

## FIRST CHANDRA KALA HORA MEMORIAL LECTURE.

### GROWTH OF THE FISHING INDUSTRY: SIDELIGHTS ON FIFTEEN YEARS' WORK.

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I think myself singularly honoured to be called upon to address this assembly. I realize that I have a formidable task before me and that I must be careful in speaking of fish for the subject is not only a fishy but a tricky one. I am reminded of the words of David Star Jordon, Chairman of the International Fisheries Commission, who once remarked that as sharks lie on the bottom of the sea and trout lie in the streams there can be no just complaint if men who fish for them also lie. I assure you that I shall be an exception, as I do not view with pleasure the prospects of being pulled up.

#### Introduction.

I confess that it is with much diffidence that I attempt to discharge the task entrusted to me today. The subject of my discourse is beset with numerous difficulties but these are resolved, to some extent, by the terms governing the award which the Council of the National Institute of Science has been pleased to bestow on me. I am expected to address you according to the terms of the award on the subject of my work. The theme is not novel, and having devoted more than half of my lifetime to the study of fishes, in one form or another, I think I may be able to present to you a picture, incomplete, I fear, of such results as I have been able to achieve.

The theme of my address is, to put it in a nutshell, the subject of my work, which, fortunately or unfortunately has so many ramifications and touches the life of the fishermen and their industry at so many points that I do not know what to say, leave alone where to begin.

#### Theme of discourse.

I hope I shall not be considered to be lacking in modesty when I claim with all humility, that the Fisheries Department now under my charge is, to a large extent, a creature of my making. I played the rôle of a midwife at its birth. The infant of that day has grown to be a lusty child, having successfully overcome its teething troubles. It promises to become in the fulness of time a worthy giant in our country's life, provided that we show foresight in our approach to its various problems.

The year 1934, seems to me but yesterday, for I vividly recall at this moment the frail fishing craft (Plate IX, fig. 1), equipped with only a nine horse-power engine,

#### Start of New Era.

which slipped down a suburban beach to inaugurate the start of a new chapter in the fishermen's life which till then had appeared changeless through the centuries. That event was symbolic in two senses. It marked not only the introduction of the use of power-propelled craft in the fishing industry in Bombay but also the beginning of the present Fisheries Department.

Till then, the means of transport of fish from our fishing fields to the city had been at what, for the lack of a more expressive term, might be called the bullock-cart stage. The bulk of our supplies of fish was derived from areas in the sea within easy reach of the city. Supplies from further afield were wheeled to the city by train and cart or brought by sailing craft. Fishermen were content to pursue their calling very much as their ancestors had done for countless centuries. The

performance of that small vessel which slipped down the suburban beach opened up a new vista to the fishermen in our province.

The sphere of operation of the vessel was expected to be 20 miles north and south of Bombay, but the vessel, frail as it was, made history. Risks were taken

and the range of voyages has gradually widened. Every Stimulus to progress. achievement, howsoever insignificant and paltry, was an incentive to further effort.

The launches, built for a specific range, have shown themselves to be possessed of the attributes of the seven-league boots. Their range of operations extends now from the Makran Coast, off Baluchistan, in the north, to Coondapur in Madras Province, in the south. The distance traversed on the round trip to Makran is about 1,400 miles, and that to the south 900 miles. Always, the impulse has been fresh fields and pastures new, with the prospects of larger harvests from untouched regions of our extensive coastline.

Not a year has elapsed since 1934 without newer, better and more powerful vessels being put into commission. Stimulus to progress has been provided by the existence of rich fishing fields which came to light when one or another of the launches chanced to visit them. The operation of the launches has conclusively established that there is no part of the coastline of this province, or even beyond, which cannot be made to serve our city's needs.

The success which attended the operation of the initial launch has kindled many enterprises, which have now become vital and indispensable features of the trade.

**Villages awaken.** The operation of the launches has brought unforeseen prosperity not only to diverse concerns but also, above all, to the sleeping fishing villages on the coast, which have been awakened from their centuries-old slumber and galvanized into activity befitting our modern age.

The number of vessels comprising the fishing fleet today is over 48, representing a total capital investment of about 40 lakhs of Rupees. The largest vessel in service tapes 112 feet from stem to stern, and is equipped with diesel engines developing 500 horse-power (Plate IX, fig. 2). A vivid idea of the vessels in service, their dimensions, their B.H.P. and their value may be formed from the statement pp. 218-19.

The successful transport of fish in these vessels has incidentally served as an eye-opener. It has indicated the great scope for their use as a means to develop the commerce and trade of the coastal regions. One respect in which these launches surpass regular coastal steamers in their easy manoeuvrability and the extraordinary facility with which they can worm their way into, and out of, narrow channels and creeks leading to inconspicuous ports which cater for the needs of their particular area. There is a vast and promising future for launches of the present description and it is no vain hope that in the years to come a good deal will be heard of the use of small power-propelled craft to minister to the requirements of growing industries all along India's coastline.

The figures below will enable you to form some idea of the expanding volume of fish brought by the launches to the city.

Year.	No. of launches.	Weight of fish. lb.
1933-34	.. 2	55,520
1934-35	.. 2	1,66,125
1935-36	.. 3	2,39,446
1936-37	.. 3	4,04,679
1937-38	.. 4	5,17,964
1938-39	.. 9	15,76,682
1939-40	.. 9	25,04,000

Year.	No. of launches.	Weight of fish. lb.
1940-41	9	22,64,000
1941-42	10	27,24,000
1942-43	8	28,34,000
1943-44	9	11,54,000
1944-45	11	12,18,000
1945-46	15	30,04,341
1946-47	23	30,86,425
1947-48	30	35,00,000
1948-49	50	63,16,828

By far, the greatest boon accruing from the operation of the launches is the unparalleled activity their presence has led to in small fishing centres along the coast. Fishermen there now strive their utmost to make as large catches as possible. The launches bring, as it were, Bombay's rich market to their very door-step, where, without the trouble of coming the long distance to Bombay, they can dispose of their catch at prices far more remunerative than those which they obtained in their villages when there were no launches (Plate X, figs. 1 and 2). Figures will speak eloquently of what the launches have accomplished. Prior to their appearance along the coastal villages, mackerel used to be sold at about 12 annas to a rupee per thousand. Today the very fish fetch the fishermen anything between Rs.15 to Rs.60 per thousand, a price which represents a substantial improvement of their economic condition.

Moreover, in the old days, before the launches started plying fishermen either cured or converted into manure such fish as they could not sell to their neighbours. The launches have been a sort of master key which have unlocked to them wealth which was beyond their ken a few years ago. One estimate, by no means exaggerated, suggests that fishermen in the Ratnagiri and Kanara District alone derived last year Rupees four lakhs, compared with barely Rs.10,000 obtained by the very fishermen in 1935, when the launches first made their appearance there.

The significance of their increased earnings is plain. A great amount of new wealth has poured into areas, which were proverbially noted for their backwardness. The purchasing capacity of the fishermen there has greatly risen, as is reflected not only in their more prosperous condition but also in their improved mode of life. At the same time, there has been a mental awakening among fishermen, who show signs of eagerness to modernize the industry.

One noteworthy sign of this mental awakening is to be seen in the increasing tendency among fishermen to identify themselves more intimately with the trade than before. Statistics are not available but there is evidence that fishermen, instead of forsaking their craft for easy sources of revenue, are concentrating more enthusiastically on the development of their industry which they now realize is as profitable as any other line of business.

It had never been expected that a 14-foot vessel, equipped with a 9 horse-power engine, would germinate into a fishing fleet unrivalled in the country. We are a far way behind European, American and Japanese standards, but compared with 1933, Bombay today can boast of some progress.

Curiously enough, the launches have not led, as anticipated by their original opponents either to any diminution in the volume of fish which fed the fish curing yards or to a dearth of supplies in the coastal areas they served. On the other hand, the fish curing yards have

**Fears falsified.** registered a progressive increase in their sale of salt. Their turnover is much larger than at any time before the appearance of the launches. This will be evident from the figures on the next page.

Year.	Quantity of fish cured in maunds.
1925-26 to 1927-28	.. 5,43,835
1928-29 to 1930-31	.. 6,05,061
1931-32 to 1933-34	.. 5,15,320

*Department established in 1933.*

1934-35 to 1936-37	.. 5,62,480
1937-38 to 1939-40	.. 5,82,570
1940-41 to 1942-43	.. 7,32,453
1943-44 to 1945-46	.. 7,72,612
1946-47 to 1948-49	.. 7,71,929

The unremitting efforts fishermen make to augment their catch in order to meet the needs of launches have proved a blessing in disguise, for not only people along the coast but also in its hinterland get more fish than before. Availability of larger supplies in these areas does by no means signify that their demand has been met to the maximum. This is not so, for the areas are capable of absorbing much larger quantities than now find their way thither.

The universal complaint, today, whether in Bombay city or in the districts, is scantiness of supplies, despite the threefold increase in the quantity of fish now brought to the city's markets. The quantity of fish landed in Bombay in 1934 was 10,000 tons, whereas today it totals 30,000 tons.

Such modernization as has now marked the industry would, five years ago, have encouraged the hope that supplies were at least on the way of balancing the demand. These expectations have, however, been nullified by the unparalleled influx of refugees, nearly 90 per cent of whom eat fish. Another totally unexpected addition to the ranks of fish eaters is the labour class. Fish was, not long ago, a monopoly of the wealthy and near-wealthy but this comestible is today in ever-increasing demand among those belonging to the humbler walks of life.

Many of our indigenous labourers were formerly vegetarians from necessity and not by choice. Times have, however, changed and not only our labourers but also their palates have changed. This change is due to the larger pay packets they now receive. Thus, the influx of refugees and the higher purchasing capacity of the toiling masses have completely offset what might have been the normal benefits of the increased quantities of fish landed in the city. The advantage of the increased catches of fish, which are almost treble those of pre-war years, is thus only illusory.

The problem now before us is extraction of more fish from the sea, and its effective solution will overcome the present perplexing issue of inequality of supplies to demand. The problem of the use of power-propelled vessels and mechanically operated nets for the capture of fish is, however, not singular to our province, but confronts every province in India which has anything to do with fisheries. This remark will conjure up pictures of superships of the industry, such as trawlers and draggers, which bring to markets of western countries voluminous supplies of fish. The effectiveness of these vessels is unquestioned, as has been amply demonstrated by trawlers which have operated in our waters. Sizable hauls have been made by trawlers in Bombay, Bengal and Madras, but an unexplained fact is that these vessels have not been financially successful, as the cost of their upkeep, loss and damage to nets far exceeds the amounts derived from the sale of their catches. The economics of this type of vessels must be closely examined from every point of view, to ensure that they do not prove to be liabilities.

Experience underlies the advisability of caution in the introduction of such large vessels in our waters as the economy of our fishing industry is not yet fully prepared for startling innovations. Only thus will every step forward be not only consolidated but interlinked with what has previously been achieved. In the fishing industry, unlike most other commercial enterprises, humble beginnings are preferable, specially for people unacquainted with the achievements of modern science.

Even the United States, which is accustomed to technological development on a mammoth scale, prefers small boats for the industry, although its turnover amounts to millions of dollars. I observed during my short stay there, the useful and valuable rôle played, both on the Atlantic and Pacific coasts, by vessels built on small proportions, and equipped with engines of small B.H.P.

Mechanization cannot be attained over-night. Approach to it has to be cautious, due regard being paid to the age-old customs and prejudices of people still accustomed to a primitive economy and mode of life. No useful purpose will be served if the practices and technique of the fishing industry in the countries of the west are to be superimposed on our fishermen without measures being taken, simultaneously, to acquaint them with the rudiments of mechanization. The most prudent course, in the circumstances, would be to associate the fishermen, from the very outset, with every scheme designed for the improvement of their craft. This objective has been in the forefront of every programme to secure not only betterment of the fishermen and their economic condition but also improvement of the meagre supplies of fish available to the public.

Our fisheries are most productive shortly after the monsoon, fish being available at no great distance from the shore. The fish begins to disappear mysteriously

**Seasonal factors.** towards the end of the year when the shoals become progressively thinner, compared with the densely packed shoals which early in the season approach the shores, resembling in volume and extent very much waves of troops converging or falling on a key target. Catches soon after the monsoon are plentiful, whether fishing operations are carried out by power-vessels or sailing craft. Extensive use of either of these types of small vessels will yield maximum results.

This view is borne out by the observations of Dr. J. O. F. Hardenberg who was head of the Laboratory for Investigations of the Sea at Batavia. He expressed the opinion that our country's fisheries were scattered over wide areas and that only the promotion of small enterprises would furnish an estimate of the total potentialities.

In the circumstances, the most effective methods for capture of fish would be, at least, in the early stages, use of small powered vessels in conjunction with the various types of drift nets and long lines, as these can be employed both in comparatively shallow and deep waters. The shallow waters are, according to our present knowledge, most productive, as is evident from the satisfactory catches made by fishermen even now by their primitive methods. Some of these are most ingenious, and every effort must be made to adapt them to the modern requirements of the industry.

A method of fishing which appears likely to yield fruitful results is the use of the purse-seine, which is extensively employed by American fishermen both on the Atlantic and Pacific coasts.

The purse-seine represents the acme of American fishing skill. Its British counterpart is the ring-net as used by Scottish fishermen at Whitby in Yorkshire. The basic principle of fishing is the same, *viz.*, to surround the fish and purse the mouth. There is, however, a variation in the technique which differs according to the type of fish to be bagged. The basic principle of the purse-seine has remained, fundamentally, unaltered throughout the years, changes having been made in the light of experience as well as experiments in the actual handling of the nets. This

has resulted in a saving of human effort, enabling the fishermen to make sets expeditiously.

The opportunities I have had to accompany, purse-seine and ring-net fishing vessels convince me that they are the most effective weapons for the capture of fish and their introduction in our waters to capture mackerel, in the first instance, would furnish the answer to most of our problems. The efficiency of the net is more than established by the fact that it is the basis of the flourishing canneries which exist in the U.S.A. and U.K. Canning of fish would not be the paying industry without copious and unfailing supplies of fish, which are made possible by the use of purse-seines.

Results achieved by the advanced fishing industry in other parts of the world conclusively show that the basic factor, on which improvement of the industry hinges is the increasing displacement of the present sailing boats by power boats. The example of Japan in this respect is a lesson we must not only read but re-read. Japan's leadership in fish production and exploration of new fishing grounds did not just happen. It was carefully planned. About the beginning of the century Japan's fisheries were conducted in primitive sailing craft. In 1941, the Japanese fisheries used 72,000 power vessels to make their catch.

I have all along felt that the fishermen have to be carried with us if experiments are not to end unsuccessfully. They have to be made to feel that they have a stake in the success of the experiments, for, without this conviction on their part, all official enterprise will be, at most, of academic interest.

My Department's next move is to show that just as power-craft have replaced sailing boats for the transport of fish, so also mechanized vessels can be used to

**New types of boats.** catch fish. With this end in view, power vessels corresponding, in essential features, with the present undecked sailing boats have been built (Plate X, fig. 5). Engines of suitable horse-power have been installed in these vessels, so that fishermen are able to venture a little further afield for the capture of fish than they have been traditionally accustomed to. In addition, fishermen are being encouraged to use their existing nets from powered vessels. One such vessel specially designed and built for the purpose is the 'Tapase' (Plate X, fig. 6). She is about 50 feet in length and is equipped with a 165 B.H.P. Grey Marine diesel engine. Encouraging results have attended initial efforts and the hope is justified that, in the fulness of time, the present unpowered craft will be replaced by boats operated mechanically.

The success which has attended such small attempts at mechanization has given a much needed jolt to our fishing villages and roused them into action. Fishermen from remote parts of the coast have been addressing the Fisheries Department in ever-growing numbers for the grant of financial assistance to enable them to go in for mass mechanization. Fishermen have become conscious of their importance in the daily scheme of life. They desire, while they serve the public, that the benefits of their trade should remain with them and are equally eager to concentrate as much of it as possible in their own hands.

Their youths show keenness to qualify as mechanics and navigators of power fishing vessels, so that they can operate their own vessels and conduct the industry on a self-contained basis. This tendency is all to the good, because, though the industry is being gradually mechanized, the elders in the trade feel that their hereditary occupation is not denied to their sons. Generous facilities have been provided to enable fisher-youths to acquire training to operate power vessels and so far 30 youths have been trained and awarded certificates from the Mercantile Marine Department. Stipends are provided to pay for the maintenance of youths during the period of apprenticeship.

The number of youths who can qualify is limited, however, for training facilities are not numerous. Thus, modernization of the conditions now obtaining in the

fishing industry is bound to take some time. Even the removal of the so-called primitive methods and the introduction of modern technique are no guarantee of provision of supplies in such a measure as to outstrip demand. Introduction of mechanized methods of fishing is only one, but not an overriding, aspect of the problem.

Augmented catches will be of no avail if vessels bringing them to port cannot enter harbour on account of inadequate docking and landing facilities. These difficulties are real, and the need for their removal has forcefully been brought home to me by my personal observations at various points along our coast. Efforts are being made to overcome these obstacles. Although my views apply mainly to Bombay, I think, nevertheless, some description of what is being done to promote expeditious entry of fishing vessels into the dock will be of general interest, as conditions in Bombay must be parallel elsewhere along the coast.

**Obstacles to be cleared.**

An example of the manner in which such obstacles are being successfully surmounted is provided by measures now in hand to make Sassoon Dock a fish landing site in Bombay, thoroughly accessible to the present fleet at all stages of the tide and in all conditions of the weather. The basin is being dredged, so that the greater depth of the water will enable launches to enter and leave it freely.

Provision is also being made for the vessels to fuel rapidly and take aboard supplies of ice. Three oil companies are putting up installations to enable fuel to be fed directly from storage tanks into vessels. The advantage of this facility is patent, as launches will no longer be needed to store their requirements in drums which cluttered up the bunder.

In tune with these facilities derricks are being installed for rapid unloading of catches brought by fishing craft. At the same time, cement concrete floors and sheds have been provided, so that fish landed is disposed of in a hygienic manner and in conditions affording protection from the effects of the sun's heat (Plate XII, fig. 1.).

Likewise, it is not generally realized that many fishing ports along the coast have to put up with insufferable handicaps arising from siltage, obstruction by rocks, decay of such makeshift piers as exist, existence of thick mangrove swamps, absence of navigation lights, and above all, lack of water both for drinking purposes and washing nets. The inevitable result of this chain of difficulties, existing not only in the Bombay province but also, perhaps, at every stretch of our extensive coast-line, is, unnecessarily to thwart the expeditious turn-round of our fishing boats. Removal of such difficulties is as urgent, if not more important than, as the adoption of measures to augment the quantity of our present catch.

These problems have not received the attention they deserve in our country and their neglect is bound to handicap whatever reforms may be contemplated for improvement of the industry. Recognizing the importance of easy passage to and from docks, my department has accorded major priority to these problems.

No less important than provision of suitable docking facilities are the twin problems of marketing and refrigeration. Efficiency of marketing is as vital as the capture of fish. Arrival of large catches is in vain if the fish does not reach the consuming public quickly enough.

**Marketing of fish.**

Conditions prevailing in almost every market in the country without exception are utterly unsatisfactory, as fish is not always made available to the public as quickly as is desirable nor sold under the most hygienic and sanitary conditions. I shall speak of the main market of Bombay, but I am sure that my observations hold good of fish markets in Calcutta and Madras.

Bombay's main market, which was constructed at a time when the city's population was 3,00,000 has now to cater for a little over 3 million people. It has, thus outlived its usefulness. The congestion in the market during the brisk hours of business in the morning is so great that the public does not have a reasonable

chance to see the fish displayed for sale. If conditions are such in the city's foremost market, they are even worse in the others, the total number of which is 27. There are, however, hopes of the various shortcomings now characterizing the city's main wholesale fish market being overcome at an early date, as measures have been initiated by the Municipality to enlarge the present floor space of the market from 7,000 cubic feet to 17,000 cubic feet. The old market has already been pulled down and a new two-storeyed structure is being reared on the site of the existing building, though the blue-print provides for the construction of three additional storeys.

If the future population of not only Bombay but other great and growing cities is to be served, it is necessary that we must plan today for the needs of tomorrow. Production of more fish and provision of landing and marketing would be fruitless, without at the same time, the adoption of adequate measures for its conservation.

#### **Provision of ice factories.**

With this end in view, the establishment of ice factories and cold storages have been generously encouraged. Accordingly, the production of ice has been substantially enlarged, so as to provide for all contingencies. The total production of ice today is over 700 tons compared with a daily output of 300 tons before the war. The present output does not, however, represent the maximum quantum which will be yet larger as soon as electrical energy is fully available.

Bombay is not, however, an isolated unit. It is vitally interlinked with the hinterland which serves it. The provision of modern amenities in Bombay without the availability at the same time, of like facilities along the coast would be in vain. The coastal regions cater for Bombay's needs to an extent not appreciated by the average man. Accordingly, facilities for the erection of plants in the coastal areas have been granted by the Government on a two-thirds loan and one-third subsidy basis. These facilities have been made available to only fishermen's co-operative societies. One such plant is being erected by the Government for the benefit of fishermen at a fishing centre near Bombay at a cost of Rs.1,40,000. The plant will be made over to fishermen, who will operate it. Rs.46,000 of this amount is a free grant by Government to the village.

Plans are also contemplated for the erection of two plants by Government for fishermen, one at Versova in the Bombay Suburban District, and another in the Kanara District. The Government's foremost consideration is that the fishermen must be made to realize that they have a stake in the maintenance and prosperity of the plants provided. The Government's attitude towards the fishermen is one of sympathy, but, at the same time, the Government is determined that fishermen must cultivate the habit of self-reliance.

Refrigeration and cold storage are, however, modern methods for the preservation of fish. There are other age-old processes which our fishermen have practised

**Fish Curing Industry.** for countless generations in common with fishermen the world over. The commonest process is that of curing fish with salt. Bombay Province has 34 fish curing establishments along the coast, stretching from Boria, in Ratnagiri District, to Bhatkal, in the Kanara District. These establishments play a valuable rôle in the economy of fishing villages, for, apart from retaining in the fish trade a large number of fishermen who might, otherwise, have drifted to other pursuits, they serve to make available supplies of fish in the hinterland where no fresh fish is to be had. The value of the fish curing establishments is, thus, unquestioned, as they provide, in a large measure, food for the poor and help them to have a varied diet.

The yield of cured fish averages 3,90,000 maunds annually, requiring the use of 1,10,000 maunds of salt. The yards are an integral part of the fishing industry, and improvements (Plate XII, figs. 2 and 3 and Plate XI, fig. 1) have been planned to modernize them at an estimated cost of Rupees nine lakhs. The improved facilities comprise:



- (1) Construction of cement concrete platforms to replace mud floors;
- (2) Construction of permanent super-structures over the platforms to replace thatched sheds ;
- (3) Sinking of wells, and provision of pumps and storage tanks;
- (4) Enlargement of storage capacity of salt godowns.

The provision of these facilities has greatly benefited fish curers and the fish curing industry, as experience has shown that a reduction of 20 per cent can be effected in the quantity of salt consumed under the former insanitary methods. The benefits of these facilities have been reflected in an improvement, desirable from every point of view, of the cured produce.

The fishing industry in our country, more than any other branch of occupational endeavour, requires to be encouraged to cultivate the virtue of self-reliance, for, as conditions now stand, the majority of our fishermen are, generally, at the mercy of money-lenders. Accordingly, active steps have been, and are being, taken to encourage fishermen to form co-operative societies, so that they are able to conduct their trade on a self-sufficient basis. There are at present 48 societies in all. Not many months have elapsed since the establishment of a central organization of fishermen, the Bombay Provincial Fishermen's Co-operative Association. Its progress has been most encouraging. So successful has been the enterprise that middlemen have been completely eliminated from several villages. The fishermen do their own transporting and marketing, as this enterprise has yielded substantial profits (Plate XI, fig. 2). The fundamental objective of the Association is to undertake the marketing of fish caught by its members, so that the profits realized are distributed among fishermen and are not diverted into the pockets of middlemen. The turnover of the society, it is expected, will reach about Rs.12,00,000 during current year. The Association has arranged for the transport of fish caught by members of co-operative societies in villages along the coast, which are affiliated to it. This arrangement is gradually being extended to villages both north and south of Bombay.

The Bombay Provincial and other co-operative societies have been put into touch with manufacturers of twine in Hungary and Italy and manufacturers of hooks in Norway so that members of their societies can obtain twine and hooks at reasonable rates. Depots are now being established by these societies at main fishing centres for the sale of fishermen's accessories.

It will thus be seen from what I have said that we have been striving throughout to introduce changes gradually, so that the fishermen are convinced of their advantages, readily adopt them and do not feel a wrench when they forsake their age-old methods. Such reforms as have been introduced in the fishing industry have been rendered possible by the financial assistance afforded by the Government. Loans to the extent of Rupees nine lakhs have been advanced to the industry on generous terms during the past five years. Nearly 60 per cent of the advances have been repaid. The proportion of recovery is, indeed, creditable in view of the chronic indebtedness and poverty of fishermen in our country as a whole.

No survey of the fishing industry in the Bombay Province will be complete without a passing reference to its ancillary activities. Progress achieved in this direction is not spectacular but it is encouraging. Such progress as has attended various enterprises undertaken on a small scale show that they are capable of germination into thriving industries, which are bound to exert a noticeable influence on the development of the country's economy. Proof of this is afforded by the increasing popularity which has attended the manufacture of shark liver oil. The stimulus for this maiden enterprise was provided by the war when supplies of cod liver oil were interrupted on account of the German occupation of Norway. Bombay quickly seized the opportunity presented to put on the market a product which

#### Co-operative endeavour.

#### Shark Liver Oil Industry.

would not merely be a substitute for cod liver oil but would effectively displace it. In 1939 the output of neat shark liver oil was but 400 gallons. Today it is about 5,000 gallons, which is not only sufficient for our needs but also provides a substantial exporting surplus. During the past year the department exported 3,500 gallons of oil worth Rs.86,000 to the U.K., U.S.A. and Australia.

Shark liver oil is, however, not everybody's meat, for its characteristic effluvia, in common with that of most fish liver oils, tends to nauseate people. Accordingly, the next venture was to concentrate on its sale in a manner which would appeal to the palate of consumers. We have succeeded in putting on the market shark liver oil in capsules, so that it can be taken by even the most fastidious and delicate palates. Encapsulation of shark liver oil is a pioneer enterprise in the country. There is little doubt that with the changed tastes of our people and with the growing recognition of the important part played by tonics in the national health the popularity of the shark liver capsules will grow.

Finally, I come to scientific research which, in the ultimate analysis, is the basis of progress in any endeavour nowadays. It has not been neglected while commercial expansion of the industry has been pursued.

**Scientific Research.** The department will soon have an up-to-date aquarium in Bombay, where not only fishes will be exhibited but Marine Biological Research carried out. Schemes are also afoot for the establishment of a Marine Biological Station at Ratnagiri. In addition, the scope of the work at the Technological Laboratory attached to this department is to be enlarged. The total cost of the station in Bombay alone will be about Rs.10,00,000.

I have come now very nearly to the end of my talk. I have touched, I feel, on almost every facet of what has been accomplished in the field of fisheries. One fact,

**Duplication of efforts.** and it is an unattractive feature which has somehow or the other impressed itself on my mind, is the apparent lack of co-ordination of effort in this country. I do not seek to be critical, as I am painfully aware of my own limitations. Yet, I feel that I should be lacking in candour if I failed to give expression to my views that the development of fisheries cannot be achieved by isolated effort. Co-operative endeavour is absolutely essential not only among fishermen but even more so among official departments, both of the provinces and the centre. Only thus will duplication of effort be avoided and needless expenditure of funds prevented.

Not only the centre but the provinces are devoting today more attention than at any time in the past to the development of fisheries as part of their drive to stimulate the output of foodstuffs. Hence it is more than ever necessary that the various Fisheries Departments must work in unison, if the final results are to be of a lasting character.

The picture which I have sketched before you, is, I realize, far from complete, but is the best that I could do under the circumstances. I believe I shall be failing

**Conclusion.** in the performance of a most obvious duty if I were not to express my grateful thanks to the Council of the National Institute of Science of India, for their bestowal of the Chandra Kala Hora Memorial Medal on me. While I appreciate the distinction conferred on me, I feel that the honour rightly belonged to the fishermen without whose enthusiastic co-operation, my task would have been well nigh impossible. They, and not I, ought to have been the real recipient of the award. It would also be unbecoming on my part if I were not to refer to the need of praise and credit due to my staff, both technical and clerical, without whose attentiveness the Fisheries Department might not have achieved the little it has done.

A word more before I have done and that is to express my grateful appreciation of the generosity of Dr. and Mrs. S. L. Hora, whose munificent liberality and devotion to the cause of scientific advancement have made possible the institution of the award. Dr. Hora is justly reputed as a trojan in the realm of zoological research. He has

shown the true breadth of vision of a scientist in the wide and elastic terms governing the award. Wisely, the use of the term development has been defined to include 'all aspects of biological, technological and sociological studies, including the improvement of fishing nets and craft and the betterment of the social and economic condition of the fishermen.' But for the generous phraseology of this condition, the honour I have received would never have come my way.

### EXPLANATION OF PLATES.

#### *Plate IX.*

FIG. 1.—The 'Shelmari', an ordinary 22 feet sailing craft, equipped in 1934 with a 22 B.H.P. engine by the Burmah Shell Oil Storage and Distribution Co. (India) Ltd. to demonstrate to the fishermen the potentialities of power vessel to transport fish.

FIG. 2.—The 'Hashimi', a 112 feet twin-screw vessel equipped with two national superior engines, each developing 250 B.H.P., built at a cost of Rs.1,00,000 for wartime services is now used for fish transport. She made the trip from Bombay to Ormara, off Baluchistan in about 70 hours.

The two figures on this plate illustrate how from a small beginning has developed today's impressive fishing fleet of Bombay comprising 50 powered vessels.

#### *Plate X.*

FIG. 1.—A view of the Sassoon Dock at Bombay.

It is for all practical purposes the focal point of the city's fish trade. Here, a launch, soon after docking, is boarded by swarms of wholesale buyers, eager to clinch bargains and rush supplies for retail sale in the city's markets.

FIG. 2.—Selling fish by numbers.

Trayful of mackerels being counted in scores by four men, one at each corner of the tray, where there is a triangular partition into which one fish is thrown as each score is removed. The number of fish in the triangular partitions gives the number of scores removed.

FIG. 3.—An improved type of fishing craft, equipped with 22½ B.H.P. marine diesel engine (mast and sail not seen) built by the Bombay Fisheries Department for sale to fishermen on subsidy-cum-loan basis.

Each boat is 45 feet in length, 11.5 feet broad and 5 feet deep.

FIG. 4.—The 'Tapase', the latest addition to the fishing fleet, has been in operation for a little over two years.

#### *Plate XI.*

FIG. 1.—A close-up view of a modern Fish Curing Yard.

The picture shows an overhead reservoir, a well and section of the Curing Yard.

FIG. 2.—'Somnathprashad', a 72 footer motor launch, fitted with twin gray marine diesel engine, each developing 250 B.H.P., owned by the Binga Fisheries Co-operative Society and used for the transport and marketing of the catches of its members.

The cost of the launch was Rs.40,000 of which Rs.10,000 was granted as subsidy and Rs. 30,000 as loan to the Society by the Government of Bombay.

#### *Plate XII.*

FIG. 1.—A view of the middle jetty at Sassoon Dock with two sheds constructed by the Port Trust, Bombay. The bulk of city's fish trade is conducted under these sheds.

FIG. 2.—An old type of Fish Curing Yard comprising a row of thatched huts where fish are cured on the bare mud floor.

FIG. 3.—A model Fish Curing Shed with cement concrete platforms to replace mud floors.

The Government of Bombay have earmarked Rs.9,00,000 for the improvement of 34 Fish Curing Yards in the State.

Statement of the Fish carrying Vessels in service along the Bombay Coast.

S. No.	Name of the vessel.	Owner.	Approx. cost Rs.	B.H.P.	Tonnage.
1	2	3	4	5	6
1	Sir Frederick Sykes	India Fisheries Ltd., Sassoon Dock, Colaba, Bombay	13,000	28.50	4.93
2	Lady Brabourne	Ditto	20,000	52.50	8.99
3	Lord Brabourne	Ditto	23,000	58	7.83
4	Karimi	Janjira Fishing Co., Sassoon Dock, Colaba, Bombay	13,000	40	12.14
5	Chand Tara	Abubakar Hussein, Sahib Thakur, Fish Merchant, Sassoon Dock, Bombay.	18,000	52	9.74
6	New Noor-e-Mohammadi	Ditto	40,000	52	19.21
7	Sitara	Ditto	50,000	165	12.60
8	Ruperal	Ditto	40,000	100	14.6
9	Mackerel Queen	Ditto	40,000	165	9.95
10	Lady Colville	Ditto	50,000	165	6.60
11	Jahangir	Ditto	60,000	165	109.98
12	Razaki	Janjira Fishing Co., Sassoon Dock, Colaba, Bombay	30,000	75	19.09
13	Gajanan Prasad	Konkan Fishing & Trading Co., Sassoon Dock, Colaba, Bombay.	30,000	100	14.25
14	Diamond Jubilee	A. Karmally, Esq., Coastal Fisheries Ltd., Yusuf Bldg., 4th floor, R. No. 37(B), Opp. Flora Fountain, Fort, Bombay.	80,000	165	26.56
15	Divali	New Malwan Fisheries Co., Sassoon Dock, Colaba, Bombay.	75,000	165	36.47
16	Sultania	Sultania Trading Co., Madina Mansion, Near Crawford Market, Bombay.	50,000	110	9.45
17	Madina	A. H. Thakur, Esq., Fish Merchant, Sassoon Dock, Colaba, Bombay.	60,000	110	13.70
18	Dhan Prasad	Valimohamed Ahmohamed & Co., Machhi Bazar, Sewri, Bombay 16.	20,000	40	11.53
19	M.F.V. Vijaylaxmi	Ditto	24,000	60 Atlantic	25.35
20	M.F.V. Palar Shaw	Western Fisheries Co., Mherwan Bldg, Sir P. M. Road, Fort, Bombay.	80,000	165	39.15
21	M.F.V. 947-Vijaylaxmi	Sansare Fishing Co., Sassoon Dock, Colaba, Bombay	24,000	60 Atlantic	25.35
22	M.F.V. Somnath Prasad	Binga Fisheries Co-operative Society, Bings, Taluka Karwar, Dist. N. Kanara.	45,000	500 Twine Grey Marine.	48.56
23	M.F.V. King Fisher	Abdul Soomar Shivji, c/o K. S. Shivji & Co., 141-146, Chakla St., Bombay No. 3.	28,000	60	20.96
24	M.F.V. Shahjahan	A. H. Thakur, Esq., Fish Merchant, Sassoon Dock, Colaba, Bombay.	60,000	500	21.30
25	Ram Leela	The Konkan Fishing Co., Sassoon Dock, Bombay	35,000	160 Grey Marine	14.25
26	Laxmi	Parker Navigation Co., Sassoon Dock, Colaba, Bombay	25,000	200 B.H.P. 6 cylinder Grey Marine.	23.06

S. No.	Name of the vessel.	Owner.	Approx. cost Rs.	B.H.P.	Tonnage.
1	2	3	4	5	6
27	Saraswati ..	Shah Bhogilal Muljibhai, Esq., Boat Hard Road, Coal Bunder, Mazgaon, Bombay No. 10.	60,000	120 B.H.P. Widop Engine.	29-13
28	Jalghanga ..	India Fisheries Ltd., Sassoon Dock, Colaba, Bombay ..	5,00,000	225 B.H.P. Lorimer Diesel engine.	42-47
29	Tapase ..	Government of Bombay, Department of Fisheries, Old Custom House Yard, Fort, Bombay.	66,000	165 Grey Marine	17-73
30	Jaya Bharati ..	Satapati Macchimer Vividha Karyakari (Sahakari) Ltd., At and Post: Satpati, Dist.: Thana.	27,000	22½ B.H.P. Ruston Marine diesel engine.	11-67
31	Shanta-Durga ..	Keri Fishermen's Association, Keri, At: Keru, Post: Ankola, Dist.: N. Kanara.	27,000	Ditto.	11-67
32	Neera ..	Parker Navigation Co., Sassoon Dock, Colaba, Bombay	35,000	225 B.H.P. Grey Marine Engine.	40 (Regd.)
33	Vitha ..	Harisachandra Govind Vaity, Esq., c/o Vithabai, Sassoon Dock, Colaba, Bombay.	35,000	Do. Diesel.	13-03
34	Jyoti ..	Kenico Ltd., 17 East and West Court, Colaba, Causeway, Bombay.	1,35,000	96 B.H.P. Grey Marine Engine.	15-22
35	M.F.V. Chandraprabha ..	D. S. Golwankar, Esq., Koliwada, Colaba, Bombay ..	35,000	255 B.H.P. Grey Marine Engine.	14-55
36	Hashemi ..	H. Hasham Haji Ahmed, Esq., c/o Alimohamad Abba, 573 Crawford Market, Bombay.	1,00,000	National Superior diesel engines 2, each 250 B.H.P.	58-52
37	Chandrika ..	The Indian Ocean Fisheries Ltd., 348 Girgaum Road, Bombay 2.	2,00,000	200 B.H.P.	39-29
38	Jalprasad ..	Messrs. P. V. Meher & Bros., Fanaswadi Koliwadi, Bombay 2.	50,000	83 H.P.	12-09
39	Nalin ..	Messrs. Parker Navigation Co., Sassoon Dock, Colaba, Bombay.	50,000	160 B.H.P. Blackstone heavy duty engine.	25-92
40	Arvind ..	Ditto ..	50,000	Ditto.	25-92
41	Kumud ..	Ditto ..	50,000	Ditto.	25-92
42	Pushkar ..	Ditto ..	50,000	Ditto.	25-92
43	Neela ..	P. Y. Killekar, Esq., Lower Colaba, Bombay	35,000	24 B.H.P. Gardner Marine Engine.	6-17
44	Bhadur ..	Dhuriwada Fish Supply Co., c/o B. S. Virkud, Sassoon Dock, Colaba, Bombay.	22,000	216 Grey Marine Engine.	13-03
45	Shamaprasad ..	Binga Fisheries Co-operative Society, Binga, Taluka Karwar, Dist. N. Kanara.	40,000	225 Grey Marine Engine.	25-94
46	Fides ..	Hindustan Fisheries, Bombay, c/o Reporter Esq. ..	70,000	110 B.H.P.	20-00
47	Ganga Sagar ..	Messrs. Akhil Koli Samaj Parishad, C. Society, Bombay	13,000	23 B.H.P. Lister Marine Engine.	4-97
48	Bombay Duck ..	S. V. Nakhawa, Mazgaon, Koliwada, Bombay ..	34,000	45 B.H.P. Two Ruston Marine Engine.	5-67









