

# THE ESTABLISHMENT OF A NATIONAL PROGRAM OF FISHERIES RESEARCH\*

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## ABSTRACT

On the basis that fisheries are common property, the paper postulates the need for government management based on a national policy. The type of administrative structure, which varies widely from country to country, will depend largely on local choice and governmental organization.

It is vital that the head of the fisheries organization should be able and energetic and he must have ample authority. The effectiveness of the organization will depend upon the quality of the personnel engaged.

A development programme must be based on facts carefully gathered and interpreted, the area from which the facts are to be gathered will be determined by local conditions and requirements in the first instance and a research team and its equipment should be built up accordingly, but only after a preliminary survey of the actual requirements has been made.

An assessment of the effectiveness of a research programme should be based on the rate of accumulation and accuracy of essential data necessary to provide the administration with the information leading to the effective management of the resource.

## THE PROBLEM

In most large countries where fishing is an important commercial activity there is an active branch of the government responsible for the development and control of this industry. The stage of development and the efficiency of the fisheries department varies considerably from one

country to another, but among the major fishing nations the level is usually rather high. There are, however, a very large number of smaller countries where the fishing industry is allowed to struggle for existence without aid or encouragement from the government, or is even hampered by capricious restrictive measures imposed without rationale.

There are some industries which can flourish without substantial help or control from the government, and which, in fact, benefit from a minimum government attention. The fishing industry is not one of these. Since it is exploiting a living renewable resource, complex problems immediately arise as a consequence of the vagaries of wild animal populations, and these require the attention of trained scientists. Perhaps of greater practical importance is the fact that fisheries, especially those in the sea, are common property, and hence require public control, to avoid their destruction or damage by fishermen who feel no responsibility of ownership. A privately owned resource is carefully managed by its owners, who plan its exploitation to obtain the maximum profit. The government must assume this function in the case of fisheries. Where government interest and machinery are lacking, an available fishery resource may remain unused, while another may be overexploited.

## THE NEED OF A NATIONAL POLICY FOR FISHERIES

In order to focus attention on the fisheries industry, and to acknowledge the unique problem it faces, the government should have an explicit national policy relative to the fisheries. This should set the goals the government has for the

\* Contribution No. 271 from the Marine Laboratory, University of Miami.  
Proc. Indo-Pacific Fish. Coun., 9 (III) : 17-21, 1961.

development of the industry, it should describe the kind of administrative machinery to be established, and it should state the philosophy of government control and assistance.

### THE ADMINISTRATIVE STRUCTURE

There will be so many differences in government structure and in the problems faced by various countries that it is difficult to generalize usefully on the kind of administrative structure which should be established.

In some countries, where the fisheries are an important part of the economy, the person responsible for their administration ranks high in the government. For example, in Canada this official is of cabinet rank, being appointed by the Premier and responsible to him. All activities of the Federal Government related to fisheries come under his control, including research, market development, law enforcement and others.

On the other hand, in Great Britain, where the fishing industry is also of major economic importance, the responsibility for its control and development is divided among more than one government agency.

In Japan, the world's leading fishing nation, fisheries come under the Ministry of Agriculture and Forestry, the Fisheries Agency being headed by a political appointee responsible to the Minister.

In the United States the Federal fisheries department is a branch of the Department of the Interior, whose chief is of cabinet rank. The fisheries share their administrative unit with the wildlife department, and sport fishing and inland fisheries are all included in the same organization.

These examples illustrate the diversity of federal administrative machinery at the highest level even among nations with highly important fishing industries. All of these systems work well, and it is clear that no one type of organization is necessarily "best". It should be emphasized, in fact, that here, as in most other human activities, it is not primarily the system used which determines how efficiently or effectively a job will be done, but instead the quality of the people involved.

Thus, in determining in which department or section of the government to place the fisheries administrative unit, a country has a wide choice of perhaps equally useful possibilities. Whether the fisheries section is given ministerial rank, with its chief sitting on the cabinet, or is placed as a major or minor branch of agriculture or some other ministry will depend, then, both on the importance of the fisheries relative to other activities and on local conditions. Of course, the rank of the fisheries ought to be as high as possible commensurate with their importance. It is vital, however, whatever machinery is set up, that the head of the fisheries unit is an able and energetic man and that he have ample authority to carry out his policies, or the ear of an official able to do so. This point is so important that it deserves further emphasis. Frequently very great amounts of energy and money, spent on biological and economic research and on other activities by a large and well-staffed fisheries department, can be brought to naught by the failure of the administrative head to have enough authority, stature or drive to bring decisions to culmination in terms of government action.

A further decision concerning the kind of administrative machinery to erect concerns whether authority shall be included over sport fishing, inland fishing (sport and commercial) and over game and wildlife. In this case it appears possible to be more specific in making recommendations. Realizing that local conditions may dictate differences even here, nonetheless it seems in general that it would be desirable to include all kinds of fishing, sport and commercial, inland and marine, under one head. Conversely, game and wildlife could usually rather conveniently be in another agency.

The reasons for suggesting such an organization are related to the fact that the principles of the biology and dynamic qualities of the populations of all fish do not vary whether they are pursued for profit or for pleasure. Many fish, in fact, are caught both by sportsmen and by commercial fishermen, and the sharing of responsibility for the species by two agencies produces many administrative difficulties. In a similar way the splitting of the administration of marine and freshwater fisheries into two parts may cause

trouble, especially when fish are involved which spend parts of their lives in each medium, or in the estuaries which divide the two.

On the other hand, the problems involved in the administration of birds, mammals and other wildlife are sufficiently different to justify a separate agency in many cases, and it is often easier to get action if the two are not combined.

### THE RESEARCH PROGRAM

To be successful any program of development of a country's fisheries must depend on facts carefully gathered and interpreted. This implies research, and the establishment of a competent and active research unit, is one of the most vital aspects of setting up the administrative machinery. Included should be research on the biology and dynamics of the fish stocks, fishing gear and methods, handling and preservation of the fishery products, and marketing of the products.

These various aspects of fisheries work cover a great range of human endeavor. There are complicated problems of life histories to be solved by trained biologists, and even more complicated questions of the dynamic changes in fish populations under the pressure of fishing to be solved by bio-mathematicians.

Exploratory fishing and development and improvement of fishing gear and methods requires its specialists, trained in boat handling and other practical fishing matters, as well as in drafting, photography and other skills.

The handling and preservation of fishery products requires the attention of chemists and bacteriologists. This branch of science is advancing at the same rapid rate of others, and part-time, untrained people cannot do the job.

Marketing and promotion of fish as a food commodity is likewise a technical problem, requiring trained experts. Such endeavors can be carried out most effectively by economists, home economists and trained promoters. A considerable amount of psychology and sociology is required in this work, and not all fishery department employees have the background or ability to solve such problems.

It is clear that an expert in one field cannot be expected to solve technical problems in

another. Hence a "fisheries expert" is not any single kind of man, but one who has competence in one or perhaps two phases of this highly complex industry. This seems axiomatic, yet all too frequently biologists are expected to solve problems in gear development or marketing, or an economist is expected to advise the industry on bacterial spoilage of fish or the establishment of fishing regulations.

Ideally, then, the fisheries department should include one or more well-trained experts in each of several fields. Obviously this is impossible in most cases, and it would be an absurdity to establish an elaborate research organization in a small country, especially in the early phases of the work.

This being the case, the problem becomes one of establishing priorities in respect to what type of experts to hire. Obviously this depends on the kind of problems faced, the order of urgency of these, and the resources available for establishing the research unit. The logic of examining the nature of the problem before hiring a scientist with a particular skill to solve it seems to be unquestionable, and yet it is more common than not for staffs of laboratories to be created on paper and their duties to be set out in detail before anyone has examined the problem critically. This is regarded as one of the chief pitfalls which new administrators can encounter, and one of the all-to-common errors made in planning research programs. It is strongly suggested that plans not be created which specify "three fishery biologists, two chemists, a bacteriologist, an algologist" to be hired to staff a proposed laboratory, unless someone has already gone to the trouble of determining that these are the scientists required to solve particular problems in that area. Instead a highly competent director should first be chosen. He should be given ample time to become familiar with the industry and to judge where to start first with the research. Then he should be given time and resources to hire the best experts available in the order of greatest need. In many cases after the first one or two such men have had an opportunity to work with the problem, the director will modify his ideas and change the order of accumulating his staff. The necessity for pro-

ceeding slowly is vital here. It will not only save money initially, in keeping staff and equipment costs down, but will save much more in later years, by avoiding costly excursions up blind alleys, and avoiding research whose application to the problem is remote, but which is hard to stop after it has got under way.

Eventually, then, the government should look forward to a fisheries staff of several scientists each doing a specialized job in biology, economics, technology or some other branch. Something can be said about the probable sequence which can be expected in a typical case.

When government attention is first focused on a fishery the common initial reaction is to suggest restrictions in the name of rather fuzzily conceived "conservation". Biological problems loom large and frequently the first attention is given to seeking justification for regulations already imposed on the fishery under the assumption that overfishing has taken place. Quite commonly the inevitable reductions which take place in the catch per unit of effort under any exploitation of the fishery is mistaken for real depletion, and the problem may not be over exploitation, but any of a number of other factors, including poor catching methods, poor handling and preservation, poor marketing or even under-exploitation.

In many instances the first expert hired should be a biologist, since biological problems are often foremost, even though their real nature may not be recognized. Also, even though biological problems are not always pressing, still it is well to begin biological work early, because it takes a long time to produce useable results.

One of the first tasks, and one which should be done by a biologist, is to set up a system of collecting fishery statistics. These will form the basis of biometrical work in the future, and their usefulness depends on a long series of accurate data. For this reason the system must be established as early as possible.

It is likely that a gear expert is needed early to assist the fisherman in finding new stocks of fish and in increasing his production in the lowering cost of catching fish. This point should have study, however, since in some cases it would be unwise to increase the catch immediately since the extra fish could not be sold. Very frequently what appears to be low level,

inefficient industry is held down for lack of markets, and could materially increase production if the product could be marketed. In this case an economist or marketing expert should be placed on the staff before the gear expert.

As market demand is stimulated as a result of economic research and promotional activities, eventually the capacity of the industry will be overtaxed, and now the gear expert is certainly required to increase production. From now on marketing and catching power must be carefully balanced, since if either outstrips the other the industry may be seriously affected.

Meanwhile it is fairly certain that some assistance will be required in handling, preservation and shipping methods and a food technologist will probably be a useful member of the staff.

The caution against creating a large staff full blown before the need for their services has been established can be repeated in the case of facilities and equipment. Too often the trappings of research are allowed to stand for the research itself, and an undiscerning administrator may be led to believe that the erection of a building and equipping it with microscopes and aquaria and other paraphernalia of science guarantees results. Once again, it is the quality of the people who will determine the productivity of the unit, and equipment should not be bought until the staff exists to use it, on a carefully planned program. In particular a vessel should not be purchased until its need is clear, and the kind of work it is to do has been established. Exploratory fishing and research vessels are extremely costly to purchase, equip and maintain, and a very considerable part of a budget goes for this cost. They should not be purchased until they are clearly needed.

#### ASSESSMENT OF THE PROGRAM

Assessment of the biological aspects of a research program in fisheries is a difficult matter, but judgments of the success of other aspects are easier to make.

Accurate judgments can be made in relation to the success of gear development and exploratory fishing programs. If landings increase the total catch and the catch per fisherman can be measured in familiar terms; if new grounds are opened up and new gears tried, their impact on the industry is immediate and concrete.

Similarly, the effect of technological research is readily measurable, although ordinarily in not quite such handy terms as the last case. Improvements in quality of the fishery products is easily discernible, and reduction of losses through spoilage can be measured quantitatively. Because of the relatively clear-cut nature of these assessments it is often desirable in the early stages of a program to include some exploration, gear development and technology. Any research must be "sold" to the industry, the public and the government, and concrete progress in these fields often helps the whole program.

The success of marketing and other economic studies is somewhat less easy to judge, but even here measurement is possible. If statistics of consumption and export of fishery products can be compared, these will serve as measures of the effect of marketing activities. This requires some statistics for the period before work starts, but these can usually be obtained.

Assessment of the biological program is by far the most difficult. The ultimate aim of biological research in fisheries is to gain enough information to be able to manipulate fishing effort and the gear used to obtain the maximum sustained catch and the sizes of fish required by the market. This involves the solving of often complicated life histories and the testing of the effects of fishing pressure on the stocks. Because the scientist is studying living creatures, which exhibit great variation in the attributes being measured, and because the observations are often extremely difficult to make, definitive results are hard to obtain and come slowly. Of greater importance in the present instance is the fact that it is often difficult to see how many of the activities of the scientist relate to the solution of the problem. The gathering of production statistics and the inquiries into the activities of the fishermen may seem to be mere nosiness on the part of the biologist, which people in the industry may resent. The collection of scales, of parasites, of eggs and larvae, may seem to the fishermen—and to the administrators—to be pedantic dabbling by the scientist. No effect of the work may be noticed for long periods; indeed none is usually possible during the fact-gathering stages of fisheries investigations.

Unfortunately, even after the fact-gathering has gone far enough to make recommendations for control of the fishery possible, it is still often

difficult to detect any certain effect of the work. The impact of changes in fishing pressure on the stock comes slowly, the adjustments depending on reactions in growth rate, survival and reproduction. Furthermore, short-term effects of the regulation may be masked by variations in abundance unrelated to changes in fishing pressure, and completely unwarranted conclusions may be drawn concerning the efficacy of the regulation.

In addition, the science of fisheries has a long way to go still in developing techniques for accurate measurement of biological changes. Great progress has been made in recent years in the theory of the dynamics of fish populations, and in practical management of these, but the job of the biologist studying the complexities of living creatures is in many ways more complicated than that of the nuclear physicist. It is not surprising that the mysteries of behavior of animal populations have not yet been completely solved, so that we can predict what effect specific regulations on the predation by man, which is his fishing effort, will have on the abundance of a fish stock. Administrators and the public should be made aware of this, and not expect immediate results.

Meanwhile assessment of the biological program should be made in terms of the logical solving of aspects of the life history of the fish, and the effect of fishing on the stock. The program can be judged successful if it works out with reasonable speed the details of reproduction of the species, its growth rate, mortality rate and the other facets of its biology. Next, the program should be judged on how accurately it obtains total landing figures and measures of fishing effort. These biological and biometrical data are required to solve the dynamic equation which will eventually inform the administration how to manipulate the fishing effort to perpetuate the fishery at its optimum level.

In summary, it appears that the sequence in establishing a research unit involves first appointing a director and allowing him time and resources to pick a staff as the various members are needed. The director should be a man of high ability, adequately paid and beyond the influence of politics. He should gather a staff of the best experts possible and assign them to specific problems. The administrator's job is to provide the director with the tools to accomplish this.