III. THE ROLE OF TECHNOLOGY IN FISHERIES DEVELOPMENT IN CEYLON

By

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As an industry, Fisheries of Ceylon is unique in that it has received more attention from foreign experts than any other in the island. Hora and Pilla pointed out in 1955 that "Very few countries have had the benefit of advice from so many specialists in planning the development of fisheries as

Ceylon." The position in 1964 is even better. Now we have had the experience of nearly double that-number of specialists and reports. Leaving aside the minor ones, over 50 such reports are now avail able. Some of these are based on sound expertise ; others on local experience ranging from 20 days (Tiews, 1963) to 10 years (Kvaran, 1962.). All this is, of course; in addition to numerous other reports, advice and suggestions imposed, offered or sold by innumerable local experts of sorts. In this confusion of opinions and suggestions, it is virtually impossible for a well-meaning lay administrator to come to any decision on how fisheries should develop.

Natuarlly like everybody else, when I was young and inexperienced, I have also tried to offer and even tried to impose for a short time, my own views on how certain aspects of fisheries should develop. Now, knowing as I do the occupational hazards of research workers turning technical advisers, I hope I shall be forgiven if I restrain myself and pose before you a few problems instead of offering solutions, and at the end of my talk I shall try to place before you five aspects of the industry which to my mind need urgent solution.

If we look back over the last decade or two of fisheries development in Ceylon, we cannot help but notice the almost imperceptible revolution that has taken place. It has been imperceptible because the changes have been small, not in themselves, but relatively. As Medcof (1963) reported " even maintenance of present standards will require a supreme effort and betterment will demand the most careful co-ordination of every ounce of energy that can be brought to bear on the problem of development and developmental research." Much of this achievement has been due to the rapid and expanding introduction of modern technology to what was virtually a stagnant industry. If any criticism can be made, it is that what has been achieved has been only a fraction of what should have been achieved with the resources that have been made available. This failure as I had pointed out on an earlier occasion (de Silva, N. N., 1964) was mainly due to administrative failure in execution of policy combined with the weakness of policy due to the failure to recognise the problems, needs or aspirations in applying modern technology to a primitive industry.

Training. Firstly, there was a failure to recognise that any technological development requires the cultivation of certain minimum skills for which a certain degree of intelligence and education, is required. It is correct that in 1958 nearly 64% of our fishermen were literate (de Silva, G. N. 1964). But it is impossible to equate literacy with either education or intelligence. It is even more fallacious to equate it with the ability to receive or accept technological change. To people, who in the execution of their profession are at a stage of technological development where the use of the wheel and the pulley is not familiar, the intricacies of an internal combustion engine and other modern navigational aids as well as the modern science of fisheries become formidable problems to cope with and master. Indeed the poverty and the depressed condition of the fishing community has been quite rightly ascribed to the uneconomic techniques adopted in their occupation. It has also been stated that this is " often due to an attitude of mind which makes them view any innovation in the industry with suspicion and even hostility." It is easy to offer criticism of this attitude of mind, easy to condemn their stupidities regarding the bad maintenance of boats and engines, their lack of managerial skills leading to their chronic indebtedness — nearly 75% of the fishermen are in debt — , but is it their fault ? Have fisheries administrators realised the socio-economic impact of the introduction of techno-logy on the fishing community ? Have they taken sufficient steps to overcome the associated problems? Indeed this is one aspect of fisheries to which experts, local or foreign have paid very little attention. The only exception was Chaplin (1957) who to a small extent pointed out the need for fisheries education The little that has been done has not been executed with the urgency or pressure that is required for a technological break-through in fisheries. We can indeed profit by the experience of the Japanese who started fisheries education simultaneously with the introduction of modern technology into fisheries. There the first fishery school. the Fuki Prefectural Obama Fishery School, was started in 1895. The Tokyo University of Fisheries was started in 1897. But it was only in 1898 that Japan bought the first second-hand steam fishing boat, a Norwegian whaler of 125 gross tons named ' Orga ' as well as the steam trawler ' Henne Castle ' of 169 gross tons from Britain. At present there are over 63 high schools teaching fisheries and over 15 Universities in which Fisheries faculties have been established. They have among them over 32 training cum research vessels. I believe that even at this late stage a basic requirement for fisheries development in Ceylon too must be an extensive and intensive programme for the education and organisation of fishermen.

Recruitment into the industry. There is another aspect of the industry which disturbs me greatly, and does not seem to receive sufficient attention. It is the low rate of recruitment of personnel into the industry. According to a survey done in 1958 only 19% of the fisher parents wished their children to take to fishing. " The percentage of those who do not want their children to take to fishery work as a profession is large enough to arrest anyone's attention. . . . . With the increase of literacy among them, fisher families tend to discourage their children from taking to fishing as an occupation. The children themselves, after finishing whatever schooling they get, invariably tend to keep out of fishing ; for though fishermen are admired for their daring and enterprise in braving heavy gales and high seas in pursuit of fish, yet fishing does not seem to reach as high in the eyes of many as do occupations like carpentry or farming " (de Silva, G. N., 1964). The percentage of new entry into fisheries is lower than 5. It has been estimated that the total increase in the fishing population compared to the existing one is very low indeed and is about 1%. With modern free education and the privilages attached to agriculture and industrial employments, the rate of recruitment into fisheries is not only comparatively low but also very poor in quality. Indeed it is those who fail to do well at school, who are unsucessful in their attempts at entry into any other profession. that drift into fisheries. Can we usher in a new era of technological advance with this quality of human material? Surely something must be done to attract young people who are keen and intelligent into the industry. Something must be done to increase the prestige of fishing as a profession if we want the anticipated break-through in fisheries to be a reality. For ultimately the success of any technological advance is dependent on the human element which exercises it and no amount of expertise or capital investment can compensate for the poor quality of this element.

Objectives. At this point let us turn our attention to the objectives of fisheries development. It is important to be quite clear in our minds what we wish to achieve and where our targets must be fixed. As Medcof (1963) put it " Many people including administrators are guilty of thinking in in circles. . . . . Their first task is to clarify their own thinking." Indeed much of the confusion in fisheries may be traced to this confusion of aims. Let me give an example. During the early forties a brave attempt was made to organise fishermen's co-operatives. Looking back on the long sad story of our failure in this direction one cannot help but notice the confusion of aims that led to this disastrous and expensive failure. We were not sure whether to foster the co-operative spirit among fishermen or try to develop fisheries. We ended up by achieving neither.

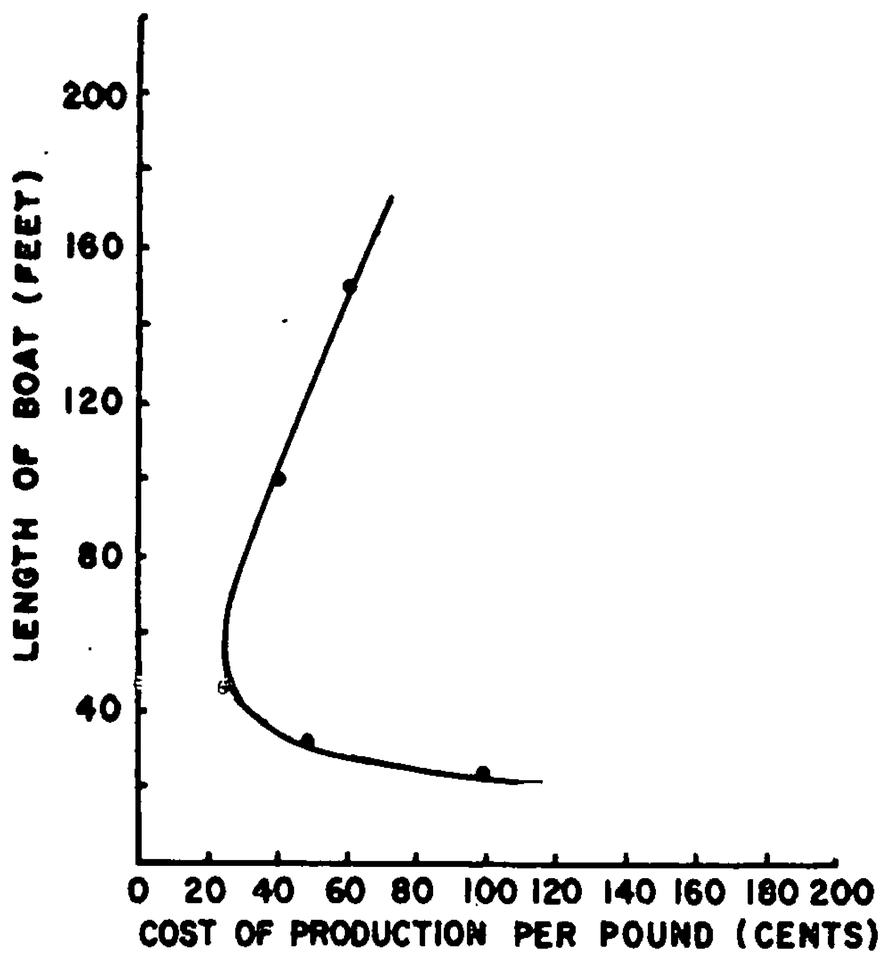

Fig. 14 : Relationship between size of boat and cost of production per pound of fish (near-water fishery, in-shore and off-shore trawlers).

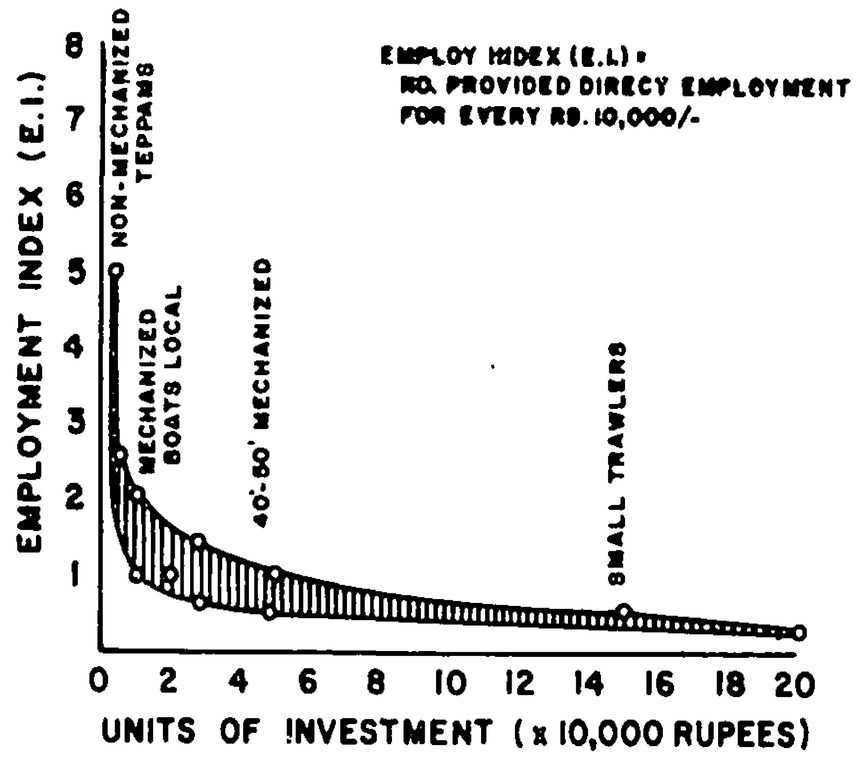

Fig. 15 : Employment Index per unit of Investment in fishing craft.

What do we want to achieve by fisheries development ? Supply fish as protein at any cost to a protein-starved population ? Ameliorate the terrible economic condition of an important segment of our community ? Save foreign exchange ? Justify political slogans ? Or even prove the advantages of one particular type of administrative organisation over another for economic development ? All these are very worthy aims. But can they all be achieved at the same time — particularly with a short term plan ? Let us by all means run towards our goal, but let us be sure first where we want to go.

This confusion of aims makes it very difficult to decide on any matter in fisheries planning. Take for example the development of the fishing fleet. The rapid development of fisheries requires heavy capitalization and the related monitoring of the fishing fleet. In this development attention must be paid to the different aspects of the industry so that it takes place in all segments of the industry simultaneously without hindering each other or the entire industry. Thus the number and size of boats will depend on what aspects of the industry we wish to develop urgently. Reference to figures 14,15,16 shows that—

(*a*) as far as economy of operation is concerned (lowest cost of production per pound of fish) a home built 50 to 60 foot boat for fishing within a 100 mile range and costing about Rs. 60,000 with a crew of 10 will be best. (Fig. 14);

(*b*) in terms of maximum employment per unit of investment, mechanization of existing craft and the mechanised 25 to 30-foot boats are to be preferred. (Fig. 15);

(*c*) for increasing the catch during the shortest possible time with the minimum of effort deep sea fishing boats (trawlers and tuna clippers) are to be preferred. (Fig. 16).

Thus any discussion of the nature of the fleet, to what extent one type of vessel should be preferred to another, and in what proportion, the spread-out of investment on the fleet, will all be determined by what objectives we have in mind.

To me, speaking as a citizen of this country more than as a fisheries research worker, the main aim of fishery development should be to make available to us plenty of fish at a reasonable price and in good condition. According to Bertram (1948) however, " the important objective in any fishery development is the emergence of the fisherman as an individual and as a class, as an active contented and independent member of the community. So ultimately will his efforts help in the attainment of higher standards for all." Holliman (1962) on the other hand thought that the objectives of fisheries in developing countries are two fold : (i) to bring about a rapid increase in fish production in order to improve the intake of animal protein; and (ii) to make parallel improvements in fish marketing and distributive facilities, and set up ancillary services that are required to carry out these developments, e.g. ship-building facilities, improved landing and harbour facilities, cold stores, fish processing and by-products plants, road-transport and housing. Whatever the objectives, they must be clarified first and foremost if we wish to plan wisely and get anywhere near success in the execution of these plans.

Socio-economic needs. Whatever the objectives are that we wish to have, there is no doubt that we shall be making a mistake, a very serious mistake, by neglecting the socio-economic aspects of the industry especially those of the existing fisheries. Planning a brand new deep-sea fishery is well and good and it is, I must say, most fascinating. But it must not be forgotten that the backbone of our fishery is and will remain for some time, the inshore fishery that is at present being carried on. To my mind, the best immediate returns, the most spectacular advance possible need not be proportional to the degree of potential investment. Indeed heavy investment in a deep sea fishery in international water where there is still no agreement on catch quotas, is I think a great risk particularly for a tuna fishery which is very sensitive to overfishing. One sometimes tends to forget during daring exploration, the much trodden but less risky paths to economic advancement. Let me give an example. If we take our existing small boats only, that is, the non-mechanized craft, mechanized traditional craft and the mechanized boats, and with these existing number of craft and personnel attempt to improve their performance for a modest increase of 10 % over the present catch, we shall be getting annually an extra 132,000 cwts. of fish. This is equivalent to the catch of some 12 or 15 tuna boats which would require an initial investment (mostly in terms of foreign exhange) of over 30 million rupees. The ease with which this 10% increase over the present catch can be achieved is

evident from Table I in which the reasons for loss of fishing time for a sample of mechanised boats is classified. There was a total loss of 65. 77% fishing days, mostly due to migration from one coast to another during alternating seasons, (14.18%), engine faliure, repairs or seizure (13.13%) and other social factors (13.32%). These must be contrasted with such inevitable factors like bad weather (8.58%) and holidays, festivals, etc. (9.18%).

TABLE I

ANALYSIS OF CAUSES FOR LOSS OF FISHING TIME

From the start of fishing operations the percentage of days in which there were no operations= 65.77%.

Breakdown analysis of the reasons for the faliure to operate the boats :

	%
Sundays, Poya Days and festivals	9.18
Seizure, engine failure and repairs.. ..	13.13
Bad weather	8.58
Reports of poor fishing by others	5.01
Lack of bait	1.70
Migration	14.18
Other social factors	13.32

Thus it is evident that socio-economic measures alone will increase the fishing time considerably (41.26%). With an adequate supply of bait it could be further increased. Thus double the catch is theoretically possible. Surely then a 10% increase out of a possible 50% is possible with the simplest socio-economic measures. According to my calculations these measures need not cost us anything more than 1.5 million rupees, about the cost of a single trawler. This money, even if we fail to achieve the target, will remain in Ceylon and at worst may be considered a subsidy to a sector of the industry, which has hitherto received none, except in the form of untaxed salt.

I am not for a moment suggesting that we must not go in for deep sea fishing or even that we must postpone such a venture. Indeed we should make this venture. The earlier the better. Only when embarking on a deep sea fishery that we should not forget the folks at home.

Marketing. Let us next take the case of fish after landing. I do not yet know what plans have been formulated but it disturbs me that the present channels of distributing this highly perishable commodity are nowhere near adequate to cope up with a sudden increase of production in bulk. It must be remembered that early attempts at trawling in Ceylon failed due to the lack of a sufficiently well organised marketing system. Even now if the catch is doubled at a fishing centre there is a local saturation of the market and a choking of the distributive channels, leading to a disastrous drop in prices. It has been shown that the economics and the productive capacity of a fishery are often limited by the efficiency of handling on shore. Efficiency in this direction is a measure of the ability to distribute fish in the widest area with the least possible delay and expense. Here naturally modern technology has a vital role to play. My limited experience has shown that much of the technology of fish handling evolved for temperate climates and temperate varieties of fish is not necessarily the best or even suited at all for our conditions in a tropical climate. In this sphere considerable re-thinking is necessary. But are we doing anything in this direction ? Some research is being done but in proportion to the problem it is woefully inadequate. This type of research leading to a rationalised distributing system will bring in immediate returns.

Looking at it in another way, let us examine the composition of the price of fish. Tables II and III show the break-down of the price of the fish in Ceylon compared to that in the U. K. A. number of intersting facts appear to emerge. Firstly, the proportion of the total price that goes to the fisherman is not very different, 52.5% in U. K. and 41.4% in Ceylon. Secondly, and it is the most significant observation, the margin of profit in U.K. is only 4.68% while in Ceylon it is as high as 39.4%. The expenses for distribution are just the reverse ; in U.K. it is 42.83% and in Ceylon 19.2%. From the figures available to us the greatest expense is borne by the wholesale mudalali at St. John's market in Colombo. This is mainly by owning or paying for the transport rather than in any other way. Finally it is also clear that while the U.K. retailer spends as much as 21.05% for selling his fish, in Ceylon the retailer incurs an expense of only 2.7% of the retail price of fish.

TABLE II

COMPOSITION OF THE RETAIL PRICE OF FISH IN CEYLON

	Expenses	*Profit*	*Total*
Producer	? ..	? ..	41.4
Beach Mudalali (Port wholesaler)	.. 3.0 ..	5.5 ..	8.5
St. John's Mudalali (Inland wholesaler)	.. 13.5 ..	23.9 ..	37.4
Fish Monger (Retailer) ..	.. 2.7 ..	10.0 ..	12.7
Total	.. 19.2	39.4	100.0

TABLE III

COMPOSITION OF THE RETAIL PRICE OF TISH IN U. K.

	Expenses	*Trade surplus*	*Total*
Producer	.. ? ..	? ..	52.50
Port wholesaler ..	.. 15.45 ..	0.91 ..	16.36
Inland wholesaler ..	.. 6.32 ..	0.73 ..	7.05
Fish Monger	.. 21.05 ..	3.04 ..	24.09
Total	.. 42.83	4.68	100.00

It is my opinion that this cutting down of expense on the sale of fish is done at a terrible price. My assistant, Mr. A. H. W. Mendis, has been conducting a survey of the bacteriological quality of marketed fish in Colombo and its outskirts. There is a certain group of bacteria the numbers of which are an index of the degree of potential contamination of food by disease causing germs. Reference to Fig. 17 shows that much of our fish gets heavily contaminated at St. John's market, partly by bad icing, use of unhygeinc fish boxes and most of all by being thrown about on the floor of the market. The simple washing that is done at the retail market lowers the bacterial count. But still the levels of contamination are sufficiently high so that, by any standards, much of the fish for sale should be condemned. The presence of high levels of bacteria also lead to quicker spoilage. Hence apart from the health hazards even the quality of the fish becomes poor.

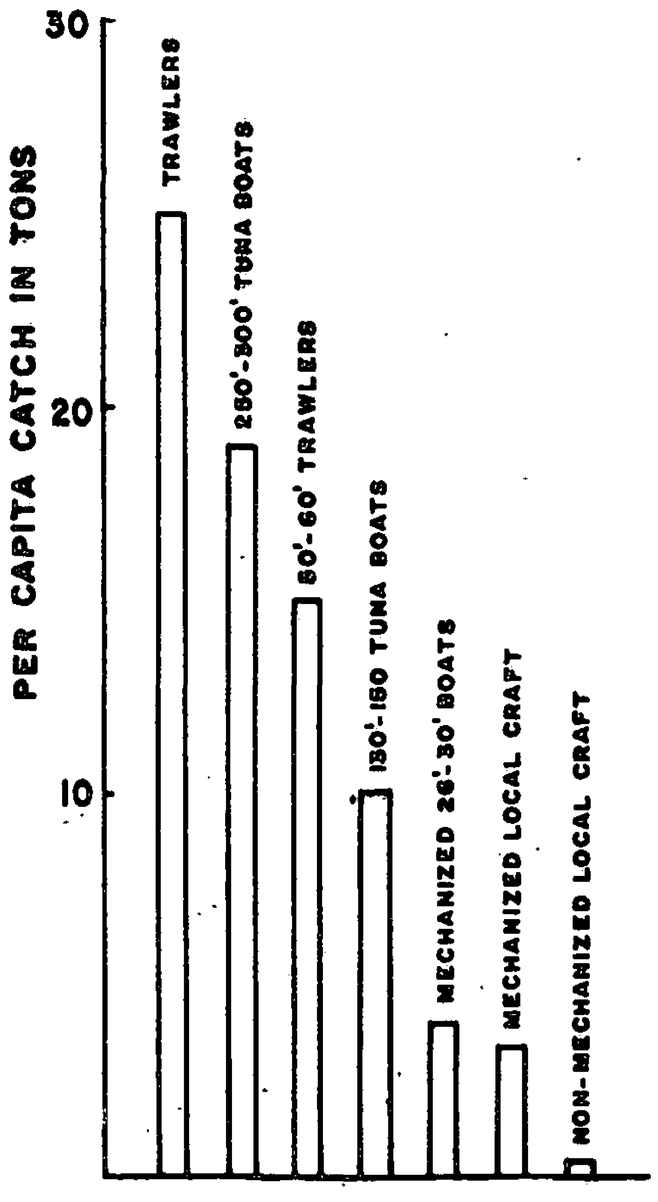

Fig. 16 : Catch per man on different types of fishing vessels.

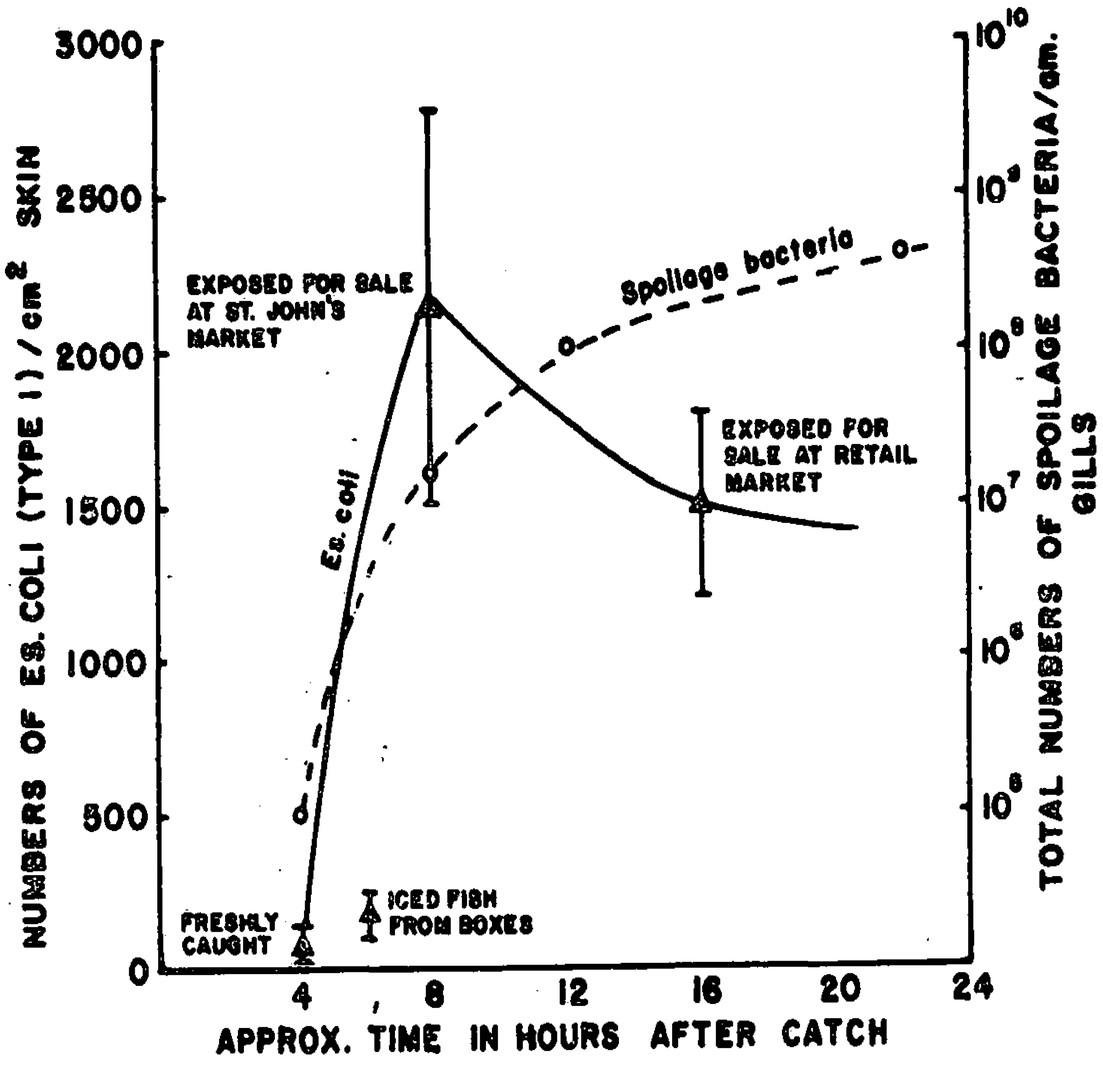

Fig. 17 : Increase of Bacterial Flora during Sale and Distribution of Fish in Colombo, Ceylon.

If we, as I think we should, channel 20% of our profits to efficient handling and increase the handling expenses to 39.2%, there is still a margin of profit of 19.4%. If we are content with a surplus of 10%, then indeed the price of fish can be cheaper to the consumer by 9.4%.

About traditional methods of preservation, I shall comment only briefly. Certainly we must try to improve traditional processes and rationalise their production. But we must not fall for the fallacious argument that all traditional processes are sutiable for the local market. Often they have lasted for want of anything better and given another alternative, such markets have dwindled away; for example, the salt-fish market in Europe. There is another group of fishery products which are specialty products and used as condiments or appetizers, eg. Maldive fish in Ceylon. Naturally it is expensive to produce but I do not think there is anything secret about its method of manufacture. In this instance technology can help by developing a product very like the original but a lot cheaper. Indeed even much of the caviare that is sold in the world today is not made as originally from the eggs of the sturgeon. Speaking for myself the simulating product appears to me much more tasty and desirable than the original. I believe the same can be done with Maldive fish.

The final point about fish preservation technology is that we are here working in a highly dynamic field. Technology must adapt itself to changing social conditions. Growth of suburban towns is accompanied by new methods of sale and display of food. Here packaging has an important role to play. And fish preservation technology must also adapt itself to it, for otherwise we shall be losing our potential markets steadily and surely. For instance, a few years ago only a few of our women went out to work. It has become very common now. In these conditions we should explore the possibilty of selling pre-cooked food, particularly fish. We must not be frightened about new and modern techniques. For example I believe that irradiation will prove, before long, one of the best and cheapest ways of preserving fish in tropical countries and that it will considerably help in our distribution problems. For, by this means fresh fish can be distributed and sold without ice. If we must catch up with the rest of the world we must not walk but run at top speed.

Even with the use of ice as at present, much can be done to provide good quality fish at a low price by rationalising the distribution, Technology has a vital role to play in the rationalisation of the stowage of fresh fish in Ceylon. For instance the widely proposed principle of having a large number of small, badly maitained Ice Factories at large numbers of isolated Fishing Centers has very little to commend it not even on the usual formula of being useful to the community. On the contrary the tendency in many countries has been to plan for centrally situated Ice and Storage Factories (so-called inland distributing depots) of sufficient dimensions to justify their overheads. This is obviously important in Ceylon where fishing intensities fluctuate between the East and the West coast during alternative monsoons. This situation of the ice factories in the central parts of the island must of necessity be linked with a centralised distribution scheme which adjusts carefully the distribution pattern on a day to day basis according to the variations of demand and supply.

It is often forgotten that fish, a highly perishable commodity, has to be preserved from the time it is caught. Whatever way we look at it, fish preservation is an expensive business—every hour between capture and sale of fish, adds to its retail price. Thus the application of modern technology to fish preservation and distribution is, if not more important, as important as the application of technology to fish capture; and investment in this field, often neglected, will certainly bring in better returns than in any other field of fisheries development in Ceylon.

Research.—Finally, what role must research play in this break-through that we all anticipate in fisheries development?

Upto now—and I say this with emphasis—fisheries has been the playground of various racketeers, dishonest fishermen and unscrupulous fish-mudalalis, big-business tycoons and commission agents. Naturally they have resented and continue to resent any kind of objective and scientific advice which may be contrary to their own prejudiced views and interests, on how fisheries should develop. It is also accompanied by a concerted attempt, not only by them but also by shallow self-styled, bogus, experts among some of our administrators, to under-estimate and despise local technical officers. I, for one, do not and cannot claim to be an expert on fisheriers, not even in my own speciality. But with all humility as a research worker, may I say that I have a role to play in the industry and it pains me that hitherto I have not been permitted to fulfil that

obligation. Our advice may not always be correct, and there is no obligaton to accept it. But we have at our disposal all the facilities to give objective and scientific advice. At least this advice has much less chance of being clouded by the desire to earn that fast buck.

In as much as a medical practitioner is consulted for the cure of bodily ailments, technical ailments need practitioners of science. When we consult a medical practitioner we will not, in our own interest, try to give a diagnosis; least of all request from him the treatment we desire. But my experience has been that many administrators are prone to seek advice from practioners of science when the cancer is far too gone and then also to suggest the diagnosis, the prognosis, as well as the cure. If modern technology is needed for fisheries development may I humbly suggest that we be asked—for what it is worth—at the very outset. In technology as in medicine prevention is better than cure. If there are still any symptoms of disorder, please let us know, If we suggest a treatment please carry it out. If however you are not satisfied with the treatment go to other practitioners, for you need not pay scientists and not use them, unless you consider that the scientific service is another sector for unemployment relief work.

This is as far as advice is concerned. But sound advice in technology can only be based on ound research. As I pointed out earlier, the problems of our fisheries are peculiarly our own. Research done elsewhere can help: but unless we know the limitations of that research under the needs and conditions of our own country, advice based on that alone can prove to be disastrous. Thus we must know intimately the peculiarities of our own enviornment first of all. Much of our research must be directed to this end.

But once a problem arises the cure must be immediate, and has to be based on what is already known. We cannot look for new antibiotics to cure an acute diarrhoea. But good research workers anticipate the problems of tomorrow and research into them. For this purpose it helps us a lot to know what is being planned for then we have a greater chance to anticipate the problems accurately.

An example of lack of research in this way was spot-lighted during the mechanization of boats in Ceylon. Much of the catch they brought in was sharks. The market for them was poor because their utilization was poor. If we had known and experimented on how this increased shark catch could be utilized or preserved, perhaps the mechanization programme might have been a greater success. The problem of shark utilization incidentally is still with us. For with the proposed introduction of new tuna boats I anticipate increased shark catches and it might well be that the difference between profit and loss during their management will be determined by our ability to utilize sharks effectively.

As scientists we have an obligation to conduct what is termed long-term research, the type of work the results of which may or may not prove to be of any immediate use. But even if 1% of such research yields any useful results, such advances that will accompany them will indeed be worth the entire expense of the research programme of the entire country. All of us have a bit of the gambler in us and though it seems difficult to justify I hope fisheries administrators will look upon with some benevolence, small degrees of such 'gambling' that we sometimes try to do. Of course the winnings are all yours. But more important to us, such research helps us to retain our sanity and our sense of proportion.

Conclusion. Based on what I have said I suggest we think in terms of the following short-term five-point programme for the development of fisheries in their order of priority:

1. An intensive and extensive recruitment, training and educational programme within the industry.

2. Immediate socio-economic measures to ameliorate the economic condition of the fishing community and increase production by 10% in the first year.

3. Plan and execute a rational and efficient sale and distribution scheme for fish.

4. Take steps towards the development of a deep-sea and mid-sea (off-shore) fishery.

5. Expand the activities and gear the working, of the research division to achieve the self-sufficiency target in 3 years.

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(4) *Fish Food :* The blue green algae play an important part in fish culture. The algae live on organic substances found in polluted waters. Their natural habitat is water foul with organic matter. One of the most important fish of the tropical Pacific is a large fish called milk fish (*Chanos chanos*) which is silvery in colour. These marine fish when kept in captivity in ponds feed on certain algae. The fry of milk fish collected from the sea are transferred into ponds containing a species of a blue green alga *Lyngbya*. This is filamentous, delicate, and slender, enclosed in a gelatinous sheath. They form the diet of this fish for three months. After three months they are transferred to ponds containing green algae, species of *Cladophora* and *Chaetomorpha*, which are much coarser than *Lyngbya*. Arter a further perid of two to three months they are transferred into ponds containing another ribbon like or tubular green alga, species of *Enteromorpha*, on which they feed until they are harvested.

(5) *Plankton :* Phytoplankton plays an important role in fisheries. A few examples are given below :—

Prediction of Mackerel fishery : The mackerel feed on copepods which in turn feed on phytoplankton. In England, for example, when there is plenty of sunshine in February, there is an abundance of phytoplankton in March and April thus producing food for copepods which in turn form the food of mackerel. Thus the quantity of mackerel is caught in abundance in May. If sunshine is poor in February very little phytoplankton is produced in March and April and the quantity of mackerel caught is small.

Red tide : The constituent organisms in the red tide vary with circumstances. Blue green algae, diatoms and dinoflagellates are significant factors causing red tide. Red tide is a menace to oyster culture. The dinoflagellates get entangled by viscous slime secreted from the gill of the oyster. These plankton choke up the gill causing difficulty for the oyster to breath. The damage can be rectified by removing the oysters from the area of the red tide or destroying the red tide by scattering copper sulphate in the water.

Departmental Work

(1) *General Survey :* In 1952 the Ministry of Fisheries and Industries became interested in the study of seaweeds. Accordingly I was instructed to carry out a survey of the seaweed beds and seaweed resources of the Ceylon coast. The above investigations were divided into three stages :—

(*a*) Systematic identification of all marine algae.

(*b*) Regional distribution of all marine algae.

(*c*) Sorting of varieties which are of commercial value.

For the purpose of this work the coast of Ceylon was divided into 8 sections :—

(1) Jaffna coast and lagoon.

(2) Jaffna islands and the surrounding seas.

(3) Palk bay between Punari and Vidateltivu.

(4) Region between Mannar and Kalpitiya.

(5) Puttalam lagoon.

(6) Region between Kalpitiya and Ambalangoda.

(7) Region between Ambalangoda and Hambantota.

(8) East Coast.

This work was confined to the littoral region from shore land to a distance of 50 feet. All the different types of algae were collected right round the coast of Ceylon. These were identified and along with their regional distribution were published in Bulletins Nos. 10 and 15.

(2) *Red seaweed survey :* During the survey it was observed that there were two commercially important red seaweeds called *Gracilaria confervoides* and *Gracilaria lichenoides*. These varieties ase commonly known as Ceylon moss. I carried out a survey of these varieties as there was a good