C. in Cravendale Creek and the highest was 28°C. at the highway bridge.

Water samples were taken near the mouth of the main river, in the North Branch and in lower Limestone Creek. These were analysed for total dissolved solids. They contained 45, 35 and 36 p.p.m. respectively.

BROWN TROUT

The density of the trout population varied greatly over the length of the river (Fig. 1). The population at each station was estimated by dividing the electric fishing catch from a given area of water by the estimated proportion caught. The latter was assessed subjectively, taking into account the nature of the water fished, and using the results of second runs at some stations as a basis. The weight of the population was estimated by dividing the catch into 1 cm. size groups and determining the numbers and average weight of the fish in each group, the latter being based on the mean length-weight relationships or mean condition factor. To convert the population figures to densities the former were divided by estimates of area calculated from approximate measurement of length and average width. The method of estimating weight from length-weight relationships involves a small systematic under-estimate but the method of collecting tends to produce a slight over-estimate of mean size.

These errors are probably small compared to those involved in determining the number of fish in an area. No true estimation of probable error is possible but it is hoped that the results are reliable to within ±20%. The 0+ fish are omitted in all estimates. Table 4 below gives the results. The stations are in order going upstream.

TABLE 4. *Trout population estimates.*

Locality	*Station No.*	*No. of fish in Station*	*No. of fish per acre*	*Lb./acre*
Mouth	8	100–S125*	110–S135*	63–S113*
	1	S60*–64	S220*–230	105–S146*
	2	149–S150	700–S750	107–S208*
	9	S150*–250	S375–625	251
	16	S75* –250	S300*–1000	S121*–283
Highway Bridge	32	S100*–200	S400*– 800	S248*–293
	14	S175*–400	S260*– 550	S117*–260*
	15	S140*–200	S550*– 800	220–S266*
	13	10	15	–
Valetta tail race	11	10–75*	50–700*	–
	12	0	0	0
	10	10	50	–
	20	5	10	–
	19	7	25	–
Mayfield confluence	21	10–S15*	30*	11*
North Branch	17	50–S75*	45–S121*	50–S300*
	24	5	20	–
	25	5	20	–
	22	S 5*–10	S 10*–20	21
	3	S 5 –10	S 30 –50	22
	23	5–S15	10 –S50	S63
South Branch	18	0	0	0
	31	5	–	–
	7	5	10	–
	6	0	0	0
	28†	0	0	0
Limestone Creek	29	5	50	–
	27† & 5†	0	0	0
Cravendale Creek	4† & 26†	0	0	0

S indicates summer survey. * excluding fish of less than 17.5 cm. fork length.
† areas where *Salvelinus fontinalis* are found.

Comparison of the brown trout densities in the Hinds River with other streams shows a high density in the lower third of the system, varying between 63 and 293 lb. per acre. The remaining two-thirds of the Hinds system has a low density of brown trout with the exception of Stations 17 and 23. The headwaters are devoid of brown trout although they contain brook trout.

The lack of trout in the South Branch was no doubt due to the fact that this stream dries up for extensive periods each year.

Burnet (1959) gives figures for Doyleston Drain, 39-135 lb. per acre, and Hanmer Road Drain, 49-99 lb. per acre, both for the period 1954-58. He estimates a density of 310 lb. per acre in the 1960 peak year on the South Branch of the Waimakariri River (pers. comm.). Allen (1951) found the trout density in the Horokiwi Stream to vary from 58 to 255 lb. per acre.

The analysis devised by Cassie (1954), plotting length frequency on probability paper, was used to calculate growth rates. The winter survey results are given in Table 5.

TABLE 5. *Age and length estimates in cm.*

Age	*Mean fork length*	*95% range*	*Standard deviation*
I	14.4	10.5–18.5	2.0
II	24.9	20.0–30.0	2.7
III	35.8	30.0–41.5	2.8
IV?	45.8?	41.5–50.0	-

The fish measured in the summer survey yielded similar results; however, the modes were not as clearly defined as the winter survey and a Cassie analysis was found impracticable for these fish. In order to eliminate, as far as possible, the variation in growth which may occur in different parts of the river, growth rates were calculated combining only two stations (9 and 15). The results are shown in Figure 2. The waves show variation in growth rate between summer and winter.

Survival and mortality (including emigration) can be estimated from these data. The survival and mortality below the age of I+ cannot be estimated because (a) trout fry were apparently released in the Hinds River system and separation of the native brown trout and the introduced brown trout is impossible, and (b) the methods of fishing were strongly biased toward capture of larger fish. The total catch by ages is as follows: 0+ 344; I–I+ 685; II–II+ 1049; III–III+ 199; IV and older 28. The assumptions are made that fish of age II and older were captured in their true proportion and that the year class strength from II up is similar. Fishing mortality is very low and can be ignored. The loss calculated is therefore a combination of natural mortality and emigration. Following the method of Heincke (1913) as given in Ricker (1958) for incomplete breakdown of old fish the following is obtained:

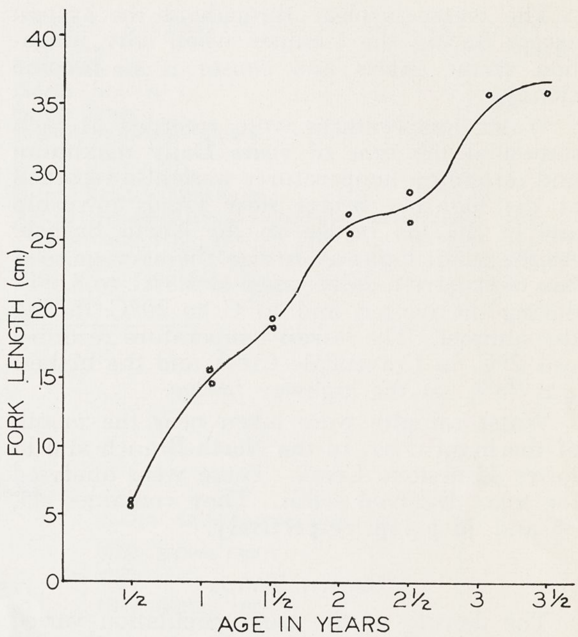


FIGURE 2. *Growth of brown trout at stations 9 and 15.*

$$1 - S = \frac{Nt_1}{Nt_1 + Nt_2 + Nt_3}$$

where $1 - S$ = total loss

Nt_1 is the number of fish of age II–II+

Nt_2 is the number of fish of age III–III+

Nt_3 is the number of fish of age IV and older.

$$\therefore 1 - S = \frac{1049}{1049 + 199 + 28} = .822$$

∴ total loss, averaged from age II onwards, equals 82% and survival for the same period 18%.

If the same method is applied to the winter data only, the loss calculated is 91% and survival 9%.

A similar method devised by Robson and Chapman (undated) was also used. This gave a loss rate of 83% which agrees closely with the Heincke method.

Diet and food availability were examined. The young trout (age I and less) feed almost exclusively on bottom fauna with occasional flying insects. The older fish feed on bottom fauna and native fish with occasional flying insects. Bottom fauna was sampled during August and November and the following groups were found, in order of abundance: Ephemeroptera, Trichoptera, Coleoptera, Diptera, Annelida, Mollusca and Neuroptera. The average numbers of animals per square foot in November was 153 (range 21–871), the average in August was 117 (range 4–291).

The results of analysis of the trout stomachs are given in Table 6.

TABLE 6. *Trout stomach analysis.*

Age Group	*Area*	*Stomach Contents*	*% of Total*	
Adult	River	Fish	40%	(including trout)
		Trichoptera	40%	
		Diptera	7%	(mostly adults)
		Coleoptera	4%	
		Mollusca	3%	
		Plecoptera	2%	
		Ephemeroptera	2%	
		Other invertebrates	2%	
Adult	Lagoon	Mollusca	80%	
		Trichoptera	17%	
		Coleoptera	2%	
		Other invertebrates & fish	1%	
Young	River	Ephemeroptera	93%	
		Crustacea	4%	
		Trichoptera	2%	
		Diptera	1%	(often adults)

It can be seen that the young fish feed almost completely on Ephemeroptera with only 2% Trichoptera and no fish, while the older fish feed almost totally on fish and Trichoptera with only 2% Ephemeroptera. The fish from the lagoon (adults) feed almost totally on Mollusca and Trichoptera: this probably reflects food availability.

There are eleven species of native fish in the Hinds River and the possibility of competition for food between these species and the trout was examined.

The diet of the native fish, as found in stomach analyses is: Ephemeroptera 43%, Diptera 24%, Trichoptera 18%, Coleoptera 7%, other invertebrates and larval fish 8%. With one exception there was no significant difference in diet, therefore the figures lump all species except *Galaxias burrowsius*. Stomach analysis of this species showed a diet of 99% crustacea. The results of stomach content analysis are summarized, in terms of possible food competition, in Table 7.

The trout stomachs examined were taken in August and November; no information for the remainder of the year is available.

It is impossible at our present stage of knowledge of the Hinds River to give with any certainty the factors which contribute to the limitation of trout in size and number. However, some correlations and factors have been suggested from the work. In the main river there is a positive correlation between native fish numbers and trout numbers. No correlation was found between the trout population and the bottom fauna numbers. Generally speaking the bottom fauna counts were fairly constant throughout the whole stream. One area with a very high bottom count (Station 23) had very low trout density. Two stations were found which had very low bottom fauna counts (Station 9 summer and Station 20 winter). Of these one had a high trout density and the other a low trout density. Although the diet of young and adult trout appears to be very different their distribution in the river was very similar.

TABLE 7. *Possible food competition.*

Fish	*Food*	*Possible Competitor*	*Food*	*Possibility of Competition*
Adult trout	Fish and Trichoptera	Young trout	Ephemeroptera	No
Adult trout	As above.	Native fish	Ephemeroptera and Diptera	No
Young trout	Ephemeroptera	Native fish	As above	Yes

The size of the trout appears to vary conversely with density. In the North Branch where the trout density is generally sparse, the individual size of the fish was large (up to 8½ lb.). In the lower third of the river, where the density is high, few fish taken weighed over 1½ pounds. Station 8 (the mouth), and the lagoon, did not follow this pattern; however, in this area sea run trout were captured during the winter survey and these fish may account for the few larger fish. A similar pattern of size distribution in the upper, middle and lower stretches of a river was found for the Oreti River, although no indication of the presence of sea-run fish is given—Allen and Cunningham (1957).

There is little apparent correlation between cover and fish number or size, although in areas of little cover there was seldom high trout density.

Pollution in the form of silt is added to the river in the summer dry season through the irrigation outlets. This appeared to have little effect.

In lower Cravendale Creek, lower Limestone Creek and the lower South Branch the native fish were infected with a disease manifested by external white spots. This was tentatively identified as "white spot disease". This may have some effect upon the trout population although the few trout in these areas were not affected.

No physical factors were found which would have an obvious limiting effect, nor any chemical or biological factors except those mentioned.

REGULATIONS

The present regulations allow only fly fishing with a size 12 or smaller hook. The bag limit is 12 fish per day with a minimum size of 10 inches. The length of the season is 7 months from 1 October to 30 April.

Under these conditions very few fish are being taken in the sport fishery while natural mortality and emigration are removing 80-90% of the fish over II+ years annually.

The present size limit of 10 inches total length is about equal to the average length of the age II fish. This age group is the only age class of any size available to the fishery, very high loss occurring after II. If the size limit was reduced to 9 inches almost all the age II fish would be available while the age I and I+ fish would still be protected. A decrease in age II fish due to fishing is likely to increase the number of older fish and probably would not materially increase the present annual mortality.

The present lure restriction (fly only; maximum hook size 12) serves only to lower the total catch and to reduce the chances of capture of the larger fish. (The larger fish were usually found under rather dense willow cover making fly fishing extremely difficult). To increase the catch and if possible make easier the catching of the large fish, it is suggested that the lure restrictions be liberalised to include all flies, spinners (threadline fishing) and the use of worms.

The present closed season is designed for two reasons; to protect the fish on the spawning areas, and to allow those fish which have spawned to return to good condition. Information gained during the winter survey and a physical examination of the river suggests that unless the river is very heavily fished this protection of spawning beds is unwarranted. (Catchment Board activity is more damaging than thousands of anglers and has little noticeable effect.) Condition during the winter can only be described as good for over two-thirds of the fish (similar results were found during the summer survey); therefore, the second reason for a restrictive season is not valid. A twelve month open season is suggested for the Hinds River. The present bag limit of twelve fish is seldom reached and so has no practical effect. If the previously mentioned regulation changes are made the limit may be reached more often. At present I see no reason to alter this bag limit.

SUMMARY

1. The Hinds River system, on the basis of the trout population, can be divided into four regions—
   (a) lower third—high density, small size.
   (b) upper portion main river—low density, small size.
   (c) North Branch—low density, larger size.
   (d) South Branch and tributaries—low density, small size; presence of *Salvelinus fontinalis*.
2. There appears to be a change in the diet of the trout with age. Those age I and under feed primarily on Ephemeroptera, those over age I feed primarily on fish and Trichoptera.
3. Competition for food between the native fish and young brown trout is a distinct possibility as both have Ephemeroptera as their main food supply.

4. The mean fork lengths at ages I to IV are 14.4 cm., 24.9 cm., 35.8 cm., 45.8 cm. respectively.
5. Estimates of the annual mortality plus emigration rate from age II on vary between 80 and 90%.
6. There is a positive correlation between native fish density and brown trout density in the main river; however, no correlation was found between bottom fauna density and trout density.
7. There appears to be a negative correlation between trout size and density.
8. The present regulations are having an adverse effect on the fishable trout population and the following changes are recommended:
   (a) size limit reduced to 9 inches total length;
   (b) lure restrictions be liberalized to allow all flies, threadline spinners and worms;
   (c) the present 7 month season be extended to 12 months.

ACKNOWLEGEMENTS

The author would like to thank Messrs. K. R. Allen and C. L. Hopkins for their help and suggestions in the preparation of the manuscript. He would also like to thank Messrs. K. F. Maynard, J. Galloway, S. Falconer, E. Moore, E. Cudby and W. Skrzynski for their energetic work in the field.

REFERENCES

ALLEN, K. R., 1951. The Horokiwi stream, a study of a trout population. *Fish. Bull. Wellington, N.Z.* 10.

ALLEN, K. R., and CUNNINGHAM, B. T., 1957. New Zealand Angling 1947-52, results of the diary scheme. *Fish. Bull. Wellington, N.Z.* 12.

BURNET, A. M. R., 1959. Some observations on natural fluctuations of trout population numbers. *N.Z. J. Sci.* 2:410–421.

CASSLE, R. M., 1954. Some uses of probability paper in the analysis of size frequency distributions. *Aust. J. Mar. Freshw. Res.* 5: 513–522.

HEINCKE, F., 1913. Investigations on the Plaice. General report. I-Plaice fishery and protective measures. Preliminary brief summary of the most important points of the report. *Rapp. Conseil Expl. Mar.* 16.

RICKER, W. E., 1958. Handbook of computations for biological statistics of fish populations. *Bull. Fish. Res. Bd. Can.* 119.

ROBSON, D. S., and CHAPMAN, D. G., undated. Catch curves and mortality rates. *Research under N.S.F. Grant No. G*10365. Mimeo rep., U.S.A.

THE SALMON AND TROUT ASSOCIATION

LONDON CONFERENCE 1965 AT IRONMONGERS' HALL, ALDERSGATE, E.C.2.

SUBJECT	TIME
"Estuarial Barrages" Mr. H.C. Gilson, in the Chair, hopes that members will put their fears and problems to him, but he will not pretend that he can give any answers	Tuesday, 23rd November 10.30 a.m.
"Counting Fences for Salmon and Sea Trout and what can be learned from them" by I.R.H. Allan, Esq. Chief Salmon & Freshwater Fisheries Officer	Tuesday, 23rd November 2.30 p.m.
"Progress in the Control of Pollution, 1948 - 1965" by Dr. B.A. Southgate, C.B.E., Ph.D., D.Sc., F.R.I.C. Director of Water Pollution Research	Wednesday, 24th November 10.45 a.m.

Conference closes at 12.30 p.m.

MEMBERS' PROGRAMME

Tuesday, 23rd November

12 noon	Local Organisers Meeting at Ironmongers' Hall (Light luncheon to follow)
7.45 for 8 p.m.	Members' Dinner at Fishmongers' Hall, London Bridge, E.C.4. Members only. Dinner Jackets. £3.5.0. a head to include drinks.

Wednesday, 24th November

1 p.m.	Buffet Lunch at Fishmongers' Hall. Tickets 17s.6d.
2.15 p.m.	Annual General Meeting at Fishmongers' Hall.
3.15 p.m.	Council Meeting at Fishmongers' Hall.

APPLICATION FORM

SALMON AND TROUT ASSOCIATION

LONDON CONFERENCE 1965

Affiliated members are entitled to send two representatives.

Please send me tickets as below:

1. Conference .... Members 10s.0d.
   Guests 10s.0d. ....
2. Members' Dinner, Fishmongers' Hall
   £3.5.0. ....
3. Members' Buffet Luncheon (Wednesday)
   17s.6d. ....

I enclose my cheque for £ __________

Name and Address (Block Letters)

____

____

____

Please return this Application Form BEFORE 1st October 1965, to:-

The Hon. Secretary,
Salmon & Trout Association,
Fishmongers' Hall,
London Bridge,
London, E.C.4.

NOTE FOR RIVER AUTHORITIES

Any River Authority seeking sanction under the proviso to Section 228 (1) of the Local Government Act 1933 to the payment of the expenses of attending the Conference, should submit a formal application to the Ministry of Housing and Local Government with an explanation of why, in their particular case, attendance at the Conference would be of value.

THE SALMON AND TROUT ASSOCIATION

London Conference 23rd and 24th November 1965

The subjects to be discussed at the London Conference 1965 will be Estuarial Barrages, Counting Fences for Salmon and Sea Trout and the Progress in the Control of Pollution 1948 - 1965.

The Conference is open to members of the Association and their guests, on payment of a Conference fee of 10s.0d. a person.

Copies of the papers to be given will be circulated to those attending and the Conference will as usual be reported in the Magazine.

For members of the Salmon and Trout Association there will be, in addition, a dinner at Fishmongers' Hall at 7.45 for 8 p.m. on the 23rd November, the Annual General Meeting at 2.15 p.m. followed by a Council Meeting on the 24th November. Organisers and their Assistants will meet in a room at Ironmongers' Hall at 12 noon on the 23rd November.

3318

The Salmon & Trout Association

Agenda for the Annual General Meeting
to be held in Fishmongers' Hall
on Monday 25th April, 1994 at 11am

---

1. **Apologies for Absence**

2. **Confirmation of the Minutes of the previous meeting held in Fishmongers' Hall on Monday 26th April 1993.**
   The Minutes have been circulated to those attending and all Branches.

3. **Matters arising from the Minutes of the previous meeting.**

4. **To receive and adopt the Chairman's Report for the period since the date of the previous Annual General Meeting.**
   Published in the Year Book.

5. **To receive and adopt the Accounts of the Association for the year ended 31st December 1993.**
   The Treasurer's Report has been published in the Year Book.

6. **To elect the Officers of the Association.**
   (a) *Chairman*
   Mrs Jean Howman has been nominated by the Council on the retirement of Mr T A F Barnes, OBE.
   (b) *Vice Chairman*
   Mr A W Bird offers himself for re-election as a Vice Chairman of the Association.

7. **To elect three members of the Council to replace those who are scheduled to retire at the 1994 AGM under the terms of the constitution:**

   Mrs H Fallon
   Mr M Metcalf
   Major J Mills
   ] *offer themselves for re-election*

8. **To elect a Trustee of The Charitable Trust**
   Mr A W Bird has been nominated to replace Mrs Jean Howman on her appointment as Chairman of the Association.

9. **Topics for discussion by Members**
   Dr M Vickers has submitted the following resolution:.
   "Can the Association's lobbying on salmon issues be improved?".

10. **Any other business.**

The Salmon & Trout Association

Income and Expenditure Account

For the year ended 31st December 1993

	1993		1992	
INCOME	£	£	£	£
Membership subscriptions		134,678		127,001
Sponsorship from Laphroaig		21,400		20,000
Donations received		6,646		4,413
Fishmongers' Company grant		6,000		6,000
Sports Council grants, net (see note 2)		2,500		500
Annual draw receipts		5,800		8,520
Net (losses)/profits on product sales		(161)		1,483
Investment income and interest (gross)		10,088		8,379
Profit on disposal of investments, less tax		14,803		2,456
Other income		899		544
TOTAL INCOME		202,653		179,296
EXPENDITURES				
Salaries		87,324		73,172
Director and committee expenses		9,467		7,151
Printing and stationery	7,981		8,728	
Postage and telephone	10,542		10,200	
Insurance and maintenance	2,354		2,173	
Office equipment costs	407		1,207	
Membership computer costs	9,655		9,716	
Subscriptions and publications	625		849	
		31,564		32,873
Yearbook and Newsletters (net)		14,016		19,202
Shows and Field Secretary expenses	10,046		8,999	
Conferences, including *Salmon in Crisis*	5,223		1,807	
Public Relations, press and advertising	7,593		0	
Training, recruitment and Development Officer expenses	5,990		0	
		28,852		10,806
Grants to Scotland and other regions	3,473		3,108	
Usk Barrage and other donations	3,809		800	
		7,282		3,908
Bank charges	3,077		1,247	
Fees of reporting accountants	500		500	
		3,577		1,747
Consultancy fees and sundry		2,911		3,165
Legal & professional costs		0		2,000
Corporation tax (see note 3)		2,436		2,095
TOTAL EXPENDITURES		187,429		156,119
Surplus of income over expenditure		15,224		23,177

The notes on page 4 form part of these accounts

The Salmon & Trout Association

Balance Sheet

As at 31st December 1993

	1993		1992	
	£	£	£	£
Fixed assets				
Display equipment		1		1
Motor vehicle		0		1
Computer equipment - at cost	12,505			
Less: Accumulated depreciation	0			
		12,505		0
		12,506		2
Investments (At cost)				
Quoted				
[Market value £162,588, (1992 £131,504)]	94,535		70,959	
Shares in SATAS	0		98	
		94,535		71,057
Current assets				
Stocks	8,653		6,581	
Debtors and prepayments	10,731		5,191	
Cash on bank deposit and short term investments	31,629		33,878	
Cash in hand	31		75	
		51,044		45,725
Current liabilities				
Creditors, accruals and VAT	51,675		27,039	
Provisions	1,600		1,600	
		53,275		28,639
Net current (liabilities) assets		(2,231)		17,086
Total net assets		104,810		88,145
Represented by:				
General Fund: Balance brought forward	64,603		41,426	
Surplus of income over expenditure	15,224		23,177	
		79,827		64,603
Reserves:				
Unexpired Life members' subscriptions		24,983		23,542
		104,810		88,145

The notes on page 4 form part of these accounts

The Salmon & Trout Association

Notes To The Accounts

For the year ended 31st December 1993

1. **Accounting policies**
   (a) Subscription income – Subscriptions from members are taken as income when received, other than Life Memberships which are credited over a fifteen year period.
   (b) Depreciation is provided on the cost of the motor vehicle at an annual rate of 25% and computer equipment at 33.3% from the date of final handover.
   (c) Stocks are valued at the lower of cost and estimated net realisable value.

2. **Sports Council Grants**
   The Association received grants totalling £13,500, (1992, £10,500) of which £11,000 (1992, £10,000) was payable to the Confederation of English Fly Fishers, to be directed towards the World Fly-fishing Championships and European Grand Slam events.

3. **Taxation**
   Corporation Tax is payable at 25% on gross investment income and interest received. Capital Gains Tax at 25% is payable on the realised gains arising from the disposals of investments.

4. **Capital Commitments**
   As at 31st December 1993, the Association is committed to the final tranche payable on the computer facilities, when fully commissioned, of £5,000.

5. **Contingent liability.**
   The Association has re-registered for VAT as from 1st July 1992, but the treatment for VAT purposes of subscription income is still being discussed with HM Customs and Excise. Full provision has been made for VAT since registration, but, subject to the outcome of the discussions, liability may arise in respect of earlier periods. It is not possible to quantify this liability, should it arise, at the present time.

T A F Barnes OBE — Chairman

N J Gooderham, FCA — Hon. Treasurer

Report to the Members of The Salmon & Trout Association

We have examined the Accounts of the Salmon & Trout Association for the year ended 31st December 1993 on pages 2 to 4 and confirm that they are in accordance with the Books and Records of the Association.

Ernst & Young
Chartered Accountants
London

25th February 1994

AN ROINN TAILTE

(Department of Lands)

PASSAGE OF SMOLTS THROUGH TURBINES—EXPERIMENTS WITH BALSA WOOD BOXES AND FISH SHAPES AT RIVER ERNE HYDRO-ELECTRIC STATION IN MAY, 1959

By

C. J. McGrath, B.E., and Eileen Twomey, M.Sc.,
Fisheries Division, Department of Lands.

Reprinted from the Department's Report on the Sea and Inland Fisheries for the year 1959.

APPENDIX No. 24.

PASSAGE OF SMOLTS THROUGH TURBINES—EXPERIMENTS WITH BALSA WOOD BOXES AND FISH SHAPES AT RIVER ERNE HYDRO-ELECTRIC STATION IN MAY, 1959.

By

C. J. McGrath, B.E., and Miss E. Twomey, M.Sc.,
Fisheries Division, Department of Lands, Dublin.

A series of experiments in connection with the above and in continuation of those initiated in May 1958 was carried out at Cliff Power Station and Cathaleen's Fall Power Station on the 12th and 13th May, 1959.

The experiments were conducted by the engineers and biologists of Fisheries Division with the co-operation and assistance of the staff of the Electricity Supply Board, in accordance with the system devised and practised by Dr. Carlin and Dr. Monten of Sweden.

According to the data published by the Electricity Supply Board there are two generating sets at Cliff Power Station having an average yearly head of 10 m. The turbines are of the Kaplan type and at this head are capable of producing 10 m.w. each.

There are likewise two generating sets at Cathaleen's Fall Power Station where the average yearly head is 28·5 m. The turbines here are also of the Kaplan type and capable of producing 22·5 m.w. each at this head.

Each test consisted of passing a number of units through a turbine operating at a pre-selected load and under a known head.

The units were introduced into the turbines by dropping them down the intake gate slots and thereafter recovered from the tail race below the power station.

The units consisted of hollow boxes and of solid fish shapes both made of balsa wood. Live smolts could be placed in the boxes and held there and in this way passed through the turbine and subsequently recovered.

Boxes and fish shapes of various lengths, as follows, 5½″; 6″; 6½″; 7″; 8″, were selected to cover the range of smolt sizes in the Erne determined by a size—frequency analysis of a large number of smolts from the river.

In the case of the boxes, the dimensions given are internal lengths, and in the case of the fish shapes, the overall lengths.

The units were manufactured by the laboratory staff of Fisheries Division. The boxes were made with a recess in the bottom which was filled with lead shot to make the boxes sink. The shot was held in place by gumming a thin sheet of newspaper over the opening. After a short period in the water the paper softened and came apart releasing the shot and the box came to the surface. The release of the shot was expedited by perforating the paper covering immediately before use.

A recess was cut into the solid balsa wood of the fish shapes which also was filled with lead shot similarly held in position with a thin sheet of newspaper pasted over the opening.

At the start of the experiments it was discovered that there was insufficient shot in these fish shape recesses to overcome buoyancy. Additional ballast was provided by filling standard fish scale envelopes with the extra shot required which were then swathed around the tail of the fish shape and gummed to it.

Typical Low ; Medium and Full generating load conditions at Power Stations were 4 ; 7 and 11 m.w. in the case of Cliff Power Station and 5 ; 11 and 22 m.w. in the case of Cathaleen's Fall Power Station. It was decided, accordingly, to carry out the tests at each Station at these particular loadings.

At the commencement of the tests both boxes and fish shapes of the complete range of sizes made up were employed in each test. Towards the end of the test, fish shapes only were employed as there was some evidence that the box shape was introducing an additional hazard into the test.

Tests with boxes having live smolts inside them were carried out at Cliff Power Station but no such tests were carried out at Cathaleen's Fall, because of the hazardous nature of the tail race site which made recovery operations exceedingly difficult and dangerous.

Whenever live smolts were passed through the turbines, the same number were placed in balsa wood boxes and held for the duration of the experiment in a floating cage anchored in the fish-pass together with a similar number of free swimming smolts. These acted as a control on the experiment.

Five smolts, passed through the turbines in this way and subsequently recovered, showed no superficial signs of ill-effects or injury on recovery. They were removed from the boxes and placed in a separate floating cage and held there for 48 hours by which time two had died. Of the control smolts none had died in the same period.

A somewhat similar experience occurred in 1958 and it is possible that death was due to injury resulting from handling the fish when placing them in the boxes rather than to the effect of passing through the turbine. It was noted that when the smolts were removed from the vessel in which they were held before being placed in the boxes, considerable numbers of scales were seen to remain in the vessel. If the mortality which occurred could be attributed to this cause, then in so far as it could be possible to come to a conclusion in view of the small numbers engaged in this particular aspect of the experiment, it would appear that at heads of 12·9 m. and 13 m. and at station discharges represented by 7 m.w. and 4 m.w., smolts suffer no injury in passing through the turbines at Cliff, due to pressure or like factors obtaining under these conditions. It may be desirable in future to anaesthetise the fish before placing them in the boxes to prevent injury while doing so.

The possibility of injury due to collision with the machinery has been considered in the light of evidence obtained of serious damage to the units that passed through the turbines and were subsequently recovered below the dam.

At first it was decided to regard units that had not been recovered and of which there was no trace as having been smashed. Subsequently it was reported from Ballyshannon that, in annual maintenance operations at these power stations subsequent to the carrying out of the tests, units were recovered intact which had already been deemed to be destroyed for the reasons stated above. In view of this it was decided to take account only of units about which full information was available as to their fate. The acceptance of this viewpoint was encouraged by the recollection of the smallness of the broken particles which it had been found possible to recover and which invariably could be traced to their original unit so that it was felt that if the boxes unaccounted for had been destroyed, as was at first believed, some evidence to this effect would have been forthcoming to support this belief.

The data collected in the course of the experiment and tabulated has been broken down, analysed and summarised on this assumption and is set out in the table below.

Date	Power Station	Type of Unit	Head in Metres	Station Load	No. of Units Re-covered	No. Smashed	No. Intact or Slightly Damaged	% Recovery Intact or Slightly Damaged
12/5/59	Cliff	Box	12·7	11 m.w.	7	—	7	100%
do.	do.	Fish Shape	12·7	11 m.w.	4	—	4	100%
do.	do.	Box	12·8	7 m.w.	6	—	6	100%
do.	do.	Fish Shape	12·8	7 m.w.	2	—	2	100%
do.	do.	Box with Smolt	12·9	7 m.w.	5	—	5	100%
do.	do.	Box	12·9	4 m.w.	5	1	4	80%
do.	do.	Fish Shape	13·0	4 m.w.	1	—	1	100%
do.	do.	Box with Smolt	13·0	4 m.w.	3	1	2	66⅔%
do.	Cathaleens Fall	Fish Shape	31·0	15 m.w.	10	2	8	80%
do.	do.	Box	31·0	15 m.w.	5	2	3	60%
13/5/59	Cliff	Fish Shape	12·8	11 m.w.	10	—	10	100%
do.	do.	Fish Shape	12·9	7 m.w.	12	1	11	91·7%
do.	do.	Fish Shape	13·0	4 m.w.	8	—	8	100%
do.	Cathaleens Fall	Fish Shape	29·2	22 m.w.	11	—	11	100%
do.	do.	Fish Shape	29·2	11 m.w.	11	—	11	100%
do.	do.	Fish Shape	29·3	5 m.w.	13	1	12	92·3%

If the assumptions already made are valid, then, on the basis of the results above, the possibility of danger for smolts passing through turbines of the type and under the conditions investigated would appear to be principally at low discharges. The problem may perhaps be even less than as suggested by the results having regard to the fact that in the tests, rigid units are employed to represent a living flexible fish. Furthermore, it was stated by Electricity Supply Board representatives in the course of the tests, that running at such low loads is discouraged. In addition, it is possible that under such turbine discharges, the attraction of the inflow for smolts is very much less than at greater discharges.

It is hoped to extend the investigations to other Hydro Electric Stations so that the effects of varying head and different sizes of turbines on the passage of the experimental units can be ascertained and the results documented and compared.

G353. D28728A. 3. 250 2/61. Dollard. G51.

AN ROINN TAILTE

(Department of Lands)

SALMON OF THE RIVER ERNE

By

EILEEN TWOMEY, M.SC., Fisheries Division,
Department of Lands.

Reprinted from the Department's Report on the Sea and Inland Fisheries for the year 1959.

APPENDIX No. 23.

SALMON OF THE RIVER ERNE

By

EILEEN TWOMEY, M.Sc., Fisheries Division,
Department of Lands, Dublin.

The Erne is 64 miles long and its catchment area and that of its tributaries cover approximately 1,690 square miles. The river, its catchment area and the geological substratum have been described by Went (1942). In 1946 work was commenced on the construction of two hydro-electric stations on this river, one at Cathaleen's Fall and one further upstream at Cliff. The station at Cathaleen's Fall was completed in 1953 and that at Cliff in 1955. A fish pass of the "White" submerged orifice type was constructed at both stations. The fish-pass extends from the tail race of the power station over the dam into the head waters. The pass at Cathaleen's Fall has 73 pools and the one at Cliff 35 pools. The passes are similar to those used by the North of Scotland Hydro-Electric Board at Pitlochry and Cluny Power Stations, (Jackson, 1955). A counter of the nylon screen type was put into operation at Cathaleen fish-pass in 1952. A daily reading of all fish passing through the counter is kept. The time of passage also of each fish through the counter is recorded, (Jackson, 1958).

Material and Methods.—The material upon which this paper is based consists of sets of scales taken from salmon captured from 1954 to 1959. As there was some discrepancy in the relationship between the number of fish sampled and the total run, allowance for this has been made by making suitable arithmetical adjustments. Up to 1957, the Electricity Supply Board were allowed to take 20% of the total run through the fish-pass. In 1958 all fishing was prohibited. It was resumed again in 1959, for a very short period (7 weeks). The restrictions in 1958 and 1959 were imposed as part of a programme to rehabilitate the stocks of fish in the river.

All fish examined were measured from the tip of the snout to the fork of the tail, and the weights were recorded to the nearest ounce. In 1954 weights were recorded for only a very small proportion of the fish, which were scaled.

Smolt Ages.—The distribution of the smolt ages is given in Table 1. In each age group and in each year under review, the two-year-old smolts were dominant. The next most important were the one-year-olds which varied from a maximum of 17·0% for the small spring fish in 1956 to a minimum of 3·9% in the small spring fish of 1957. The distribution of the smolt classes for all the age groups is given in Table 2. The one-year smolts varied from 16·2% in 1956 to 7·5% in 1954. Went (1942) got a much lower percentage for one-year smolts (4·8% in 1921, 1926 and 1927).

Smolts may be classified as Type A or Type B fish. If they show freshwater growth in the spring of the year in which they migrate they are described as Type B smolts, and those that show little or no growth are described as Type A smolts. The Type B smolts were the dominant type in the River Erne (Table 3).

Age Groups.—The salmon of the River Erne may be divided into five groups of maiden or unspawned fish, and a heterogeneous group of previously spawned fish. The small summer fish (2+winters) were dominant over the grilse (1+winters) by 0.4% in 1954, but in every other year grilse were dominant (Table 4). In the previous investigations carried out by Went (1942) the grilse was also the dominant age group. The percentage of previous spawners was low in 1954 and 1956 compared with the present and previous investigations carried out on this river. Went (1945), in his paper on "Previously spawned salmon in Ireland" records a figure of 15·4% for the Erne for the year 1944.

Except in 1957 when 57·4% of the total were taken in June, most fish were taken in July (Table 5). Spring fish were dominant in April and May each year with the summer fish next in importance. Except for June 1954, when the small summer fish were more numerous than grilse, grilse were dominant in June and July each year. Very few previous spawners were taken in April and May except in 1957 when over 30·0% of the total catch were previous spawners (Table 6).

Table 7 gives the years in which the fish were hatched and their years of return. In 1956, 1957 and 1958 the majority of the fish were progeny of the fry hatched three years earlier. In 1954 the catch was equally divided between the fry of three and four years earlier.

The size distribution is given in Table 8. Lengths between 25·59 and 33·95 inches were dominant in 1954. In 1956 and 1957 the dominant length groups were between 23·95 and 29·95 inches. The variation in the length groups can be attributed to the abundance of small summer fish in 1954 and in 1959 to the complete absence of scale material from early running fish.

In Table 9, the percentage composition by weight for 1956, 1957 and 1959 is given. Grilse were the most important age group from the commercial point of view. An estimate was made for 1954 which gave 64·9% small summer fish by weight and 17·3% grilse by weight.

The average condition coefficients or length weight relationships (calculated from the formula $K=10^5\ W/L^3\times36$ where W=the weight in pounds and L the length in inches) are given in Table 10. The condition coefficient was lower on an average in 1957 than in 1956 and 1959. Spring fish had a higher value for K in 1956. Spring and summer fish were equal in 1957, and in 1959 the summer fish had a higher condition coefficient.

Previous spawners (with SM's) can be classified according to their absence habit. In 1954, 1956 and 1959 all the previous spawners returned to the river having spent less than a full year at sea (short absence). In 1957, however, a little over 50% of the previous spawners returned to the river after a long absence (a full year feeding in the sea between spawnings). No fish with a very long absence habit was recorded (Table 11).

The monthly percentage of fish having erosion in their scales, i.e. the phenomenon due to the absorption of the substance of the scales during ripening of the gonads is given in Table 12. As the season advanced, the percentage of fish having eroded scales increased in each age group. The percentage of erosion was highest in 1954 and lowest in 1959. The fact that the majority of fish taken in 1959 were net caught fish in the estuary would account for the very low percentage of erosion ; whereas in 1954 all the fish scaled were taken out of the fish catching pool in the fish-pass and it is possible they had experienced some delay in entering the pass.

The average weights and lengths for the different age groups are given in Table 13. The variation is only very slight, with the exception of 1959 when the average for previous spawners was below that of 1956 and 1957.

Resumé

(1) The two-year-old smolts formed almost 80% of the total in 1956 and over 80% in each of the other years under review (Tables 1 and 11).

(2) The two-year-old Type B smolts were the dominant smolt type (Table 3).

(3) Grilse were the most important age group except in 1954 when the small summer fish exceeded them by 0·4% (Table 4).

(4) Except for June 1957 the bulk of the fish were taken in July each year (Table 5). The bulk of the Spring fish were taken in April/May each year. Small summer fish and grilse were dominant in June and July, (Table 6).

(5) In each year 65% of the stocks and over relate to a single brood year except alone in 1954 when the stocks were divided almost equally between two brood years (Table 7).

(6) More than half the stocks had lengths between 22 and 30 inches (Table 8).

(7) Commercially in 1956, 1957 and 1959 the grilse were the most important age group (Table 9).

(8) The average condition coefficient for the most important age groups is given (Table 10).

(9) The majority of the fish exhibited the short "absence" habit (Table 11).

(10) In 1954, the percentage of fish with erosion of the scales was fairly high in each month, but in 1956, 1957 and 1959 the incidence of erosion was only slight (Table 12).

(11) The average weights and lengths of the different age groups were found to be uniform (Table 13).

References

Hely-Hutchinson, G. W. (1901) "Tables of Irish Rivers, Dublin."

Jackson, P. A. (1953) "A Simple Type of Fish Counter." *Salmon and Trout Magazine* No. 138, May 1953.

——— (1958). "Movements of Salmon on the River Erne." *Nature* Vol. 182, p. 543.

Went, Arthur E. J. (1942). "Salmon of the River Erne". (*Sci. Proc. R. Dublin Soc.*) Vol. 22 (N.S.) No. 49.

——— (1945). "Irish Previously Spawned Salmon". (*Sci. Proc. R. Dublin Soc.*) Vol. 24 (N.S.) No. 1.

TABLE 1.—Percentage of each smolt age in each age group (maiden fish only).

Smolt Class	Age Group in Winters 1+	2	2+	3	3+	Total
			1954			
1 ..	3·7	—	10·9	—	50·0	7·5
2 ..	85·9	100·0	87·1	100·0	50·0	86·9
3 ..	10·4	—	2·0	—	—	5·6
Total	100·0	100·0	100·0	100·0	100·0	100·0
Average age of smolts	2·07	2·0	1·91	2·00	1·50	1·98
			1956			
1 ..	16·8	17·0	7·3			16·4
2 ..	78·6	75·0	87·8	100·0	100·0	78·9
3 ..	4·6	8·0	4·9	—	—	4·7
Total	100·0	100·0	100·0	100·0	100·0	100·0
Average age of smolts	1·87	1·91	1·92	2·0	2·0	1·88
			1957			
1 ..	8·8	3·9	21·1	—		10·0
2 ..	88·6	96·1	78·9	—	—	84·9
3 ..	2·6	—	—	—	—	5·1
Total	100·0	100·0	100·0	—	—	100·0
Average age of smolts	1·94	1·97	1·79			1·95
			1959			
1 ..	9·5	14·3	30·6	100·0	—	11·1
2 ..	88·6	82·1	69·4	—	—	88·9
3 ..	1·9	3·6	—	—	—	2·0
Total	100·0	100·0	100·0	100·0	—	100·0
Average age of smolts	1·92	1·89	1·79	—	—	1·81

TABLE 2.—Percentage of each smolt class in each year.

Year	Smolt class 1	2	3	Average age of smolts
1954	7·5	86·9	5·6	1·98
1956	16·2	79·2	4·6	1·88
1957	9·4	88·4	2·2	1·95
1959	10·9	87·1	2·0	1·81

TABLE 3.—Estimated proportion (%) of the different smolt types in each smolt class (maiden fish only).

Year	1954		1956		1957		1959	
Smolt Age	Type A	Type B	Type A	Type B	Type A	Type B	Type A	Type B
One year	—	15·1	—	16·5	—	10·6	—	11·1
Two years	17·6	63·4	19·6	59·0	23·1	63·7	27·8	58·9
Three years	2·9	1·0	4·6	0·3	2·6	—	2·2	—
Total	20·5	79·5	24·2	75·8	25·7	74·3	30·0	70·0

TABLE 4.—Percentage of each age group in the catch of each year.

Year	1+	2	2+	3	3+	with SM's	Total
1954 ..	43·0	9·4	43·4	1·7	0·7	1·8	100·0
1956 ..	91·2	2·4	4·1	—	0·2	2·1	100.0
1957 ..	74·0	6·7	11·2	—	—	8·1	100·0
1959 ..	86·7	2·8	6·2	0·1	—	4·2	100·0

TABLE 5.—Estimated monthly catch in each age group as a percentage of the yearly catch.

Month	Age Group 1+	2	2+	3	3+	With SM's	Total
				1954			
April–May	—	5·6	4·1	1·4	—	—	11·1
June ..	11·8	3·4	17·6	0·3	0·3	—	33·4
July ..	29·8	0·4	18·3	—	0·4	1·5	50·4
August ..	1·4	—	3·4	—	—	0·3	5·1
Total	43·0	9·4	43·4	1·7	0·7	1·8	100·0
				1956			
April–May	2·2	2·4	2·7	—		—	7·3
June ..	31·1	—	1·1	—	0·2	0·2	32·6
July ..	52·8	—	—	—	—	1·9	54·7
August ..	5·1	—	0·3	—	—	—	5·4
Total	91·2	2·4	4·1	—	0·2	2·1	100·0
				1957			
April–May	0·3	3·6	2·1			2·6	8·6
June ..	46·6	2·2	6·4	—	—	2·2	57·4
July ..	23·9	0·9	2·7	—	—	3·3	30·8
August ..	3·2	—	—	—	—	—	3·2
Total ..	74·0	6·7	11·2	—	—	8·1	100·0
				1959			
June ..	19·6	1·6	3·0	0·1	—	0·2	24·5
July ..	67·1	1·2	3·2	—	—	4·0	75·5
Total ..	86·7	2·8	6·2	0·1	—	4·2	100·0

Table 6.—Estimated percentage of total of each age group in each month.

Month	Age Group 1+	2	2+	3	3+	With S.M.'s	Total
1954							
April–May	—	59·5	9·4	82·3	—	—	11·1
June ..	27·4	36·1	40·6	17·7	42·8	—	33·4
July ..	69·3	4·4	42·2	—	57·2	83·3	50·4
August ..	3·3	—	7·8	—	—	16·7	5·1
Total	100·0	100·0	100·0	100·0	100·0	100·0	100·0
1956							
April–May	2·4	100·0	65·8	—	—	—	7·3
June ..	34·1	—	26·8	—	100·0	9·5	32·6
July ..	57·9	—	—	—	—	90·5	54·7
August ..	5·6	—	7·4	—	—	—	5·4
Total	100·0	100·0	100·0	—	100·0	100·0	100·0
1957							
April–May	0·4	53·7	18·7	—	—	32·1	8·6
June ..	64·6	32·9	56·1	—	—	27·2	57·4
July ..	32·3	13·4	25·2	—	—	40·7	30·8
August ..	2·7	—	—	—	—	—	3·2
Total	100·0	100·0	100·0	—	—	100·0	100·0
1959							
April–May	—	—	—	—	—	—	—
June ..	21·4	57·1	48·7	100·0	—	4·7	24·5
July ..	78·6	42·9	51·3	—	—	95·3	75·5
August ..	—	—	—	—	—	—	—
Total	100·0	100·0	100·0	100·0	—	100·0	100·0

Table 7.—Proportion of the different brood-years in the catch of the different years.

Brood year	Returned in 1954	1956	1957	1959
1949	1·4	—	—	—
1950	47·8	—	—	—
1951	46·3	1·3	1·4	—
1952	4·5	11·0	2·7	—
1953	—	72·2	24·0	—
1954	—	15·5	65·6	0·5
1955	—	—	6·3	12·2
1956	—	—	—	89·0
1957	—	—	—	8·3
Total	100·0	100·0	100·0	100·0

Table 8.—Estimated size distribution as a percentage of the total catch in the different years.

Class interval * (inches)	Year 1954	1956	1957	1959
18	—	—	—	0·5
20	0·6	1·9	0·9	6·7
22	12·9	3·7	14·0	32·3
24	21·3	22·4	36·4	38·3
26	7·4	36·7	14·9	10·5
28	6·1	23·5	2·5	5·1
30	22·3	27·3	20·9	4·5
32	15·2	2·1	5·2	1·2
34	8·5	1·4	2·7	0·7
36	3·9	—	2·5	—
38	1·5	1·0	—	—
40	0·3	—	—	0·2
Total	100·0	100·0	100·0	100·0

* Class interval 18, etc. include fish with lengths between 17·95 and 19·95 inches

TABLE 9.—Percentage composition by weight in 1956, 1957 and 1959.

Year	Age Group in Winters						
	1+	2	2+	3	3+	With S.M.'s	Total
1956 ..	81·4	5·1	7·4	—	1·5	4·6	100·0
1957 ..	61·5	1·2	20·8	—	—	16·5	100·0
1959 ..	79·6	4·3	10·8	0·4	—	4·9	100·0

TABLE 10.—Average condition coefficient (K) in the more important age groups in 1956, 1957 and 1959.

Age Group	Year		
	1956	1957	1959
1+	1·01	1·02	1·15
2	1·04	0·98	1·01
2+	1·07	0·95	1·12
with S.M.'s ..	1·03	1·01	1·08
Spring Fish	1·04	1·01	1·01
Summer Fish ..	1·01	1·01	1·13

TABLE 11.—Absence habit of previous spawners (expressed as a percentage).

Absence habit	Year			
	1954	1956	1957	1959
Short	100·0	100·0	46·7	100·0
Long	—	—	53·3	—
Very long	—	—	—	—
Total ..	100·0	100·0	100·0	100·0

TABLE 12.—Percentage of fish in the different months' catch showing erosion on their scales (maiden fish only).

Month	1	2	2+	3	3+	Total
			1954			
April–May ..	—	0·0	14·0	—	—	12·5
June	2·0	40·0	23·0	0·0	100·0	15·6
July	6·0	100·0	52·0	—	100·0	25·7
August	100·0	100·0	78·0	—	—	86·6
Total	6·7	81·8	33·3	0·0	100·0	23·3
			1956			
May	—	0·0	0·0	—	—	0·0
June	0·0	—	0·0	—	0·0	0·0
July	5·2	—	0·0	—	—	5·2
August	54·1	—	0·0	—	—	58·3
Total ..	8·3	0·0	0·0	—	0·0	6·8
			1957			
April–May ..	0·0	0·0	12·5	—	—	6·9
June	0·0	0·0	0·0	—	—	0·0
July	17·2	50·0	25·0	—	—	20·0
August	45·0	—	—	—	—	45·0
Total	10·1	6·2	11·1	—	—	11·1
			1959			
June	0·0	31·5	2·7	0·0	—	2·4
July	0·0	66·6	18·7	—	—	1·5
Total	0·0	37·0	7·5	—	—	2·0

TABLE 13.—Average weights and lengths of the different age groups in 1956, 1957 and 1959.

Age Group	Year					
	1956		1957		1959	
	L	W	L	W	L	W
1+	24·4	5·3	24·5	5·5	24·0	5·8
2 ..	29·6	10·5	30·8	10·4	29·6	9·5
2+	29·1	9·8	31·8	11·2	29·9	11·0
with 5 ins.	30·0	10·7	30·9	10·9	26·6	7·5

L—length in inches. W—weight in pounds.

G353. D28728A. 3. 250. 2/61. Dollard. G51.