

REPORT
ON THE MARKETING OF
FISH IN THE
MADRAS STATE

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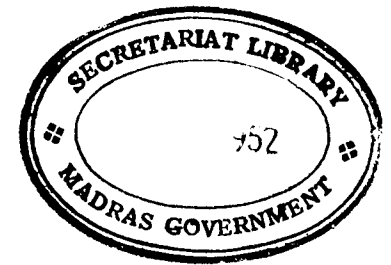


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MADRAS
1951



REPORT
ON THE MARKETING OF FISH
IN THE
MADRAS STATE



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MADRAS
1951

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REPORT ON THE MARKETING OF FISH IN THE MADRAS STATE.

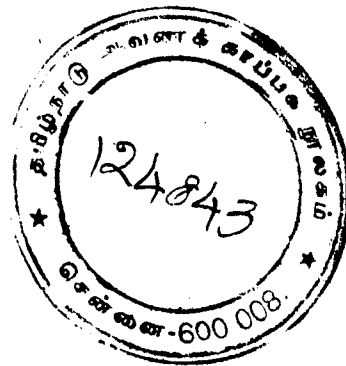
INTRODUCTION

The first report on the marketing of fish in Madras was prepared during 1930, along with other States. With the publication in 1946 of the All India Report on the marketing of fish, the Madras Report was revised and made up-to-date. As the material gathered in the All India Survey conducted by the Agricultural Marketing Adviser to the Government of India is of great importance to all states, many of the portions of that report have been freely incorporated in the Madras Report, in order to present a comparative position for the whole country as well as Madras.

Being rich in protein, fish is a valuable item of diet and is specially valuable to ill-balanced cereal diet or in rice-eating areas. The *per capita* consumption in India was only $3\frac{1}{2}$ lbs. and in Madras 8 lbs. as compared to 40 lbs. in England. The consumption can be much higher from a nutritive point of view. At the present period, any effort to increase fish-production will greatly ease the difficult food situation.

In this report are given the production, demand, prices and methods of marketing of fish in India and Madras, and many details have been given in regard to methods of preparation for the market, storage and preservation. The Fishing Industry in India is in the hands of comparatively very poor people. While the average consumer finds fish very costly, the producer gets only a small return for it. In this report many improvements have been suggested which in the course of marketing are likely to benefit the industry as a whole and the fisherman in particular.

During the war, fishing received increased attention and many lines of development taken up by the Government of India and Madras are also mentioned in this report.



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To A. Khaleeli, Esq., I.C.S., and M.T. Raju, Esq., I.C.S., Directors of Industries, Commerce and Fisheries, acknowledgments are due for much valuable information contained in the report especially in respect of curing yards and statistics. Thanks are also due to several officers of the Fisheries department, to producers, the trade, railway authorities and other Government departments who co-operated with this enquiry. Special acknowledgments are due to M.P. Kunhikutty, Assistant Marketing Officer (Retired) who wrote the 'First Report.'

The Government of India or Madras should not be assumed to take responsibility for any or all of the material of this report.

STATE MARKETING OFFICER,
MADRAS.

For a quick grasp of the subject the reader is referred to a summary of conclusions and recommendations at the end.

REPORT ON THE MARKETING OF FISH IN THE MADRAS STATE.

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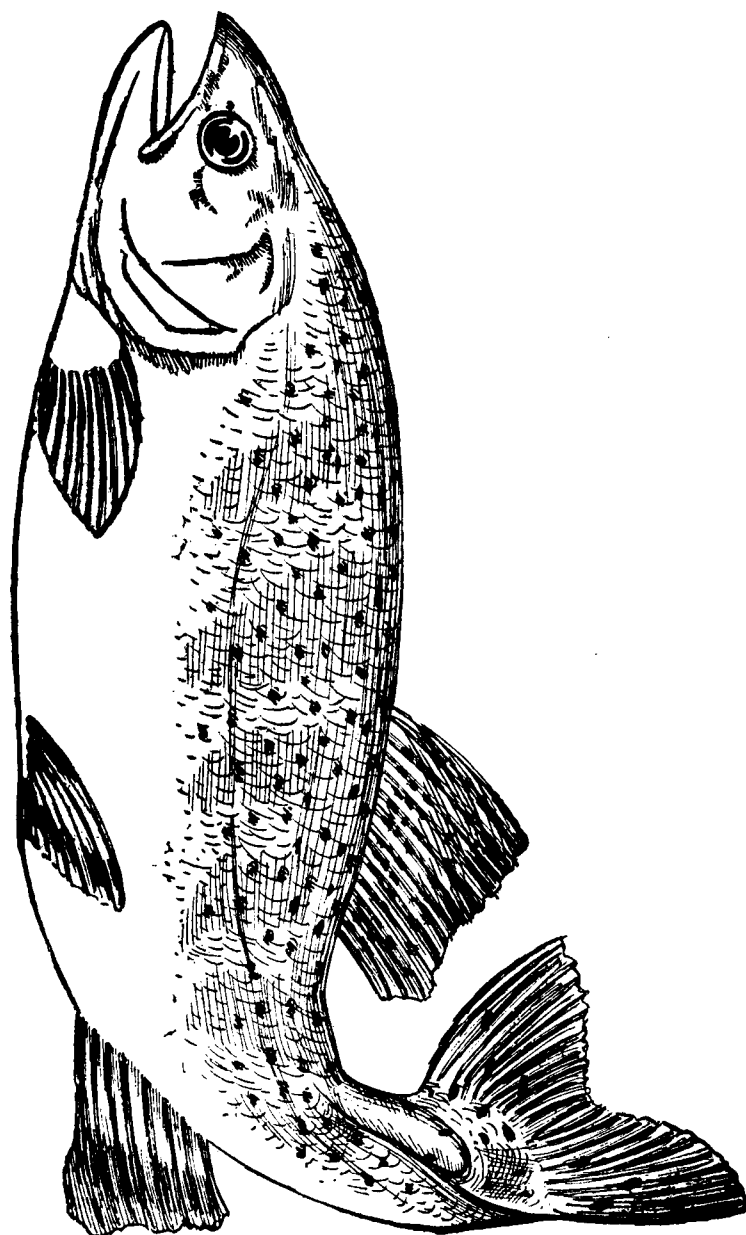
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THE NILGIRI TROUT



CHAPTER I

TYPES OF FISHES

General.

Fish is a specially valuable addition to the diet, because it is as rich in protein as meat and is also a source of certain vitamins and mineral salts. Particularly it is invaluable in a diet which consists mostly of rice or ill-balanced cereals or is deficient in milk or meat. In India the industry occupied only a minor place in the economy of the country. Part of this is due to the fact that the industry was in the hands of very backward illiterate and poor classes, and even the trade was poorly financed. The methods employed are still primitive and adequate improvements have not been effected in the handling, storage or marketing. The importance of fishing has been the subject of study by several Commissions, including the Royal Commission on Agriculture, the Fish Committee of the Imperial Council of Agricultural Research (1940), and recently the Famine Enquiry Commission and fishing received increased attention during the recent world war. The Government of India as well as the Provincial Governments have started many schemes of research and organisation for the development of the fish industry recently.

(A) World production of fish

The production of sea fish in certain countries was reported in the statistical year book of the League of Nations, although no records are available of inland fisheries. India was not included. Between 1933 and 1938, the average production of fish was as follows from the years for which data available, as compared to India.

Average world production of sea fish (in reporting countries (1933 to 1938).
ooo tons.

Name of Continent.	Name of country.	Production.	Continental total.
AFRICA	French Morocco	27	27
		—	
AMERICA	Alaska	339	2296
	Canada	404	
	United States of America	1474	
	Others	79	
	Total America	—	

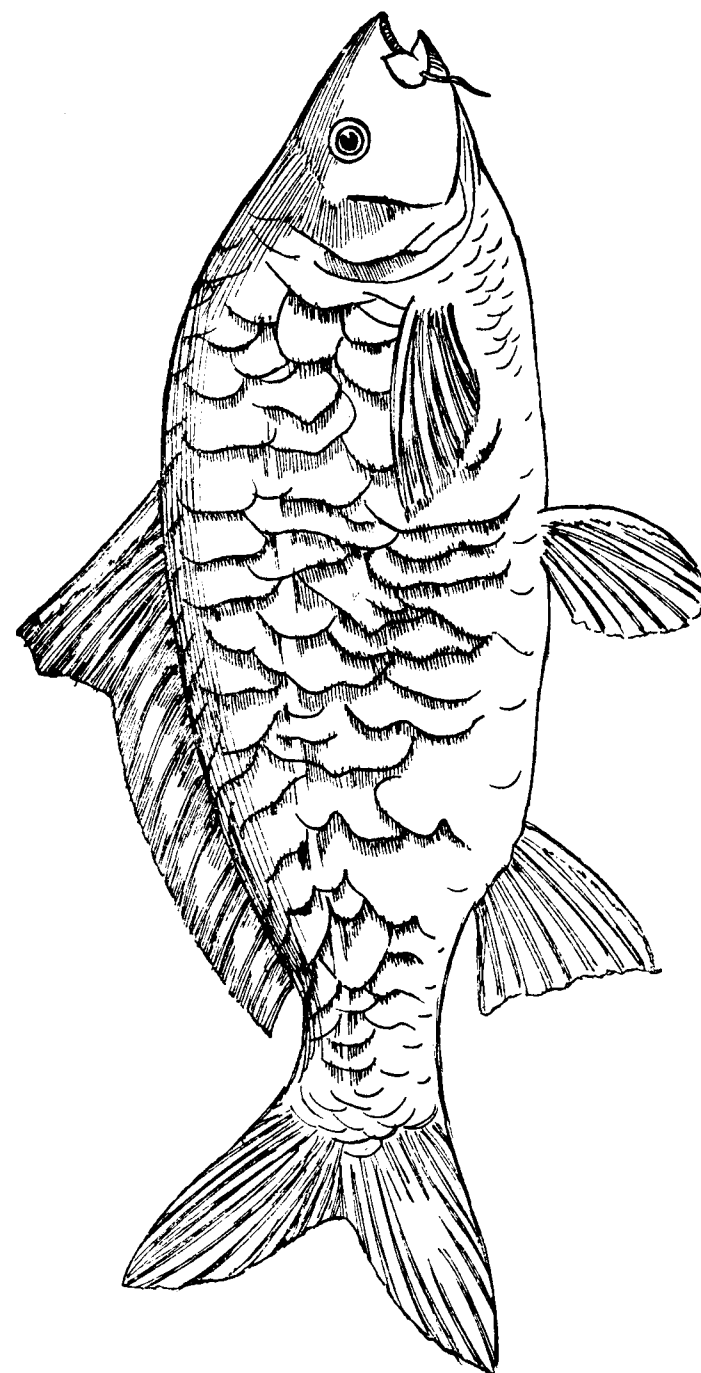
Name of Continent.	Name of country.	Production.	Continental total.
ASIA (excluding India.)	Japan	3591	5065
	Korea	1371	
	Others	103	
	Asia excluding India	—	
U.S.S.R.	Total United States of Soviet Russia	1252	1252
	EUROPE	—	
EUROPE	Germany	538	4285
	Spain	382	
	France	303	
	Iceland	207	
	Norway	993	
	Netherlands	212	
	Portugal	200	
	United Kingdom	1000	
	Others	450	
	Total Europe	—	
Total excluding India	India	12,925	429
	World Total	13,354	

Out of nearly 13.35 million tons of sea fish reported from important countries in prewar years, the share of India was 429,000 tons or only about 3 %. Important producers of sea fish in the world were in order of importance Japan (3591,000 tons), United States of America (1474,000 tons), Korea (1371,000 tons), United States of Soviet Russia (1252,000 tons) and the United Kingdom (1000,000 tons).

(B) Nomenclature

Most fishes are known by different local names in Indian languages in different parts of the country. In the markets or even in the fisherman's dialect, the same name is applied to several species of the same genera, and sometimes in different are as for the same genus. Unfortunately even the popular English names as the mackerel, the anchovy do not refer to the same species everywhere.

The first comprehensive and systematic classification of fishes on an All-India basis was made by *Francis Day* in his "Fishes in India" (1876-1889) and in his two volumes of fishes in the *Fauna of India* and this work has been usefully supplemented by the Fisheries department



THE MIRROR CORP

of the Government of Madras, and the Zoological survey of India. In this report the names and descriptions have been given more or less on the lines described by Day. The commercially important fishes of India are given in Appendix I, with the corresponding names in the Indian languages for both sea fishes and fresh water fishes.

(C) The Commercial fisheries of India

Fishes are caught from different waters in the country. The chief sources are the coastal margins of the sea, rivers, estuaries and back-waters for marine or estuarine fish. For fresh-water fish, the sources are rivers, irrigation and other channels, lakes, tanks, innulated tracts, shallow inland lakes called jhils etc.

India has a coastline of 3220 miles exclusive of sinuosities and indentations and the total area of the sea which lies between the coast and 100 fathoms line is approximately 115,000 square miles. Only a small portion of this area is worked and there was practically no deep sea fishing, as the boats were generally of the catamaran or canoe type and night fishing is not general.

The Indian rivers form extensive estuaries before they join the sea. Near the river mouth, the water is brackish owing to tidal influence and several valuable species of fish and crustaceans acclimatised to changes in salinity are caught in the estuarine regions. Estuarine lagoons generally known as back-waters which extend southwards from the mouths of all important rivers and streams, and are bounded by the sand on the seaward side, also yield several varieties of food fish. Several varieties of edible fish are also caught from fresh water source all over the country. The estuarine and riverine fishes are important as they already supply considerable quantities of fish and are free of many of the difficulties attending deep sea fishing. Inland waters such as reservoirs, tanks, ponds etc., belong to a different and simple class of fishery, although only a few confined waters are actually devoted to fishing.

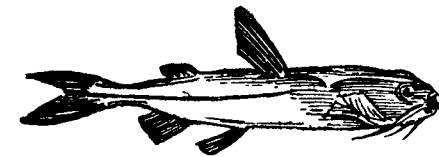
In Chapter III, fishing gear and methods under marine fisheries (C.A.) are described ten sea fishing areas extending from Sind on the West, to the Deltaic areas of the Ganges and Brahmaputra in the East, namely: (1) Sind, (2) Gujaret, (3) Konkan, (4) North Kanara, (5) South Kanara, (6) Malabar coast and Kanara backwaters, (7) Gulf of Mannar, (8) Coromondal coast and backwaters, (9) The Telugu areas and (10) Deltaic area.

Although the number of species of fish (*Sensu stricto*) present in Indian waters is quite large, only certain types are caught in

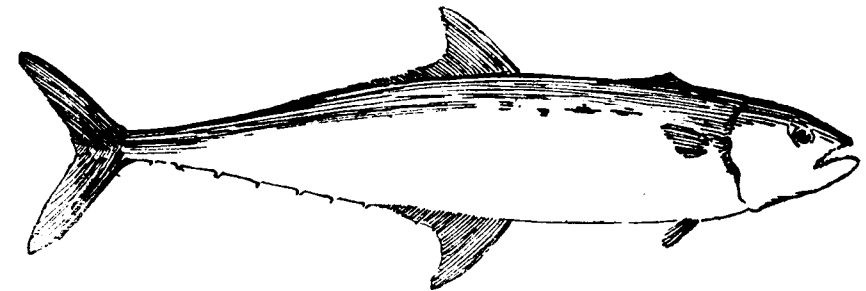
appropriate quantities. These species have been classified into 16 groups and the localities where they are found are given below:—

The chief commercial fishes of India and the localities where they are found.

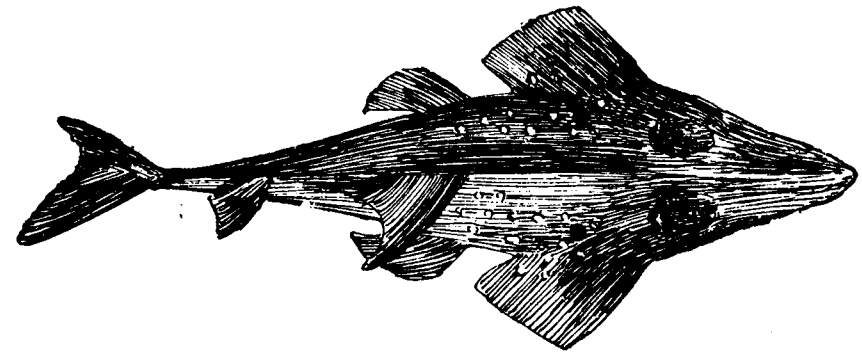
Name of fish.	Localities where chiefly caught.	Remarks.
I. Elasmobranchs group.		
(a) Sharks :		
(i) <i>Carcharias gangeticus</i> .	Coastal waters, chiefly Bay of Bengal and in large tidal rivers.	69 species of cartilaginous fishes are known in Indian waters.
(ii) <i>Galeocerdo rayneri</i> .	More common in the Arabian sea off Malabar and Travancore.	Liver oil is very rich in Vitamin 'A.'
(iii) <i>Zygaena blochu</i> .	Commonest shark in the West coast, young ones seen in large numbers.	Not highly esteemed as food.
(b) Saw fish :		
<i>Pristis cusfridatus</i> .	In the seas and high up in the large tidal rivers.	Liver oil rich in Vitamin 'A'.
(c) Skate :		
<i>Rhynchobatus djeddcusis</i> .	Bay of Bengal coast largely.	Not highly esteemed as food.
(d) Rays :		
<i>Trygon Sephen</i> :	Common all along the west coast during the South West Monsoon.	do
II. Eels group.		
(a) Marine :		
<i>Muraenesix talabonoides</i> .	Bombay coast.	
(b) Fresh water :		
<i>Anguilla bengalensis</i> .	In running waters, sometimes in paddy fields also.	20 marine species and 10 fresh water species exist in India.
III. Cat fishes group.		
(a) Marine :		
(i) <i>Arius dessumneri</i> .	Common on the West coast. November to March off Bombay and April to October off Madras.	
(ii) <i>Arius sona</i>	Bombay coast	28 marine species known in India.



CAT FISH



THE SEER FISH



THE SKATE

Name of fish.	Localities where chiefly caught.	Remarks.
(b) <i>Fresh water:</i>		
(i) Wallago attu.	Adults only in the large Northern Indian waters, small specimens in all fresh waters.	...
(ii) Bagarius yavellii.	Only in Northern Indian waters.	...
(iii) Clarias magur.	In rivers, jhils and tanks.	...
(iv) Pangasius buchana- nani.	Only in the large northern Indian rivers.	...
(v) Silundia gangetica.	do.	...
(vi) Macrones seen- ghala.	Fresh waters throughout India; Large ones in river systems.	...
(vii) Eutropithys vacta.	Only in the large Northern Indian rivers.	Over 80 species of cat fish are known to exist in India.

IV. Silverbar fish group.

Chirocentrus dorab.	Off Bombay coast, in the south of the Madras East coast and in the sunderbans.	...
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V. The Herrings and the Anchovies group.

(i) Clupea longiceps	South-west coast.	...
(ii) Clupea funi- bricata.	All along East coast and in large numbers in the Bay of Bengal coast.	...
(iii) Clupea ilisha.	Estuarine regions of the Indus, Sabarmati, Cauveri, Krishna, Godavari, Mahanadi, and the Ganges at the time of local floods.	...
(iv) Engraulis puruva	All along the coasts.	45 species of anchovies are known in Indian waters.
(v) Engraulis telora		

Name of fish.	Localities where chiefly caught.	Remarks.
VI. Bombay Duck group.		
Harponus nehereus	Abundant off Bombay coast and in the estuaries of Bengal.	
VII. Feather-bocks group.		
Notopterus spp.	In the fresh and brackish waters.	Two species are known <i>N. Chittala</i> being larger.

VIII. The mackerels and the perches group.

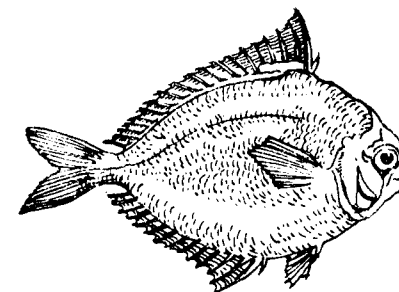
(i) Scomber microlepidotus.	South West coast of India.	
(ii) Cybiu	All along the coast, abundant near estuarine of large rivers.	Altogether 60 species of mackerels, and 150 perches are known in India
(iii) guttatum.		
(iii) Cybiu comersonii.		
(iv) Lates Calcarifer.	do	
(v) Trichiurus hanmela.	Abundant in Madras coasts.	
(vi) Carauz crumenophthalmus.	South west coast of India.	
(vii) Etroplus suratensis.	Brackish waters.	Can be acclimatised to fresh waters.

IX. Silver bellies group.

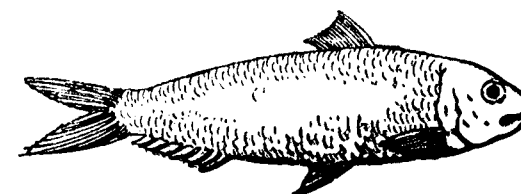
Equula and Guzza species.	South west coast of India.	12 species of equula species and 3 of gazza are known.
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X. Pomfrets group.

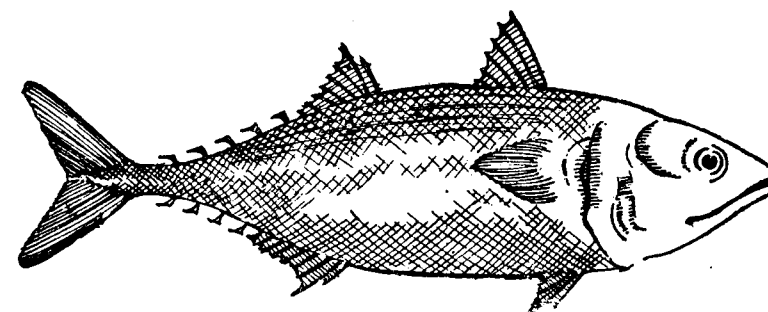
Stromateus species	Off Sind, Gulf of Cambay and in certain areas of Coromondal. Small quantities all along the coast.
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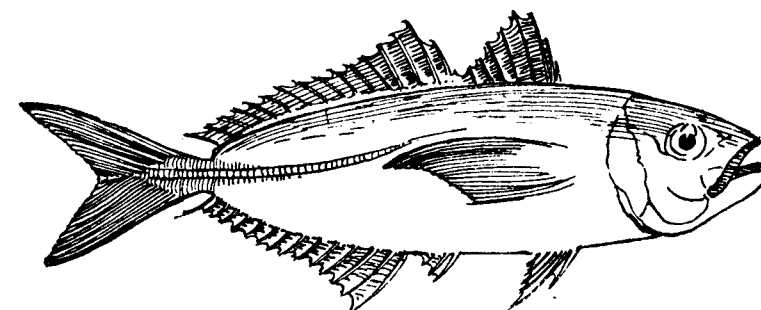
EQUULA SPLENDEUS



THE OIL SARDINE



THE INDIAN MACKEREL



THE HORSE MACKEREL

Name of fish.	Localities where chiefly caught.	Remarks.
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XI. Flat fishes group.

Plagusia etc. species.	Large specimens off Sind and small ones along the West coast.	Several species of soles and tongue fishes exist.
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XII. Mullet group.

(a) Marine:

(i) Mugil speigleri	In the larger river estuaries.	25 species known in Indian seas, but they can ascend rivers and be acclimatised to fresh waters.
(ii) Mugil ocur		

(b) Fresh water:

(i) Mugil corsula	In the larger rivers.	4 species known in India.
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XIII. Indian Salmon group.

(i) Polynemus tetradactylus.	Chiefly near mouths of rivers.	...
(ii) Polynemus paradisius.	Only estuaries of Bengal.	...

XIV. Jew fish group.

Sciacna species	Bombay, Travancore and Northern section of Madras East coast.	Several species known and come in shoals.
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XV. "Live" fishes group.

(i) Ophiocephalus species.	Tanks, pools, jhils mostly stagnant waters.	Several species known of different colours.
(ii) Anabus scandens	Estuaries and fresh waters of India.	Able to live out of water due to accessory breathing organs.

XVI. Carps group.

(i) Labes species	In streams and rivers all over India. Large specimens found in North India and Nilgiris.	Several species known.
(ii) Catta buehanani		
(iii) Cirrhina mrigala		
(iv) Barbus tar		

Among shell fish, the Crustaceans i.e. prawns, crabs, lobsters and certain *Molluscs* e.g. clams and oysters, are edible. The commercially important shell fish used for food are given below with the areas where they are chiefly got.

THE CHIEF EDIBLE SHELL FISH OF INDIA.

Name of fish.	Localities where chiefly got.	Remarks.
Crustaceans group :		
1. Prawns.		
(a) <i>Marine</i> —	Off Karachi, West coast of Madras, backwaters of Cochin and Travancore, Chilka lake and estuarine regions of Bengal.	Several species known in India.
(i) <i>Penacus</i> species.		
(ii) <i>Lander shliferus</i> .		
(iii) <i>Metapaneans monoceros</i> .		
(b) <i>Fresh water</i> —		
<i>Palaeman</i> species	... In the larger rivers, Col- lair lake in Madras.	...
2. Lobsters.		
<i>Panulirus</i> species	... Sind and Bengal chiefly.	...
3. Crabs.		
(a) <i>Marine</i> —	All along the coast.	Several speci- mens known
(i) <i>Scylla serrata</i>		
(ii) <i>Neptunus pelagicus</i> .		
(b) <i>Fresh Water</i> —	Rivers, lakes and canals.	...
<i>Paratephusa pinigera</i> .		
4. Clams :		
<i>Tapes</i>	Creeks and estuaries of Sind and Bombay.	...
<i>Meretrix</i>		
	Small quantities all along the East coast.	
5. Oysters,		
<i>Ostrea</i> species.	... Karachi Harbour, Ennore Pulicat and Sonapur.	Oysters beds are not properly worked. There is over fishing and the beds are often ruined through indus- trial and sewage pollution.

In addition to the above mentioned shell fishes which are consumed in large quantities, there are several other species along the coasts which are of local importance. They are sea-mussels, cockles, Razor-shell, whelks, cuttle fish and squids. Sea mussels which are found in oyster clumps are rare, but their flesh is highly esteemed. Whelks are not usually used as food, except in parts of Bombay. Squids and cuttle fish are of economic importance on the West coast. Cuttle fish is also valued for its shell which is used in medicine as well as for polishing wood, the flesh being used as a bait.

The pearl oysters and chanks are fished for the commercially valuable pearls and the shanks respectively.

(a) **Pearl fisheries.**—There are two types of oysters (1) the window pane oyster (*Placuna placenta*) whose shell is used for decorative purposes and (2) the true pearl oyster (*Pinctata vulgaris*). Window pane oysters are found in creeks and back-waters from the Sind to the Madras Presidency but also occur in the open sea off the Coromandal coast and in the gulf of Mannar. In the Runn of Cutch and the Bombay coast, fishing for these shells have existed for many years and the small seed pearls though lacking in lustre and shape, were widely used in indigenous medicine.

The true pearl oysters are found in the gulf of Cutch and Mannar, but the latter fishery is of greater importance. The Cutch fishery is only worked as a cottage industry. The fisheries in the gulf of Mannar are erratic in appearance and have been worked in the past once in 15 years, as a crown monopoly under the Madras Fisheries Department. The oysters are found in about 10 to 11 fathoms of water unlike in Japan, where oysters are found in shallow waters. Research is being conducted at the Fisheries biological station Krusadai Island, Madras by the Fisheries department on the possibilities of rearing pearl oysters in captivity and in making cultured pearls.

(b) **The Chank fisheries (*Xancus*)** are worked off the six southern maritime districts viz., Tinnevely, Ramnad, Tanjore, South Arcot, Chinglepet and Nellore in the East coast. The most important are those of Tinnevely which yielded during 1945-46 nearly 4.75 lakhs of shells. During 1944-45 and 1945-46, the following quantities were got in several districts.

Production of Chanks (full sized) (No.)

District.	1944-45.	1945-46.
Tinnevely	268,318	476,302
Ramnad	68,671	72,549
Tanjore	23,028	20,807

The lease of the Ramnad shanks were given to private merchants for 10 years from 11-7-46, the rest being under the Madras Government wormed and undersized (below $2\frac{1}{4}$ " diameter) are eliminated in counting and the shells sold in auction. The divers were compensated by a payment of one anna per shell on one-third of the mature shells fished. During 1944-45 a bonus of 9 pies per shell was paid as compared 0-1-9 during 1942-43.

The prices of the shells ranged in prewar years from Rs. 200 to 400 per 1000 shells. The prices realised during 1944-45 were as follows for full sized shells:

District.	Quality.	Price per 1000 full sized shells. Rs. (1944-45)
Ramnad	Rameswar	915
	Kilakarai	775
	Irupuravai	775
	Patil	635
Tinnevelly	Fair average	826
Tanjore	Adirampatnam	511
	Sethubavachatram	525

Under sized and immature shells were sold at Rs. 96 per 1000 in Tinnevelly and Rs. 50 to 65 in other areas.

Chank shells are used as feeding cups for infants and for tying round the neck of cattle to ward off the evil eye. Bigger shells are used for blowing (conch) and for offering puja in temples. The largest number are used for making chank bangles, rings, ornaments, buttons etc., particularly in Dacca and Murshidabad district of Bengal. A good quality lime is produced from shells of calcined chank shells and used for buildings or medicine. The shank meat is edible as a dried product as a fry and as an ingredient of curry, and in the manufacture of scented sticks to control the burning.

CHAPTER II—SUPPLY.

A. TOTAL SUPPLIES—ANNUAL LANDINGS OF FISH.

1. Method of survey :

India has a coast line of about 3220 miles of which the Madras Presidency excluding Cochin and Travancore accounted for 1420 miles, comprising 1180 miles of East coast and 240 miles in the West coast. Although the East coast is longer the districts of South Kanara and Malabar in the West are very important for fish supplies. This is because the muddy bottomed and comparatively surfless region of the west coast attracts seasonal migratory shoaling fishes and predatory larger fishes who come for the former. The East coast is however sandy and surf beaten and not suited to shoaling fishes.

It is estimated that the total area between the sea coast and the 100 fathoms line is about 115,000 square miles. Besides fish are caught from the estuaries of large rivers, as well as from the estuarine lagoons called backwaters. Fresh water sources also supply several varieties of edible fish and in-land waters as tanks, ponds etc. With such a large source of supply, it is not possible to have a correct idea of the fish production of India. In Madras, however the Industries & Fisheries departments have established a number of fish curing yards and these offer a fair estimate of marine supplies, especially in the West coast.

Estimates for India have been made after taking into account (1) curing yard figures (2) number of fishing boats (3) number of adults engaged in fishing and (4) such other published figures of production and trade available. For fresh water fish, the estimates are based purely on information supplied by local officers and the trade.

2. Production of fish in India.

The total annual production of fish in India is estimated as follows :—

Estimated production of fish in India (Prewar).

	Quantity Lakhs of Rly. maunds.	Value Lakhs of rupees. 1940.
Sea fish (including estuaries and backwaters) ...	116.7	302.7
Fresh water fish (excluding non-professional catches)	62.6	742.3
Total ...	179.3	1045.0

Although fresh water fish formed only 35% of production their value is estimated at 73% because they got a better price.
(a) Sea fish production according to provinces.—The production of fish according to different areas is given in the following table:—

ESTIMATED PRODUCTION OF SEA FISH IN INDIA (Prewar)

Area.	Total catch ooo Mds.	% to Indian total.	Value Lakhs of Rs.	% to total.	Number of adult fisher- men.	Catch for fisher- men. Mds.
1. Baluchistan states	...	0.79	5.0	1.65	2224	41.6
2. Sind Coast	197.8	1.70	10.6	3.50	2600	76.1
3. Kathiawar	99.8	0.86	5.4	1.78	2306	43.3
4. Bombay	1361.1	11.68	73.0	24.12	32991	41.2
5. Madras	...	—	—	—	—	—
I. WEST COAST.						
S. Kanara	1019.9	8.74	50.7	16.75	15352	66.4
Malabar	1877.5	16.08	...	...	27019	69.5
II. EAST COAST.						
South Section	182.4	1.56	31.3	10.34	9572	19.1
Central	270.4	2.32	...	...	13287	20.4
North	1316.7	11.29	...	...	68671	19.2
Total Madras.	4666.9	39.99	82.0	27.09	133901	34.9
6. Cochin	626.8	5.37	16.3	5.39	8155	76.9
7. Travancore	2588.9	22.19	64.7	21.37	30093	86.0
8. Orissa	303.3	2.60	11.1	3.67	—	—
9. Bengal	1729.0	14.82	34.6	11.43	—	—
Total India.	11,666.2	(100)	302.7	(100)	—	—

Of the sea fish production of 11.6 million maunds (or 430,000 tons) about 71% is produced in British India and 29% in the Indian States. Of the prewar production in India the percentage accounted for by different provinces was as follows :—

Madras	...	40.2%
Travancore	...	22.2%
Bengal	...	14.8%
Bombay	...	11.6%
Cochin	...	5.4%

It may be noted that the Malabar and South Kanara coasts accounted on the whole for 25% of the production in India and over 60% of the production in the Madras Presidency. In other words 215 miles of sea coast in the above district account for one-fourth of production over 3220 miles in India. The East coast in India is comparatively poor and produced over 1770 miles only 1/3 of the sea fish.

(b) Production of fresh water fish in India according to provinces.—The estimated supplies of fresh water fish available in different provinces and states of India is given below :—

(Statement — Opposite Page 14).

Of the marketable supply of inland fish in India namely 6.26 million railway maunds (or 232,000 tons) only 4% is the share of India states and the large bulk is from British India (96%). The most important areas of production were Bengal (50%), Bihar (15%) and Assam (11.5%). Madras which produced over 40% of sea fish in India accounted for only 3% of the inland fresh fish supplies.

ESTIMATED MARKETABLE SURPLUS OF FRESH WATER FISH.

Provinces or State.	Production. (000 Mds)	Percentage to Total.	Estimated value (Lakhs of Rs.)	Percentage of value to total.
Assam	721.6	11.6	46.22	6.23
Bengal	3133.2	50.1	432.92	58.32
Bihar	959.5	15.3	95.99	12.63
Bombay	81.0	1.3	9.82	1.32
Central Provinces & Berar	156.0	2.5	16.28	2.19
Delhi	5.6	0.1	0.80	0.11
Madras	187.0	3.0	18.96	1.88
North-West frontier	1.5	—	0.24	0.03
Orissa	326.0	5.2	34.92	4.70
Punjab	25.0	0.4	3.90	0.55
Sind	266.5	4.3	38.56	5.19
United Provinces	147.0	2.3	22.77	3.07
Total Provinces	6010.1	96.0	716.59	96.52
Indian States	248.9	4.0	25.84	3.48
Total India	6258.9	(100.0)	742.33	(100.0)

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3. Classification of India fish production.

(a) **Sea fish :** Although more than 1500 distinct species of fish are known to exist in Indian waters, the commercial types can be classified into 16 categories. The production of these types according to provinces is given below :

Quantities of sea fish landed in the different coastal areas arranged according to varieties.

(In thousands of maunds.)

Name of the group.	Balu-chistan coast.	Sind coast.	Kathia-war coast.	Bombay coast.	Madras West coast.	Cochin coast.	Travan-core coast.	Madras East coast.	Orissa coast.	Bengal coast.	TOTAL
1. Elasmobranchs	19	14	20	182	79	11	108	40	15	12	500
2. Eels	...	2	1	26	...	...	1	Neg.	...	...	30
3. Cat-fishes	5	10	9	105	69	1	64	29	21	30	343
4. Dorab or silver-bar fish	4	...	...	40	1	...	Neg.	25	...	11	81
5. Herrings and Anchovies	...	30	12	137	1,072	60	870	752	66	971	3,470
6. Bombay Duck	...	...	10	161	...	...	...	16	12	9	208
7. Mackerels and perches	32	17	15	282	577	102	949	412	22	127	2,535
8. Silver-bellies	...	...	...	13	155	19	50	76	...	...	313
9. Pomfrets	...	10	6	80	5	...	11	32	21	17	182
10. Flat-fishes	14	20	...	9	151	31	1	Neg.	...	40	266
11. Mulletts	...	15	9	38	Neg.	...	10	41	23	30	166
12. Indian Salmon	11	5	2	44	1	...	...	9	40	75	187
13. Jew fishes	...	13	8	107	19	...	92	170	20	9	438
14. Crustaceans	...	50	4	66	82	243	249	65	55	346	1,160
15. Minor shell fishes.	...	3	...	13	...	...	...	Neg.	3	44	63
16. Miscellaneous	7	9	4	59	686	159	184	102	5	9	1,224
Total	92	198	100	1,362	2,897	626	2,589	1,769	303	1,730	11,666

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It will be seen that the Herrings and Anchovies group accounts for over a third of the total catch of sea fish in India while Mackerels and Perches account for just over a fifth (22%) and Crustaceans which comprised chiefly Prawns, accounted for 10%. The popular varieties like Pomfrets, Mulllets, Indian Salmon, accounted for hardly 1½ % each.

(b) **Fresh Water fish.**—The production of different types of important fresh water fish in India according to provinces is given below :—

ESTIMATED MARKETABLE SURPLUS OF FRESH WATER FISH IN INDIA

(000 Ry. Mds.)												
Assam.	Bengal.	Behar.	Bombay.	Central Provinces and Berar.	Madras.	Orissa.	Sind.	United Provinces.	Other Provinces.	Indian States.	Total India.	
250	1084	342	11	45	40	113	37	47	6	63	2044	Cat fishes.
—	251	19	10	—	19	26	32	—	1	21	380	Mulletts.
290	999	355	33	52	55	104	109	59	14	76	2146	Carps.
36	219	48	19	11	21	23	62	1	5	26	471	Prawns.
81	329	67	3	15	23	34	9	25	2	28	616	Live fishes.
41	157	38	3	—	12	16	11	5	2	9	294	Feather backs
—	31	5	1	5	2	3	3	—	—	3	53	Eels.
—	—	24	—	—	—	—	—	—	—	—	24	Herring and Anchovies.
18	63	61	1	28	15	7	4	10	—	23	231	Miscellaneous.

[In the whole of India carps accounted for about a third of fresh fish output, and cat fishes nearly a third; while, *live fishes* accounted for about 10% and Prawns for about 7½%.

4. Production of different varieties of fish in Madras according to fishing areas.

The production of sea fish in Madras can be classified according to three zones namely:

(1) *West coast* comprising the districts of Malabar and South Kanara.

(2) *East Coast—North*: Comprising the districts of Vizagapatam, East Godavari, West Godavari, Kistna and Guntur.

(3) *East Coast—Central*: comprising Nellore, Chingleput and South Arcot.

(4) *East Coast—South*: comprising Tanjore, Ramnad and Tinnevely.

In the following table the actual supply based on figures of fish curing yards are given and do not include minor catches.

(Statement—see page 18)

The above represents the commercial catch as based on the figures of curing yards. Some more fish is caught outside the yards especially in the East coast and an estimate made by the Fisheries Department some years back put this at 34 lakhs of maunds for the East coast alone.

It is, however, better to base production on commercial figures and an estimate of 58.5 lakhs of railway maunds represents the market supplies for the past five years.

The estimate for inland fish is only approximate and is roughly two lakhs of maunds. The important areas for inland fish were as follows :—

<i>District.</i>	<i>Name.</i>	<i>Rly. maunds.</i>
Godavari and Kistna	... Kollair lake	... 10,000
Tanjore	... Colaroon	... 7,500
Salem	... Mettur	... 6,000
Coimbatore	... Bhavani	... 1,800
Chingleput	... Madurantakam tank.	1,500

The quantity of fresh fish brought in the different yards of the West coast are given in Appendix II.

FISH PRODUCTION IN THE MADRAS PRESIDENCY.

Year.	East coast			West coast			Total
	North	Central.	South.	Total East Coast.	Govt. Yards.	Total Sea fish.	
1935—36	...	2.70	1.90	20.60	36.70	56.60	58.47
1936—37	...	2.70	1.41	15.11	32.00	46.41	48.28
1937—38	...	2.70	1.54	15.24	25.00	40.24	42.11
1938—39	...	2.70	1.90	11.60	20.00	37.60	39.47
1939—40	...	2.70	2.35	20.05	29.00	49.05	50.92
Average	13.20	2.70	1.82	17.72	28.54 + 0.41*	46.26 + 0.41*	48.13 + 0.41
1941—42	Assumed same as 1935—36 to 1939—40.			17.72	24.90	42.62	44.62
1942—43				17.72	44.00	61.72	63.72
1943—44				17.72	38.40	56.12	58.12
1944—45				17.72	38.40	56.12	58.12
1945—46				17.72	48.20	65.92	67.92
Average	13.20	2.70	1.82	17.72	38.78	56.50	58.50

* Outside Government Yards.

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The quantity of fresh fish landed in some of the important fish curing yards is given below :—

District.	Name of yard.	Quantity of fresh fish caught in the yards. (Rly. maunds).	
Malabar	Palayangadi (2 yards)	130,000	to 300,000
	Tanur	190,000	to 200,000
	Tellicherry	100,000	to 140,000
	Badagara	130,000	to 160,000
	Cannanore	90,000	to 120,000
South Kanara	Calicut	150,000	to 195,000
	Malpe	300,000	to 500,000
	Madaryi	130,000	to 205,000
	Udiyavara	160,000	to 205,000
Chingleput	Ponneri	50,000	to 60,000
East Godavari.	Uppada	35,000	to 60,000
Kistna	Bimilipatam	16,000	to 22,000

4. Classification according to fishing areas.

The following tables give an indication of the proportion of different varieties of fish appearing in the several important fishing areas of the Madras Presidency:

Fish supply according to varieties, seasons and areas.

Place.	Total amount of fresh fish available (Rly. maunds).	Particulars regarding varieties and seasons.
Malpe (South Kanara Dt.).	400,000	Mackerels and Perches 30% (October—November—December), Herrings and Anchovies 25% (October to December), Soles 5% (September), Crustaceans 4% (June to August and February), Cat fishes 4% (October to March), Elasmobranchs 3% (August—December).
Mangalore (South Kanara Dt.).	38,000	Mackerels and Perches 20% (October — November — December), Herrings and Anchovies 30% (October — November — December), Soles 13.2% (September—October), Cat fishes 10.3% (October to March), Elasmobranchs 5% (August to December).
Calicut (Malabar Dt.).	180,000	Mackerels and Perches 22% (September to February), Herrings and Anchovies 15% (October to December), Soles 12% (September), Cat fishes 10% (March—April—May).

Place.	Total amount of fresh fish available (Rly. Maunds).	Particulars regarding varieties and seasons.
Tanur (Malabar Dt.).	195,000	Herrings and Anchovies 20% (October — November — December), Mackerels and Perches 15% (September to December), Soles 13% (September — October — November), Silver bellies 12% (May, August to October), Cat fishes 8% (March—April—May), Elasmobranchs 6% (August to December), Prawns 5% (August to February).
Tuticorin (Tinnevely Dt.).	8,000	Chirocentrus dorab 32% (all through the year, maximum January to July), Mackerels and Perches 30% (all through good supply), Herrings and Anchovies 15% (September to April), Jew fishes 9% (November—March).
Madras City ...	150,000	Crustaceans 25% (All through the year maximum January—February), Mackerels and Perches 24% (all through, maximum January—February and September), Herrings and Anchovies 10% (all through), Silver bellies 7% (all through), Mulletts 4% (all through, maximum February — March), Elasmobranchs 3% (all through), Pomfrets 1% (all through, maximum August to September), Indian salmon 0.4% (all through).
Uppada (East Godavari Dt.).	49,000	Jew fish 42% (all through except April—May), Herrings and Anchovies 38% (January—March), also caught Pomfrets (March), Prawns (August to April), Mackerels and Perches (May to September).

Seasonal variations in production.

(a) *Sea fish*.—Fishing boats normally ply when calm weather prevails. During the monsoon fishing is generally poor due to squally weather conditions. In the West coast (*i.e.*, Malabar and South Kanara) fishing starts almost all along the coast after the conclusion of the South-West monsoon *i.e.*, after July. From this period the catches increase and reach a peak in October or November. After February, there is a progressive decline in the quantity of fish caught.

ANNUAL VARIATIONS IN THE CATCHES OF DIFFERENT VARIETIES OF FISH (WEST COAST)—(000 Railway Maunds).

	Elasmo- branches.	Cat Fish.	Herrings & An- chovies.	Macke- rels & Perches.	Pom- frets.	Silver Bellies.	Flat Fish.	Jew Fish.	Prawns.	Miscel- laneous.	Total.
1929—30	102	35	118	2233	7	178	77	24	142	342	3258
1930—31	86	70	244	348	16	97	173	23	186	404	1646
1931—32	110	92	95	4067	7	130	268	52	223	370	5410
1932—33	88	52	128	2190	14	40	83	20	102	418	3133
1933—34	71	83	2016	671	9	48	93	11	140	255	3397
1934—35	87	57	79	1476	5	110	154	40	153	300	2460
1935—36	88	126	70	2359	48	100	116	19	141	299	3366
1936—37	116	194	789	1223	9	77	117	72	150	440	3181
1937—38	127	284	552	408	10	76	100	64	108	679	2468
1938—39	106	90	177	789	15	114	112	61	61	478	2002
Average	98	108	427	1576	14	97	129	39	141	399	3032

APPROXIMATE MONTHLY CATCHES OF DIFFERENT VARIETIES OF FISH (000 Railway Maunds) 1939-40 (contd.)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Total.
Pomfrets :													
W. Coast	...	...	1.0	...	1.0	...	...	1.0	1.0	1.0	...	...	5.0
N.E. Coast	...	0.5	0.5	1.0	0.5	1.0	1.0	1.5	2.0	0.5	0.5	...	9.0
S.E. Coast	...	0.5	0.5	0.5	...	...	0.5	0.5	...	...	...	...	3.0
...	...	1.0	2	1.5	2	1	1	3	3.5	1.5	0.5	...	17.0
Jew Fishes :													
W. Coast	1	1	2	...	...	1	2	2	7	37	1	1	55
N.E. Coast.	2	3	4	5	3	4	7	5	8	4	3	3	51
S.E. Coast	1	1	1	1	...	...	...	1	...	1	1	1	8
...	4	5	7	6	3	5	9	8	15	42	5	5	114
Crustaceans :													
W. Coast	...	2	6	2	9	11	14	7	19	7	5	1	83
N.E. Coast	...	2	2	2	1	2	3	2	3	1	...	...	18
S.E. Coast	1	1	1	...	...	1	...	...	...	...	1	1	6
...	1	5	9	4	10	14	17	9	22	8	6	2	107
Silver Bellies :													
W. Coast	...	...	...	5	16	21	32	36	40	5	...	...	155
N.E. Coast	2	2	1	4	1	...	...	...	1	1	2	2	16
S.E. Coast	0.5	0.5	0.5	0.5	...	0.5	...	...	...	0.5	0.5	0.5	4
...	2.5	2.5	1.5	9.5	17.0	21.5	32	36	41	5.5	2.5	2.5	175

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APPROXIMATE MONTHLY CATCHES OF DIFFERENT VARIETIES OF FISH—(000 Railway Maunds) 1939-40.

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Total.
Sharks :													
W. Coast	9	8	9	6	7	2	2	2	8	2	11	12	78
N.E. Coast	...	...	1	1	...	1	1	1	1	...	...	...	6
S.E. Coast	1	2	2	2	2	1	1	2	2	3	1	1	21
...	10	10	12	9	9	5	4	5	11	5	12	13	105
Cat Fishes :													
W. Coast :	3	3	3	11	7	3	4	2	6	12	8	5	67
N.E. Coast	1	1	0.5	0.5	0.5	...	...	...	...	...	1	0.5	9
S.E. Coast	0.5	0.5	2	0.5	0.5	...	...	...	...	...	...	...	4
...	5	4	5	12	8	3	4	2	6	12	9	6	76
Herrings & Anchovies (Sardine group).													
W. Coast	42	8	5	1	1	2	7	9	19	378	355	245	1072
N.E. Coast	36	21	23	27	9	5	3	1	5	6	23	29	188
S.E. Coast	5	6	5	3	4	2	3	3	3	5	2	5	46
...	83	35	33	31	14	9	13	13	27	389	380	279	1306
Mackerels & Perches :													
W. Coast	55	26	10	11	6	1	10	72	212	90	49	35	577
N.E. Coast	7	4	4	6	5	5	12	9	16	8	6	5	87
S.E. Coast	1	2	2	2	1	5	3	6	7	9	4	2	44
...	63	32	16	19	12	11	25	87	235	107	59	42	708

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**AVERAGE MONTHS CATCHES OF FISH IN DIFFERENT COASTAL
AREAS—(000 Railway Maunds) SEA FISH.**

	Percentage.						
	Malabar.			S. Kanara.		Madras	
	Malabar.	S. Kanara.	Madras	North East.	South East.	Total.	Total.
January	305	261	632	49	17	12.6	13.3
February	192	54	300	35	19	7.9	6.3
March	104	41	202	39	18	4.3	4.3
April	96	15	171	49	11	4.0	3.6
May	85	10	134	26	13	3.5	2.8
June	92	7	135	20	16	3.8	2.9
July	128	10	180	30	12	5.3	3.8
August	238	60	338	21	19	9.8	7.2
September	269	80	402	39	14	11.1	8.5
October	328	269	654	32	25	13.6	13.8
November	248	541	840	39	12	10.3	17.7
	2421	1697	4735	424	193	100.0	100.0

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On the South-East coast the maximum catches are made in January and February.

The following table illustrates the monthly catches of fish in the different areas namely Malabar Coast, South Kanara Coast, the North-East Coast comprising Vizagapatam and East Godavari districts and the South-East Coast comprising Ramnad, Tinnevely and Tanjore districts.

(Statement see page 24)

Fish catches in South Kanara district are more concentrated than in Malabar as about 32% of the total is got in November and about two-thirds in the months October to December. In Malabar about 40% of the total catches is got from October to December and about 70% from August to January. In the North-East Coast, the catches are more spread out, the months of December, January and April giving relatively somewhat larger catches. In the South, a slightly greater production is got in September, while the period April to July is relatively low. For the whole of the Madras Coast it can be said fish production is highest from October to January (60%) and very low in the period between March and July.

Approximate monthly catches of different varieties of fish.

(Statements—see page 22, 23)

In the West Coast, Sharks appear in small quantities all through the year with a maximum in November—December. This is also true of cat fish. Herrings and Anchovies have a concentrated high production in October to December and the Mackerel group in August to November. Jew fish appear most in September—October while Crustaceans and Silver bellies are more frequent in the period July to September.

Trend and seasonal variations in the catches of different varieties.

Considerable variations occur from year to year in the proportion of different varieties of fish. An idea of such variation is given in the following data of the West coast for which complete figures are available.

(Statement—see page 21)

While the variations in Elasmobranchs is relatively small (70,000 to 120,000 maunds) variations are of a very high order in the Herrings and Anchovies group (70,000 to 2,016,000 mds.) and Mackerel-Perch group (348,000 to 4,067,000 mds.). Thus the Herrings group formed less than 2% of the total catch in the years ending 1932, 1935 and 1936 while it formed 60% during 1933-34. In a similar way, the mackerel group was hardly 2% of the total during 1930-31, 1933-34 and 1937-38 while it formed over 60% during 1929-30, 1931-32, 1932-33 and 1935-36. To a certain extent these two groups are complementary high catches in one being associated with low catches in the other and *vice versa*. Poor appearances of jew fish occurred when there were high catches of the Herrings or the Mackerel groups. Pomfrets were generally

always low, except for a large apperance during 1935-36. The catches of flat fish have been relatively more uniform especially in the period between 1935 and 1940.

Such variations in the total annual catches of fish and of different varieties fish are common, to all countries. This is due partly to the life history of the different varieties some of which are predatory and also to conditions of their development from the eggs and larval stage under marine conditions.

There has been an increasing volume of opinion especially after the years 1930 to 1935, that the supply of fish in West coast has been diminishing.

Although production was low during the years 1938 to 1940, the production does not show a progressive downward trend. Thus the quantity of fish caught in the West coast Government curing yards was as below :—

**Quantity of fresh fish landed in Government Curing yards
(West coast) lakhs of maunds.**

Year.	West coast.	East coast.—North.
1941-42	24.9	1941 6.0
1942-43	44.0	1942 5.4
1943-44	38.4	1943 6.7
1944-45	38.4	1944 7.0
1945-46	48.2	1945 3.8
1946-47		1946 3.9
(11 months).		

Compared to the figures given above in this chapter under seasonal variations, for the years 1930 to 1940 there is no evidence of progressive decline in the catches. In fact the catches during 1945-46 (48 lakhs of maunds) were the highest recorded in the past 15 years with one exception (1931-32 54 lakhs of maunds). The figures in the East coast though they show large variations do not indicate that fish production is falling. The coast is comparatively very long and deep sea fishing is likely to open up possibilities both in the East as well as in the West coast.

Fresh water fish

Regarding fresh water fish no figures are available which can illustrate the trend of production. There is, however, a consensus of opinion

that the inland fisheries are rapidly deteriorating in India due to the following causes :—

- (1) The construction of dams and weirs over the main rivers which obstruct the migratory fish from reaching their customary spawning grounds;
- (2) gradual silting up of rivers.
- (3) Reclamation of jhils (shallow inland lakes) and other fishery areas owing to the increased pressure of population.
- (4) Neglect of tanks and other sources of water supply consequent on the development of better irrigational facilities.
- (5) Over fishing.
- (6) Destruction of fry and immature fish ; and
- (7) pollution of streams and waterways in general.

Some of these causes should be looked into and maintenance of waterways and irrigation sources may be carried out in consultation with the fishing authorities. Although it may not be possible to remedy the effects due to unfavourable season, or the drying up tanks or rivers, it is possible to definitely improve the quality and quantity of fish by multiplying seeds of good varieties in selected Indian waters. This work is being done by the Fisheries and Industries department in many inland waters and is expanding into many districts.

(7) Fish retained by Fishermen.

It is possible to give only a rough approximation of the quantities of fish actually retained by the fishermen in the villages. Near cities and towns very little is retained by fishermen for their own use. In rural areas, however, many villages take to fishing and are used to private consumption ; particularly in Bengal and Assam, wherein fishing for one's own consumption is not considered derogatory.

The quantity retained by professional fishermen depends chiefly upon the size of the catch, varieties, the existence of a curing yard nearby and finally the transport available. In marine areas where fishing is available within 5 miles of homesteads, the quantity retained is not high but in the case of inland fisheries where long distances are traversed up the river a fair portion is consumed by fishermen by themselves or as gifts. If the catch is of superior varieties like seer, pomfrets, perches etc., fetching a good price, the whole quantity is sold and this is true of inland fish such as Catla, rohu etc. When the catch is mixed, the small sized and bony ones are retained for consumption.

As regards sea fish out of a total production of 117 lakhs of maunds of sea fish in India 8.8 lakhs of maunds or 7.5% was retained by fishermen. In the Madras Presidency the quantity retained by producers is estimated at 5%.

B. IMPORTS OF FISH AND FISH PRODUCTS TO INDIA.

1. Total quantity and value :

(a) *India*.—The imports of fish into India for the years 1936-37 to 1940-41 are given in Table III, p. 31. Under the classifications the term "total fish" includes the following namely : (i) Fish dry unsalted, (ii) fish dry salted, (iii) fish maws and shark fins, (iv) fish wet unsalted and (v) fish, other sorts. Besides total fish, imports of fish products are classified as follows :—

- (1) Canned fish.
- (2) Cod liver oil.
- (3) Fish or whale oil hardened and
- (4) fish manure.

The average imports under the above heads is compared below with the imports during 1940-41.

(Statement—See Page No. 29.)

On the average about 96,840 cwt. of fish and fish products were imported into India in prewar years of which total fish comprised nearly two-thirds of 61,750 cwt. canned fish accounted for just over 10% (10,580 cwt.), Cod liver oil about 1% (1,240 cwt.) while hardened fish or whale oils accounted for about 25% (23,270 cwt.) Besides there were imports of fish manure to the tune of 43,450 cwt. There was practically no import of raw fish into India, the quantity brought in cold storage of European or Canadian Fish being negligible.

IMPORTS OF FISH AND FISH PRODUCTS INTO INDIA.

	Average for 12 years ending 1940-41.				1940-41.			
	Quantity. Cwt.	Value. Rs.	Import price per Cwt. Rs.	Quantity.	Value.	Import price per Cwt. Rs.		
Total fish excluding canned fish	61,750	546,620	8 13	8	110,520	661,030	5 15 9	
Canned Fish	10,580	542,440	51 4	8	10,150	593,480	58 7 3	
Cod Liver Oil	1,240	81,840	65 12	8	1,780	184,910	103 11 4	
Fish or Whale oil hardened.	23,270	327,950	14 1	6	...	...	...	
Total	96,840	14,98,850	...	...	122,450	14,39,420	...	
Fish Manure	43,540	1,36,120	3 2	0	77,340	1,23,900	1 9 8	
Grand Total	1,40,380	16,34,970	...	...	199,790	15,63,320	...	

For the five years ending 1941-45 imports by sea from other provinces averaged 11,600 cwt. of dry fish and about 2,390 cwt. of wet salted fish.

Imports by rail and boat : The Madras Presidency used to receive from Travancore and Cochin supplies of dry and wet fish by rail and boats, part of which used to be exported to Ceylon and Burma. It is only possible to give a rough indication of such supplies as the supplies are also made by road. Besides imports were also received from Bombay into the Ceded districts. The total imports by rail and road are estimated as below :—

ESTIMATED IMPORTS BY RAIL AND BOATS OF FISH INTO THE MADRAS PRESIDENCY.

		(Railway Maunds).					Average.
		Prewar From	1941.	1942.	1943.	1944.	
Dry Fish unsalted.	Travancore.	32,600	51,940	32,890	35,320	31,940	36,370
Dry Fish salted ...	Travancore.	220,800	155,860	230,250	247,250	223,580	219,600
	Cochin.	24,400	10,000	10,000	10,000	10,000	10,000
(Estimate) ...		245,200					229,600
Total dry fish ...		277,800	217,800	273,140	292,570	265,520	265,920
Fresh Fish (Wet)	Travancore.	2,000	1,850	8,190	11,560	6,430	6,730
	Cochin.	1,000	1,000	1,000	1,000	1,000	1,000
Total wet fish ...		3,000	2,850	9,190	12,560	7,430	7,730

(b) *Madras Presidency.*—The foreign imports of different kinds of fish products into the Madras Presidency are compared to the total Indian imports below :

RELATIVE SHARE OF MADRAS IN THE FOREIGN IMPORTS OF FISH PRODUCTS INTO INDIA.—(Cwt).

31

	1935—36.	1936—37.	1937—38.	1938—39.	1939—40.	Average (Prewar).						
	India. ras.	India. ras.	India. ras.	India. ras.	India. ras.	India. ras.						
Fish dry salted ...	1310	2220	10	2280	260	3120	4830	2550	4340			
Fish dry unsalted.	3120	2800	2710	2360	35040	4610	52850	56710	30090			
Fish maws and Shrak fins ...	6600	90	6100	...	6860	...	3690	130	4760	5600	20	
Fish Wet salted.	26660	3060	25640	3300	28640	4240	31520	6540	32830	5510	29060	4540
Fish other sorts.	2770	90	3120	120	3550	360	3110	...	2860	...	3080	...
Total Fish ...	40400	6140	39800	5790	76370	9420	94290	...	101000	...	70370	...

Total imports of dry and fresh fish into the Madras Presidency.

These are estimated as follows :—

Estimated imports of fish into Madras Presidency.

	Prewar. Cwt.	Average 1941-1946.
<i>Fish Dry Salted :</i>		
Foreign	100	20
By sea from other provinces ...	800	1,030
By rail and boats	175,440	195,530
Total	176,340	196,580
<i>Fish Dry Unsalted :</i>		
Foreign	4,240	1,450
By sea from other provinces ...	7,080	10,570
By rail and boats	41,900	26,710
Total	53,220	38,730
<i>Fish Wet or fresh :</i>		
Foreign	4,540	350
By sea from other provinces ...	190	2,390
By boat, rail and road	2,200	5,680
Total	6,930	8,420
Total fish Dry and Wet	236,490	243,730

Periodicity of imports of fish

(1) *India*.—For the whole of India imports of dry unsalted fish were high during March, May, September and October and very low between June and August. Supplies of dry salted fish usually were maximum during January (40%) and of fish maws and shark fins during January to April. The imports of foreign wet salted fish were small between July to November, the supplies increasing from December and reaching a peak in March—April. The season of supplies from Arabia which sends the bulk of the preserved fish to India (92%) is from September to May in the fair weather season, when this coast is busy. Supplies of fish other salts which came in large steamers independent of the weather usually arrive in all periods of the year.

Madras.—Fish imported from Arabia into Madras is of small unsalted variety and arrives at Mangalore mostly between December and February. The supplies of dry fish from Bombay also imported at Mangalore are confined to the period October to May. Imports from Travancore and Cochin are received in the fishing season of the West coast largely during September to March.

2. SOURCES OF IMPORT OF FISH:

(a) *India*:

The sources of import of fish into India for the five years ending 1935—36 were as follows :—

Imports of preserved fish into India from different countries (percentage to total by weight).

Name of country.	Year.					Average. Percentage.	Quantity-Cwt.
	1935-36.	1936-37.	1937-38.	1938-39.	1939-40.		
United Kingdom	5.3	7.0	4.1	3.0	2.6	3.8	2690
Ceylon	1.3	1.3	0.2	0.4	1.1	0.8	570
Burma	4.5	2.8	5.4	2.7	0.4	2.9	2050
Other British Possessions	0.8	3.3	0.2	0.9	0.6	0.9	630
Total Empire Countries	11.9	14.4	9.9	7.0	4.7	8.4	5940
Musket & Oman	62.3	59.2	68.6	72.9	72.7	69.1	48890
Other States of Arabia	18.9	24.8	18.4	10.5	20.1	17.5	12380
Iran	0.7	0.5	2.6	4.1	2.1	2.4	1700
Other foreign countries	6.2	1.1	0.5	5.5	0.4	2.6	1840
Total	88.1	85.6	90.1	93.0	95.3	91.6	64810
Total Cwt.	42,300	39,800	76,400	94,300	1,01,000	70,750	
Value Rs.	4,39,800	4,43,900	6,70,300	6,89,100	7,29,500	5,94,500	

Of the average quantity of 70750 cwt. imported in the quinquennium ending 1939—40, Muskat and Oman accounted for about 69% while Arabia accounted 17½% or nearly 90% was from the Arabian coast. Of this again 50% was landed in Bombay ports, 30 to 40% in Sind and 10 to 15% in the West coast parts of Madras, chiefly South Kanara.

Madras.

The foreign and coastal imports of fish are given in Appendix III. Of the average quantity of 4340 cwt. of dry salted and unsalted fish imported during the five years ending 1939—40 from foreign countries, the share of Arabia was nearly 50% (2160 cwt.) and Turkey about a third (1370 cwt.). During the five years ending 1944—45, the imports declined to an average of only 1440 cwt. of dry unsalted fish of which the share of Iran was 910 cwt. and Muscat 380 cwt. The sea borne imports from other provinces was mostly from Bombay. In the trade by rail, the Travancore state was by far the largest supplier of fish to Madras, the average in the past six years ending 1946 being 219,600 railway maunds of dry salted fish, 36230 railway maunds of dry salted fish and 6730 maunds of wet fish. Imports from Cochin were relatively small as noted formerly.

(3) Canned Fish.

(a) **India** :—Canned fish consumed in India are practically wholly imported. There were various brands as Salmon bloaters, sardine in oil, herring, roes etc., in the market and in this classification are also included products like fish pastes, bottled shrimps and canned crabs and oysters. The trend of imports of the above is given below :—

Imports of Canned Fish into India.

Year.	Quantity. Cwt.	Value. Rs.	Import cost. per cwt.
			Rs. A. P.
1929-30	...	...	...
1930-31	...	...	...
1931-32	...	...	...
1932-33	...	...	...
1933-34	...	...	...
1934-35	...	...	...
1935-36	...	...	...
1936-37	...	...	...
1937-38	...	...	...
1938-39	...	...	...
1939-40	...	...	...
1940-41	...	...	...
Average for 12 years.	...	...	...

The quantity imported generally ranged about 10,000 to 12,000 cwt. annually and averaged 10,576 cwt.

The average monthly imports of canned fish to India was as below :—

Percentage of imports of canned fish in different months.

(Average 1936-37 to 1939-40.)

Month.	Percentage to Total.
January	11.9
February	9.6
March	10.5
April	12.0
May	8.3
June	5.5
July	4.7
August	5.6
September	6.6
October	6.7
November	7.5
December	11.1
Total	100.0

Imports were relatively high in the months December to April, when there is a general increase in the demand for fish all over India and the fish production is low.

The sources of supply of canned fish into India were as follows :—

Sources of import of canned fish (%) Prewar.

Name of country.	1935—36 to 1940. Average %.
Empire countries :	
United Kingdom	28.2
Canada	29.5
Other British	0.4
Total	58.1

Name of country.	1935—36 to 1940. Average %
Foreign countries.	
Japan	10.2
United States of America	20.6
Norway	7.6
Portugal	1.1
Others foreign	2.4
Total ...	41.9
Grand Total ...	100.0
Quantity cwt. ...	12,210

While nearly 60% of canned fish were from Empire countries, (30% each from Canada and United Kingdom) there were also imports from America (20.6%) and Japan 10%. Imports from Norway consist wholly of herrings in oil.

(b) **Madras** :—During the five prewar years 1935-36 to 1939-40, the import of canned fish into the Madras Presidency averaged 1593 cwt., which is about one-seventh of the imports into India. Of the Madras imports the share of the United Kingdom was 459 cwt. (29%), America 401 cwt. (25%), Japan 333 cwt. (21%), Canada 191 cwt. (12%) and Norway 139 cwt. (9%). Full details are given in Appendix IV.

With the progress of the war, imports declined and practically ceased during the years 1942-43 to 1944-45. During 1945-46 and 1946-47 imports were received from Canada only to the tune of 506 cwt. and 657 cwt. respectively.

The monthly variations are similar to imports into India i.e., the largest quantities are usually received from December to April.

(4) Cod Liver Oil.

(a) **India** :—Cod liver oil is a medicinal product and is imported into India in the raw condition as also in the form of emulsions and patent medicines. The Customs returns show only the imports of raw Cod liver oil. Imports have been steadily on the increase since 1929-30 and the maximum was 2505 cwt. during 1938-39 valued at Rs. 133,650 against an average of 1240 cwt. (prewar) for 12 years. There are different brands and the prices variable, depending on quality. Relatively larger

quantities used to be imported from March to June. The quantity of Cod liver oil imported into India were as follows :—

Imports of Cod Liver Oil into India.

		Quantity. Cwt.	Value. Rs.
1935-36	...	904	41,170
1936-37	...	1669	52,320
1937-38	...	1473	92,720
1938-39	...	2505	133,650
1939-40	...	1703	102,130
Average ...	...	1651	84,400

(b) **Madras** :—Imports of Cod liver oil into the Madras Presidency in prewar years were as follows :—

Foreign imports of Cod liver oil into the Madras Presidency by sea (Cwt.)

		Quantity. Cwt.	Value. Rs.
1933-34	...	377	17,880
1934-35	...	402	20,790
1935-36	...	292	12,480
1936-37	...	655	38,140
1937-38	...	578	47,610
1938-39	...	1004	59,330
1939-40	...	500	38,320
Average ...	...	...	...

During the war period imports of Cod liver oil from foreign countries was as below:—

FOREIGN IMPORTS OF COD LIVER OIL—(Cwt).

From	1940—41.	1941—42.	1942—43.	1943—44.	1944—45.	1945—46.	Average.
United Kingdom,	259	4	1	...	...	500	...
Canada	...	12	...	...	...	...	...
Norway	105	...	...	...	...	...	...
Netherlands	67	...	...	...	...	...	...
Japan	90	117	...	...	...	...	...
United States of America ...	56	129	6	...	117	...	...
Total	577	262	7	Small	117	500	244

40

41

Imports of Cod liver oil declined from 1940-41 practically ceased during 1943-44 and 1945, while during 1945-46 500 cwt. were imported from the United Kingdom.

(5) Fish or whale oil hardened.

The quantity of fish oil and hardened whale oil imported into India and Madras were as follows :—

Imports of hardened Fish or Whale oil.

Year.	To India.		To Madras.	
	Quantity. Cwt.	Value. Rs.	Quantity. Cwt.	Value. Rs.
1934-35	18,569	219,000	321	4,780
1935-36	17,597	233,220	89	1,510
1936-37	9,240	136,980	100	1,470
1937-38	5,415	94,010	Nil	Nil
1938-39	3,733	58,010	Nil	Nil
1939-40	1,183	24,500	Nil	Nil
1940-41	Nil	Nil	Nil	Nil

(Average 1935-36 to 1939-40 = 7434 cwt.)

These were separately classified only since 1934-35. Most of the fish oil and the bulk of the hardened whale oil were used in industries.

(6) Fish maws and shark fins.

Imports of fish maws and shark fins into India were almost entirely received at Bombay the share of Madras being negligible.

Imports of Fish maws and shark fins into India.

Year.	Quantity. cwt.	Value. Rs.
1933-34	5,995	24,920
1934-35	4,871	25,190
1935-36	6,601	26,300
1936-37	6,096	27,250
1937-38	6,859	44,270
Average	6,084	29,590

(7) Fish manures.

Although India was an exporting country for fish manure, there were imports to the tune of 43000 cwt. on the average annually. The quality was poor and the cost was about Rs. 2 per cwt. prewar as against Rs. 4-8-0 fetched by the Indian produce. Almost the entire quantity was got from Muscat or Native States in Arabia mostly to Sind during the fishing months.

— Imports of Fish manure into India and Madras.

		To India.		To Madras.	
		Quantity. cwt.	Value. Rs.	Quantity. cwt.	Value. Rs.
1935-36	...	29,580	112,850	420	2,550
1936-37	...	52,320	173,310	120	390
1937-38	...	35,660	52,240	60	170
1938-39	...	46,980	72,540	...	...
1939-40	...	49,960	98,710	40	190
Average	...	42,900	101,930	128	660

Imports of fish manure into the Madras Presidency were negligible from the years 1942-43 to 1946-47.

C. Exports of fish products from India.

(1) Total Exports.

(a) India.—Fish and fish manure were exported from India to Ceylon, Burma and countries in the Far East. The average quantities of preserved fish and fish manure exported during the nine years 1932-33 to 1940-41 were as below :—

Average exports of fish products from India.

(1932-33 to 1940-41.)

		Quantity. cwt.	Value. Rs.	Value per cent.		
				Rs.	A.	P.
Preserved fish	...	353,238	74,18,440	21	0	0
Fish manure	...	95,651	4,06,290	4	4	0

In regard to preserved fish, the drying and curing methods depend on the requirements of the export market. When the war broke out, India lost all her export markets except Ceylon.

(2) Exports of preserved fish.

(a) India.—The quantities of preserved fish exported from India for the years 1936-37 to 1940-41 were as follows :—

EXPORTS OF PRESERVED FISH FROM INDIA—(Cwt.).

	Year.					Average Value Rs.
	1936—37.	1937—38.	1938—39.	1939—40.	1940—41.	
Fish dry unsalted	212,418	208,076	205,193	201,732	171,704	199,824
Fish dry salted	174,545	121,292	119,592	142,291	150,216	141,587
Fish wet salted	4,195	4,090	5,224	7,246	16,213	7,394
Fish maws & Shark fins.	4,246	5,066	5,959	6,233	7,699	5,840
Total preserved fish	395,404	338,524	335,968	357,502	345,832	354,646

Although the total of exports has remained more or less steady there has been a steady decline in the exports of dry unsalted fish.

The season of exports was usually from September to March

The destinations of exports from India were as below :—

To	Average share %.
Ceylon	66.1
Burma	30.8
Other Empire countries	2.8
Foreign countries	0.3
Total ...	100.0

Ceylon was the principal market and 99.7% of them were made to empire countries in the East adjoining India.

The average share of the exporting provinces were as follows :— Madras (74%); Sind (15%); Bombay and Bengal (5% each). Madras was easily the largest exporting province for fish in the foreign trade and accounted for about three-fourths of the sea borne Indian trade.

(b) **Madras.**—(i) *By sea to foreign countries.*—The foreign exports of fish wet salted, dry salted and dry unsalted are given in Appendix V. The total quantity exported of dry salted and unsalted fish together averaged 256841 cwt. in the quinquennium ending 1939-40 as compared to only 5691 cwt. of wet salted fish. Ceylon took the entire quantity of wet salted fish, and nearly 78% of the dry salted and unsalted fish. Burma was the next largest importer with 55,956 cwt. of dry fish or roughly 21% of the total Madras exports.

The war closed the market for Indian fish in Burma from the year 1942-43, and Ceylon was the only foreign market. The character of the exports, however, changed. Exports of dry unsalted fish varied considerably reaching a maximum of 190859 cwt. during 1943-44 but fell off to only 43992 cwt. during 1945-46. On the other hand, exports of dry unsalted fish increased considerably from 66674 cwt. during 1940-41 to 365,509 cwt. during 1945-46. Exports of wet salted fish also increased considerably from 16213 cwt. during 1940-41 to 73454 cwt. during 1945-46. On account of these causes the average foreign exports during the war increased to 307,383 cwt. of all dry fish as compared to 256841 cwt. prewar while the average foreign exports of wet salted fish increased from 5691 cwt. prewar to 30613 cwt. in this six years ending 1945-46.

(ii) *Exports by sea to other provinces.*—Compared to the foreign trade exports by sea to other provinces were on a small scale only. The quantities were variable and the total exports of dry fish salted and unsalted decreased from 11593 cwt. during 1935-36 to only 867 cwt.

during 1939-40, and kept at a low level till 1942-43 (1336 cwt.). During 1944-45 and 1945-46 exports suddenly increased and reached a total of 34648 cwt. during 1945-46 the highest recorded in the past 10 years. In a similar way, the exports of wet salted which stored at 4912 cwt. during 1935-36 declined to negligible proportions during the years 1939-40 and 1940-41 and increased to 1264 cwt. during 1945-46. The prewar exports of dry fish by sea to other provinces averaged 4834 cwt. as compared to 6905 in the six years ending 1945-46, and of wet salted fish 1493 cwt. as compared to 546 cwt. in the post-war period. Bombay was the chief market in the export by sea to other provinces. (Appendix V.)

Exports by rail to other provinces.

Exports by rail were made chiefly in prewar years to Mysore, Travancore, Pudukottah and the quantity of dry fish exported totalled 18,333 railway maunds as follows :—

Average Exports by rail of dry fish and fresh fish (Prewar) Rly. maunds.

To.	Dry fish.	Fresh fish.
Travancore	6904	...
H. E. H. Nizam's State	...	2666
Cochin	1861	...
Mysore	5614	8023
Pudukottah	3784	73
Others	190	62
Total ...	18,333	10,823

Exports of dry and wet fish in recent years were as follows :—

Exports by rail of fish to other provinces.

To.	Rly. maunds.			
	Dry salted.		Fresh fish or wet fish.	
	1942-43.	1943-44.	1942-43.	1943-44.
Mysore	5920	5600	3720	1739
Cochin	590	40	...	...
Hyderabad	120	170	...	...
Bombay	30	...	...	...
Pudukottah	340	240	...	...
	7000	7050	3720	1739
Average ...	7026	7050	2730	1739

Exports by road.

In prewar years, the exports by road from the Madras Presidency were estimated as follows :—

Exports by road (estimated) Prewar.

(Railway Maunds.)

To	Rly.	
	Fresh or Wet fish.	Dry fish.
Mysore	7000	13,640
Pudukottah	2000	5,000
Coorg	1500	3,000
Total ...	10,500	21,640

The trade by road also continued during the war period and is estimated to be about the same level.

(3) Fish Manures.

(a) **India** :—During the years 1935-36 to 1939-40, foreign exports of fish manures from India averaged 109,128 cwt. as follows :—

Exports of fish manure from India.

	Quantity cwt.					Average.
	1935- 36.	1936- 37.	1937- 38.	1938- 39.	1939- 40.	
Quantity cwt. ...	94,240	104,320	127,960	94,200	124,240	109,128
Value Rs. lakhs.	3.73	4.04	5.59	3.79	5.80	4.59
Value per cwt. Rs.	3/15	3/14	4/6	4/0	4/11	4/3

Of the above the average shares of different countries were as follows :—

To	%
Ceylon	82.7
United Kingdom	6.9
Belgium	6.4
Italy	1.4
Others	2.6
Total ...	100.0

Exports increased on the whole from 94,240 cwt. during 1935-36 to 124,240 cwt. during 1939-40. The Empire countries took on the average 91% and foreign countries 9% of the total sea borne exports.

The Province of Sind was the largest single exporter and accounted from 82 to 97% of the total trade while Madras accounted for the rest namely (3 to 18%).

(b) **Madras**.—Exports of fish manure by sea to foreign countries was small and ranged as follows :—

Exports of fish manure to foreign countries from the Madras Presidency (Cwt.)

Year.	Year.
1933-34	32,840
1934-35	29,240
1935-36	24,340
1936-37	18,300
1937-38	12,880
1938-39	3,100
1939-40	20,250
Average ...	81

Average for five years
ending 1939-40. 15,770

D. Re-exports of fish products from India.

(a) **India**.—Excluding canned fish, re-exports from India average 1051 cwt. during the years 1936-37 to 1940-41 as follows :—

Re-exports of fish, excluding canned fish from India.

	Cwt.	Value Lakh Rs.
1936-37	1508	1.25
1937-38	1766	1.41
1938-39	1319	1.19
1939-40	549	0.39
1940-41	114	0.05
Total ...	1051	0.86

This represented only 1.6% of the total imports though in value it represented 13.5% due to higher values in re-export for such articles as fish maws and shark fins. Imports declined to negligible proportions from the year 1939-40 probably due to the war.

(b) Of the imports of dried fish from Travancore it is estimated that about 60% is re-exported directly to Ceylon, only touching the Madras ports. The quantities are estimated to vary from 90,000 cwt. to 200,000 cwt. according to season. This is mainly due to the higher prices in Ceylon than in Madras.

E. Total and Net Available Supplies.

(1) For the whole of India, the gross landings and imports and exports were as below :—

Net supply of fish (Lakhs of maunds) Prewar.

	Sea fish.	Fresh fish.	Total.
Gross landings of fresh fish	116.66	62.59	179.25
Deduct quantity retained by Fishermen ...	8.80	Nil	8.80
Deduct quantity offered for curing	70.14	0.89	11.03
Net home supply of fresh fish and for fish products	37.72	61.70	99.42

Fish Products :

	Production.	Imports.	Exports.	Net Supply.
1. Fish dry unsalted	37.12	0.60	2.72	35.00
„ Salted	31.52	0.03	1.93	29.62
Fish maws and Shark fins	0.08	0.07	0.08	0.07
Fish Wet salted	2.39	0.40	0.10	2.69
2. Canned Fish Small	...	0.16	...	...
3. Cod liver oil	...	0.02	...	...
4. Fish oil (hardened)	0.36	0.05	...	0.41
5. Fish Manure & Gauno	3.71	0.58	1.58	2.71
6. Re-exports	...	...	0.01	...

Of the estimated total production of fresh fish India of 179.3 lakhs of maunds, about 99.5 lakhs (or roughly 5.5 %) enter into the market as fresh fish; besides 8.8 lakhs of maunds retained by producers.

In the absence of precise information regarding the various products traded in, it has not been possible to reduce these quantities into equivalent weights of fresh fish. As far as value is concerned, the prewar export trade in fish and fish products was Rs. 76 lakhs, as compared to an import value of Rs. 15 lakhs, leaving a balance of trade in favour of India by Rs. 61 lakhs.

(b) **Madras.**—The pre-war position of fish supplies in the Madras Presidency is estimated as follows :—

Net supply of fish in the Madras Presidency.—Pre-war (lakhs of mds.)

		<i>Sea fish.</i>	<i>Fresh fish</i>	<i>Total</i>
Gross landing of fresh fish	...	46.67	1.87	48.54
Less retained by fishermen	...	2.32	...	2.32
Less quantity converted into canned fish		30.14	...	30.14
Net supply of fresh fish for the market, or fish products	...	14.21	1.86	15.67
	<i>Production</i>	<i>Imports.</i>	<i>Exports.</i>	<i>Net Supply</i>
Fish dry salted	... 12.85	1.76	3.96	22.69
„ unsalted	... 16.09	0.53		
Fish maws and shark fins	... small	0.08	...	0.98
Fish wet salted	... 1.20	0.07	0.31	0.96
2. Canned fish	... small	0.02	...	0.02
3. Cod liver oil	005	0.006	...	0.11
4. Fish oil hardened	... 0.07	0.02	0.06	0.03
5. Fish manure & guano.	2.46	small	0.21	2.25
6. Re-exports		small	...	...

The position of net supply of fish in the period 1940-41 to 1945-46 was as below :—

Net supply of fish and fish products in the Madras Presidency (Average 1940-41 to 1945-46).

(Lakhs of maunds).

	Sea fish.	Inland fish	Total.
Gross landing of fresh fish ...	56.500	2.000	58.500
Less retained by fishermen. ...	2.825	...	2.825
Less quantity converted into fish ...	40.100	...	40.100
Net supply of fresh fish for the market and for fish products. ...	13.575	2.000	15.575

plank built boats of different types are used, but in the smaller rivers simple and cheap dug-outs are adequate.

The nets and other implements used in fishing are designed to capture particular fishes. Broadly in India, large predacious varieties like sharks, perches etc., are generally caught at a distance of five miles from the shore on long lines or with large meshed drift nets. When the shoal tends to approach the shore as in Bombay ducks, prawns etc., stake nets operated by the tides are used. In the South Kanara and Malabar coasts, sardines and mackerels come very near to the sandy shore and highly efficient in-shore-drag-nets have to be used to capture them. Soles and deep water car-fishes are caught with trawl type nets which scour along the bottom.

In shallow back-waters and tidal estuaries, stake and dip nets are widely used. For capture of small varieties, cast nets are universally employed along the coasts.

As regards fishing in tanks and *jhils*, the implements often used are spears, traps, baited springs, hanpoons, nets etc. In estuarine fisheries of India, seines and dip nets are also common besides stake nets, while in the deep estuarine channels leading direct into the sea, drift-nets are used. In the lower reaches of the larger Indian rivers, where the waters are swift and deep, several kinds of nets are used as purse-nets, dip-nets, drag-nets, drift and gilling nets. In the upper reaches of the main rivers, and in the tributaries which go dry during part of the year, fishing is done by traps, weirs and small nets. Drag nets and cast nets with traps of many patterns and types are used in small tanks and *kols*.

B. FISHING VESSELS.

1. Description of the types of fishing vessels.

(a) Sea craft :

(i) WEST COAST.

Dug-out canoes.—This canoe is made by scooping out material from a large trunk of trees called aini (*Artocarpus hirsuta* Lane) and cheeni (*Tetrameles mediflora*) in Malayalam. The keel portion is left thicker than the sides. Two sizes are usually employed the larger ones which are 32 to 35 feet long, 3 feet wide and $2\frac{1}{2}$ feet deep are usually used in pairs chiefly for working bag nets and weigh 3 to 5 tons. The smaller ones average $2\frac{1}{2}$ tons in weight, measuring $24 \times 3 \times 1\frac{1}{2}$ feet, and are used by drift or cast net fishermen. The larger boats usually carry a crew of seven, the smaller three or four. The bigger canoes have a bamboo mast 15 feet high and a simple sail, while the smaller ones generally have two masts and a large canvass sail.



FISHING CANOE - TUTICORIN



FISHING CANOE - TRANQUEBAR

Although shark fisherman proceed much farther into the sea than others, they prefer the smaller flat bottomed type of canoe, as sharks can easily be loaded into it. The average life of dug out canoe is about fifty years.

c *Boats*.—The largest of the fishing boats are low free board one alled *Machuvras* are used for deep sea fishing in the Bombay coasts by the Ratnagiri fishermen. They measure $30 \times 9\frac{1}{2} \times 3\frac{1}{2}$ feet with a displacement capacity of 5 to 10 tons. Built of teak frame and planking with subsidiary upper strakes of mango wood, they carry a single mast and great press of sail and of good sailing power and sea-going capacity. They are low in the waist but have no separate deck on accommodation for nets, which are bigmeshed drift nets, employed for deep sea fishing. In the Konkan and Kanara districts, a special type of boat called *akada-hodi* in Konkan and *padava* in Malabar is employed to shoot the long-haul shore seine. It is 16 to 20 feet long and its basal part is either a low dug-out or made up of a bottom plank and two narrow vertical planks.

All the boats described above have cut-rigger equipment formed by two covered bamboo poles (*bowkar*) and a float (*uldi*) the poles being laid across the waist of the boat and extending to 5 or 6 feet on one side of the boat; and so tied that the distance between the posts decreases towards the distal ends. To these is directly attached the light wooden float made generally of *Erythrina indica* (*Muruka*—Malayalam).

(ii) EAST COAST.

(1) *Catamarans*.—This is the characteristic fishing craft on the coast and is a keel-less raft formed by lashing together three to five pieces, occasionally seven, of light trough hewn-wood. The logs are 12 to 15 feet long cut square on one edge and carried into a rough cone at the other, the conical end rising slightly above the general level of the raft and forms the stem of the catamaran. All logs are not of the same length, the end ones being shorter and giving a horn like resemblance to the raft when tied. A bamboo mast and a simple sail are used with the catamarans.

(2) *Boats*.—The only boats in use are the non-rigid *masula* boats (which are constructed with planks without frames or ribs so as to withstand the severe knocking from the surf. Some of them are quite large running from 26 to 35 feet in length, 5 to 8 feet in breadth and $3\frac{1}{2}$ feet in depth and accommodate a crew of nearly 20. For a smaller crew of two, the size is 15×3 feet. In Baruva in Vizagapatam district, catamarans are provided with a plank on each side to a height of about 9 inches and serve as boats.

(3) *Boat catamarans*.—The boat catamaran is a large catamaran composed of three logs semi-permanently secured together by cross pieces at either end in such a way that the side logs rise higher than the

upper surface of the central one, thus forming a longitudinal hollow similar to the cavity in boats. The craft is seen only in the south-east coast between Punnakayal and Cape Camorin in the Tinnevely district.

(b) **River craft.**

(i) *Rafts and dug-outs.*—Many types of material are used in India in river fishing craft, as inflated skins, plantain stems, bundles of *shola* sticks, inverted earthenware pots laced together etc. Crafts of inflated skins (buffaloe) are generally used in the upper reaches of large rivers. Rafts of plantain stems or *shola* sticks are met with in Tanjore district of Madras and in Bengal in marshy low lands. The *chatty* or earthenware pot is seen in Patna, Gaya and in the North and in Trichinopoly, Tanjore area of the south, and is made up of nine earthen pots arranged in rows of three and supporting a light platform of bamboo by connected bamboos lashed on either side of the mouths of the pots. Single pots are sometimes used as in Sind for *hilsa* fishing. In the Cauvery and Tungabadra rivers, a circular and bigger coracle is used. The usual type is of a shallow cylindrical frame of wicker work about five feet in diameter over one mouth, round the sides of which a cow hide is stretched and firmly tied. Dug-out canoes called *donga* in Bengal and *ekhta* in Bihar are also common in the shallow tributaries of the Ganges and other rivers. These are made from the low ends of the stem of the palmyra palm.

(ii) *Plank built boats.*—Of the various types those used for *hilsa* fishing are called *jalia dinghi* 15 to 25 feet long and 3 to 4 feet deep, and employed with the clap net (*sangla*). A similar type used with the triangular dip net is called *bhesal jal*.

For rapid transport, of fish to centres of demand a narrow boat propelled by numerous rowers is used as the *chhip*.

(iii) *Large fishing boats.*—In the lower and wider reaches of the deltaic rivers, a large fishing boat called *chhandi* carrying a sail and propelled by 3 or more rowers in the bow is used. The largest size is 60 feet long and 10 feet wide, but the more common ones are 34 to 35 feet long, 5 to 5½ feet wide and 2 feet deep. The boat is partially decked with planking. Another type of large fishing boat is the *bachavi* longer and narrower than the *chhandi* and used for fishing with a bag cast net. In Eastern Bengal, for the carriage of line fish to Calcutta, boats 30 to 50 feet long are used and the greater part of the hold is partitioned off to form of a live well in which fish are transported in water.

(2) *Number and distribution of fishing vessels.*—An approximate estimate of the number of fishing vessels in the maritime provinces is given below, as estimated during 1941, omitting Bengal and Orissa.

Approximate number of vessels used for sea fishing in India.
(1940-41).

Section of coast.	Plank built boats.	Masula boats.	Dug-out canoes. Large	Small.	Catamarans.
West Coast.					
Sind ...	100	...	...	270	...
Gujarat ...	500	...	...	1070	...
Bombay City	125	...	...	200	...
Konkan ...	2460	...	...	6930	...
Kanara ...	400	400	...	2620	...
South Kanara	...	225	1090	5250	...
Malabar ...	...	...	2760	3490	...
Cochin ...	...	...	1350	1720	...
Travancore	...	...	3960	5040	1000
East Coast.					
Tinnevelly ...	...	90	...	...	880 (boat catamarans.)
Ramnad ...	...	180	...	50	120
Tanjore ...	...	890	...	...	2582
Chinglepet ...	...	360	...	...	4,360
Nellore ...	...	390	...	...	1,000
Guntur ...	...	110	...	8	715
Krishna ...	...	790	...	485	775
West Godavari	...	760	...	235	115
East Godavari	...	140	...	9	1,105
Vizagapatnam	...	1,860	...	50	11,200
Total ...	3,585	6,195	9,160	27,427	23,852
Share of Madras ...	...	5,795	3,850	9,577	22,852

C. FISHING IMPLEMENTS.

Implements of catching fish are numerous but all of them are variations of a few broad types. The chief fishing implements used in different tracts in India are given in Appendix VI with the corresponding vernacular names. They can be broadly classified as follows :—

- (a) Fixed or stationary nets.
- (b) Bag nets and purse nets.
- (c) Seine nets.
- (d) Drift and gilling nets.
- (e) In-shore drag nets.
- (f) Cast nets.
- (g) Scoop nets.
- (h) " Pouch " traps.
- (i) Trawl type nets.
- (j) Long lines.
- (k) Miscellaneous appliances e.g. fish spears, harpoons, fish screens, traps, baited springs etc.

Large sized implements are employed chiefly in sea-fishing. In the back-waters, estuaries and in inland waters, however, traps, tidally operated screen barriers, cast-nets and large dip-nets are used. Drift-nets used only in the longer back-waters, in the vicinity of sea-ward channels.

The coast of India may be divided for fisheries purposes into ten natural areas and the river systems into two, as follows :—

a. Marine Fisheries.

- (1) *Sind area*.—The cape Monze to the mouth of the Sir river.
- (2) *Gujarat area*.—The gulf of Cambay (including South Kathiawar) and down the coast of Gujarat to the Kolak river.
- (3) *Konkan area*.—From Kalai on the southern frontier of Daman to the mouth of Terekhol creek (north of Goa).
- (4) *North Kanara area*.—From Myali on the Southern boundary of Goa to Bhaktal near southernmost coastal limit of Bombay.
- (5) *South Kanara area*.—From southern boundary of Bombay province down to the north of Balipatam river near Cannanore.

(6) (a) *Malabar coast area*.—From Cannanore in the North to Cape Camorin.

(b) *Malabar and South Kanara*.—Back-water fisheries.

(7) *The Gulf of Mannar area*.—From Cape Camorin to Point Calimere.

(8) (a) *The Coromandal coast*.—From Point Calimere along the East Madras coast to Pulicat lake (30 miles north of Madras).

(b) *The Coromandal coast back-water fisheries*.

(9) *The Telugu area*.—From Pulicat lake northwards to Puri in Orissa including Chilka lake.

(10) *The Deltaic area*.—The estuaries of the Mahanandi, the Ganges, the Brahmaputra stretching from Puri to Cox Bazaar.

b. Riverine Fisheries.

- (1) The Gangetic system of rivers.
- (2) The Indus system of rivers.

The fixed or stationary nets are employed all along the west coast from Sind to South Kanara and in the gulf of Mannar and in Coromandal. Bag nets and purse nets are used in Gujarat, Konkan, Kanara, Malabar, Coromandal and Telugu coasts and in the Gangetic system. Seine nets are used in all the marine areas of the west and east coast except Kanara and Coromandal. Drift and gilling nets, in-shore drag nets are used all along the east and west coast, and cast nets throughout the sea coast, except Mannar. Scoop nets have a use in the Sind, Konkan, Malabar, Mannar, Coromandal, in the sea coast, and in the Indo-Gangetic riverine areas. The pouch trap is confined to the Coromandal Telugu area, and the trawl type net to the Mannar area and the deltas.

A detailed description of the nets used in the different tracts of the Madras Presidency is given in Appendix VI with the different kinds of fish got by each net.

The following gives a brief note on some important kinds of nets and fishing implements used in the presidency.

NETS.

Fixed stationary nets.—[Gorati bali or Endi (Kanara) Katanikalli (Mannar) Kala or Katta vala (Coromandal)] are of two sizes in Kanara either 27' or 45' long, made of cotton and is used to catch mullets or prawns. A long piece of netting is doubled upon itself by folding and sewn at the ends. The mouth is crossed into pockets by short sticks

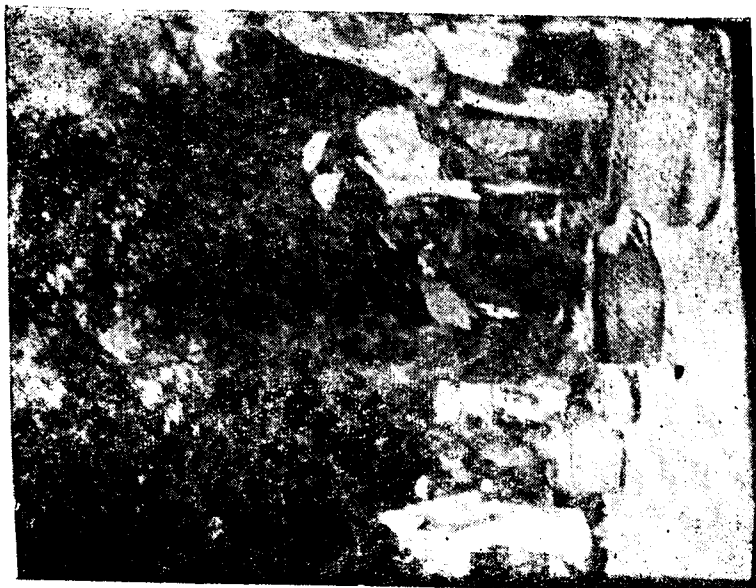
and the net is extended to the widest extent by men who run with it for a short distance and close it. In shallow waters, the fixed net used (Endi) is submerged and suddenly raised when fish is driven to this region.

Grey mullets are caught by fixed nets in the Calimere area and mullets and cockup in the Coromandal coast.

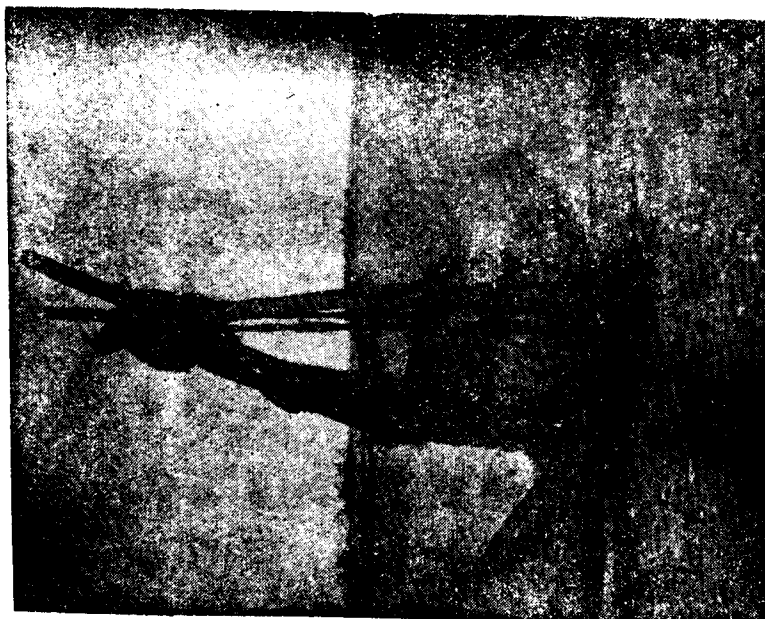
Bag nets and purse nets.—Vai balai, Nulu balai—Kanara; Nadar vala or Thuri vala—Calimere; Padda vala, Naga vala, Katta vala or Kavala vala (Pulicat lake). These are nets in the form of bags varying in length from 36' at South Kanara, 40' to 60' in Calimere, and 20' to 24' in the Telugu area. The *Vaibalai* has got wings 90' to 60' made of coir and manned by two canoes with a total crew of 10 to 14 men. The kind of fish caught are shoaling pelagic fishes like Sardines, mackerel, ribbon fish etc., in South Kanara; and miscellaneous pelagic fishes in the Coromandal as also shoals of pomfrets, sardines, mackerels etc.

Seine nets.—Odam vala, Vakku vala or Kolli vala (Malabar); Vangu valai (Mannar). In Malabar the Odam vala which is also a bag net consists of a wide mouthed bag of cotton (48'), a coir net base (60') and two long wings (150'), one on either side of the mouth, the meshes being '15 to '25" for the bag, 7 to 9" at the base, and 1 to 3 feet at the wings. The *Kolli vala* is similarly designed but the base and sides are of small mesh cotton instead of coir, and the wings are very short, the length of the bag base and wings being respectively 36, 72 and 48 feet. (Alathi Kolli). The *Ailakolli* is made stronger of hemp fibre to catch larger fish. The kinds of fish got by the seine nets in Malabar of various types are shoaling fishes like Sardines, Mackerels, Silver bellies (*Odam vala*) big cat fishes and jew fishes (*Vakku vala* hemp) and sardines (mathi kolli) and mackerels (*Aiyla Kolli vala*). In Cape Camorin, the seine nets are employed to catch prawns and in the Coromandal area pelagic shoaling fishes.

Drift nets.—Kandadi balai, Acha balai, shoraka balai (South Kanara) Odam vala, Thirandi vala, Srare vala, Kandadi vala (Malabar), Vala vala, Kola vala (Mannar). In South Kanara drift nets are made of hemp and are of sizes ranging from 60 to 108 feet length and 9' or 18' width; the meshes being 2 to 3" or 6". The nets are used in fleets, with floats attached to the head rope, and stone sinkers at the foot rope. A long cord is attached to one end of the head rope, and the free end of the cord is carried in a canoe, which along with the net drifts in the current. Seer, pomfret, cat fishes, small sharks and rays are caught with this type of net in South Kanara and Malabar. In the Mannar area, the drift nets are 144' x 30' or 64' x 33' and are used to catch Silver bar fishes, Sardines, and Anchovies. The *sravu vala* of Malabar (35' x 12') with meshes 5 to 8" is used for catching Sharks and the *Therandy vala* (6 to 9" mesh) for rays.



WEEKLY SHANDY - MELAPALAYAM



WEIGHT FOR A DRAG NET

Gilling nets: Chala valai (Malabar); Kanda valai (South Kanara); Vala valai, Kanni valai, Thirukkai valai (Coromandal); Koduravalai (Coromandal back-waters).

The Vala Valai is a drift net about 1200 feet long and 20 feet wide and meshes of one inch used day and night mainly to catch shoaling fishes. The seine net of Malabar is of two kinds, Adachala 60' x 36' with mesh of $\frac{3}{8}$ to 1" and *Mathe chala* with mesh of $\frac{3}{8}$ to $\frac{5}{8}$ " length 36 to 75 feet and depth 12 to 18 feet. The former is used for mackerels and the latter for sardines. The gill nets in the Coromandal area ranged from 150' to 250' length, and are used to catch pomprets, seer, cockup, Indian salman (2" cotton mesh), and skates, rays and sea fishes (3 to 5" hemp mesh).

In-shore drag nets.—Rampani (South Kanara), Peria valai (Coromandal). The rampani of South Kanara is made of hemp and measures 1000 to 1800 feet the width increasing from the end from 6 feet to 15, 20 and 24 feet in the centre progressively and the mesh decreasing from $1\frac{1}{4}$ " at the ends to $\frac{1}{2}$ " at the centre. It is used in South Kanara for catching sardines and mackerels in large quantities. In the Coromandal, the in-shore net made of hemp is 36' long with wings of 700' with a bag 21' long and is used to catch shoaling fishes like mackene, ribbon fish, silver bar, prawn etc.

Cast nets.—Deb valai (South Kanara), Vichu valai (Malabar), Vicha valai (Coromandal), Bhakti Jal, Nanjia Jal, Noli (Telugu). The cast net is in general use everywhere, and is adopted for catching small shoaling fishes near the shore. It is made of cotton thread and is circular with a strong cord at the centre. The diameter is 30 to 40' with meshes $\frac{3}{8}$ to $\frac{5}{8}$ " and bits of lead are used to serve as sinkers round the circular cord. The kinds of fish caught by different kinds of cast nets are—sardines and mackerels and prawns (South Kanara and Malabar), all kinds of fishes in the back-waters of the west coast, prawns and small fishes in the Coromandal and in the chilka lake.

Scoop nets or hand nets or dip nets.—Kai valai (hand-net—Canara); Cambu valai (dip nets—South Kanara); Seepa valai (Mannar); Arippu vala, Vettu vala (Malabar); Kai valai (Coromandal). In Malabar the hand net is a small bag shaped cotton net with $\frac{1}{4}$ " meshes used to catch prawns and small fishes. The dip net of South Kanara is 2' x 2' with meshes $\frac{1}{4}$ to $\frac{1}{2}$ " made of cotton, while the Chinese dip net (Cheena vala) is 30 to 35 feet square and catching all kinds of surface fishes.

Pouch traps.—Iriga valai (Coromandal); Siru valai (Telugu). The Pouch trap in the Northern Circars is a cotton seine net operated from two catamarans, the bag being 50 feet wide at the mouth and 25 feet broad with $\frac{1}{4}$ " mesh at bottom and 1" mesh at the mouth, and catching ribbon fish jew fish and pomfret. The *siru vala* is 70' x 21' made of cotton with meshes $\frac{1}{2}$ x $\frac{1}{2}$ " and the catches are chiefly mullets.

Trawl type nets.—Modi valai (Mannar) Moi jal (Delta). In the Mannar area, the trawl net has a cotton bag 54' long, hemp wings and seven of 75', and coir rope 108' and is operated by two catamarans maintaining a definite distance between them during sail and closing up when hauling. The catch is miscellaneous consisting of sardines, silver bellies etc.

Miscellaneous : Implements :

(a) *Long lines.*—Cheria or Valia beppa (South Kanara); Cheria or Sararru beppu (Malabar); Tamani Kayaru (Coromandal).

In Malabar and South Kanara the lines are of tanned cotton 1000 to 3000 feet long with hooks 1 to 2" long attached every five to six feet from mine snoods. The catches include cat fish, seer, Jew fish, cockup, small sharks, rays, Indian salman etc. Lines are small in the Coromandal sea coast with terminal lead sinker and two snoods using worms as bait, but in the backwaters long lines of 600 to 900' made of coir, using prawns as bait are used for catching cat fishes; and this is also practised in the Telugu area.

(b) *Harpoons.*—This spear like missile (Chattuli—West Coast) is 8 to 10 feet long with barbed iron point (8 to 9") and attached to a line (240' long) and thrown with strong force to catch sharks, large rays, dolphins, dog fish etc.

D. NOTES ON THE MANUFACTURE OF NETS AND OTHER FISHING TACKLE.

Light nets are made of ordinary cotton thread available in the Bazaar. These are spun into thicker threads of 3, 4, 5 and 6 strands by means of the *Chadu* or *takli* (spinning instrument). The stronger or coarser nets are generally prepared with sannhemp fibre (*crotolaria juncea*). Nets are mostly made in the fishing villages, generally by the fisherwomen.

The nets are frequently "barked" i.e. treated with tanning materials like *Odina wodier* (Kalisam or odayam maran) or fruit of *Diospyros crubryopteris* (panachika) or the bark of *Karel* wood imported from Zanzibar. The bark or dried fruit is finely ground and the tannin extracted by boiling with water. When the resultant decoction is cool, the net is soaked in it for sometime. After drying on a scaffold, it is run through the decoction a second time. In Bengal, coal tar is used for preserving fish. Damaged sections of the net are replaced or patched by new lines and the net can be used for a very long time.

Long lines used in fishing are always made of cotton and tanned periodically, and used with indigenous hooks. For angling the hand

lines are made from the fibre of sannhemp or leaf stalk of palmyra or kitul (*caryota urens*) and the fibre of *Calatro phisiganta*.

Waste silk is often used in Bengal. Usually a light cotton net lasts only for about nine months i.e. one season. Nets covered with blood, Slime and fish oil when stored wet easily lose strength due to bacterial action or oxidation of oils. The life of the nets can easily be prolonged by sprinkling salt over them as is done in America. Blue vitriol alone or combined with soap and creosote is also largely used in other countries, so that nets might retain their elasticity, as well as lightness. Recently copper plate has been recommended by the United States Bureau of Fisheries as a highly efficient fish preservative.

E. FISHING WITH POWER BOATS.

(1) *Fishing with power boats in other countries.*—The application of power to fishing craft has been an important development in sea-fishing during the last 75 years in Western countries. In Great Britain, the increase in the demand for fresh fish due to the advent of the railways and the inadequate catches made by sailing craft, led to the development of the steam trawler and steam drifter, but these have not entirely displaced the sailing craft even now. The latter are used where coal is expensive or fishing grounds close by.

Power may be used not only for propulsion but also for dragging or hauling the heavy net as in the case of other trawls. Trawling is the chief method employed for bottom feeding "white fish" like cod, haddock, plaice, dab etc., which constitute nearly 60% of the fish landed in Great Britain. The Danes prefer small crafts fitted with motors, while in the in-shore fisheries of Canada, motor boats using nets and lines are employed. In Japan, rapid progress has been made by employing longer fishing boats fitted with auxiliary motor engines and their number increased from 5000 during 1920 to 31,000 during 1931.

(2) *Use of trawlers in India.*—In India, experiments on deep sea fishing were conducted in the Pre-war period from 1902 to 1925 in the Ceylon coast, from 1908 to 1922 in the Bombay area, from 1908 to 1931 in the Madras area. But for various reasons, the ventures were given up. The conclusion of the Madras Committee which sat in 1919, was that till harbours and cold stores were available, trawling on a commercial scale would not be feasible. The bulk of the fish caught were prime food, the better class of fish being surface and mid-water species. It was noted that the cost of trawling was about four to five annas per pound of fish as against a wholesale price of two annas per pound at that time.

(3) *Possibilities of better off-shore fishing using power.*—(a) *Drifter trawling with seine nets.*—From the working of the steam trawler "William

Carrick" in Bombay, Mr. Hefford has suggested that a more suitable vessel for fishing in Bombay would be the smaller drift trawler equipped with a trawl, Danish seine and large indigenous nets. The cost was estimated at about a fourth of the cost of steam trawler, and the crew about half, but large sharks and dog fishes might get through the light twine.

(b) *Development of motor boat fishing.*—The Agricultural Marketing Adviser to the Government of India, in the report of the Marketing of Fish in India (1946) suggested as a possible line of development the introduction of motor boats fitted with large seine and drift nets. This would allow of a moderately cheap equipment capable of taking the crew to further waters against heavy surf and enabling the use of more powerful nets and lines.

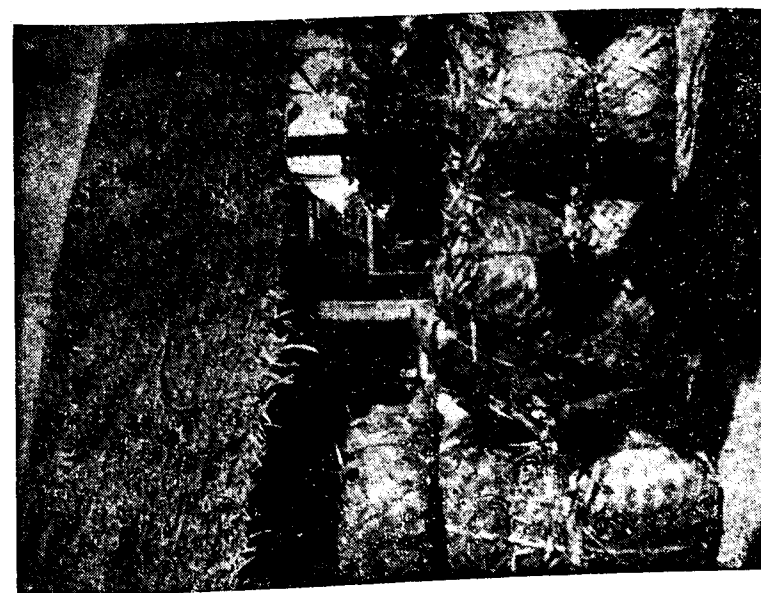
The coming of the war led to a greater effort towards the motor boat industry and upto 1947 eight motor boats have been launched by the Madras Fisheries department. Of these the vessel M. F. V. Madras is a 45' launch with diesel oil engines, tonnage 26 and speed 8 knots, introduced from August 1946 in the Madras Harbour. M. F. V. "Adirampatnam" is similar working in the park strait from September 1946 and caught on its first operation a huge shoal of 901 cat fish weighing 7000 lbs. M. F. C. "Sea scout" was introduced in Tuticorin in October 1946, and made a record catch of 7 sharks in 10 days time, weighing 2526 lbs., one shark weighing 588 lbs. (135 lbs. liver). These vessels are adapted to cover a distance of 40 to 60 miles and a depth of 30 to 40 fathoms.

It is too soon to forecast the possibilities of motor boat fishing, as this has been of very recent introduction, but it is a line of development which, if carefully expanded, is likely to increase the catches of fresh fish for human consumption and thereby improve the critical food situation.

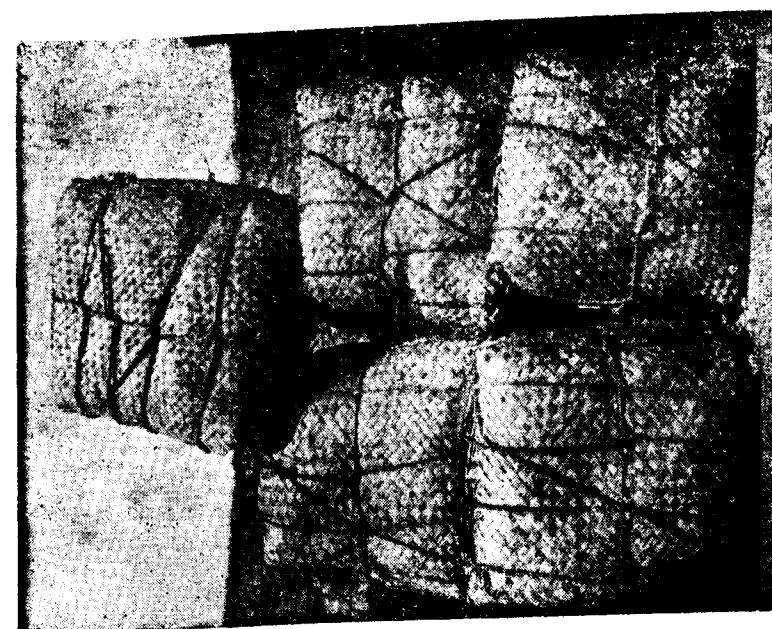
CHAPTER IV—PREPARATION FOR THE MARKET.

A. *General.*—The marketable surplus of fish caught from rivers tanks and other inland resources is almost wholly consumed as fresh fish. The preparation of such fish generally consists in merely removing the viscera, viz., intestines, heart, liver, lungs etc. and washing.

Among perishable foods, fish is, however, most liable to taint in the warm climate of India due to action of bacteria and enzymes. Ordinary fish become therefore unfit for human consumption eight hours after being caught, unless otherwise treated in the interval. This presents difficulties in the case of sea fish. Due to scattered coast line, the method of catching and the time taken between the catch and bringing it to the shore the supply of fish from the sea coast is generally often



ICED FISH PACKETS - BADAGARA



FISH PACKED IN BASKETS - PONNANI

tainted, except in some important markets where ice can be supplied. In order to reach consumers in internal markets, the bulk of the sea fish is therefore sundried or cured with salt and this also happens when enormous catches are made from unexpected shoals. When the catches of fish comprise types which are not considered by custom or prejudice as useful as food, they are converted into industrial products like manure " gnano " etc.

B. Methods employed after catching.

(1) *Catching* —As described in the previous chapter (III) various types of nets and fishing gears are used for catching different kinds of fish. To some extent, the further preparations depend on the nature of the fish and the methods employed in catching.

(2) *Collecting*.—The fish caught are usually put in a heap on the boat or in a coir net. Generally boats land fish either early in the morning or after four o'clock in the evening, but if shoals are caught, the boats get quickly filled and the catches may come at any time. Where fish is to be exported by rail, the fishermen usually collect their catch to suit the local railway timings. The catches are handed over to fisherwomen or middlemen, who first sort the fish according to species and arrange for sale.

In order to ensure the rapid transport of fish to urban coastal markets, and thereby provide for a greater utilisation as fresh fish, " motor boat " were introduced by the Bombay Government to operate for a distance of 200 to 300 miles from Bombay. The trade took up the work and there were nine carriers in 1940 handling about 500 tons. Such carriers were also tried in Calcutta, upto the time of World War II (1939).

The common method of using a sailing boat for carrying fish has got limitations. In the Madras coast the use of motor boats using fish carriers using as base Mangalore, Cochin and Calicut would open up large markets for fresh sardines, mackerels and other varieties in the inlands.

(3) *Gutting and cleaning*.—The process of removing the viscera is termed gutting. In this process, a long cut is made along the dorsal or ventral line of the fish using a knife and the various organs are pulled out by hand. Fresh water fish are gutted by the fishermen as soon as landed. The operation is not so promptly done for sea fish, but this is an essential preliminary to every kind of salting or drying process. Large fish such as the seer, pomfret, cat fish, small sharks, jew fish etc., are split through the dorsal line from the root of the tail to the tip of the snout, and the guts and gills removed. The ventral column which remains attached to the fish in this position is severed from the skull

by a transverse cut at the junction and the knife again passed downwards till the root of the tail is reached, thus separating the ventral column from the fleshy side for the greater part but keeping it attached by the uncut portion of the skin on the dorsal side. Scores are made in the thick fleshy parts by passing the knife lengthwise, and the fish washed before application of salt. In the case of thinner fish such as ribbon fish, mackerels, small pomfrets etc., only the first dorsal cut is made and the ventral column remains attached to one side of the fish and no scores are needed. Mackerels are usually slit on the abdomen and the guts and gills removed before salting, but for exports to Ceylon, they are slit on the back and the guts removed by an incision made in the abdomen before salting. Sardines are cured either by cutting off the head and the abdomen with a single diagonal cut or by simply slitting and removing the guts and gills. Skates and rays are cut on both sides of the ventral column which is removed together with the head and tail and the remaining portions, which are the really elongated fins, cut into fillets. Large sharks are cut into pieces of convenient size and filleted. Smaller fish of various kinds are gutted by pulling off the gullet or they are simply roused with salt, put in lines and sundried. All cut up fish are washed usually in the sea water before salting.

There are some important points that should receive attention in the process of gutting and cleaning the fish. As the alimentary canal is the starting point of all putrefactive changes, it is necessary that it should be quickly removed in a tropical country like India. Ordinary varieties of sea fish are usually gutted from 5 to 6 hours after death. Moreover gutted fish are not always washed, and the entrails are also thrown in a haphazard way and no attempts made to utilise them as manure. In this connection, the use of motor boats as carriers will be helpful and attempts should be made to clean and gut the fish as early as possible after the catch in a central place. This will also enable the salvaging of the unedible matter which forms 20 to 30% of the raw weight, for use as a nitrogenous manure.

C. PRESERVATION AND CURING OF FISH.

All the processes which inhibit or wholly arrest postmortem changes in animal products, e.g., refrigeration, dessication, pickling, smoking, canning, treating with antiseptics etc., can be utilised for the preservation of fish.

(1) Refrigeration.

The method of treatment differs according to the period for which the fish is to be preserved. Whether for one or two days only or for several days together. For preservation for short periods merely packing the fish with broken ice in a deal-wood box would suffice. Saw dust or rice husk can be sprinkled over to prevent a too rapid melting of the ice.



ASSEMBLING DRY FISH - PARAMAKUDI



HANDLING ICE FISH PACKAGES - TANUR

From	To	Rate
Ernakulam	{ Parpanangadi.	Quarter parcel rates for consignments weighing 3 maunds and over.
	{ Palayangadi.	
	{ Kanhangod.	
	{ Kasargod.	
Coimbatore Mangalore	{ Mangalore.	do.
	{ Parpanangadi.	
	{ Pantalayini.	
	{ Badagara.	
	{ Tellicherry.	
	{ Cannanore.	
Coimbatore	{ Palayangadi.	do.
	{ Kanhangod.	
Mangalore	{ Kasargod.	do.
	{ Mangalore.	
Mangalore	{ Tirur.	do.
	{ Tanur.	

There were during 1939 about 50 cold store installations, large and small, all over India of which only one had special arrangements for freezing fish. During 1946, the number of cold store houses in the Madras Presidency, increased to 13. Of these, a few are owned by the R.I.A.S.C. and others private, used to store fish along with other perishables. Fish merchants in Bombay used to keep baskets of fish packed with crushed ice in the chilled room of the cold storage to prevent tainting. Only fish which remain unsold at the end of the market hours, or arrived too late for the day's auction, used to be so stored and reduced charges were quoted for the first day. It would be profitable to instal similar storage rooms, in all urban coastal markets in the vicinity of centres for landing or assembling fish.

In the report on the marketing of fish in India, it is stated that on the whole fish freezing has a limited scope for development in India ; as frozen fish even in the best inland market could not be sold in Pre-war years at more than Re. 1 a seer, and the cost of freezing with an average temperature of about 90°F came to about as much as the cost of the fish; the storage costs amounting to one anna per pound per week for maintenance at 10°F., besides the cost of packing and dry ice.

Recent developments during the war period have given an impetus to increased consumption of fresh fish, especially by the Defence Services, through transport in low temperature vans for perishables. There have also been considerable seasonal variations in prices of the rare fish as follows :—

Variations in wholesale prices of fish (1944).

(Rs. per Imperial maund).

		West coast.		East coast.	
		Highest.	Lowest.	Highest.	Lowest.
Pomfrets	...	15/11 (August)	4/6 (October)	9/6 (May)	5/10 (August)
Seers	...	12/8 (March)	5/10 (December)	12/4 (December)	4/8 (January)

Such variations in prices, due to limited stocks may be remedied by refrigerated storage and the possibilities should be more fully investigated.

The Director of Industries and Commerce has under proposal the erection of cold storage houses for fish in important coastal fishing centres. Supplemented by cold storage arrangements in the power boats it is possible to expand the consumption of fresh food, while also reducing the loss due to storage, tainting etc., under present conditions.

(2) CANNING.

At present there is practically no fish canning in India. The factory at Bezwada formerly used to can a small quantity of prawns and a private cannery at Chalam, Calicut known as 'Malabar Fisheries Company' was not doing work. The demand in India at present is small and is confined to excellent imported European and American goods to the extent of 500 tons annually. The consumers who are mostly Europeans and Anglo-Indians prefer tinned salmon or herring to any of the Indian varieties. Certain investigations on canning were conducted by the Madras Government from 1911 to 1927, in the cannery at Chalam (South Malabar). In reviewing the work, Sir Fredrick A. Nicholson has pointed out many practical difficulties as the dearth of cans, lack of proper machinery, want of technical knowledge, choice of varieties etc., but these are difficulties which every new industry has to face, although they exist even now.

Fish fit for canning are oil sardines, mackerel, prawns, seer and pomfrets, the last two in slices. Sardine canning is done as follows :—

Sardines which are quite fresh and absolutely free from taint are taken to the cannery and after removal of head, tails and guts rinsed in fresh water and placed in prepared brine for 10 minutes. They are then placed on grills to drive out excess moisture, and subsequently put in pans containing bubbling oil, chiefly olive oil, and cooked for a few minutes. They are afterwards placed in sloping tables to drain off the excess oil and packed in tins well immersed in olive oil, if desired.

Cloves, pepper, curry leaf etc., are also added to suit the taste of consumers. The cans are thereafter closed air-tight in the usual way with lids, provided with rubber rings, and steam cooked in retorts. They are then tested for air tightness and finally wrapped with attractive paper wraps. They are again tested for leakiness or air tightness and if satisfactory, consigned to consuming areas.

The main difficulty with canning fish in India is that canned fish are not adopted to Indian methods of cooking, and the average Indian might prefer his own fish, than the ready-made canned ones from undesirable hands. Further the canning period is short and lasts only 100 days in the year while the skilled hands have to be engaged for the rest of the period. As regards supplies of fish, it is difficult to obtain fish of uniform size and quality in appreciable quantities. In Western countries, the raw material is made up of pelagic fishings like herrings, bristlings etc., or seasonal sea fish ascending to rivers like the Salmon. In India, although the sardine and mackerel appear in pelagic shoals, their movements are uncertain and further a method for softening their bones has to be worked out. If transported in carriers to the factory, the costs of transport, and consequent high price, have to be considered, besides the cost of the container. The Agricultural Marketing Adviser to the Government of India has estimated that the manufacturing cost for a tin of sardine or mackerel would be 4 annas (pre-war) of which the cost of the fish would be 15 % of the can 50 % while labour and overhead charges would amount to 35 %.

To overcome these difficulties, it has been suggested in the report of the Marketing of Fish in India, that a mobile cannery can be used to get a regular supply of prime fish at cheap rates; using a wooden boat with the necessary canning equipment, and developing a reasonable speed in the calm waters of the Arabian Sea from September to March. Floating canneries were used by the Japanese successfully in the Pacific to can crabs and a similar venture might prove quite practicable in India.

The Agricultural Marketing Adviser to the Government of India has estimated that a power propelled motor launch with canning machinery to handle 2 tons of fish a day would cost about Rs. 2½ lakhs (pre-war) and would cover 270 to 300 nautical miles to and fro in 3 to 5 days. He has suggested suitable storing centres in India at Karachi, Bombay, Calcutta and Cochin. The produce can be graded and standardised, according to defined specifications.

(3) CURING.

GENERAL.

(a) *India*.—The chief methods of curing fish in India are sundrying without salt, salt curing by the dry process and salt curing by the wet process. In curing the object is to withdraw the natural moisture of the tissues and thus prevent bacterial or enzymic decomposition which

develops in the presence of moisture and warmth. About 75 to 85 % of the weight of raw fish is water. For very good curing, the drying should be rapid and thorough. The drying can be performed by (a) heat, (b) dry air, (c) salt and (d) salt and pressure. Moisture alone is removed from the cells by heat or dry air, while when salt is applied, it displaces by osmosis not only the water but also the crystalloid nutrients present. Pressure acts further by driving out the contents from the cells, in addition to what has been extracted by salt.

Generally drying is preferred to wet salting by fishermen in India. As salt is expensive wet salting is rarely practised. When salt is used it is used sparingly, putrefaction being prevented by the subsequent heavy drying. Salting, whether done dry or wet, yields generally a product, which though not unwholesome is neither attractive nor appetising.

The methods of curing depend on the kinds of fish cured, climate, materials, the period during which fish are to be kept and above all, the market for which the cured fish is intended.

The approximate quantity of fish cured by various methods in India is estimated as below:—

ESTIMATED

Quantity of fish cured in India by different methods in different provinces (000 railway maunds) Pre-war.

Province or State.	Govt. fish curing yards			Outside fish curing yards			Grand Total	Percentage
	Wet salted	Dry salted	Total	Sun dried	Salted	Total		
Sind ...	9	44	53	22	...	27	75	1.1
Bombay ...	101	210	311	453	24	477	788	11.1
Madras ...	120	1200	1320	1609	85	1694	3014	42.3
Travancore ...	...	68	68	410	1274	1684	1752	24.7
Cochin ...	7	27	34	167	9	176	210	3.0
Orissa ...	2	19	21	95	3	98	119	1.7
Bengal ...	...	...	...	850	150	1000	1000	14.1
Baluchistan ...	...	...	...	15	20	35	35	0.5
Kathiawar ...	...	...	...	20	1	21	21	0.3
Total ...	239	1568	1807	3461	1566	5207	7014	98.8
Percentage to total sea fish caught.								
	2.1	13.4	15.5	31.2	13.4	44.6	60.1	—

Province or State	Govt. fish curing yards			Outside fish curing yards			Gardn Total	Percentage
	Wet salted	Dry salted	Total	Sun dried	Salted	Total		
Assam	...	...	...	50	15	65	65	0.9
Other areas	...	...	...	21	3	24	24	0.3
Total ...	...	...	...	71	18	89	89	1.2
Percentage to total of fresh water fish.	...	...	...	1.1	0.3	1.4	1.4	...
Grand Total.	239	1569	1807	3712	1584	5296	7103	100.0
Percentage to total fish production.	1.3	8.8	10.1	20.7	8.8	29.5	39.6	—

It will be seen that of the total average quantity of fish cured; namely 7.1 million maunds about a fourth was cured in Government Fish Curing Yards. The quantity of fresh fish cured represented about 40 % of the total Indian production. In regard to the share of the different provinces, the quantity cured in Madras was highest and represented about 42.4 % of the total in India (1.75 million railway maunds), the next in importance being Travancore (24.7 %) and next Bengal (14.1 %). Thus over 80 % of the fish bought for curing in India was accounted for by these Madras, Travancore and Bengal.

In regard to different methods employed in curing, it is seen that for the whole of India 52 % of the fish bought for curing was sundried, about 3 % wet salted and the rest about 45 % dry salted as compared to 53 %, 4 % and 43 % respectively in the Madras Presidency.

(b) Madras.—For the curing yards in the West coast, the total quantity of fish bought for curing with the quantity of cured fish got was as below :—

Total fish caught and quantities of fish brought for curing West coast—(Madras Presidency).

(000 Railway maunds).					
	Total fish caught.	Fresh fish brought for curing in yards.	Percentage of catches cured.	Cured fish got.	Percentage of cured fish to fresh fish.
1942—43	4394	2055	46.8	1264	61.5
1943—44	3840	1725	44.9	1069	62.0
1944—45	3844	2124	55.2	1340	63.1
1945—46	4823	2329	48.3	1455	62.5
Average	4225	2053	48.6	1282	62.3

The average output of cured fish to fresh fish bought for curing worked to about 62.3 % in Government curing yards, while only 48.6 % of the total catches are bought for curing. The output of cured fish to total fish landed therefore works only to 30.3 %.

In the northern division comprising Vizagapatam and East Godavari districts, the total catches and the quantity cured were as follows:—

Total catches and quantity of fish cured in Vizagapatam and East Godavari districts (000 Railway maunds).

	Total fish caught.	Fresh fish bought for curing in the yards.	Percentage of catches cured.	Cured fish got.	Percentage of cured to fresh fish.
1941	600	232	38.7	120	51.7
1942	540	266	49.3	153	57.5
1943	672	337	50.1	178	52.8
1944	698	278	39.8	159	57.2
1945	383	138	36.0	78	56.5
1946	392	134	34.2	75	56.0
Average	548	231	42.0	127	55.3

In the northern circars, about 42 % of the total catches were bought for curing and the percentage of cured fish was about 55 % of the fresh fish bought for curing and only 10 % of the total catches.

During the years 1944-45 and 1945-46, the quantity of fresh fish bought for curing and the output of cured fish in all the yards in the Madras Presidency were as follows :—

Quantity of Fish (thousands of maunds) in Government yards.

	Fresh fish bought.	Cured fish got.	Percentage.
1944—45	2124	1340	63.0
1945—46	2530	1455	57.5

Total quantity of fish cured in the Madras Presidency :—

Although accurate figures are available for the quantities of fish cured in Government yards, these are however, comparatively large quantities particularly of sundried fish, cured outside these yards. It is possible only to get a rough approximation of the quantities to cured.

From trade sources it is estimated that the estimated percentages to total catch and quantities cured were as below :—

Average estimated quantity of fish cured outside Government curing yards—(Lakhs of maunds).

Division.	Percentage.	Pre-war.	Percentage.	1940-41 to 1945-46
East Coast :				
North ...	30	3.96	30	3.96
South ...	30	0.55	30	0.55
Central ...	10	0.27	10	0.27
West Coast ...	40	12.16	30	11.63
		-----		-----
		16.94		16.41
		-----		-----

Adding this to the total quantity brought for curing to the Government curing yards, the average quantity of fish cured in Government curing yards and private yards is estimated as below :—

Average quantity of fish bought for curing in the Madras Presidency (000 Railway maunds).

Period.	1935-36 to 1939-40.			1940-41 to 1945-46.		
	In Govt. yards	Out-side Govt. yards	Total	Govt. yards.	Out-side Govt. yards.	Total
East Coast :						
North ...	167	396	563	231	396	627
Central ...	21	27	48	21	27	48
South ...	64	55	119	64	55	119
	-----	-----	-----	-----	-----	-----
Total ...	252	478	730	316	478	794
West coast	1068	1216	2284	2053	1163	3216
	-----	-----	-----	-----	-----	-----
Total ...	1320	1694	3014	2369	1641	4010
	-----	-----	-----	-----	-----	-----

Fish intended for long storage have to be quickly frozen in special air cooled chambers or with chilled brine glazed and stored at a low temperature.

There were in 1939 about 270 ice factories operating in India and the cost of a ton of ice in Pre-war years ranged from Rs. 45 ex-factory at Bombay to Rs. 45 F.O.R. at stations in Malabar. Practically all of these factories cater to the needs of the public for cool drinks in summer months. There was only one factory at Bombay which manufactured ice specially for fisherman and which did not put up the price during summer months. Ice is used for keeping fish wholesome during transit to distant markets inland, especially during summer. But supply of fish in the coast was difficult to obtain.

With a view to facilitate the supply of ice to the fish industry, and cheapen the costs of transport the South Indian Railway quoted the following reduced rates for transport of ice to fishing centres in the Malabar coast.

From	To	Rate per Maund	Date of introduction
Calicut Kallayi.	Badagara. Tellicherry. Cannanore. Kanhagod.	Quarter parcel rates for consignments weighing 3 maunds and over.	1-3-1935.
Calicut ...	Mangalore	do.	5-6-1937.
Ernakulam ...	Pantalayam. Badagara. Tellicherry. Cannanore.	do.	5-6-1937.
Ernakulam ... Coimbatore ...	Tirur. Tanur.	do.	16-9-1937.

The above rates were 50% lower than the ordinary tariff half parcel rate. With effect from the 15th March 1940, the following further concessions were granted at the instance of the Provincial Marketing Officer.

From	To	Rate
Calicut.	Tirur. Tanur. Parpanangadi. Pantalayini. Palayangadi. Kasargod.	Quarter parcel rate for consignments weighing 3 maunds and over.

From	To	Rate
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	{ Kanhangod.	
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	{ Mangalore.	
Coimbatore Mangalore	{ Parpanangadi.	do.
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GENERAL.

(a) *India*.—The chief methods of curing fish in India are sundrying without salt, salt curing by the dry process and salt curing by the wet process. In curing the object is to withdraw the natural moisture of the tissues and thus prevent bacterial or enzymic decomposition which

in layers in a barrel with a sprinkling of salt and tamarind between the layers. Heavy weights are placed on the top of the pile and the barrel is temporarily closed. At the end of 3 to 4 days, the "self brine" is run off through a small hole made in the bottom. The fish are found to have shrunk considerably. They are pressed down and the barrel is filled with more fish from other barrels to make good the shrinkage. When completely filled in this manner, the cover is put back into the barrel and the original pickle (brine) returned till the barrel is "bungfull". The proportion of salt is 30 lbs. per imperial maund of fish, and of tamarind about 2 pounds. Each barrel may contain 6000 mackerels and weigh about 10 to 12 cwt. This type of cure is practised by Colombo merchants, who specially go to Malpe in South Kanara for the purpose during the mackerel season. Rarely large fish as seer, promfret etc., cut up into slices may be treated in the above manner.

(ii) *Prawn curing*.—Prawns are cured by boiling and then drying or by simple sun-drying. The former method is chiefly resorted to during wet weather. Prawns are placed in wide mouthed copper vessels (*andahs*) filled to a fourth with water and boiled for about half an hour until they turn brown. They are next sun-dried over coir mats for a day. The dried prawns are put into jute gunnies filled partially and beaten against a hard block of wood or stone to remove the shells. Winnowing is done to separate the fleshy part from the skin and the kernels are sorted out and once again dried before storage. The shells are used as manure. In the second process, i.e., sun-drying fresh prawns are simply sun-dried and the shells are not removed from the dry product. Shelling and drying result in a loss of 80% of the weight of the raw prawns, while sun-drying (unshelled) causes a net loss of only 40 to 50%.

The chief centres for prawn curing by boiling are Cochin, Palayangadi, pentalayini etc., in the West Coast and for dry prawns Coconada in the East coast.

A new process for curing and storing prawns is being popularised by the Madras Fisheries Department. Here prawns are blanched (i.e. sealed) by dipping in boiling water or a 6% salt solution and then shelled and salted by immersion in saturated brine for about 20 minutes. After draining off the brine, the kernels are dried either in the open air or in a drier. The drying is only partial and is stopped when the prawns are so firm that fairly strong pressure between the thumb and the finger leaves an impression on them. This product is put into a tin which is sealed and then charged with carbon dioxide. "Semi dried" prawns are said to keep for nearly a year. When immersed in water for about thirty minutes the excess salt dissolves away, the prawn absorbs water and resembles and tastes like fresh fish.

(iii) *Pit curing*:—Pit curing is a very common method adopted in the Tanjore and Tinnevely coasts. After being gutted and cleaned, fish are placed in layers in pits with a mat lining at the bottom and sometimes at the sides; and salt is sprinkled between the layers. Another mat is placed on the top and the pit covered with sand. Next day the pit is opened and the fish is well rubbed with salt, repacked and again left in pits for 3 or 4 days, until the salt is completely dissolved. The fish are then ready for despatch.

(iv) *Fish paste*:—Tamarind fish is prepared in Malabar from sea fishes. In the process, the fish are cut into slices, salted and when dry, treated with a pungent and spicy paste consisting of chillies, mustard, garlic, tamarind etc., prepared in vinegar. The process is also in vogue in parts of Bengal and Assam, using various constituents like pepper, caladium or even fish oil for preparing the paste.

D. Issue of duty-free salt for fish curing.

Throughout the world salt is the most important curing agent for fish and live-stock products as meat, hides, skins etc. In the days before salt became an excisable commodity in this country, fishermen used to prepare salt from sea waters (salt earth) for house consumption as well as for curing fish. Even after the imposition of this duty, the collection of salt earth was permitted in Malabar and South Kanara, and it was complained in the last quarter of the 19th century that the salt tax killed a flourishing industry in the coasts of Bombay, Bengal etc.

Records on the subject show that the salt enclosures (the present day fish-curing yards of the Madras Presidency) were established in the interests of the public, namely to provide them with more wholesome salted fish as an article of diet and incidentally to save the Government the trouble, expense and risk of designing and administering measures against the use of salt earth, the collection of which was an immemorial right in certain districts. An institution like the fish curing yards does not exist in any other country.

Although the hope that the better quality cured fish of the yards would displace fish cured in the primitive way, did not materialise, due to the inability of the poorer classes to appreciate the difference, the fish curing yards became numerous and popular, Madras having 108 yards in 1892 as against 115 during 1945-46.

In the initial stages the Salt Department of the Government of India was the administering and controlling authority and the policy was to confine as far as possible, any expense of maintaining the yards merely to foregoing the excise duty on salt issued for curing.

The cost of running the yards e.g. construction, maintenance, establishment, transport of salt etc., was recovered on a charge made on the issue price of salt. Financial considerations were generally important in locating the situation of these yards. The Central Government fixed the prices of salt by contract with local merchants and the issue price was different in different provinces. As it was found that the amount recovered from the yards did not cover the expenses, the issue price was raised from 10 annas to Re. 1-4 in Madras in 1924, and from 14 annas to Re. 1-1 in Bombay when the transfer of the yards to the provincial fishery authorities took place.

It is stated in the report on the marketing of fish in India that a policy of opening new yards in suitable centres with issue of cheaper salt would induce more fishermen to own 'tickets' in the yards and that it is not the case even now. In Madras applications for new yards are entertained only if the applicants undertake to (a) provide a suitable site, (b) erect buildings on the site according to required specifications. (c) and fence the site satisfactorily at their own cost. Secondly, the price of salt was also raised as a source of revenue in some provinces.

In Madras, the pre-war cost of production of salt varied from 4 annas per maund at Tuticorin, to 7 annas per maund at Bimilipatam, while the average cost in Bombay was 6 annas including transport charges. The yards were originally established more in the interests of public health rather than to benefit curers, although undoubtedly better cured fish at cheaper rates were available especially to the poorer consumers, fishermen have not been benefitted. The Madras Committee on Fisheries actually recommended that out of the calculated issue price of Re. 1-4 per maund (including cost of salt and running the yards) only 60% or 12 annas should be recovered from the curers, the balance being met from general revenues but this recommendation has not yet been implemented by the Provincial Government.

The quantity of fish and salt issued for curing in the Madras Presidency in recent years was as follows:—

Fish bought for curing and salt issued.

Year.	Fish Quantity bought for curing. (maunds)	Salt issued maunds	Ratio of salt to fish
1944-45	21,24,345	334,148	1:6.4
1945-46	25,29,628	368,851	1:6.8

E. Number, location and size of fish curing yards.

There were during 1940-41 in all about 151 fish curing yards in India distributed as follows:—

Distribution of fish curing yards in India with average quantity of fish salted in them (1940-41.)

Name of District or Section.	No. of yards.	Length of coast-line.	Average quantity of fish bought for curing.	Average quantity of salt issued.
		Miles.	Maunds.	Maunds.
West Coast:—				
Bombay: Ratnagiri Dt.	18	90	6974	1979
North Kanara	14	80	7395	1969
Madras: South Kanara	22	150	6585	3635
Malabar	34	90	17767	
States: Cochin	2	41	15954	1700
Travancore	12	172	5635	1486
East Coast:—				
Madras: Southern section	14		4159	872
Central „	9	1150	10029	1499
Northern „	26	...	3654	498
Total India.	151	1773		
Madras: West Coast	56	240		
East Coast	49	1150		
Total Madras	105	1390		

In Madras there were 105 curing yards during 1940-41 and these increased to 112 during 1944-45 and 115 during 1945-46.

The yards deal only in salt cured fish. The area of each yard ranges from half an acre to five acres and is strongly fenced with one entrance. The passage is through a building with an office room on one side and a salt godown on the other. Larger yards are in the charge of Sub-Inspectors who were paid Rs. 60 to 80 a month in pre-war years and small yards by petty yard officers paid Rs. 20 monthly. Each yard has a number of curers to whom "tickets" are issued free of cost. The majority of curers are fishermen, and the number of tickets ranges from 5 to 120 per yard. All salting operations should be done within the yard and the ticket-holder has to

The proportion of dry salted, wet salted and sundried fish is estimated as below:—

Estimated average quantity of fish cured by different methods of curing in the Madras Presidency—(000 Railway maunds).

Period	In Govt. curing yards.			Outside Govt. curing yards.			Grand total
	Wet salted	Dry salted	Total	Wet salted	Dry salted	Total	
1935-36 to 1939-40.	120	1200	1320	1609	85	1694	30.14
1940-41 to 1945-46.	120	2249	2369	1559	82	1641	40.10

(a) *Sun drying*.—Drying in the sun or shade is the simplest method of curing fish and theoretically also the best because the nutrients are not withdrawn from the cells and wasted as in salting. But a good cure is not possible on the tropical sea coasts, because the air, though hot, is very moist and the exterior of a thick tissue gets hardened when exposed to the sun, even though the inside remains moist and warm. In dry regions like in the interior of Bengal or Assam, sundrying is relatively more successful, especially during winter.

Small or thin fishes such as Bombay duck, ribbon fish, prawns, silver bellies, white bait etc., are dried in the sun all along the coasts of India in centres where curing yards are not easily accessible or when the fish caught are very much in excess. The catch is simply spread on beach in a thin layer on a coir mat, catjan leaves or bamboo *thatties* to prevent admixture with sand and dried for a day or two. Periodically the fish are turned over, and before nightfall removed and heaped up in a closed enclosure. Sundried fish usually contain 5 to 6 % sand as impurity. In the absence of sunshine, some fish especially the oily varieties, putrefy and may have to be disposed of, as manure. A few special products like shark fish, fish maws and trepang, prawns, shrimps and white bait are always dried without salt. On the Gujarat-Kathiawar coast, all varieties except jew fishes are sun-dried. In Bengal, the sea and the estuarine fishes are simply sun-dried in the foreshore of many districts. In Assam, sun-drying is practised for fresh water carps as labeas, catla etc., after gutting, either on mats or bamboo platforms, the period being about 7 to 10 days, without fish being removed at night.

In the Madras Presidency, some very small fish as white bait, small sardines, silver bellies, etc., are simply sun-dried without salt. It is estimated that out of a total of 30 lakhs of railway maunds

brought for curing, about 16 lakhs of railway maunds is sun-dried; the operation being done entirely outside the Government curing yards,

(b) **Curing with salt:**—There are two methods in vogue known as (a) the Common cure or Dry cure and (b) the Ratnagiri or Wet cure. In addition, small varieties which are intended for quick consumption are sometimes “light cured” in certain coastal areas. This process consists in lightly salting the gutted and cleaned fish by keeping them for a few hours in saturated brine and completing the cure by washing and drying in the sun. The Common cure and Ratnagiri cure are described below :—

(i) *Common cure or the Dry cure* :—Large fish as seer, pomfret, cat fish, jew fish, perch etc., are split through the dorsal line from the root of the tail to the tip of the snout and the guts and gills removed. In this position the vertebral column remains attached to one side of the fish. The vertebral column is next severed from the fleshy side for the greater part of the depth of the fish, but it is not cut and removed. This operation gives the fish a wide flat shape, with an apparently enlarged appearance, an important matter, since such fish are sold by number and not by weight. Scores are made on the thickly flesh parts by passing the knife lengthwise. After washing, the fish are ready for the application of salt. In the case of thinner fish such as ribbon fish, mackerels, small pomfrets etc., only the first dorsal cut is made. Mackerels are sometimes slit in the abdomen. Sardines are cured by cutting off the head and the abdomen with a single diagonal cut or by simply slitting and removing the guts and gills. Large sharks are cut into pieces of convenient size and filleted, i.e., bones and skins removed, giving two fillets in the case of round fish. All cut up fish are usually washed in sea water before salting.

The proportion of salt is variable in different provinces. In Sind and Bombay, it is one part of salt to every five parts of fish irrespective of the variety. In the Madras yards fish are divided into five groups for purposes of issuing salt, the proportion of salt being determined with regard to the thickness of flesh of the fish and weather conditions. Large fishes get 1:3 in wet weather, and 1:4 in dry weather, while smaller varieties get 1:8 or 1:10. The higher proportion allowed during the wet weather is to enable more thorough expression of moisture and to compensate for unsatisfactory drying. During the two years 1944-45 and 1945-46 the average in Madras was 1:6.6. In Cochin the proportion was invariably 1:8 while in Travancore, it was 1:3 for fat varieties and 1:4 for lean ones.

The salt used is marine salt obtained by the solar evaporation process. It consists of coarse small crystals with colour ranging from brownish white to white and containing about 90% sodium chloride, 4% magnesium salts, 1% calcium salts and 2% of insoluble matter.

The salt is applied to the scores and rubbed all over the cut surface. The fish are then arranged in layers in salting receptacles such as half barrels, tubs, small dug-out canoes, or cemented tanks. Old canoes are very popular in Sind and Bombay. On the east coast of Madras salting is done in earthen pots in the Northern Circars and in pits, *chatties* (mud pots) or hollow palmyra butts in the Tamil districts. Generally the fish are kept in salt for 12 to 18 hours. They are then taken out, washed in the self brine (i.e., the saline solution impregnated with tissue fluids) found in the salting vessels and put out in the sun or coir mats or catjan leaves spread on the sand. A second washing in sea water after salting improves the appearance and colour of the fish but as the washed fish should weigh less after cure, this is rarely done. It takes at least two days to dry the fish. Nearly 16 lakhs of maunds of sea fish which is 13.4% of the total annual sea fish got are cured in this manner. The Madras Presidency alone dry-salts about 2 lakhs of maunds of fish every year.

Small fish dry better than larger varieties. The fish also absorb salt during the curing process, hence it is difficult to calculate the real dryage, i.e., net loss in weight. In the Madras yards, the percentage of cured to fresh fish was 62.3% in the West Coast, 55% in the East Coast, and roughly 60% for the whole presidency. Cured fish from fish curing yards are further dried for a day or two before despatch. If intended for long storage, the fish are periodically exposed to the sun by curers or merchants.

(ii) *Wet salting or “Ratnagiri” method of curing* :—This is the method adopted in the Konkan district of the Bombay Presidency. In Madras, it is adopted by curers who resort to Malpe from Ratnagiri, Goa, Viziadrag etc., in Bombay. In Bombay large fish such as seer, black pomfrets, sharks, Indian salmon etc., are generally treated in this manner and in Madras generally mackerels and sometimes sardines and other varieties. The fish are split, gutted and cleaned as for dry salting. One pound of salt is required for every three pounds of fish, half the quantity of salt is rubbed on the cut surface of the fish on the first day which are then stacked on the floor of the curing shed to a height of 3 to 4 feet. On the second day half the remaining salt is rubbed in and the fish so restacked that the top fish become the bottom ones. On the third day the remaining salt is applied and the fish restacked again. They are allowed to remain in this condition for another eight days and then removed. They are not sun-dried afterwards. The foul brine flowing from the stacks is absorbed by the sand on the floor of the shed.

A method somewhat similar to the Ratnagiri method is adopted in Malabar for goods intended to Madura, Koilpatti, Dindigul, Tanjore etc., and is called “Maduraipani”. Large fish are split, gutted and cleaned and salted in the ordinary method kept for 4 or

5 days in the shed and a second application of salt ($1/3$ over the usual quantity) given. The fish are not sun-dried and remain in semi-wet condition.

(c) **Smoking** :—Smoking is almost as universal as salt-curing in every country except India. This is probably due to the comparatively small need for a fire in the coastal areas of this country. The preserving power of smoking is due partly to the dessication by heat and partly to the antiseptic action of small amounts of creosote, acetic acid etc., present in the smoke.

The process is simple and often a delicious and tasty article is prepared on a domestic scale by fishermen and their families. A barrel or packing case, open at the top with a small opening at the bottom for the fire, and with a removable cover and a few spits (rods) on which the fish hang, makes a very good "hot smoking" kiln for small quantities. By placing the fire outside and passing in the smoke by a pipe, the same kiln serves for "cool smoking". For large quantities any cheap structure through which smoke can easily ascend serves the purpose. Hence smoked cure can be introduced in India only if the public would accept this wholesome preserved food. When fish come too late at night for Government curing yards, or in too large quantities, they might be turned into palatable food by light smoking instead of rejecting them as tainted or drying them for fertilisers. For this purpose salting is first a preliminary to smoking and as only small quantities are required duty paid salt can be used. The fish are safe as soon as they get into smoke and the process can be carried out even under adverse conditions.

Experiments conducted at Madras show that sardine, mackerel and small seer, pomfrets, jew fish, ribbon fish etc., give good results. Hilsa may give the best results comparable to Japanese or English varieties. Smoked fish will readily appeal to European tastes and will also serve the use of troops in India.

During 1945, the smoked fish section of the Department of Industries and Fisheries in Madras manufactured 6975 lbs. of smoked fish mainly to the Army. Production was continued but as the agents could not push through the sale of smoked fish in spite of strenuous efforts, and as the demand was limited, large scale production was suspended.

(d) **Other Methods.** (i) *Pickling with salt and tamarind* :—This is also known as the 'Colombo' method of curing. Mostly mackerels are cured in this manner in the West Coast and the entire quantity is exported to Colombo. After gutting and washing, salt with a small piece of Malabar tamarind (*Goruku pulli*—Malayalam) is thrust into the abdomen of the fish. They are afterwards arranged

provide himself with a shed, salting receptacles, match etc., for drying the fish. The yards are generally constructed in rows along the fence with doors facing the quadrangle the open space in the middle being used for drying the fish. The yards should be of standard pattern approved by the Fisheries authorities and provided with cemented tanks having round sides and bottom for salting the fish; but in the East Coast mud pots are sometimes used and tubs made of palmyrah as in Uppada.

The fish brought to the yard are weighed first or when the consignment is large, the weight estimated by measuring in baskets of known capacity. Salt is added according to the type of fish and methods of curing, described formerly. Salt has to be paid for on the spot, no credit being allowed.

When the curing is over, the weight of the cured fish is noted and the percentage loss in weight noted and checked, so that curing has been done in the approved manner.

In Sind and Bombay duty-free salt is issued to large boats proceeding to the sea. In Bombay there were 32 yards serving a coast-line of 170 miles. In Madras 56 curing yards existed in the West Coast with a coast line of 240 miles and 49 in the East coast with a coast line of 1150 miles. The transfer of the yards to the local Fishery authorities has materially improved the quality of fish. The value of improved sheds are demonstrated in Madras.

The fish curing yards are unique institutions. They automatically become the assembling centres for fresh as well as cured fish.

(a) The quantity of fish assembled for curing in different fish curing yards of the Madras Presidency.

These are given in Appendix VII for the years 1941-42 to 1943-44. The more important of them are given below :—

Important fish curing yards with the quantity of fish brought for curing.

District.	Name.	Quantity brought for curing (Rly. maunds)	
South Kanara:	Malpe (2 yards)	74,000	to 221,000
	Gangolly	33,000	to 79,000
	Hangarakotta	33,000	to 84,000
	Udayawar	30,000	to 106,000
	Kirimayeswar	14,000	to 53,000
	Mangeswar	25,000	to 32,000
	Hosdrug	32,000	to 64,000
	Kumbla	22,000	to 27,000

Malabar:	Tanur	92,000	to	166,000
	Madangi	67,000	to	120,000
	Tellicherry	40,000	to	83,000
	Cannanore	42,000	to	65,000
	Badagara	42,000	to	72,000
	Quilandy	30,000	to	70,000
	Ponnam	34,000	to	60,000
	Calicut	30,000	to	50,000
	Blangod	35,000	to	45,000
	Vadapuram	28,000	to	37,000
	Palapatti	29,000	to	30,000
	Parapanangadi	34,000	to	52,000

In the curing yards of the Vizagapatam District the quantity brought usually ranged from 5000 to 6000 maunds annually. The Uppada yard accounted for the largest quantity in the East Coast, the quantity ranging from 9,000 maunds during 1940 to 43,000 maunds during 1943 in the past six years.

F. Fish oils, manures, meal etc.

(a) Manufacture of fish oils etc.

Oil derived from fish can be classified broadly into two groups namely (1) Oils from the muscles and flesh and (2) Oil from the liver. In some fish, as sardine, mackerel, catfish etc., oil is generally distributed throughout the muscles and flesh. In others which have lean flesh, the oil is concentrated in the liver. In the former case, the oil is generally obtained by expression from the whole fish and called "fish oil" and is used for various industrial purposes as soap making and leather manufacture. The other class of fish yield the valuable medicinal 'liver' oils, the therapeutic values depend on the presence of Vitamins A. and D.

Guano is the product obtained by drying the cooked fish after the oil has been expressed. Both 'fish oil' and *guano* are made only in the west coast of the Madras presidency, where shoals of oil sardines appear, usually in abundance from August to June. Very small quantities only of crude oil are prepared in Bombay and Bengal from sharks, rays, catfishes etc. and the quantities are negligible.

From time immemorial, oil sardines have been used either for oil or fertiliser, but only in a crude way, the usual method of obtaining the oil being by putrefaction of a mass of sardines in an old and dug-out canoe. The oil was of bad quality, as prepared above and only useful for smearing planks of country boats, so as to make them impervious to water. For fertiliser purposes, the sardines were dried on the sand before the sun. Large quantities of oil were wasted in the process and the product also contained a high admixture of sand.

In 1907-08 the Madras Fisheries department conducted experiments on this important subject and recommended the adoption of the American practice with some modifications. Under this method the fish were boiled in open pans over a fire and the stuff pressed scrap was dried in the sun and formed 'guano'. The whole of the oil was thus obtained as a valuable marketable product.

The department also advocated the opening of small factories for the purpose and several oil and guano factories came into existence. These were situated within short distance of the sea and equipped with drying yards, cemented tanks, iron cauldrons presses etc.; and have to be licensed by the local board authorities and fulfil conditions as distance from inhabited areas and proper equipment and ventilation.

Fish meal used for cattle and cattle and poultry is also manufactured in a similar manner, but more care is taken and the cooked fish is dried on a tiled barebecue to prevent admixture with sand. The scrap is then powdered and sieved giving fish meal. All common fishes can be used for fish meal but very hard bone and excessive oil are not desirable.

(b) Production of fish oil and manure.

The prewar production and consumption of fish oil were as follows :—

Fish oil (quantity gallons).

Estimated production	...	62,000
Imports	...	16,000
Exports mainly to Calcutta	...	50,000
Supply available for internal use	...	28,000

Fish oil is used for preparing insecticides such as fish oil resin soap and for leather manufactures. There was a small foreign trade to Europe chiefly France but this was stopped due to low production.

The production and supply of fish guano and manure in prewar years was estimated as follows :—

	Fish manure (Tons)	Fish guano (Tons)
Estimated Production	3,780	5,250
Imports	10	...
Exports	740	780
Net supply	3,030	4,470

The manure is applied to crops like betel, tobacco, sugarcane etc. The production of fish guano and fish manures was recently investigated by a special officer of the Department of Industries and Commerce and estimated ruling 1945-46 to be 6000 tons mostly of inferior quality.

The production of fish meal used for poultry or cattle food on a small scale, was estimated at 7000 lbs per annum.

(c) **Medicinal "fish liver" oil** :—The use of shark liver oil as a tonic for wasting diseases was known in India as early as 1850. The method described by F. Day is given below:

"Livers are graded into three grades (1) firm and pinkish (best), (2) firm, greyish externally and reddish when cut (medium quality) and (3) flabby whitish externally as well as internally (inferior). The liver should be treated within 6 hours of the death of the fish and the gall bladder should be at once removed and the gland thoroughly washed. The glands are next bled by slitting the veins and washing repeatedly with water, and cut into pieces of 4 lbs weight each. Two such pieces are placed in an earthen vessel of 4 to 5 gallons capacity. Sufficient water is poured to cover the liver with $1\frac{1}{2}$ inches of fluid. The vessel is placed 15 to 20 minutes over a slow fire, and stirred up at 130 F.

When frothing commences, the vessel is at once removed and placed on sand to cool. The oil floating on the top is skimmed into large glazed earthenware jars by means of a wooden ladle. The crude oil is passed through flannel to remove rejections.

The main centre of production was Calicut where manufacture was initiated in 1854 and about 5000 lbs per year were produced. About the year 1870, Cod-liver oil began to be imported into India at a price lower than Indian fish liver oils and the industry began to languish.

The stoppage of imports of Cod liver oil due to the second World War and the necessity for a cheap oil containing Vitamin A, has again led to the revival of the indigenous industry. Production increased in the Government Factory at Calicut and was also encouraged in Bombay and Travancore. An analysis of the Indian fish liver oil has shown that on an average it contains 10,000 international units of Vitamin A i.e., 15 times as much as the average imported Cod-liver oil. Hence before putting on the market it is blended with refined groundnut oil in suitable proportion to bring down the Vitamin A potency to about 1500 I. U. which is double that enjoined in the British pharmacopoeia for medicinal Cod-liver oil.

In the Madras presidency the livers are brought by the fishermen to the nearest fish curing yards. When they are cleaned, washed and boiled in open tin coated copper pans with water. The fishermen were paid in prewar years at the rate of 3 annas per pound of raw liver. The crude oil extracted is sent to the Government oil factory at Calicut where it is purified and blended with refined groundnut oil. About sixty curing yards are equipped to prepare shark liver oil.

The quantity of shark liver oil manufactured at Calicut was as follows:—

Manufacture of shark liver oil (gallons)

(Madras Presidency)

1940-41	...	4460
1944-45	...	8798
1945-46	...	9672

The richest oil so far extracted had a potency of 210,000 I. U. of Vitamin A per gramme. An extract of malt with shark liver oil was prepared during the war period at Coimbatore by the Agricultural department. Recently private enterprise has also taken up this work.

By addition of other substances containing Vitamin D, the Industries Department is preparing a high potency medical preparation called "Adamin" which contains 12000 I. U. of Vitamin A and 1000 I. U. of Vitamin D. Although the industry has a great future, it is already facing difficulties, from outside competition as the war is over. Experiments should be done to prepare a palatable product as the groundnut oil gives an acid flavour.

G. Note on the manufacture of shark fins and isinglass (fish maws).

(a) **Shark fins**—The fins of large sharks (excepting the caudal fin) are cut near their roots, washed in sea water, dusted with a mixture of hot wood ashes and slaked lime and dried in the sun or smoked according to the prevailing weather conditions. The cured product which is crisp and brittle, is exported to China and other Far Eastern countries. The soup prepared from the cartilaginous rays in the fins is considered to be a delicacy in China and the Phillipines. During September 1946, the price realised was Re. 1-8-0 per pound for good fins.

(b) **Isinglass (fish maws)** :—Isinglass is obtained from the air bladder (termed "sounds" or "maws") of several species of sea, estuary and fresh water fishes. The name was originally applied to the sounds of the Russian fish sturgeon.

In India, the best air vessels are those obtained from perches and the Indian salmon. An inferior quality is got from jew fish and certain varieties of catfish. The superior quality isinglass is tongue shaped whereas from the catfishes it is rounded. After removal from the fish, the air bladders are slit open, washed in sea water and sun dried. They are then ready for export. No effort has been made to refine the product.

Isinglass is used in the clarification of wine and beer and also as a substitute for gelatine in confectionery for the preparation of special cements and as a constituent for special waterproofing composition.

H. Suggestions for improvement in the preparation of fish for the market.

(1) **Organisation in other countries.**—Organised efforts are being made in other countries to improve the design and equipment of fishing vessels, the catching and releasing power of various nets and in the transport, storage and treatment of fish caught. In Great Britain the Advisory Committee on Fishery Research (Minister of Agriculture and Fisheries) the Scottish Fishery Board and the Department of Scientific and Industrial Research, as well as the British Trawler's Association experiment on new methods of catching and utilising fish. In other countries research is carried out by the Bureau of Fisheries, Washington, the Biological Board of Canada, the Fisheries Section of the Council for Scientific and Industrial Research, Australia, the Fisheries Department in the Union of South Africa, and the "Suisanki" of Japan. In America, advanced methods of filletting fish for the consumer's use have been developed.

(2) **The Outlook for India.**—It is only recently that India has started an organisation for such work. This is partly due to the manner in which the industry is carried on in this country. First the industry is scattered, the boats small and the nets of low catching power. Secondly the fishermen and fish curers are mostly illiterate and backward and slow to adopt improved methods. Thirdly the industry is poor and cannot afford costly improvements. Methods of curing are crude and poor. Gutting and cleaning of fish at the boats is seldom practised and the application of ice or salt is not done immediately. The following improvements can be effected without much expenditure of time or money :—

(i) **Collecting** :—Fish should be killed as quickly as possible after catch. Exhausted fish putrefy more rapidly than fish stunned to death. Fish should be properly stowed in boats so that they are not trodden upon or needlessly exposed to the sun. To expedite the collection of fish from fishing boats the use of power propelled vessels as fish carriers should be encouraged.



CARRYING FISH ON HEADLOAD

(ii) *Cleanliness* :—Cleanliness in the preparation of fish for the market for fish is very important in a tropical country like India, but this is singularly absent in boats, baskets, curing tub etc., used by fishermen. The sheds lack proper ventilation and the yards littered with guts. The remedy is to conduct model curing yards as in Bombay at Government expense and recovering the outlay by levying a cess on salt.

(iii) *Rapid transfer of fish to the market or curing yards* :—This is of very necessary for obvious reasons.

(iv) *Sun dried fish* :—Only thin varieties should be sun dried and spread on loosely woven bamboo-trellis work supported on raised platforms. This would ensure simultaneous drying of both surfaces and prevent admixture with sand.

(v) *Salt cured fish* :—The defects noted are : (a) insufficient quantity of salt, (b) too short a period for salting, (c) not washing the fish in clean when taken out of the curing vats and (d) drying on the ground, sometimes without mats so that the underside does not dry up properly. The result is that Indian salt cured fish have bad odour and do not keep long. Recent researches in America have shown that the reddening of salt cured fish (*pink eye*) is due to the presence of an organism present in all sea salt and this can be overcome by disinfection of the salting plants and the use of salt sterilised by heat.

(vi) *Manufacturing of industrial products* :—The process of extracting shark liver oil should be taught to fishermen and arrangements made for collecting, testing, blending and marketing the oil.

The Departments of Fisheries both in India and Madras have been recently enlarged and many of the problems associated with the better preparation of the market including storage and transport are being taken, and several lines of new work started as the introduction of motor boats manufacture of shark liver oil, improved curing and smoking of fish etc. Proposals for improved storage and transport including cold storage are also under consideration.

I. Cost of preparation for the market.

The items included in the costs of preparation for the market are (1) cost of transport to the curing yards from the beach or landing centre (2) cost of gutting and cleaning, (3) cost of salt and salting and (4) cost of drying. The costs of packing etc., is included under distribution. The costs vary with conditions and in different markets, but an approximate relative idea of prewar costs of curing is given below for comparative purposes.

APPROXIMATE COST OF CURING ONE MAUND OF RAW FISH—(Prewar—As. Rs.)

Name of Province and type of curing.	Transport charges.			Cutting & Cleaning charges.			Cost of salt.			Salting charges.			Drying or labour charges.			Total cost.		
	From	To	A. P.	A. P.	A. P.	A. P.	A. P.	A. P.	A. P.	A. P.	A. P.	A. P.	A. P.	A. P.	A. P.	Rs.	A. P.	To
Sind :																		
Sun drying	0 6	2 0	0 6	3 0	...	...	...	...	...	...	...	...	4 0	0 5	0 9	0	0	0
Dry salting	0 6	2 0	0 6	3 0	3 2	3 2	3 2	2 0	2 0	4 0	4 0	4 0	4 0	0 10	0 14	2	0	14
Wet salting	0 6	2 0	0 6	3 0	5 4	5 4	5 4	2 0	2 0	4 0	4 0	4 0	4 0	0 10	0 15	4	0	15
Bombay :																		
Sun drying	1 0	1 6	0 6	3 0	...	...	...	...	...	4 0	4 0	4 0	4 0	0 5	0 8	6	0	8
Wet salting	1 0	1 6	1 0	3 0	6 0	6 0	6 0	2 0	2 0	4 0	4 0	4 0	4 0	0 14	1 0	6	0	14
Madras :																		
Drying salting (Tannur)	0 6	1 0	0 6	2 0	3 6	3 6	3 6	1 0	1 0	2 0	2 0	2 0	2 0	0 7	0 9	6	0	7
Pickling in bar- rels (Malpe)	0 6	1 0	0 6	2 0	15 0	15 0	15 0	4 0	4 0	8 0	8 0	8 0	8 0	1 12	1 14	0	1	12
Boiling & drying	0 6	1 0	0 6	2 0	...	...	...	...	...	5 0	5 0	5 0	5 0	0 6	0 8	0	0	6
Prawns (Ponnani)	0 6	1 0	0 6	2 0	...	...	...	...	...	3 0	3 0	3 0	3 0	0 14	1 0	0	0	14
Pit curing (Tuticorin)	0 6	1 0	0 6	2 0	7 0	7 0	7 0	3 0	3 0	...	...	...	...	1 2	1 3	0	1	2
Bengal :																		
Salting Hilsa	...	...	2 0	2 0	12 0	12 0	12 0	4 6	4 6	...	...	...	...	0 12	1 4	0	0	12
Sukti	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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In prewar years the curing expenses ranged from 10 to 25% of the price of sun dried and salted fish respectively. The cost of salt alone worked to about 15%. In recent years, the costs are 2 1/2 to 3 times higher.

The prewar costs of treating 1 ton of fresh sardine for the extraction of oil was as below:—

	Prewar	Approximate—1946.
30 baskets at 6 pies per basket	0 15 0	2 13 0
Fuel ...	0 6 0	0 14 0
Labour charges for boiling and processing. 2 coolies	0 12 0	1 8 0
Labour for separating the oil and drying the scrap. 3 coolies	1 2 0	2 4 0
	<u>3 3 0</u>	<u>7 7 0</u>

The prewar cost of treating 100 lbs. of shark liver yielding about 4.25 gallons of medicinal oil (at Uppada) worked to 13 annas as shown below—

	Prewar.
Fuel ...	0 4 0
Cooly for skimming and filtering ...	0 9 0
	<u>0 13 0</u>

The present costs are about 2 1/2 times the prewar cost.

CHAPTER V

DEMAND AND UTILISATION.

Fish has been used as an article of human diet since prehistoric times. Recent research has shown that fish proteins are easily and completely digested and that fish fat is usually rich in two accessory food factors viz, Vitamins A and D.

The moisture and protein contents of fish are given by Rao Sahib V. John in the September 1946 issue of the Indo-Commercial Journal as follows:—

Fish :	Values per cent.	
	Moisture.	Protein.
White pomfret ...	71.0	16.4
Black pomfret ...	70.6	18.4
Kora (Sciaenidae) ...	77.4	17.3
Seer ...	78.9	17.9
Mackerel ...	74.7	19.5
Sardine ...	77.4	18.6
Cat fish ...	78.1	12.7
Shark ...	72 to 75	24 to 26
Ray ...	77.5	20.0
Other Foods :		
Chicken ...	73.5	20.0
Pork ...	64.0	19.4
Mutton ...	73.6	20.3
Goat meat ...	73.4	22.5
Beef ...	73.2	18.3

The percentage of protein is highest in sharks and next rays. It is believed that shark flesh is beneficial to diabetic patients.

The bulk of the fish caught in the country is used as human food. In addition to being eaten fresh, fish is preserved by chilling, drying, salting, pickling and smoking. Surplus fish is converted into oil, fertiliser etc. Oils of two kinds are obtained—the medicinal oil from the livers of sharks and other cartilaginous fishes, and “fish oil” from certain marine or fresh water species. Fish roes are either salted or dried. Coarse isinglass is prepared from various marine and fresh water fishes and the fins of large sharks are limed and dried.

(A) Demand.

(1) **Per capita consumption of fish and fish products.** For India, as a whole, the *per capita* consumption for the total population is estimated at 3.4 lbs. per year, including fresh fish, as well as fish products. For different provinces and states, the consumption has been estimated as follows:—

PER CAPITA CONSUMPTION OF FISH IN DIFFERENT PROVINCES.

Province or State.	Quantity of fish available.	Population in Millions.	Per capita consumption on basis of (lbs.).	Total population	Fish eating population.	Fish eating population.
	000 mds.					
Assam	483	10.93	8.79	3.64	4.52	...
Bengal	5027	61.46	45.62	6.73	9.67	...
Bombay	1737	20.85	13.50	6.85	10.59	...
Central Provinces	165	18.60	12.57	0.73	1.08	...
Cochin	252	1.21	1.06	17.19	19.56	...
Hyderabad	42	14.44	10.31	0.24	0.33	...
Madras	4946	49.84	29.89	8.16	13.62	...
Mysore	102	6.57	4.71	1.28	1.78	...
North-West Provinces	9	5.42	4.60	0.13	0.16	...
Punjab	37	34.31	28.54	0.09	0.11	...
Sind	436	4.54	3.68	7.91	9.76	...
Travancore	1087	6.08	4.83	14.71	18.53	...
Total India	16072	388.80	...	3.40	...	...

There are very wide variations in the consumption which is so low 0.13 in the North-West Frontier and so high as 17.2 lbs in Cochin. This is because the maritime provinces and states as Bombay, Cochin, Madras Travancore, Bengal and Sind have a higher production and therefore greater consumption of fish. The low consumption in the inland areas as the North West Frontier, Punjab and Hyderabad is evidence that sufficient arrangements have not been made for transport of fish into the interior.

Consumption in different provinces and states is decided by local custom, religion and prejudice. In Sind both Hindus and Muslims are accustomed to eat fish, but in the North West Frontier meat is preferred by the Pathans. In United Provinces and Delhi, Hindus and even some Muslims refuse to take fish, while in Bengal and Bihar fish is largely consumed. In India as a whole generally Brahmans, excepting in Bengal, Bihar or Kashmir Pundits, and certain classes of Hindus, as Bhabras, Vaishnavas, some Sivites, Deva Samajists etc., Jains and Buddhists totally abstain from eating fish as food.

It is estimated that in some marine villages, south of Bombay as in Konkan or Kanara, the *per capita* consumption is so high as 80 lbs. In Madras, cured fish is also largely consumed and the relatively high consumption in Mysore is due to imports of cured fish.

(2) **Per capita consumption of urban areas:**—In urban areas, where people have a comparatively higher purchasing power, the demand for fish is also higher. The following gives the relative *per capita* consumption in certain urban areas, as compared to the corresponding value of the whole province.

Per capita consumption of fish lbs.

Name of City.	Urban.	Whole Province.
Bombay ...	16.02	6.86
Calcutta ...	21.38	6.73
Calicut ...	52.10	8.16
Cuttack ...	13.29	3.48
Madras ...	15.89	8.16
Bangalore ...	38.57	8.1
Peshawar ...	2.64	0.13

In every province or state, there is hardly any town which does not receive some supply of fish, however small for consumption, but there are vast tracts of rural areas where no fish is ever seen.

The per capita consumption in some urban areas of the Madras Presidency in prewar years was estimated as follows:—

Pounds per head per annum	
Trichinopoly	10.7
Bezwada	9.8
Coimbatore	4.2
Bellary	1.9
Calicut	52.0
Madras	15.89

B. Utilisation of fish in India

(a) *India* :—

The quantities of fish utilised for various purposes in India is estimated as follows :—

Consumption of fish in India

	Annual quantity [000 Mds.]	Percentage to total production.	Percentage to total quantity converted into products.
Consumed as fresh fish ...	8968	50.1	
Converted into sundried fish	3714	20.7	41.6
Do. salted fish ...	33.80	18.9	37.8
Do. fish manures etc.	1853	10.3	20.7
Total ...	17925	100.0	100.0

Half the supply in India is consumed as fresh fish and nearly 90% for edible purposes.

(b) The relative position of the Madras Presidency, as compared to some important provinces in the utilisation of fish is given below:—

ESTIMATED COMPARATIVE CONSUMPTION OF FISH IN MADRAS WITH OTHER PROVINCES—(Prewar.)

Province or State.	Annual Production.	Consumed as fresh fish.		Converted into sun dried fish.		Converted into salted fish.		Converted into manure.	
	000 mds.	000 mds.	%	000 mds.	%	000 mds.	%	Quantity 000 mds.	Percent- age.
Madras	4854	611	12.6	1609	33.2	1405	28.9	1228	25.3
Bombay	1442	101	7.0	453	31.4	335	23.2	553	38.4
Bengal	4862	3862	79.4	850	17.5	150	3.1	Small	Small
Cochin	642	430	66.9	167	26.0	43	6.7	3	0.4
United Provinces	147	145	98.7	Small	Small	Small	Small	2	1.3
Punjab	33	33	100.0	...	...	...	...	...	...
Mysore	10	8	78.7	2	21.3	...	...	...	...
Behar	959	957	99.7	3	0.3	...	...	...	...
Travancore	2664	910	34.1	410	15.4	1342	50.4	2	0.1

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(2) *Consumption of fresh fish* :— Practically the entire supply is consumed as fresh fish in the Punjab, Bihar and United Provinces and over 70% in Bengal. Mysore, Madras accounted for only one-eighth of production as fresh fish.

There are also special preferences for, or prejudices against, certain varieties in different areas. Sharks and other cartilaginous fish are popular everywhere in Madras and in southern parts of Bombay, but there is only a poor demand for these in Sind, Bombay City and Bengal. Cat fishes and eels which possess no scabs are rejected by Jews and *shia* Muslims. In Bengal Hilsa got in brackish estuarine waters are preferred to those netted in the upper regions of the Ganges. In urban areas, preference is given for fish with clean appearance, firm flesh, good taste and the minimum of small bones. Under this category come pomfrets, seer, mullets, beekti, Indian salmon, soles and prawns among marine fishes. Among fresh water fishes, hilsa, carps, and 'live fishes' are in great demand. Magur (*clarias magur*) murrels (*Ophiocephalus* spp) climbing purch (*Anabas Seandeus*) and other species which are marketed alive are considered very nourishing and are specially in demand in certain areas.

A peculiarity among Indian consumers is that those accustomed to eating fresh water fish have no liking for sea fish and similarly those accustomed to sea fish, seldom go in for fresh fish.

Fresh fish is believed to be more digestible than other animal foods. In India fish is cooked and eaten with rice and *chapatties*. It is also consumed after being fried in ghee along with potatoes.

Madras :—Out of a total average production in recent years of 58.50 lakhs of maunds it is estimated that 18.67 lakhs of maunds were offered for curing in Government curing yards, while 20.29 lakhs were cured outside (mostly sun-dried) leaving a balance of 17.54 lakhs for consumption as fresh fish or conversion into fish products.

The demand in Madras City was estimated at 50,000 maunds of dry fish and 33,000 railway maunds of fresh fish in pre-war years. Arrivals during 1942-43 and 1943-44 averaged only 15,000 railway maunds of dry fish and 5,000 railway maunds of fresh fish for civilian consumption from the Malabar district. Iced fish from Malabar contributed to about 75% of the fish consumption in Madras City and urban centres in the south. Pomfrets, seer, mullets, Indian salmon and prawns are prime fish in great demand among Europeans and richer Indian classes. The shoaling fishes as sardines, silver bellies, ribbon fish, *Engraulis*, *Trachuropus* etc., enter largely into the dietary of the poor.

In general it can be said that a great demand exists for fresh fish in urban areas, but the supply is limited to what can be transported in fresh conditions.

Demand for sun-dried fish :—As much as 20.7% of the total production of fish is marketed in India in the form of sun-dried fish, as compared to about a third in Madras. Assuming that the drying reduces the weight to about one-third, the quantity got as dried product is estimated at $12\frac{1}{2}$ lakhs of railway maunds in India, $5\frac{1}{3}$ lakhs of maunds in Madras.

In the coastal areas there is no demand for sun-dried fish except during the monsoons. Of the varieties only Bombay duck is in demand with the richer classes, while all other varieties of sun-dried fish are consumed by the poor. Generally people always prefer fresh fish to dry fish, but in places remote from the sea they have to be satisfied with dry fish, as fresh fish is not available. The varieties mostly consumed by the poor are silver bellies, ribbon fish, soles, white bait, engraulis etc. More than 50% of the fish consumed dry in Madras is unsalted. Important consuming areas for unsalted dry fish were South Arcot, Salem, Madras City, North Arcot, East Godavari, Tinnevely and Ramnad.

(4) Demand for salted fish :—In India, about 34 lakhs of maunds (or 19% of production) were cured by salting, as compared to 14 lakhs of maunds in Madras in pre-war years. The latter represented about 29% of the provincial production. Of the Indian production of sea fish, about $15\frac{1}{2}$ % were cured in Government fish curing yards of which 13.4% were dry salted and 2.1% wet salted. The varieties preferred for dry salting are sardines, mackerels, cat fishes, seer fishes, pomfrets, sharks etc. For wet salting and for brine pickling for export to Ceylon, mackerels are preferred, while seer is used for pickles or with tamarind. Prawns which were exported to Burma, were usually salted and shelled before despatch. Salted pomfret, seer, soles and to some extent cat-fishes are usually consumed by the middle classes, while other inferior varieties are consumed by the poor as silver bellies, ribbon fish, *Engraulis* etc.

As stated in the chapter on the preparation for the market, the kind and quality of curing depends on the demand. Thus 'pit-cured fish' or 'Madura cured fish' is in demand in Southern districts, the Ratnagiri cured product in the blackcotton tracts of Bombay and the wet salted mackerels in Ceylon.

(5) Utilisation as manure :—The quantity of fish used as a fertiliser varies from year to year and depended on the appearance of shoaling fishes in the West Coast of India. In pre-war years 18.5 lakhs of maunds of fish or roughly 10% of production in India, was estimated to be so utilised in India. The corresponding figure for Madras was 12.3 lakhs of maunds representing a fourth of the provincial production. This, however, changes from year to year and depends on the quantity which becomes unfit for use as food and is dried on

the sands as "Beach manure". Horse mackerels, mackerels and Sardines used to be utilised for this purpose and the annual pre-war production was estimated at 120,600 railway maunds in Bombay, 102 750 railway maunds in Bombay and 228,000 maunds for the whole of India. Assuming that the dry weight is in the ratio of 1 : 5, the quantity of fish utilised would be 553,900 maunds in Bombay and 513,750 in Madras, and 11.40 lakhs of maunds in India. "Beach manure" contains 5 to 7% nitrogen and 3 to 5% P_2O_5 and upto 15% sand and used largely as a fertiliser in coffee and tea plantations.

Fish manure popularly called 'guano' is the dry refuse after oil has been pressed out from cooked sardines (*clupea longiceps*) during the manufacture of sardine oil. The average production of fish 'guano' in Malabar and South Kanara districts for the 20 years ending 1940-41 was 5,250 tons or 142,905 railway maunds. Taking the ratio of guano to fish at 1 : 5, the average quantities of sardines utilised for this purpose works to 714,425 railway maunds. Guano desintegrates in the soil readily and is easily assimilated by plants. The low percentage of oil is an additional advantage. The best varieties contain less than 5% sand and 8 to 10% of nitrogen and phosphorus. Fish guano is used in tea and coffee plantations. During the quinquennium ending 1939-40, about 1.18 lakhs of maunds of fish manure (mostly guano) were annually exported from India, mainly to Ceylon.

(6) Demand for manufacture of other products.

(a) Fish maws and shark fins :—Reliable statistics are not available regarding production of fish maws and shark fins, but the annual prewar production is estimated at roughly 8000 railway maunds of which 7500 maunds were exported to countries in the Far East.

(b) Canned and bottled fish :—The quantity of fish utilised for canning was less than 100 maunds annually. Imports into India averaged 13750 maunds of canned and bottled fish annually and the entire quantity was consumed by Europeans, Anglo-Indians and middle-class Indians in the urban areas. Imports into Madras averaged only about 2000 railway maunds.

(c) Fish oil :—Sardine oil which is the only fish oil produced on a commercial scale in India is obtained as a by-product in the 'guano' industry. The average recovery of oil is 5%. In India about 7.1 lakhs of maunds of sardines used for the manufacture of guano are estimated to yield 35,730 maunds of fish oil and 258,680 gallons of oil. The oil is used in industries such as soap-making, batching jute, tanning leather etc. Small quantities of oil produced by fishermen in most of the fishing villages by crude methods, were used for caulking boats. In Bengal and Assam the oil prepared from punti fish is used as a crude illuminant.

(d) *Shark liver oil*:—The production has been discussed in the Chapter on the preparation for the market and production which was 4460 gallons during 1940-41 in India. In Madras the present production is about 10,000 gallons.

(c) *Fish meal*:—Powdered fish guano when used as feed for poultry, pigs, cattle etc., is known as fish meal. Its use is however not popular in India and the quantity produced is insignificant (7000 lbs. annually in Madras).

(7) Demand and utilization of minor shell fish.

Shell fish i.e., crabs, clams, lobsters, oysters, turtles etc., are caught in small quantities in most parts of the plains. Crabs and a river turtle called 'Bungona' are caught from fresh waters. Out of an estimate of 63,000 maunds in India, nearly 70% was caught in the estuarine regions of Bengal and consisted mainly of lobsters and crabs. In Bombay, the creeks and estuarine yielded 20% mostly of clams. In other areas, production was not commercially important.

'Oysters' are in demand in the larger towns. In the Madras presidency, oyster shells are powdered and sold by the Fisheries department as "shell grit" for feeding poultry.

Though oysters fetch a high price in some markets, they do not find favour in other parts of the country. Crabs are in good demand in large towns, clams are abundant during the monsoons when fish is scarce. The green sea turtle (*Chelone mydas*) is common in the Palk Bay round Rameswaram and Tuticorin. The turtles are shipped alive to Jaffna in Ceylon. Turtle oil is prepared from the leathery turtle in Travancore and South Madras coast.

(8) Demand for by-products.

(a) *Prawn manure*:—During the manufacture of shelled prawns prawn dust is obtained as a by-product and is largely employed as manure. The production is estimated at about 1.8 lakhs of maunds part of which is exported to Ceylon.

(b) *Shell for lime burning*:—The shells of clams oysters and various and other marine animals yield excellent lime on calcification. No estimate is available regarding the quantity produced in the country but production is believed to be quite considerable.

(c) *Pit manure*:—The fish offal, particularly the refuse obtained by gutting and cleaning fish prior to curing is put in pits and allowed to decompose. The production of this manure is however small and its use is limited to local areas, for want of packing and transport.

C. Seasonal variations in demand.

(a) *Sea fish*:—Sea fish is consumed all the year round in coastal areas. When prime fishes like pomfrets, seer, hilsa etc., are available, the urban markets usually reject the bony varieties. The monthly despatches from the different areas given below are indicative of the monthly variations in demand.

Percentage of despatches in different months.

Month.	West Coast Karachi.	West Coast Cochin.	East Coast Chilka fish.
January	10.4	13.1	7.5
February	9.2	7.0	6.9
March	9.2	7.4	8.7
April	6.9	7.3	12.6
May	6.7	5.6	11.7
June	5.9	6.3	8.9
July	5.2	10.2	7.2
August	5.0	14.8	6.6
September	5.7	11.3	5.1
October	7.4	5.0	5.7
November	14.2	6.0	9.4
December	14.2	6.0	9.7
	---	---	---
	100.0	100.0	100.0
	---	---	---

Despatches are high during November to January from Karachi, July to September from Cochin and March to June in the Chilka area. The seasonal demand is however determined by the supply and is decided by the availability of different varieties in different months discussed in the chapter on supplies.

(b) *Fresh water fish*:—The demand is determined by climatic conditions and the supply. It varies considerably in different areas.

(c) *Cured fish*:—The average percentage of cured fish exported in different months from the West Coast of India (Bombay, Madras and Travancore) was as follows and is compared to the quantity produced in the West Coast of Madras.

Average monthly despatches of Cured fish from India and production of Cured fish in the West Coast of Madras.— %

	India. (Exports)	West Coast, Malabar and South Kanara. (Production)
January	14.3	11.8
February	9.8	6.1
March	7.7	4.9
April	6.2	4.0
May	5.2	4.2
June	4.9	2.4
July	4.7	3.9
August	4.9	6.0
September	5.6	11.0
October	8.2	18.5
November	14.4	15.0
December	14.1	12.2
	100.0	100.0

While the quantity cured is heaviest from September to January, exports are at a maximum from November to February, a few months later.

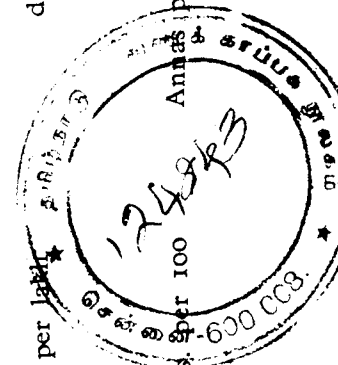
Summary of analysis of demand.

It will be seen that although fish production averaged 58.50 lakhs of maunds in the five-year period 1945-46, the quantity cured was 40.10 lakhs of maunds leaving a balance of 18.40 for internal consumption and manufacture of fish products. Of this quantity 8.16 lakhs of maunds are estimated to be converted into manure because they could not be utilised as food for a number of causes. About 1.40 lakhs of maunds are estimated to be utilised for fish oil, and about 28,000 railway maunds for shark liver oil. This leaves a balance of only 8.56 maunds consumed as fresh fish or roughly 15% of total production.

If better methods of marketing are adopted, including better storage and quick transport, more fresh fish can be rendered available for immediate consumption. These are discussed in the Chapter on the preparation for market.

Units of sale and basis of price quotation for fish in different parts of India.

Area.	Varieties.	Units of price quotation.		Equivalent in standard weights
		Wholesale	Retail	
I. FRESH FISH :				
North-West Frontier ...	All.	Rs. per local maund	Annas per seer.	1 seer—105 tolas. 1 maund—40 seers.
Punjab ...	All.	Rs. per standard maund.	do	(Rarely a local maund of 16 seers is used).
Bombay :				
(a) Ratnagiri ...	Mackerel	Rs. per Hazari	Annas per fish	Hazari—1000 fish.
Bombay	Jew fishes	" Sakda	do	Sakda—100 to 105 fish.
(b) Thana ...	Bombay Duck	Basket measure	Annas per heap	Measure—25 seers.
Madras :	Clams, Oysters	do	do	Measure—10 seers.
(a) South Kanara and Malabar.	Sardine	Rs. per kalli	do	Kalli—5.8 standard maunds.
	Mackerel	Rs. per 1000	Annas per dozen	
	Silver bellies (shoaling)	Rs. per 1000	Annas per dozen	
	Mackerel	Rs. per 1000	Annas per dozen	
	Sardines	Rs. per 1000	Annas per dozen	
	Silver bellies and soles	Rs. per 1000	Annas per dozen	
	Seer, pomfret, cat-fish, Jew fish, mullets, small sharks, etc.	Rs. per 100	Annas per fish	1 lakh fish—200 to 300 maunds (may all be measured in baskets for counts). Weight depends on size.



Area.	Varieties.	Units of price quotation.		Equivalent in standard weights
		Wholesale	Retail	
	Large sharks, jew fish, bekti, Indian salmon, etc.	Rs. per fish	sold on cut as annas per lb.	weight depends on size
(c) Northern circars	Hilsa	Annas per pair	Annas per pair	0.75 to 1.5 seers.
Mysore	Small catfishes	Basket measure	Annas per heap	Measure—12 to 18 seers.
	Other fishes	Per 100 or 1000	Annas per fish	
Orissa :				
(a) Cuttack	Large varieties of over 2 seers	Rs. per <i>Kathi</i>	Annas per local seer	1 maund—40 seers of 105 tolas.
(b) Chilka	Estuarine varieties	Rs. per whole catch in a net	Annas per viss or by count	
(c) Baisore	All	Rs. per standard maund	Annas per seer.	
Bengal :				
(a) Producing Centres.	Hilsa	Rs. per <i>Kahan</i> or <i>Pen</i>	Annas per pair	<i>Kahan</i> —1280 fish
	Bekti	Rs. per <i>hali</i>		<i>Pen</i> —80 fish.
				<i>Hali</i> —4 fish.
(b) Calcutta	Mango fish	Rs. per 100	so many per fish	100 fish—20 to 25 seers.
lobsters etc.	All varieties except Mango fish, lobsters etc.	Rs. per standard maund	By weight on cwt. or in small heaps	Mango fish, lobsters etc. sold as per 100.
Assam :				
Shillong	All	do	Annas per seer	
Bombay :				
(a) Tana	Pomfret	Rs. per score	Annas per fish	Score—21 pieces.
(b) North Kanara (Ratanagiri).	Sardine, mackerel & shoaling fishes	Rs. per <i>kandi</i>	Annas or pies per heap	<i>Kandi</i> —8 maunds.
	Botaboy duck	Rs. per <i>chakki</i> or round	do	<i>Chakki</i> —Bundle of 4000 fish.
Madras :				
(a) West Coast	Sun dried or salted sardine, mackerel and shoaling fishes	Rs. per <i>Thulam</i> Rs. per candy	Annas or pies per fish	<i>Candy</i> —640 lbs. at Cannanore. —680 lbs. at Calicut. —700 „ Tirur. 1 <i>Thulam</i> —16 seers at Cannanore. —17 seers at Calicut. —15.5 seers at Tirur.
(b) Koilpatti	Sun-dried or salted sardine, mackerel & shoaling fishes	Rs. per <i>kattu</i>	Annas or pies per fish	<i>Kattu</i> —10.25 seers.
(c) Ongole and S. Arcot etc.	do	Rs. per <i>tooku</i>	do	<i>Tooku</i> —3 seers at Ongole 2 seers at South Arcot.
Mysore	Small dried or salted varieties	Rs. per local maund	Annas per viss	Local maund—25 lbs. 1 maund—12 seers. 1 viss—120 tolas.
Orissa :	Cat fishes, jew fishes, sharks, hilsa, etc.	Number of viss per rupee	Annas and pies per viss	Viss—120 tolas at Berhampore to 180 tolas at Puti.

CHAPTER VI

“PRICES”

Owing to the absence of records of prices from the illiterate fishermen, and even from the trade, it is difficult to get satisfactory quotations for fish over a long period, for comparative or analytical purposes. In Madras, records are maintained by the Fisheries Department on the estimated catches and values of some important varieties and weekly bulletins of cured fish prices, used also to be issued. In the case of other provinces and states, information was gathered from the fishermen and the trade.

“A”. UNIT OF SALE AND BASIS OF PRICE QUOTATION.

In the primary markets, fish is never weighed and fishermen offer their catches in small lots or in heaps. Buyers usually estimate by experience the probable weight when offering prices for each lot.

The following table gives an indication of the units of price quotation employed in different parts of India in wholesale and retail trade and the equivalents in standard weights.

The unit in any one locality for a particular variety is seen to depend on the volume of the catch. Thus in Malabar, when fish is plentiful, a *kalli* (5.8 maunds) which is the largest unit, is used for mackerel. In view of the large quantities which have to be speedily handled, and the liability to deterioration, the catches in such cases are disposed of on the beach immediately the boats land, as it is not practicable to weigh them. Although there is not much of an inter-provincial trade in fresh fish, yet the absence of a common or uniform system of price quotation gives rise in this trade also to the many disadvantages that have been noticed in the marketing of other commodities. Thus a thulam is 16 seers in Cannanore, 17 seers at Calicut and 17.5 seers at Tirur, while a candy in Malabar district ranges from 640 lbs. to 700 lbs. Apart from this, it is better to have the same standards for areas connected by a marketing route as Madras and Bombay, Madras and Bangalore, etc. It is reported that in the fishing parts of England, such as Grimsby, Aberdeen etc. the catch brought in a trawler or drifter is sorted according to prices and then to sizes, “boxed” in standard containers and then only auctioned. In the fish curing yards of India, fish is admitted only on the basis of weights. It is desirable, that the possibility of using ‘standard’ baskets in the producing areas and inducing fishermen to quote on the basis of standard weights are investigated by the provincial fisheries departments.

In the case of cured fish, certain malpractices as the use of non-standard weights and selling fish which is not wholly dry, occur in certain areas. In the retail trade, cured fish is often sold in small heaps although for the superior varieties, quotations are by weight on cut prices or whole in urban areas.

“B”. FACTORS AFFECTING PRICES.

In the whole of India, the following factors mainly influence or determine the prices of fish and its products :—

- (i) The type of fish, its size, weight and quality.
- (ii) Purpose for which it is sold i.e., consumption of fresh fish or for curing or for manufacturing purposes.
- (iii) The distance of the producing centre from the place of consumption.
- (iv) Elasticity of demand.

Of the above factors, factor (ii) refers mostly to sea fish.

(I) TYPE OF FISH, ITS SIZE, WEIGHT AND QUALITY

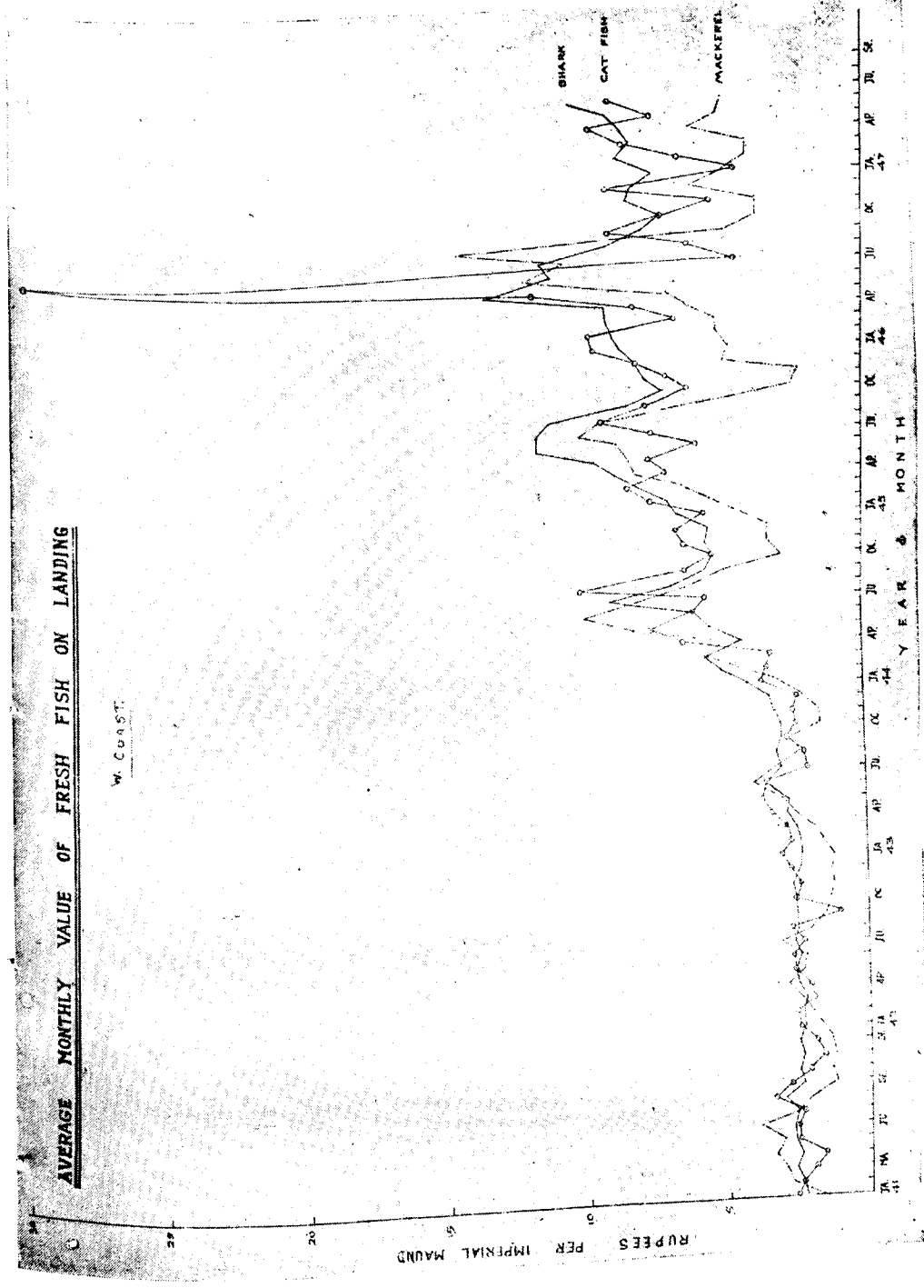
Varieties like pomfret, seer, hilsa beekti, Indian salmon, etc., among sea fishes, and prized for their taste. The following table gives the relative price of such varieties with cat fish which is regarded as coarse.

Comparative prices of different varieties of fish

Name of centre	(Prewar) (Per maund)		Average price of catfish	Ratio of price of catfish
	Name	Average price		
		Rs./as.	Rs./as.	
Karachi	Seer	6/12	5/12	1.2 to 1
Colaba Dt.	Pomfret	11/15	8/0	1.5 to 1
South Kanara and Malabar Dts.	Indian salmon	2/11	2/3	1.2 to 1
Tinnevelly	Beekti	4/8	2/10	1.8 to 1
Bengal	Hilsa	7/12	4/13	1.6 to 1

Average wholesale values at landing of different varieties of fish.—(Rs. per Imperial Maund).

Variety	Area	Year									
		Prewar	1940-41	1941-42	1942-43	1943-44	1944-45	1945-46			
Sharks	...	2/4	2/5	2/7	2/10	4/2	7/7	9/7			
	West Coast										
	East Coast	3/4	2/9	2/7	2/13	4/2	6/9				
Catfish	...	2/1	2/4	2/5	2/12	3/10	6/14	10/2			
	West Coast										
	East Coast	2/10	2/14	2/15	3/3	3/11	6/5				
Sardine	...	1/4	1/10	2/0	2/2	2/4	3/4	4/13			
	West Coast										
	East Coast	2/4	2/2	2/2	2/4	2/11	3/15				
Jew fish	...	1/7	1/15	1/8	2/9	3/5	6/3	6/9			
	West Coast										
	East Coast	2/6	2/3	2/5	2/4	3/-	4/12				
Mackerel	...	1/12	2/1	1/15	2/1	4/4	5/5	6/4			
	West Coast										
	East Coast	2/11	2/4	2/5	2/2	3/9	6/7				
Pomfret	...	2/15	3/0	2/12	3/6	5/5	16/4	19/14			
	West Coast										
	East Coast	3/12	3/5	3/7	3/5	5/9	6/12				
Seer	...	3/2	3/2	2/10	...	6/8	8/2	11/8			
	West Coast										
	East Coast	4/2	4/6	4/1	4/10	5/8	8/15				



These priced varieties gave similar better prices in the cured state also.

Among fresh water fishes, the favoured varieties are "live" fishes, carps and mullets. Carps used to fetch 15 to 25% higher prices than catfishes in the inland markets.

Madras:—In recent years, the comparative average value of different varieties of fish in the East Coast and West Coast, were as below ; from records of the Madras Fisheries Department. The prices refer to the value of the fish at landing and not to the market prices which are higher.

Average wholesale values at landing of different varieties of fish Rs. per Imperial maund.

(Vide Page 106)

There are some local variations in prices in the West Coast and East Coast, but on the whole, sharks and pomfrets are the highest priced fishes, while sardine and next mackerels are cheapest. Jew fish catfish and sharks occupy an intermediate position.

Size is not as important a factor in determining the price of sea-fishes, as in the case of fresh water varieties. Most of the economic sea fishes arrive in large shoals comprising fishes of almost the same size and weight. But in the case of fresh water fishes large and small sizes are often caught at the same net as with carps, catfishes etc., which grow to enormous sizes. Up to a certain size, regarded as optimum for the species beyond which the fish becomes coarse, the prices per maund increase in proportion to the size of the fish.

Fish which is absolutely fresh fetches a better price, than one showing signs of taint. Consumers judge the quality of a fish by examining the eyes, gills, sheen, and above all, the smell. The eyes of a fresh fish are full and prominent with a fat black pupil, while the gills are red instead of gray and slimy. The natural sheen vanishes when scales become patchy. Fish in the condition known as *rigor mortis* when the flesh is firm and elastic, is considered fresh. When purchasing on cut, consumers judge the quality by examining whether there is any discoloration around the backbone.

"Live fishes" that can be kept alive upto the time they are dressed are esteemed not merely for their so-called nourishing qualities, but also for their absolute freshness.

(2) Fish sold to manufacturers of fish products

As the curing and drying of sea fish, and the manufacture of manure or guano are usually carried on in the rural areas of the sea

coast, from where it is difficult to transport fish to consuming urban areas, competition between fish merchants and curers is rare, except during years, when due to the general failure of the fishing season, the economic varieties are not got in normal quantities and the prices are high.

Fishermen generally prefer to sell their individual catches to merchants dealing with fresh and iced fish, when the quantity available is small, and to the curers, when it is large. This is because the latter are able to buy in much larger quantities than fresh fish merchants. The prices paid by curers are invariably lower than those paid by fresh fish merchants, as can be seen below :—

Comparative prices for fresh fish paid by curers and Fresh Fish Merchants Rs. per Imp. Maund.

Name of centres.	Date.	Variety.	Price paid by fresh fish merchants.	Price paid by curers.	Percentage of curer's price to merchants.
(1)	(2)	(3)	(4)	(5)	(6)
Malpe	25-2-1942	Oil Sardines	1 6 0	1 2 8	84.9
"	24-2-1942	Pomfrets	4 6 0	3 8 0	80.0
Tanur	29-3-1941	Mackerel			
		(Per 1000)	3 7 0	2 15 0	85.5
"	"	Silver bellies	1 14 0	1 11 0	90.0
"	"	Prawns	2 9 0	1 11 0	65.9
"	Oct. 1940	Sardines	0 13 0	0 7 0	53.9
		(Manure)			

It is also seen that a lower price is paid when fish is bought for the production of fertilisers.

(3) Distance between producing and consuming centres.

When fish consumed in urban markets is not got locally, prices are higher, especially when the distance to be covered is long, or the catches small. The following gives an indication of prices during 1940 at producing and consuming centres :—

Relative prices of fish in producing and consuming markets.

Consuming centre & variety.	Producing area.	Prewar—(Rs. per maund)		Percentage difference.
		Wholesale price in Producing area.	Consuming area.	
Calicut :				
Oil Sardine	Bey pore	1/8	3/8	133.3
jew fish	Tanur	1/6	3/8	154.6
Madras City :				
Pomfrets	Tanur	2/12	7/8	172.8
Seer	Tirur	5/4	12/8	138.1
Silver Bellies	Ponneri	3/5	6/4	88.6
Bombay :				
Mackerel	Bhaktal	3/0	12/8	316.6
Pomfret	Verval	2/0 per score.	9/8 per score.	375.0

The prices are also decided by the distance from the market. Thus fish from Tanur are sold at the following prices:—

Relative prices of fish from Tanur (Prewar.)

Name of market.	Distance from Tanur. (Miles)	Price at Tanur.	Price at consuming centre.	Percentage difference.
Orthanad (Tanjore Dt.)	260	5—12—9	6—12—0	16.5
Melapalayam (Tinnevely Dt.)	325	5—12—9	7—11—2	32.8
Davleshwaram (E. Godavari Dt.)	796	5—12—7	7—14—5	36.3
Colombo (Ceylon)	—	5—12—9	9—8—0	63.3

(4) Elasticity of demand

Good prices are got for fish of the catches arrived early in the morning. Prices are also depend on whether the day of sale is a 'fasting day' for consumers or 'day of rest for fishermen'. For fresh fish to be packed in ice, fishermen usually time their return to suit the train timings. When fish arrive late in the afternoon, there is not enough time to dry the fish in the sun or apply salt, and prices therefore fall considerably.

'C.' Seasonal Variations in prices.

Variations in the price of fish from month to month are very important. Thus price of mackerels in the West Coast was Rs. 4/8 per maund in January 1945 and Rs. 10/2 in July; and of pomfrets Rs. 26/— in August and Rs. 6/3 in October. This is due largely to the seasonal availability. The monthly average wholesale values of sea fish in the West and East Coasts are given in Appendix VIII and IX for the year 1941 onwards.

The average monthly values for important varieties in the year 1938, as compared to the average of the years 1941 to 1944, were as below:—

(Vide Opposite Page 111)

The above values are indicative, as very wide variations occurred especially during the war period, when there was pressure on the supplies for civil and military consumption. In a normal year, prices for sharks were low in the West Coast from September to November and in the East Coast north in May and March. For mackerels prices were low in the West Coast from September to November and in the East Coast during April, October and December. Pomfrets were quoted low in the East Coast north from July to October and in June and December. Prices were high during May.

On the whole, there are three distinct periods in the West Coast, namely, September to January (the height of the season), February to May (ebb of the season) and the June to August (fish scarcity due to the monsoon). For the varieties of fish caught in large numbers, prices are low during the post-monsoon period (September to January) and high during the monsoon period (June to August). In the East Coast prices are not regular, but generally prices are lower in the first quarter of the year, and are high during August to November.

Prices of fish are high at the beginning of the season than when the season is well advanced. This is because with increased supplies, public taste or demand declined. Prices also depend on the variety. When shoals appear prices are low.

(b) *Cured fish*:—The average prices of some important varieties of dry cured fish ranged as follows in the years 1937 to 1941:—

Monthly average wholesale values of fish on landing.—(Rs. per Imperial Maund).

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Period
Sharks :													
West Coast	2/2	2/7	2/8	2/0	2/7	2/10	2/7	3/0	1/14	1/15	2/1	2/6	1938
"	2/13	3/0	3/4	3/1	3/6	3/10	4/5	3/14	3/6	3/5	3/7	3/7	1941-4
East Coast N.	2/12	2/11	2/14	3/1	2/0	3/11	3/4	3/8	3/0	3/7	3/10	2/15	1938
"	2/13	3/2	3/9	3/4	4/0	3/15	4/6	3/10	3/11	3/5	3/10	3/6	1941-4
Mackerel :													
West Coast	2/8	2/9	3/15	2/15	2/2	1/0	2/0	2/0	1/13	1/7	1/5	2/1	1938
"	1/14	2/8	3/0	3/4	3/15	4/14	...	3/3	2/10	1/13	1/14	2/2	1941-4
East Coast N.	3/0	3/8	3/3	2/9	3/12	3/6	3/8	...	4/3	2/11	3/3	2/8	1938
"	2/5	2/11	2/9	3/6	3/9	3/2	...	3/11	4/1	3/7	3/0	2/11	1941-4
Pomfrets :													
West Coast	1/14	2/14	3/8	2/8	3/0	0/8	...	3/11	1/12	2/5	2/4	1/0	1938
"	3/10	2/13	4/7	4/13	7/14	5/7	6/14	6/6	3/13	3/0	3/3	6/5	1941-4
East Coast N.	5/2	4/13	4/6	3/12	5/2	3/12	3/8	3/14	3/11	3/14	4/7	4/0	1938
"	4/6	4/3	4/4	4/6	5/11	4/6	4/11	4/5	4/8	4/9	4/8	4/12	1941-4

Average monthly prices of dry cured fish—(Rs. per Imperial Maund)—1936-40

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Sharks:												
Orthanad	7/14	7/10	6/6	5/14	7/10	8/1	8/3	6/15	7/1	5/1	5/4	6/7
Catfish:												
Melapalayam	10/6	9/8	7/6	7/14	8/0	7/4	7/6	6/6	6/14	8/1	8/14	7/8
Orthanad	6/8	6/0	9/8	6/11	6/11	7/8	6/14	7/14	7/9	5/8	6/11	5/12
Cannanore	5/4	5/4	5/6	7/8	5/14	6/1	...	6/6	7/6	6/0	5/2	5/5
Mackerel:												
Cannanore	3/15	3/15	4/7	3/13	3/11	...	...	...	2/15	3/4	2/11	3/4
Melapalayam.	8/4	9/11	...	7/3	14/5	7/11	7/1	7/11	7/3	6/8	7/4	7/3
Jew Fish:												
Davleshwaram	7/12	7/8	7/1	7/0	9/6	11/10	10/6	10/7	10/10	8/4	8/12	8/9
Orthanad	12/10	8/3	7/9	8/8	...	...	5/10	7/13	8/2	6/0	7/10	5/10
Seer:												
Cannanore	6/4	6/10	6/3	6/6	6/5	...	...	...	7/2	6/5	6/10	6/11
Davleshwaram	14/0	13/6	13/15	13/0	13/13	14/15	14/12	15/10	14/11	14/13	15/15	14/4
Shelled Prawns:												
Cannanore	11/11	11/12	11/12	13/5	13/13	12/11	8/13	8/10	7/6	9/2	9/6	10/13

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Wholesale prices of cured fish (Rs. per Imperial Maund)

	Name of market.	1937	1938	1939	1940	1941 (first half)
Catfish:	Orthanad	6/8	5/11	8/6	6/6	11/7
	Melapalayam	5/11	5/0	9/6	10/8	6/2
	Davleshwaram	7/0	9/4	9/5	7/11	10/6
Jew, Fishes	Orthanad	7/10	6/2	10/6	6/6	5/6
	Davleshwaram	8/11	11/5	8/10	8/14	6/0
Sharks:	Orthanad	5/8	5/13	9/8	6/5	6/5
	Melapalayam	5/6	4/0	9/6	7/6	10/8
Pomfrets	Davleshwaram	12/14	15/2	13/5	13/5	—
	Melapalayam	7/0	5/5	16/5	7/2	—

Apart from the variations due to varieties and places above noted there are also seasonal variations. The average monthly prices of cured for the years 1936-10-3940 were as below.

In the West Coast (Cannanore) prices of cured mackerels and prawns were low from September to December and of cat fish from November to February. At Devaleswaram jew fish were quoted low from January to April, and this was also true of seer. The seasonal prices are therefore different in the East and West Coasts.

Trend of prices: Although it has not been possible to get the actual prices of raw fish for a series of years, the general trend in producing areas is indicated from the average values of fish given in the fish statistics of the fisheries department.

Average value per maund of fresh fish on landing.

WEST COAST— (Rs. per maund)

Year.	Catfish	Mackerel.
1928-29	4/0	1/1
1929-30	4/2	0/8
1930-31	3/9	2/9
1933-34	2/12	1/4
1934-35	2/15	1/1
1935-36	2/0	0/12
1936-37	1/10	0/14
1937-38	1/12	1/4
1938-39	2/6	1/12
1939-40	5/11	1/6
1940-41	2/4	2/1
1941-42	2/5	1/15
1942-43	2/12	2/1
1943-44	3/11	4/4
1944-45	6/14	5/5
1945-46	10/2	6/4
1946-47	7/4	6/1

Since the prices are also decided by uncertain factors, which change from season to season, the trend is erratic. Prices have increased markedly from 1943-44 and the price of mackerels have become relatively higher.

The retail price at Madras had increased from 0/2/3 to 0/2/9 per lb. in pre-war years to a range of 0/9/0 to 0/13/0 during 1944-45, according to variety.

The most noticeable feature of fish prices is the low price in the fishing areas and the comparatively high prices in urban markets. This can only be remedied by proper utilisation of the fish by quicker transport, better methods of curing marketing and increased facilities for the trade in iced fish, as well as cold storage.

(2) **Prices in the Foreign trade.** An idea of the trend of prices can be got from the declared values of fish products in the foreign trade.

The following give the relative prices in the export trade of the Madras Presidency:—

Declared value of fish products exported from the Madras Presidency.

(Rs. per cwt.)

Year	Fish dry unsalted.	Fish dry salted.	Fish wet salted
1928-29	18/11	20/6	5/12
1929-30	14/6	20/11	6/3
1930-31	16/2	21/0	7/0
1931-32	15/7	18/8	6/6
1932-33	14/8	19/0	10/0
1933-34	14/6	15/12	6/6
1934-35	14/13	14/7	8/1
1935-36	13/11	13/13	7/14
1936-37	12/15	13/1	7/15
1937-38	18/11	18/11	9/7
1938-39	20/13	17/8	8/0
1939-40	20/1	16/4	10/2
1940-41	21/1	14/5	5/2
1941-42	17/15	16/1	4/0
1942-43	23/0	21/0	4/0
1943-44	49/11	32/9	6/10
1944-45	59/8	45/5	12/14
1945-46	53/8	56/8	15/1

Increased prices during war time became pronounced only during 1943-34 and kept at a high level thereafter. In the prewar period prices per dry fish fell during the years 1934-35 to 1936-37 and rose thereafter. Wet salted fish was quoted low during the years 1941-42 and 1942-43.

"D". Note on prices of fish fertilisers, fish oil, etc.

The qualities of fish guano and fish manure produced in various tracts differ considerably and the prices of these products show extreme variations. The buyer's quotations in Ceylon - the Chief Market for Fish Fertilisers - are based on the nitrogen and phosphoric acid contents of the fertiliser with a tolerance for sand. Manures conforming to the standard Ceylon Specifications are not usually available. The fertilisers are not analysed; a sample is examined and the price settled. The fertilisers without any further treatment are exported to Ceylon.

Fish guano fetches a better price than fish manure, as it contains more nitrogen and phosphoric acid (cf. Chapter IV). During the five years period ending 1939-40, the Colombo quotations for guano ranged from Rs. 62 to Rs. 78/12 per ton while the prevailing prices in the west coast area were Rs. 39/8 to Rs. 42/3. The prices of fish manure in the West Coast increased from about Rs. 30/- per ton during 1955-56 to Rs. 32/8 during 1939-40, the Colombo quotation in the latter period being Rs. 60/8 per ton.

During 1945-46, the guano was sold at Rs. 90 to 95/- per ton loose ex-factory in Malabar, but prices vary with the quality and analysis. Thus at Udipi and Mangalore (South Kanara) the following prices were quoted:—

Wholesale prices of fish manure and guano at Udipi (Mangalore)

	(Rs. per ton)		
	Rs.	Rs.	Rs.
	Fish Pit manure Udipi	Fish guano Mangalore (Nominal)	Fish manure Good quality Mangalore
1942	70	150	80 to 85
1943	75	150 to 170	100 to 125
1944	75	150 to 170	120 to 145
1945	70	170	150 to 162/8
1946-7	75	200	100 to 210

Prices varied according to quality of sources.

The prices of fish oil also vary over a wide range in the absence of standard specification. Due to a general decrease in production, prices in the west coast increased during 1939-40 to Rs. 225 per ton as compared to Rs. 175 during 1935-36. During 1945-46, the oil was sold at Rs. 7 to 8 per tin of 4 gallons or roughly Rs. 437-8-0 to Rs. 500 per ton.

Fish fertilisers and fish oil are manufactured during October-November when the fish prices remain low. Fish manure and guano are generally marketed before the end of January.

Bombay was the Chief Market for fish maws and shark fins. Prices are quoted according to classifications. The large maws from jew fishes and Indian Salmon go under the trade description *Pota*, while maws from cat-fishes are called '*Pok*' and '*Bitki*'. Maws thickened by blood are called '*Badla*'. The Bombay prices during 1939-40 were Rs. 40 to 50 for large maws from jew fishes, Rs. 30 to 35 for those from eels, Rs. 40 to 45 for Indian Salmon and Rs. 6-7 for catfishes per cwt.

Quotations for shark fins at Bombay are decided by the price in Hongkong. During 1940, the Bombay rates were Rs. 21 to 27 per cwt. for the black fins and Rs. 63 to 72 for the higher priced white fins.

Note on the prices of canned and bottled fish.

The retail prices of some of the important types and brands in cities during 1939 and in recent years were as follows :

Prices of canned and bottled Fish

Name of product	Common unit in container	Converted prices per pound of canned fish	
		1939.	1947.
Anchovies in oil	4 oz. bottle	3 0 0	n.s.
„ in butter	1 lb. „	1 12 0	n.s.
Keppared herrings	1 lb. tin	0 8 4	ns.
Herrings in tomato sauce	do.	0 6 4	0 11 5
Bloaters	do.	1 2 0	n.s.
Herring Rose	½ lb. tin.	2 4 0	{ 3-8-0 (Martons)
Salmon red	1 lb.	0 10 8	1/3/0 to 1/7/0
„ Pink	do	0 5 4	n.s.
Lobsters	¼ lb. bottle	2 13 4	n.s.
Oysters	½ lb. bottle	2 8 0	n.s.
Prawns	do.	1 12 0	n.s.
Finnan Haddock	1 lb. tin.	1 2 0	n.s.
Shrimps	5½ oz. bottle	1 10 0	n.s.

(N.S. = no stock.)

“F”. Market Intelligence

The localised character of the demand and the lack of recognised standards of qualities are largely responsible for the absence of a market intelligence service for fish. In town and cities where the trade is somewhat organised, merchants and commission agents keep themselves in touch with the prices prevailing in producing areas. The fisherman gets information only by a visit to the local assembling market or from his neighbour who have done so recently. The information is not however accurate or up-to-date.

In the case of fish despatched for sale in urban markets, sale on commission basis is very common, and the commission agents keep the consigners informed about the prevailing price ranges; weekly or fortnightly. From Ceylon, weekly price lists on printed forms are received by the big exporters from the Ceylon commission agents. Stocks or arrivals are not indicated and very often prices are misleading.

The Madras Fisheries Department arranged during 1939 for a weekly bulletin giving prices of cured fish in five important markets, but the work was stopped from November 1941.

CHAPTER VII

ASSEMBLING, STORAGE, TRANSPORT AND DISTRIBUTION

A. General.

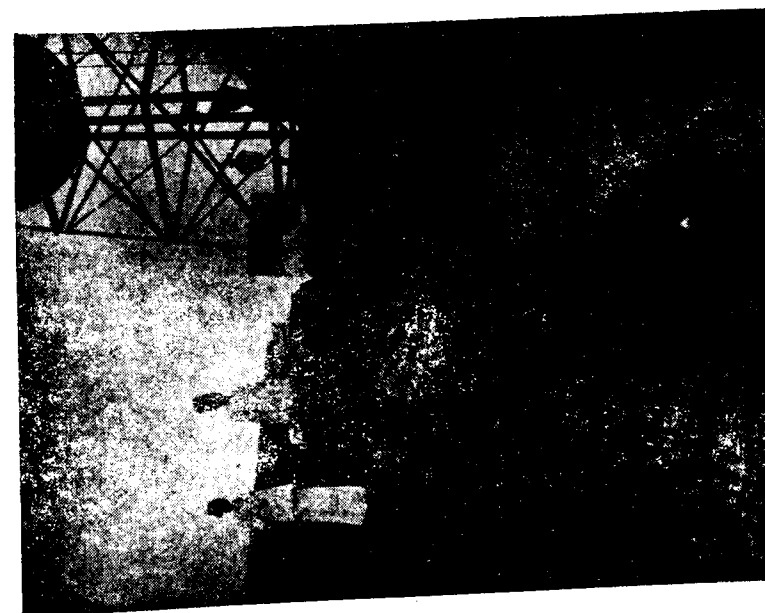
Although fish is landed at very many centres in India, fishermen have, however, to depend on chance for their supplies. The catch in some days may be big or of good varieties and in some others it may be the reverse. No effective means of regulating the quantity or nature of catch exists, especially, in the marine fisheries. On the other hand the total landings of fish have to be cleared daily and sold immediately on account of its perishable nature. The owner's main desire is to sell at once, whether as fisherman, middleman or retailer. From an economic point of view, it would appear very advantageous to secure a more uniform supply. Since this cannot be the very nature of the case be achieved by a regulation of the quantities landed it must be found in the process of marketing. Under the present conditions, an immediate market is imperative and results in frequent gluts or sometimes shortages. If the supplies could be stored, even for a short period, without deterioration, the condition of the trade would be far improved. Storage facilities for fish are almost wholly not available.

The fisherman *i. e.*, those who actually catch the fish, play an insignificant part in the disposal of the catches. Their task generally ends when boats have been brought to the shore. The members of the fisherman's family do the preliminary assembling and distribution of the catch are generally done by merchants and commission agents who step in at this stage. If facilities for sending out fish are available at the fishing centres, certain important varieties *e. g.*, pomfrets, seers perches, large prawns etc., are sorted out and despatched to the nearest towns and cities where they are in demand, otherwise preserved fish or fish manure is made out of the whole catch.

The average consumer in this country finds fish costly. The fisherman, however, gets a small proportion of the price paid by the consumer. The fish trade in all countries is beset with similar problems due to the material of the industry not being a stationary object. In this country, custom, religion and prejudices and ignorance on the part of the distributive trade and the buying public introduce further complications in the industry, which is scarcely, if at all, organised.

B. Fishing population

(1) **Fishing communities** :—The fishing castes of India present many features of interest which are survivals of manners and



LOADING FISH, TIRUR

customs, dating from very remote times. According to ancient Hindu legislation, fishermen belonged to a distinct caste. In many coastal areas, there are still two distinct types of fishermen (i) those who capture fish a few miles out into the sea; (ii) those who pursue their avocations from the shore or in backwaters and creeks. In the Malabar district men who capture fish with hooks and lines, cannot take part in fishing operations with nets or *vice versa*. In the Chilka lake, certain castes are permitted to fish only with fixed engines *i. e.*, bamboo screens and traps, and cannot use nets, while certain other castes can only capture fish while certain other can only market the fish. Although the above old time conventions are now less strictly observed, and fishermen have taken to other occupations. They still exert a great influence on the organisation of the industry in most parts of the country.

The marine fishing population consists of Hindus, Muslims and Christians; in different coastal areas one or other of the communities predominates. In Sind, the fishermen are all Muslims. In most parts of the West Coast, Muslims and Hindus are found in more or less equal proportions. The Hindus belong to the castes Bohis Kolis, Mukuvas, Mogers etc., and the Muslims belong to tribes like Daldis, Pudu Islams, Mappillas etc. Roman Catholics predominate in central Travancore and in the Palk Straight Bay. Along the Coromandal coast, Hindu fishermen exceed those belonging to other communities. In the Madras Presidency the most important fishing communities are the Mappillas of Malabar, Billavas of South Kanara, and some Nadars, Maraikkairs and Ravuthers of southern districts. To some, the ownership of boats or the shipping trade, have offered, an incidental occupation in the fishing line. In the Coromandal coast particularly fishermen have customs of a patriarchal nature, and certain hereditary powers are held by certain individuals. The fishing villages or *Kuppams* have hereditary or elective headmen and hereditary priests, who are the final referees in all family and caste disputes.

(2) **Numbers engaged in the fishing industry:**—The actual capture of the fish is exclusively the job of the male. The fisherwomen actively co-operate in transporting fish on headloads and as assemblers, curers or retailers.

In the All-India census report of 1931 fishermen have been classified under the sub-groups "Fishing and hunting" and "Fishing & pearling" each sub-group being divided into "(1) Total earners principal occupation (2) Total working dependants and (3) Total following occupation as subsidiary to other". The classification is given below:—

(Statement—vide page 120)

The largest number of fishermen workers in India was noted in Bengal (20%) and next in Madras (21%) which together accounted

Classification of fishing population in India—(Census 1931).

Provinces or State	Adult Fishermen workers.		Assemblers, Retailers, etc.		Total fishing population.	Percentage of workers to total population.	Ratio, Number of workers (100) to assemblers and retailers.
	No.	Per- centage.	Female workers.	Working Independently Male & Female.			
Assam	34,580	6.3	840	5,790	114,820	30	19
Bengal	158,620	28.8	26,120	6,280	464,460	34	20
Bihar & Orissa	42,110	7.7	9,100	1,350	124,180	34	25
Bombay & Sind	47,210	8.6	12,310	8,970	147,710	32	45
Central Provinces & Berar	36,010	6.5	5,800	2,960	108,120	33	24
Madras	117,470	21.3	34,810	13,020	355,850	33	41
Punjab	3,300	0.6	10	260	10,120	33	8
United Provinces	14,420	2.6	3,470	2,330	46,100	31	40
Hyderabad	33,580	6.1	14,860	15,700	120,830	28	91
Cochin	8,160	1.5	850	290	23,920	34	14
Travancore	31,550	5.7	2,540	4,040	101,750	31	21
Other areas	23,600	4.3	14,430	3,010	71,770	33	74
Total	550,610	100.0	115,140	64,000	168,9630	33	33

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for half the total in India. On the average, about one out of every three of the total fishing population was a worker, while one out of every ten was a retailer or distributor.

A large number of people were engaged in fishing as a subsidiary industry or means of living as curers, boat builders, merchants, middlemen, commission agents, net-makers, labourers etc., and these constituted roughly about 57% of the total fishing population.

The fishing population in India constituted only 0.5% of the total in India during 1931, and about 0.8% in Madras.

Certain estimates have been made by Dr. H. T. Sorley in 1931, regarding the earning power of fishermen in the Bombay-Sind area and it was stated that fishermen catering to Bombay City earned nearly double that earned in the North Kanara area. It has been reported that fishermen are well off in Sind, in a fair condition in South Kanara, but very poverty stricken in the Cape Camorin—Coromandal coast. But on the whole, especially in parts removed from towns, and as compared to other classes, the average fisherman especially the producer, is still in a very backward and poor condition, and any effort to develop the industry must be devoted primarily to benefit him.

C. Methods and Agencies of Assembling

The marketable surplus of fish is disposed of by members of the fishermen's family (1) either by themselves taking it to the nearest market or assembling centre or (2) by selling at the landing *ghats* to intermediaries, who take it to assembling centres. The latter include agents of middlemen—as boat owners and curers, village merchants, and itinerant dealers. Fish merchants play an important part, especially in the coastal areas of South India, in the assembling (and distribution) of fish, functioning in the triple role as wholesalers, commission agents and curers.

(1) Fisher-folk

The fishermen catch the fish and the disposal is usually left to other agencies. In Madras, most producers do not take part in the assembling and distribution of fish, because they work more or less as labourers to the merchants who provide the fishing craft. Usually a share of the produce is given to the fishermen, but even this is generally sold at a reduced rate to the merchant. There are however some fishermen who are allowed to independently sell their share of the produce. All along the coastal areas, the fishermen are generally engaged only in landing the fish and the fisher-folk, *i.e.*, members of his family mostly women collect the catch and do the

preliminary assembling. If there is a near market, the fisher-folk take it directly in headloads for sale direct to the consumer. This is possible upto a radius of about 10 miles, and each woman keeps a basket of fish and takes out a small handful to be spread on the floor for sale. The services of a middleman are necessary in all other cases. The fishermen also take short term loans paid mostly in kind to the merchants and the produce is therefore entirely marketed through the village merchants, ex-beach, at prices lower by even 25% of the current market rates. A few producers cure their own fish, if unsold, in the Government curing yard.

For marine fisheries in the larger areas of India, fishermen work in batches and sell to commission agents.

(2) Middlemen Boat Owners

The middlemen boat owners, have by virtue of their position, as financiers, a great hold on the producers, for practically all the fish landed by the debtors. Besides many of these boat owners are also curers. The boats and nets used in coastal fishing are mostly owned by non-fishermen. Fishing operations are carried on by parties of 3 to 10, sometimes 20 persons. The catch is usually shared by the middlemen boat-owner and the fishermen. Although each member of the fishing party is free to sell his share, it generally happens that the boat of net owner gets the whole stuff for sale. This is because his catch is often considerable, exceeding the share of any individual fisherman and he has facilities to market the whole share. Besides, most boat owners are also card-holders in the curing yards, and are able to dispose of the catch, even though there is no immediate market for the fresh fish. Besides the fishermen are more or less to depend on the boat owner for money as well as the continued use of the boat.

In Bombay, there is another type of middleman boat-owner. He keeps fast sailing boats, which do not conduct any fishing operations and meets fishing boats and purchase at rates agreed by contract annually.

The power-propelled boats which bring supplies to Bombay and Calcutta, visit surrounding areas and buy fish at prices within ceiling rates, fixed by the boat owner for different varieties.

(3) Petty and wholesale merchants, curers and money-lenders.—There are many petty dealers, who work independently with their own capital in coastal and fresh water fishing centres. The amount required for their daily business is only a few rupees rarely exceeding Rs. 10. Each merchant purchases straight from the beach or landing *ghat* or river bank, and the quantity will be the individual

share of one or two fishermen. Having secured the fish, he takes the fish to the interior villages or town market on a swing or a headload, walking fast or almost running, lest the fish get damaged. Fish is also sold to consumers on the way. Fresh fish is also assembled by petty dealers through bicycles to markets 10 to 15 miles away, in such places as Uppada (Godavari), Madras, Mangalore (West Coast) etc. The baskets are tied to large planks which serve as "carriers" to the bicycles.

The assembling methods adopted by wholesale merchants is as follows :—

Each wholesale merchant in the producing area is usually also a commission agent and a fish curer, dealing in both fresh and cured fish; usually for export trade. Each wholesaler has a number of paid labourers working under him on daily or monthly wages. Some of them are daily sent to landing beach to buy and bring expeditiously fish suitable for the iced fish trade. The suitable varieties of fish re-packed hurriedly with ice and kept ready to load in the train for urban markets. The wholesalers advance in cash or kind *i.e.*, provisions boats, fishing nets etc., on the undertaking that the fish would be sold to them. The remaining quantity of fish is used for curing, sun-drying, or for the manufacture of manure, fish oil etc., depending on the quality and variety of supplies. The cured fish is packed in mats and sent in goods trains, while the fresh fish has to be loaded rapidly into the trains within the few minutes of stoppage.

Commission agents and wholesalers in urban areas at the consuming end receive fresh fish either from (1) the producers in the neighbourhood (2) the agents who have gone in boats to buy fish as in Bombay or Calcutta or (3) wholesale merchants in producing areas. Any convenient site is chosen for assembling and auction depending on the market, as the special siding at Sealdah in Calcutta, an open space in the railway compound in the Basin Bridge station of Madras City, the Crawford Market at Bombay or the Khudda market at Karachi.

Cured and dried fish are, however, taken to the godowns of commission agents or assembled in the weekly markets, the transport being arranged to suit the market day. Some of the wholesalers in the consuming areas frequent the producing areas to buy fish and arrange to have it cured and packed by local labour and exported to their centres. In the weekly shandies, cured fish arriving in cartloads is auctioned in bundles usually between 10 and 11 a.m. Usually separate accommodation is provided for fish.

In Chittagong (Bengal) certain money-lenders (*mahajains*) assemble dried fish, the money advanced being payable in kind at an agreed rate, the total transactions amounting to Rs. 8½ lakhs annually (pre-war).

(4) **Co-operative Societies.**—Although there are over 200 Fishermen's Co-operative Societies in India which finance members and sometimes assist them in the sale of cured fish, the number of these institutions which undertake the assembling and distribution of the members' catch is very few.

During 1941, there were only six societies in the Madras Presidency doing non-credit work in South Kanara and Malabar districts, one society in Orissa and two in Bengal. The model bye-laws for Fishermen's Co-operative Societies in all provinces provide for joint sale of the members' produce.

The Ajanur Fishermen's Co-operative Society, South Kanara, attempted during 1941, the pooling of the catches of the members with a view to selling them either fresh, cured or converted into manure through other co-operative sale societies in the presidency. The Society was granted a ticket in the 'HOSDRUG' fish-curing yard during 1942, this being the first time a corporate body to be granted a ticket. Loans were granted by the society only to such of the members as would undertake to sell their catch through the society. The catches were pooled and cured in a hygienic way by members themselves under the supervision of the Directors. The cured fish was sold in distant markets and proceeds shared by members of the pool, according to individual shares. The object of the society was also to purchase boats and nets to be hired at nominal rates to members. Other societies in Madras are copying the Ajanur model.

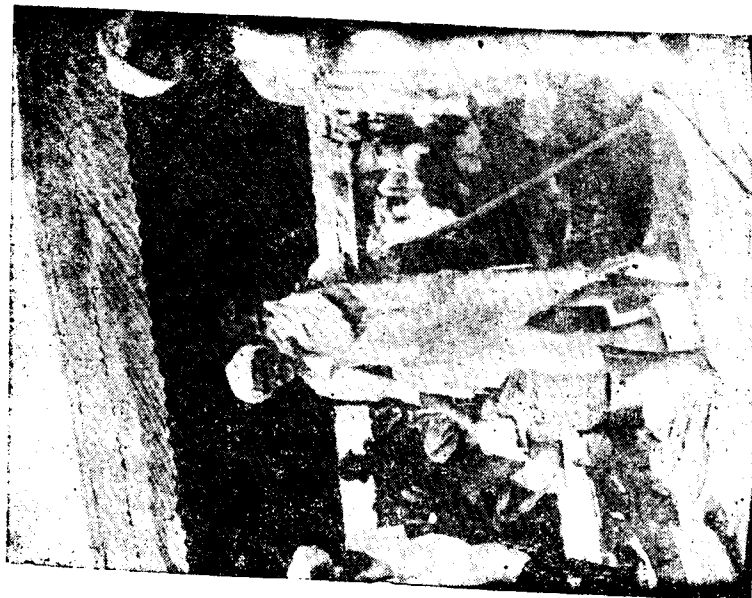
In Bengal, there is a society at Datterbad, which had acquired a right near the Bidhadhari river and provides boats and nets to 86 local fishermen members, and sells the entire quantity itself at Calcutta in retail markets. A similar society worked in Chittagong.

The assembling of fish by co-operative societies or unions a convenient places for advancing loan to members for equipment and for sale of the produce after processing and packing will create a better bargaining power among fisher-folk. Improved methods of preparation for the market, packing and curing can also be undertaken. It would be necessary for these societies to open depots in consuming markets for marketing. The advantages should be demonstrated through certain model societies, and it may be necessary for Government or other agencies to subsidise these societies, until they become self-supporting,

(5) **Cost of assembling and losses.** The small producers and petty dealers spend practically nothing in the way of marketing, when the quantity is small, as they themselves take it in head-loads, cycles, or bamboo loads (bahangi) to the market. Wholesale merchants, on the other hand, have to incur some expenses for assembling fish when



FISH MARKET - DOWLESHWARAM



the quantity is large. The items of charges are (1) cost of transport from the landing centre to godown, (2) cost of preparations for the market and (3) incidental charges on packing or despatching fish either fresh or preserved to the consuming markets. Labour is also required to arrange and keep the fish bundles in order, and also to unpack and display the contents for intending purchasers. The costs vary from place to place. In producing areas, merchants engage coolies paid usually on monthly wages for all such work as curing, packing, storing, assembling etc. These incidental charges are discussed in detail under the head "Merchandising Charges" later in this chapter.

Due to lack of proper landing facilities, losses in assembling are fairly heavy, especially in the iced fish trade. From the time of reaching the shore, considerable distances have to be traversed with the catch exposed to the hot sun, before collection in convenient centres. This is the vast area of sand or the soft mud on the banks of the river where progress is slow and good landing facilities are not available even in such places as Bombay or Calcutta or Madras. Also road communication between assembling markets and fishing centres are poor.

The condition and variety of fish, the quantity of ice packed, method of packing, season and handling all these affect the keeping quality. More widespread use of ice will result in smaller losses while assembling. In summer months losses are relatively higher. Sharks are reported to keep longer than mullets or pomfrets. If non-rigid packages are piled one over another, losses occur due to the crushing of the fish. Very often fish has to be sold at low prices owing to taintness. On an average the loss in assembling fresh fish may be about 5%, while in cured fish losses are small ranging from nil to 2%.

D. Fish Markets.

At some stage or other all fresh fish are preserved, except those retained by producers, pass through markets. These may be either daily or weekly ones in rural areas, or terminal ones in large cities.

(1) **Rural markets.** In almost all villages situated near a fishing centre, there are open spaces which serve as fish markets. Here some producers and village merchants assemble their produce, and consumers or retailers buy the fish. Prices are settled after a good deal of haggling.

The weekly markets otherwise called *hats* or *shandies* play an important role in the assembling and distribution of dry fish. A separate place is usually allotted for sale of fish. The markets are usually owned by District Boards or local bodies in the Madras

Presidency, and also by *Zamindars* in other parts of India. All commodities are sold in these markets, and a fee is collected on arrival, usually by contractors, who have successfully bid for the right of collecting the same each year. The rates usually vary from 6 pies per headload to 4 annas per cart or roughly 3 pies to 1 anna per maund of fish. In some markets, a fee is collected from the retailers, based on the space occupied as Theni, Dowleshwaram.

Although fish is only one of the commodities handled, there are some weekly shandies which may be considered relatively important for fish in the Madras Presidency, and these are given below:—

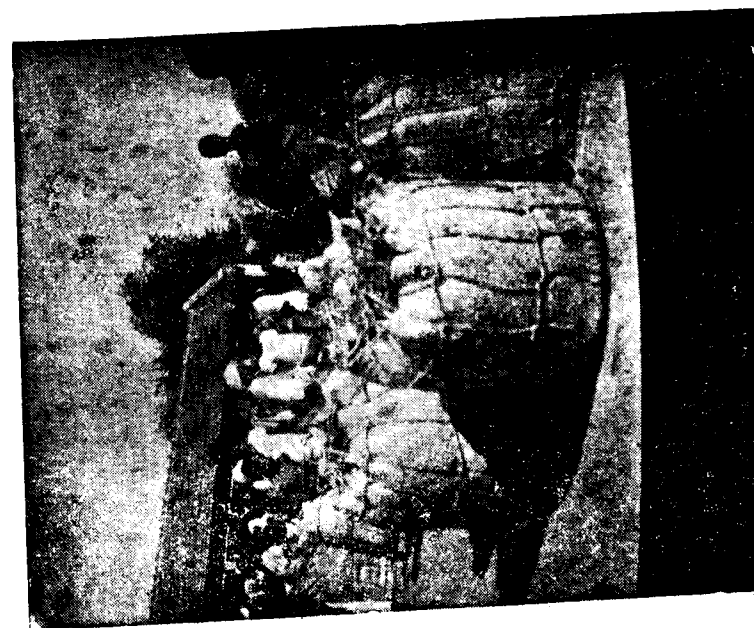
Important weekly shandies for fish in the Madras Presidency.

<i>Name of market.</i>	<i>District.</i>	<i>Quantity of fish assembled per year.</i>	<i>Market day.</i>
-----	-----	-----	-----
		Rly. maunds.	
Dowleshwaram	East Godavari	50,000 to 60,000	Sunday
Melapalayam	Tinnevelly	25,000 to 30,000	Tuesday
Paramakkudi	Ramnad	20,000 to 30,000	Thursday
Ortunad	Tanjore	15,000 to 25,000	Saturday
Thuruvai	Tinnevelly	15,000 to 25,000	Wednesday

The important fish curing yards and the quantities assembled, have already been discussed under the chapter on the preparation for market.

(2) **Urban markets:**—Urban markets (called *mandis* in certain areas) are wholesale daily markets usually situated in the district headquarters important trade centres or near railway stations. Both assembling and distribution of fresh fish take place in these markets.

Urban markets vary considerably in size and lay-out. In Bombay a special section is allotted in the Crawford Market serving as a secondary market, while in places like Lahore and Delhi transactions take place in the auction shops (*adatyas*). The fish section of the Crawford Market is a large bloc with expanded metal screens instead of walls, to provide for light and air, while the raised platforms can be



FISH AUCTION - PARAMAKUDI



RETAILING FISH - ORTHANAD

flushed with water after the day's business is over. Several auctions take place simultaneously and the method of auction is usually adopted in the *adatysa*, *mandis*, as described below:

The auctioneer is the *adatya* and his shop is usually a commonplace shed or only an open yard, and water is provided in a tub for washing fish. Fish consignments are sorted on arrival according to varieties and size and arranged in lots of nearly equal weight and value. The bid is started by the auctioneer and bids are intimated by certain signs and closed at a certain price. This lot is removed and a fresh one put up. The auction usually proceeds from 8 a.m. to 12 noon and the auctioneer's accountant (*mumim*) prepares a statement of sales, and deducts from the price all charges paid by the auctioneer as transport, commission customary *mamools* etc. In certain *mandis* deductions are also made in kind. Cash is paid immediately to seller by the auctioneer, or adjusted against advances or loans which are usually free of interest. If the seller has simply consigned the goods and is not present, the net sale proceeds are remitted to him by post.

(3) Organisation and control of markets. The time of holding the fish market varies in different places. In rural areas, transactions take place when supplies have assembled, while in urban areas, the markets are held early in the morning or both morning and evening. The turn-over is generally more in the morning.

Except markets in cities, municipalities and cantonments, other wholesale markets are not held subject to the supervision or control, of any public or Government organisation. Under the legislative powers, the Executive authorities of Municipalities and Cantonments are empowered to control the sale of food and drinks, to inspect the quality of fish exposed for sale and to destroy unwholesome fish. Within municipal or cantonment limits, retail prices should not exceed those fixed by the market authorities who also keep the market in a sanitary condition.

In the Commission shops, no direct transactions between seller and buyer are permitted, and the methods of business, commission and market charges are established by convention or custom.

E. STORAGE

Being a perishable commodity, fish is not stored long and attempts are made to dispose of stocks as quickly as possible. In spite of this, some storage is inevitable, between one place or agency and another and much care and attention are needed during storage.

Fresh fish is not stored in any consuming centre for more than 24 hours. Even for such storage, the fish has to be packed with

broken ice, or kept in a chilled room of a cold storage as in Bombay. The quantity of frozen fish stored for long periods is negligible in India.

Live fish from fresh waters is sometimes stored by producers in mud pots, containing water, for a few days to sell it in a fresh state. In the marine trade, fresh fish from stations in Malabar and South Kanara consigned to such places as Madras, Bangalore, Madura is packed with ice for preservation in the journey.

Fishermen do not store preserved fish as they are in need of cash and sell the fish to a local merchant, immediately when they are dry. During the preparation, fish are kept in gunnies, baskets, coir matting or in heaps near the fire-place. Curers and wholesale merchants store preserved fish in heaps in a corner of their houses or in special sheds erected for the purpose under lock and key. Wholesale merchants, dry fish is stocked in gunnies or mat bundles. In the weekly *shandies* of the Madras Presidency, cured fish received in bundles from producing areas is kept as such till shandy day when they are opened and exposed for sale. In the market at Arkonam spacious rented godowns belonging to the South Indian Railway are used for fish storage. A similar arrangement exists at Sewri market in Bombay, where a godown of 50 rooms each measuring 20' x 10' is maintained by the municipality.

In the case of preserved fish, the ordinary period of carry-over to reach the consumer ranges from two to three weeks, in such markets as Arkonam, Koilpatti, Villippuram etc. The bulk of the stock is visible during October to March, but this is not carried over beyond April in most of the areas. Stocks are almost negligible in the monsoon months, except in Bengal, where dry fish are consumed during rains and special storage methods are adopted.

Fish oil is stored in Kerosene tins or in large drums which when full are sold along with the containers.

Preserved fish are liable to insect and bacterial attack, the losses amounting to about 1 % normally. Even well-cured fish loses its taste on long storage. If pronounced deterioration has taken place, merchants sell such fish as manure at low rates.

F. TRANSPORTATION

The means of transport employed for fish in India are more or less the same employed for agricultural commodities, namely, head-loads, shoulder slings, bicycles, pack animals bullock carts, pony carts, motor vehicles, railways, boats and steamers. The use of



CARRYING FISH ON SWING

a particular means of transport depends on the locality, distance to be traversed, quantity of fish, the facilities for quick and safe despatch and finally also the relative costs.

(1) **Transport by road:**—Road transport of fish is common in all producing areas, producers carry fish to wholesaler's godown or village markets in baskets and retailers when hawking from house to house. When a larger quantity is involved, the *bahangi* or *kavu* (bamboo sling) is employed for distances upto five miles and loads of about two maunds. In such cases no extra cost is involved as producers themselves carry the fish. The use of bicycles is becoming more popular, and cycles are supplied by merchants who get them on hire. Usually 50 to 80 pounds of fish are carried on each bicycle, the distance covered being upto 10 miles, but sometimes even 30 miles are covered in relays by three persons. This method is relatively rapid on roads, and can be used on footpaths and on landing grounds. The costs of transport during 1940 ranged as follows:—

Costs of transport by bicycle

<i>District</i>	<i>Route</i>	<i>Miles</i>	<i>Cost of transport</i>	<i>Load</i>
Chingleput	Sadras to Chingleput	18	5 annas	50 to 80 lbs
South Arcot	Markanam to Tindivanam	22	6 „	„
South Kanara	Mangalore to Puthur	30	6 „	„

The costs worked roughly at 3 pies per maund per mile during 1940 and is now 2 to 3 times more. The relaying of fish is practised from Uppada in East Godavari to such places as Rajahmundry, Rajanagaram, Gollaprolu, Durgoda etc. Transport by head-loads, slings or bicycles is confined to fresh fish.

Pack animals are employed for carriage of fish in the Punjab; North-Western Frontier, United Provinces, Central Provinces. and, H. E. H. the Nizam's State and camels in Sind.

Pony carts are used in urban areas and can come from 15 to 20 miles with a load of about 6 maunds. From Ponneri, Pulicat and other fishing areas in the Chingleput district, fish is brought to Madras City in pony carts. The costs during 1940 worked from 6 to 9 pies per maund per mile.

Motor lorries are utilised for quick transport for distances ranging about 50 miles or over. They are more advantageously used for dry fish, as from the West Coast areas to Coorg, Mysore, Coimbatore etc. Small cars are used for transport of fish from places like Tada, Arambakkam, Sulurpeta in Nellore and Chingleput districts. The load is about half a ton (30 to 40 bundles) and the rates charged during 1940 was 10 to 12 annas per basket of 40 to 60 lbs for distances of 60 to 80 miles. The rates by lorry are more on local competition and varied from 0.5 to 2.5 pies per maund per mile during 1940, and were cheaper for longer distances and full loads. Occasionally buses are allowed to carry a basket or two of fish on the top in some parts of South Kanara, Malabar and Vizagapatam, but the practice is objected to and is not on a large scale.

Bullock carts are very useful for carrying heavy loads of 15 to 20 maunds on road, but as progress is slow, the practice is confined to dry fish, for distances ranging usually from 15 to 25 miles, but sometimes even 60 miles.

They are commonly employed to carry parcel from rail head to godowns. The rates for long distances worked out as follows :—

Cost of transport by carts (1940.)

District.	Distance miles.	Rate per maund.	Rate per maund per mile.
Tanjore	15	0-2-6	2.0
Vizagapatam	20	0-2-6	1.5
West Godavari	40 to 50	0-4-6 to 0-6-0	1.4
Tinnevelly	55 to 60	0-6-6 to 0-7-0	1.4

The costs were lower for longer distances with fuller loads, and worked from 1.5 to 2.0 pies per maund per mile, during 1940, and were three times higher during 1946-47.

(2) Transport by water

Except in a few areas, boat transport of fish is confined particularly for fresh water fish from the fishing boat to the nearest point where a better means of transport is available to the assembling market. This is common in riverine fishing in places like Bengal as fishermen

themselves tow the boat to appointed centres. Boat transport is prevalent in such places as Irikam, Tada, in Nellore district, Pulicat or Arambakkam in Chingleput and places in South Kanara and Malabar as from Tanur to Cochin or Udupi to Mangalore. Where facilities exist, boat transport was relatively much cheaper than other methods, but also the slowest.

The steamer freight for fish transport during 1940 ranged from Rs. 42 per ton from Cochin to Rangoon, Rs. 8/33 cents per ton from Tuticorin to Colombo and Rs. 9/33 cents per ton from Dhanushkodi to Colombo. The rates increased considerably during the recent war. Fish products from Arabia are brought to the ports on the West Coast in sailing vessels, while the major portion of the trade to Ceylon is handled by sailing schooners.

(3) Transport by Rail

Rail transport is the most important means employed for carrying fish over long distances. While fresh fish is accepted by mail and fast passenger trains, dried and salted fish are mostly consigned by goods trains and occasionally by passenger trains.

The general tariff rates for carrying baggage and parcels by passenger or mail trains is based on distance and weight and fixed for all Railways by the Indian Railway Conference Association with the approval of the Railway Board. Fish are charged at half parcel rates on gross weights i.e., plus ice plus container, at owner's risk and pre-payment of freight is compulsory. Being a perishable commodity, booking and delivery are open on all days of the week. The Railways require that packing should be done in *durable* containers, properly tied and labelled. If however, risk note form 'A' which absolves the Railway from risk of damage or loss is executed, insecured packets are also accepted. The Railways do the handling at despatching and receiving stations, but merchants also assist in loading, where the halts are short. In most cases the parcels are piled one over another in the brake vans. At the receiving stations, fish parcels have to be removed within 24 hours or earlier, if they are likely to become offensive, otherwise the station authorities are empowered to auction them at owner's risk and expense. Parcels are therefore cleared off early, and sometimes with the co-operation of the Railway staff, and weigh-bills surrendered as soon as received by post.

Empties are returned at half parcel rate provided (1) freight is prepaid, (2) the return is within seven days of receipt, (3) the particulars of original booking are quoted and (4) the consignee and consignor are the same as before.

As a rule only preserved fish are consigned by goods train. The freight charged for fish under the general classification of goods in India was as follows :—

Goods charges for transport of fish

Commodity.	Class or Schedule.	Rate per maund per mile.	Conditions.
dried or salted.	2nd class	0.42 pic	Railway risk.
do.	C/G schedule.	.38 to 0.10 pic according to distance.	Only in South Indian Railway.
			(1) Owner's risk
			(2) Minimum weight 200 mds. in metre gauge and 400 mds. in broad gauge.
			(3) Distance over 51 miles.
Fresh fish.	4 B Class.	.72 pic	Railway risk, prepayment of freight compulsory.
	4th Class.	.62 pic	Owner's risk, prepayment of freight compulsory.
Fish in tins.	6th Class.	.83 pic	Railway risk.

(Loading and unloading by owners).

Station to station rates were quoted by all Railways on certain important routes, ranging from $\frac{1}{4}$ to $\frac{1}{3}$ of the usual parcel rates. From the West Coast area special rates were quoted to places like Arkonam, Tuticorin, Colombo etc., in pre-war years but some of these rates have been cancelled or revised since. Special rates for Colombo were cancelled in March 1947.

Live fish for rearing purposes are given a concession rate at $\frac{1}{4}$ parcel rate in the M. & S. M. Railway if certified by the Government department concerned.

Some of the Railways in India provide a few special facilities for fish transport, as special standard containers in the B.A., I.G.N. and R.S.N. Railways. Mention has already been made of the reduced

rates for transport of ice, which were further extended in the South Indian Railway through the Marketing staff. Some Railways used to give season tickets to market vendors and permitted to carry some additional load of fish or market produce in the M.S.M. & S.I. Railways.

(4) Insulated van for transport of fish

Long distance fish traffic is not great in any Railway system at present. There are difficulties of getting a regular and economic load stand which stand in the way of refrigerated vans for fish traffic. In this connection, certain experiments were conducted during 1940, by the South Indian Railway in collaboration with the provincial marketing staff for carriage of fish from the West Coast stations to Madras in a broad gauge insulated van. The van which was constructed by the Railway had a carrying capacity of 9 tons, but was not pre-cooled or provided with bunkers filled with ice. The load consisted of fish parcels packed with ice, and as the van was insulated, a rapid and continuous melting of ice was avoided. The aim was to reduce the quantity of ice per parcel and thus economise both cost and freight.

Some of the details are given below :—

The van was 27' 6" long, divided into three compartments, and the floor was lined with zinc sheeting inlaid with 6" thick cork slabs. The sides, roof and doors have also been suitably insulated with 3" to 4" thick cork slabs and the temperature inside was about 15°F lower than the outside temperature. The loss in weight of ice ranged from 35 to 70% in the insulated van as against 40 to 80% in the controls. The condition of fish transported in the insulated van was distinctly better; being quite fresh and turgid.

The Railway company charged the same rate for fish in the insulated van as by ordinary vans. The running of the van was discontinued due to lack of haulage.

The use of carriages cooled by ice for carriage of perishables for the Defence services in the war period indicates the possibilities of refrigeration in the development of the fish trade. It may be necessary to have refrigeration centres in producing and consuming areas, if the transport under refrigeration is to be fully utilised. Considering the seasonal nature of production and the large variation in prices particularly of choice varieties, refrigerated storage, as well as transport of fish is a line of improvement which has got distinct possibilities in the development of the industry.

(5) Types of containers and packing materials used

In India, the following containers are used in the fish trade namely (1) nets, (2) baskets, (3) gunny bags, (4) wooden cases, (5) earthen pots, (6) kerosene oil tins and (7) leaf mats made of cocoanut, palmyra or screw pine leaf.

Nets are used chiefly in the producing areas for carrying small quantities of fish from the boats to the assembling centres of nearby fish markets. In certain areas, large masses of fish are kept alive in water in bag nets staked near the shore from which quantities are removed according to requirements.

Baskets are in universal use in the fish trade. They are generally made of bamboo strips but the rigidity, size, shape and cost vary. For short distances transport in the same district packing is done loose in baskets covered with gunny, without ice as in Malabar, Chingleput or Tanjore. In Malabar a piece of flattened leaf stalk of the arecanut palm is stitched to the underside of baskets to collect any water that may drain from the fish. Deep strong baskets of plaited bamboo are used for sending fish over long distances, and ice is used in this case. Fish and broken lumps of ice are placed in alternate layers and when full, a lid of the same material is put on, and firmly tied with coir or ropes. The average weight of a basket with ice is 20 seers gross. The baskets are returnable and may be serviceable even for six journeys.

Wooden cases are used mostly by commission agents and wholesale merchants for despatching fish in ice by rail to distant markets. Cases which have been once used for packing fruits, soap, cutlery or tea are used. The method of packing fish with ice is similar to the one adopted for baskets. For iced fish intended for Madras from the West Coast, the quantity of ice used was 30 lbs. per case for seer, and 25 lbs. for prawns, while sharks were usually packed in baskets. For Bangalore usually baskets holding 5, 10, 20 seers are used. It is reported that in Bengal, arrangements are made for adding ice for long distance transport involving transshipment; occasionally more ice is added at the receiving end if necessary till sale.

In Bengal standard containers are used and the following dimensions laid down viz.,—

33" × 24" × 21"	charged for 5 maunds gross weight.
30" × 24" × 18"	" 4 "
27" × 21" × 18"	" 3½ "

No weighment is necessary in such cases. Occasionally dried fish from valuable varieties like seer, intended for Colombo is packed in dealwood cases in the West Coast.

Baskets are cleaner, lighter and cheaper than boxes on the whole. As empties are not washed or disinfected for fresh use, it would appear that from a hygienic point of view a non-returnable container would be the best.

Gunny bags: The use of gunny bags is confined to the transport of large fresh water fish from producing centres to nearby markets. Usually second hand ones are used and stitched. Being non-rigid the disadvantages are obvious. Fish guano and manure are always packed

in gunnies. Dry fish are occasionally packed in gunnies of about 2 Railway maunds in parts of Tanjore, South Arcot and West Godavari districts.

Earthern pots and kerosene tins are used in the transport of live fish, the tins being preferred for rail transport. These containers are more than half filled with water. Fish oil is universally transported in kerosene tins.

Coconut, palmyrah and screw pine-leaf mats

Mats are generally used for packing dried fish. Small fish like white bait, silver bellies, prawns are packed in mats of cylindrical pattern, whereas for large fish like catfish, sabre fish, pomfret, the container has a rectangular shape. Plaited cocoanut leaf mats are used from the West Coast to Trichinopoly and Tanjore districts but as the package lacks strength, it is used for short distances only. Screw pine mats are stronger and all salted and dried fish sent to Ceylon from the West Coast are packed in screw pine mats. The relative costs during 1940 per 100 mats were follows:—

Coconut leaves 45" × 18"	Rs. 0-12-0 per 100
Palmyra mats 30" × 15"	" 1-4 -0 " "
Screw pine mats 60" × 42"	" 4 to 6 " "

Fish is not allowed to remain for more than two weeks in such bundles and the quality is not seriously impaired. There are various sizes ranging from half to one Railway maund. During 1940, the packing charges varied as follows per Railway maund:—

	Dry fish		Fresh fish	
	Tellicherry Screw pine mat	Tanjore Palmyra mat	Nellore Palmyra basket	Calicut Dealwood case
Cost of package	0-5-6	0-0-10	0-0-10	0-6-0
Coir	0-2-0	0-0-5	0-0-3	0-0-3
Labour	0-4-6	0-0-7	0-0-3	0-1-3
	0-12-0	0-1-10	0-1-4	0-7-3
Cost of ice	...	...	...	0-14-6
				1-5-9
				1-3-0
				1-9-9

G. MERCHANDISING CHARGES

(1) In rural markets:

When fishermen take fish to a village market or weekly shandy, the charges ranged from 6 pies for headload to 4 annas per cart or roughly 3 to 6 pies per Railway maund. In many markets in this

presidency a separate charge is fixed for cured or dry fish, the fresh fish being charged per vendor and the cured fish on quantity. Buyers have not to spend anything in rural markets.

(2) In large assembling and distributive markets

The merchandising charges which the seller has to pay at terminal markets amounted to approximately 25% of the value and comprised (1) charges incurred by rural dealers in consigning fish and (2) charges of the commission agents recovered from sellers. The former varied from place to place as below:—

Market charges incurred in despatching one maund of fish to other markets—(1940.)

ITEMS	Fresh fish Bombay Sholapur	Fresh fish Tanur Madras	Salted fish Tirur Colombo
Cost of			
1. Container	0-4-6	0-5-0	0-2-0
2. Ice	0-4-0	0-12-6	...
3. Packing material	0-1-0	0-1-0	0-1-6
4. Packing charges	0-1-0	0-1-0	0-2-3
5. Transport to station	0-3-0	0-1-0	0-0-6
6. Station expenses	0-1-3	0-2-0	0-1-0
Total	0-15-9	1-7-0	0-8-0

(b) Charges of commission agents recovered from sellers for clearing and selling the consignment:—

These comprise the following:—

(1) **Clearance and cartage:**—For fresh fish the transport from station to godown ranged during 1940 from one to three annas per maund besides one anna per parcel to the railway personnel. The charges for dried fish were smaller.

(2) **Octroi** is charged in certain areas in Northern India. In the Madras Presidency, Local Boards were empowered to levy a fee not exceeding Rs. 5/- per annum in respect of public curing yards, curing or storing fish and one rupee in respect of any private house.

(3) **Commission:** Commission is the main item of expenditure. For fresh fish sold at Madras City the commission was 8 annas per parcel irrespective of the value received in auction. The rates of commission for cured fish were 6½% at Mannargudi (Tanjore), 7½% at Palghat and 10% at Mannargudi, Paramagudi (Ramnad) and Colombo.

(4) **Charity:** A deduction on this account was made on sales of cured fish at 2 pies per bundle.

(5) **Miscellaneous charges:** These comprised godown rent, sales tax, postage etc., sometimes 8 annas per Rs. 100/- is charged for changing notes and rupees.

H. PRICE SPREAD BETWEEN PRODUCERS AND CONSUMERS

The following examples are illustrative of the approximate charges incurred and the prices, in export of fish from producing to consuming centres.

(a) Fresh fish:

Approximate costs of railing one maund of iced fresh fish from Tanur to Madras City.

	1940-41		1944-45	
	<i>Sharks</i>	<i>Pomfrets</i>	<i>Sharks</i>	<i>Pomfrets</i>
Cost of fish at Tirur	3-14-0	4-4-7	18-0-0	24- 7-0
Basket and ice	0-7-0	1-4-7	1-4-7	3-14-0
Railway freight and handling	3-0-0	3-6-10	5-2-0	6- 7-0
Total	<u>7-5-0</u>	<u>9-0-0</u>	<u>24-6-7</u>	<u>34-12-0</u>
Wholesale price at Madras	<u>8-9-0</u>	<u>11-2-0</u>	<u>36-0-0</u>	<u>46- 5-0</u>
Retail price at Madras	<u>11-9-0</u>	<u>14-2-0</u>	<u>46-5-0</u>	<u>61-12-0</u>

The quantity of ice used was 10 pounds for every case of 80 lbs. of sharks, and 30 lbs. per case of 70 lbs. of pomfrets. One railway maund usually contains 20 to 25 sharks and 35 to 45 pomfrets.

(b) Dry Fish:

The expenses of exporting one maund of dry fish from Tirur to Colombo worked approximately as follows:—

	(Per 1000 mackerels).	
	1940	1947
Price of fish at Tirur	4- 0-0	8- 0-0
Transport charges	0- 0-9	0- 2-0
Gutting and cleaning	0- 1-3	0- 4-0
Cost of salt	0- 3-6	0- 5-3
Cost of salting	0- 1-0	0- 4-0
Drying or labour charges	0- 2-0	0- 4-0
	4- 8-6	9- 3-3
Packing and station charges	0- 5-0	0-10-0
Railway freight	1- 6-5	1- 9-6
Customs duty	1- 0-0	1- 0-0
Commission 8% on value	0-11-0	3- 0-0
Income-tax, miscellaneous	0- 0-9	0- 1-6
Total cost at Colombo	7-15-8	15- 8-3
or roughly	8- 0-0	15/8

The charges incurred in exporting wet salted fish were as below:—

Wet salting (*packing in barrels*).

(Ratnagiri method—I Railway maund).

	1940	1947
	—	—
Cost of fish	4- 0-0	8- 0-0
Transport	0- 0-9	0- 2-0
Gutting and cleaning	0- 1-3	0- 4-0
Cost of salt	0-15-0	1-12-0
Salting charges	0- 4-0	0-10-0
Cost of barrel and pickling	0- 8-0	1- 2-0
	5-13-0	11-14-0

The above charges are indicative and approximate only as considerable variations occur in the cost of fish, as well as of the materials from place to place.

For instances of fish sold at different markets, it was seen that for fish sold by the producer direct to the consuming market as at Cannanore his share worked even to 74% of the consumer's price. For sale through a Commission agent to a market in Tanjore district from Malabar the share was only 44%. In the whole of India the Share was so low as 27% from the Punjab to Delhi and 46% from North Kanara to Bombay. From West Coast stations to Madras City it ranged about 40%.

From all these instances, it will be seen that the producer's share of the consumer's price ranged from 30 to 50% from distant urban markets and about 70% from local ones.

I. MAIN DIRECTIONS OF TRANSPORT OF FISH IN THE INTERNAL AND FOREIGN TRADE OF THE MADRAS PRESIDENCY

Dry fish is transported by rail from different stations in Malabar and South Kanara districts to Madras City, Bangalore and urban areas in practically all districts of the Madras Presidency. As the transport was restricted during the war period, an indication of the importance of the different exporting centres is given by the following pre-war figures of the quantities exported.

Export by Rail of dry fish from important stations in the West Coast (Railway maunds.)

(Pre-war).

District.	Station.	Quantity exported.
Malabar.	Tirur	... 67,640
South Kanara.	Mangalore.	... 53,740
Malabar.	Tanur.	... 34,770
	Tellicherry	... 23,440
	Palayangadi	... 23,230
	Badagara.	... 19,360
	Parappanangadi	... 16,840
South Kanara.	Kasargod	... 13,280
Malabar.	Pantalayini	... 13,020
South Kanara.	Kanhangod	... 13,010
Malabar.	Nadapuram	... 11,600
	Cannanore	... 10,260
Malabar and South Kanara.	Manjeshwar, Kotikulam Ullal, Kadalundi, West hill	... 5,000 to 10,000
Ramnad.	Dhanushkodi	... 7,720

Important receiving stations for dry fish in the pre-war period were as follows:—

District.	Station.	Quantity.
Ramnad.	Dhanushkodi	... 157,480 For export to Ceylon.
Tinnevely.	Tuticorin	... 62,300
Madras City.	Salt Cotaurs and Egmore.	50,520
Trichinopoly.	Trichinopoly	... 32,440
Tinnevely.	Koilpatti	... 26,420
Ramnad.	Paramakkudi	... 24,620
North Arcot.	Arkonam	... 19,670
South Arcot.	Villupuram	... 13,730
Tanjore.	Tanjore	... 12,290
North Arcot.	Katpadi	... 10,434
Other districts.	Bezwada, Tiruttani, Palghat, Dindigul, Salem, Karaikkudi, Coimbatore	... 5,000 to 10,000 each.

The important railway stations for export of fresh fish were as below in order of importance.

Exports of fresh fish (pre-war) Railway maunds.

<i>District.</i>	<i>Station.</i>	<i>Quantity (Rly. maunds)</i>
Malabar.	Tirur	11,930
	Tanur	10,480
	Calicut	7,350
	Pantalayini	5,610
Tanjore. Malabar.	Tranquebar	5,100
	Parappanangadi	4,520

During the war years, the exports were restricted and were also influenced by the needs of the Defence services.

Supplies by rail to Madras city in the pre-war years averaged 50,520 maunds of dry fish and 33,050 maunds of fresh fish as detailed below:—

Imports of fish into Madras City by rail (pre-war)

	Railway maunds.	
<i>From Dt.</i>	<i>Dry fish.</i>	<i>Fresh fish.</i>
Malabar	20,440	20,510
Travancore	20,740	
Nellore	3,740	5,700
Tinnevely	2,640	...
South Arcot	1,550	920
Chingleput	30	4,880
Cochin	...	1,040
Others	1,380	nil
	—	—
	50,520	33,050
	—	—

Exports by sea to Ceylon and Burma have been discussed under the Chapter on Supplies, as also exports by rail to Mysore and the imports from Travancore and Cochin States.

J. DISTRIBUTION

Consumers receive their supplies of fish from one or other of the following agencies viz., (1) Fisherfolk, (2) village merchants, (3) curers, commission agents and wholesale merchants, (4) co-operative societies and (5) retailers.

(1) **Fisher folk.** The producers i.e., relations of fishermen, often hawk fish in near by villages or markets, or on the roadside or in improvised stalls, the local urban markets. Better prices are got in the towns. Usually a bundle or basket is carried by each fisherwomen and sold retail in heaps or counts, sometimes after bargaining.

(2) **Village merchants:** Petty dealers purchase fish on the beach and hawk in retail in the local villages or markets, made in the same way as producers. This is particularly the practice for fresh fish. Sale is usually by weight or counts for cash or rarely for kind. The surplus after retail sales is sold to wholesale merchants or curers.

(3) **Curers, commission agents and wholesale merchants:** These differ from village merchants in having premises for their business and in handling larger quantities of fish. For iced fish the distributors are mostly commission agents, who consign fish on order at fixed rates as to merchants at Bangalore or again to commission agents as at Madras. At Madras each case is sold in auction to retailers. In large centres like Calcutta, Bombay or Madras the distribution actually commences at the railway platform, and prices settled by auction.

Dry fish is also distributed through commission agents. A few curers who are also merchants also take part in the distribution.

(4) **Co-operative Societies:** Except in the case of the Co-operative Societies in the South Kanara district (Ajanur), the part played by Co-operative Societies in the distribution of fish, is not significant.

(5) **Retailers:** In towns and cities, retail sales are made from the shops of wholesale distributors and retail merchants. These shops generally also sell poultry and eggs. The shops may be either in a street or in a municipal market, and are visited directly by consumers. In municipal market, a separate section or group of stall is reserved for fish along with meat etc. In most municipalities cantonments and notified areas, hawkers and retail shopkeepers of fish are licensed the fee ranging from Re.1/- to Rs. 2/8 per half-year.

In Bengal, Orissa, Madras and Bombay Provinces women carry on the retail trade in shops. The usual equipment is a kind of bent knife fixed on a wooden board, a few baskets and a mud pot containing water. When fish is to be weighed two small baskets serve as a pan for the balance. After weighing, the seller would remove the fins and the scales and cut the fish into pieces as required by the customer. The cut pieces are wrapped in paper and carried home. In the case of small varieties, the fish are carried dangling on a string passed through the gill openings.

K. FINANCE OF THE FISH TRADE

Of the different agencies engaged in the assembling and distributive trade of fish, the wholesale merchants at the producing areas, and the commission agents in the consuming markets constitute the chief financing agencies. Their earnings depend on the extent to which they can attract regular supplies from various sources and arrange for their remunerative and speedy disposal. They generally adopt the following procedure to meet this end:—

(i) advancing varying sums of money to fishermen and petty dealers in lieu of prior claim on the catch, (ii) giving boats and fishing nets to fishermen for a share of the catch; (iii) helping fishermen with provisions or with material for net making *e.g.*, cotton, hemp etc.; (iv) employing agents to visit various fishing centres to buy catch from the fishermen and (v) encouraging small scale retailers and hawkers to distribute the fish.

Although fish merchants do not generally advance money to small scale retailers and hawkers they provide them with fish on credit and realise the wholesale prices. All that the retailers require is a rupee or two at a time.

Wholesalers and commission agents meet the cost of packing material, salt, curing expenses, Railway freight etc. To meet all these, they require finance. Generally they have their own capital. Sometimes they borrow against some substantial security but not against the assets connected with the actual fish trade.

At present banks do not give loans to fishermen or fish merchants except when material unencumbered assets like jewels, property etc., are tendered as security. Co-operative Societies, at present, play a minor part in the finance of fish marketing.

CHAPTER VIII

MISCELLANEOUS A. Fisheries Departments

(I) Historical

During the sixties of the last century a number of dams and rivers were constructed in South Indian rivers. Sir Arthur Cotton who was in charge of these projects expressed a fear that dams might adversely affect the local coastal and inland fisheries, and an officer from the Government of India, Dr. F. Day was deputed to investigate. In his report on "Fresh water fish and fisheries of India and Burma", Dr. Day drew attention to the widespread slaughter of breeding fish and fry and urged legislative measures to conserve the fisheries. After some lengthy correspondence with Provincial Governments, the Indian Fisheries Act (Act IV of 1897) was passed for the whole of India except Burma, by which dynamiting and poisoning of waters for killing fish was absolutely prohibited. The Act empowered Local Governments under certain conditions to frame rules for regulating (i) the erection and use of fixed engines, (ii) the construction of weirs, (iii) the dimension and kind of nets to be used and the mode of using them and the prohibition for all fishing in any specified waters for a period not exceeding two years. In regard to sea fisheries Dr. Day's endeavours resulted in the grant of duty-free salt for curing fish within fenced enclosures.

The Madras Government considered that fisheries, an important food industry, demanded special attention especially as it was in the hands of a backward community without capital or initiative, and deputed Sir F. A. Nicholson in 1905 to investigate the fishing industry, both inland and marine, in the presidency. As a result, a small Department of Fisheries was constituted by the Madras Government in 1907 with Sir F. A. Nicholson as its first Honorary Director. A large amount of detailed and useful work has been carried out by the Madras Fisheries Department in respect of the preservation of fish under Indian conditions and in the uplift of the fishing population. During 1941, the Department of Fisheries, Madras was amalgamated with that of the Department of Industries and Commerce.

Other Provinces followed Madras in the matter of fishery investigation. Investigations were made in the fisheries of Bengal, Bihar and Orissa in 1906 by Sir K. G. Gupta of Bombay and Sind during 1908-10 by Mr. W. H. Lucas; and of the Punjab by Mr. H. S. Dunsford during 1911. A report on the fisheries of the United Provinces by E. H. H. Edye was published in 1923; of Baroda by James Hornwell in 1930, and a revised report about Bombay and Sind by H. T. Sorley in 1931.

In Bengal Sir K. G. Gupta recommended artificial propagation coupled with a system of short closed seasons and other protective measures for fresh water fisheries and the exploration of the Bay of Bengal by Government to find out where marine fish are to be found and investigations into how they are to be caught and brought into the market. The recommendations were accepted and a Commissioner and European expert appointed. A trawler survey of the head of the Bay of Bengal was undertaken and investigation of the fresh water fisheries of Bengal and on Hilsa. The Department of Fisheries, Bengal, Bihar and Orissa was abolished in 1923. During 1938, the Bengal fishing industry was again investigated by an expert from Madras and the Bengal Government revised the Fisheries Department in 1942 to organise the fish trade under war conditions, conserve the existing supplies and improve the yield of tank fisheries.

In Bombay, the only practical result of Mr. Lucas's investigations was an extension of the use of duty—free salt for curing sea-fish. Later a fisheries officer was appointed for the enlargement of the fish curing industry including the use of motor boats for transport of fish.

In the Punjab Mr. Dunsford recommended artificial propagation coupled with measures to prevent wasteful destruction of fish. A Fisheries Department was constituted in 1912 and continued to exist as a separate entity till 1932 when it was transferred to the administrative control of the Director of Agriculture, Punjab.

Research work in fisheries in India has been conducted by the following agencies:—

- (1) Provincial and State Fisheries Departments.
- (2) Surgeon Naturalist to the Marine Survey of India.
- (3) Zoological Survey of India.
- (4) Zoological Departments of Calcutta and Madras Universities and in the biological laboratories of certain colleges.

Research on fishery matters is within the province of the Animal Husbandry branch of the Indian Council of Agricultural Research. In 1940, a Committee appointed by the Council to review the present position of fisheries in India and to suggest steps for the development of the industry, recommended that Provincial Governments having no fishery departments, be apprised of the desirability of having an organisation to survey their respective fishery resources. At the present moment a great deal of interest is being evinced in

local fisheries by several provinces and States. During the past few years, fishery investigations have been started in Sind and Orissa, and in the States of Baroda, Hyderabad, Mysore, Cochin and Travancore.

(2) Functions.

The functions of the fisheries departments in India may by conveniently considered under three headings, viz.:

- (a) Administration,
- (b) Research,
- and (c) Socio-economic and other activities.

(a) **Administrative** :—In most provinces fisheries officers have to attend to a great deal of routine administrative duties and as a consequence they cannot devote themselves wholly to research work. In Bombay, Madras, Cochin, Travancore and Orissa, the administration of the fish curing yards claimed the first attention of the fisheries staff. In non-maritime areas as the Punjab, Jammu and Kashmir, in the interior of Madras etc., the fishery officers have also work of a routine nature as the administering of the provisions of the Local Fishery Acts and issuing licenses for fishing and leasing Government waters to private individuals. The chief source of revenue is from the sale of salt in fish curing yards, leasing Government waters to private people for catching fish, and by sale of fishing licenses. As local Governments have insisted on the fishery departments being self supporting, it has not been possible even for fishery experts to dissociate themselves from these revenue yielding duties. Recently, however, special staff devoted entirely to research have been employed in the fisheries biological stations at Calicut and for special items of research.

The fisheries section of the Industries department under the Director of Industries and Commerce consisted in Madras City of two Deputy Directors (marine) and (inland), two Assistant Directors for inland fisheries and one for deep sea fishing, two special officers for craft and tackles (marine and inland) an information officer, a hydrologist, algologist and a research officer, fresh water biological station, a superintendent for fisheries training, one information and a marketing officer. Besides there were Assistant Directors of Fisheries at Calicut, Tuticorin, Coconada, Mangalore and a special officer for manufacturing of smoked fish and another for fish manures at Calicut, and a Fisheries research officer at Calicut and at the Wilson Fish farm, Ootacamund. There are inspectors of fisheries at Kurnool and Vellore etc., and fisheries demonstrators (usually one for two districts); Assistant Fisheries demonstrators in important centres and yard officers in the curing yards. Recently it has been made into a separate department.

During 1947, there were 37 deep sea fishing centres, 60 fishery schools, 63 Fishermen's Co-operative Societies and 115 fish curing yards.

(b) **Research** :—The main divisions of research in relation to problems of fishing are (1) biological research dealing with living fish and their environment, (2) technological research into the methods of preservation and (3) research into the design and equipment of fishing vessels and nets.

(i) **Biological Research** :—In sea fisheries, the presence of shoals of fish, their local movements and migration and their appearance and seasonal abundance have been attributed to reproductive urge or for food. Certain movements are also caused by temperature and climatic changes. Biological research in respect of sea fisheries, therefore, consists in making the collection and examination of sea fauna of particular localities and investigation of data regarding temperature, salinity, direct on and movements of currents and the extent of plankton supply and bottom organisms. It is only in the Madras Presidency that investigations of this nature are being carried on. Research originally started with oil sardines and pearl oysters and is conducted in the biological stations in the West Hill and Krusadai respectively. At West hill research on the bionomics of the economically important food sea fishes like oil sardine, mackerel, sharks, sole., Indian sprats and silver bellies is also conducted. Recently work has been started at Ennur on the brackish water fishes, edible oysters and prawns.

In the case of inland fisheries the chief need is to develop the existing resources. These include methods to improve the yield of fish from rivers, irrigation canals, lakes, ponds etc., by protection, stocking and culture.

Apart from legislative measures such as prohibiting the use of small meshed nets and fixed engines, and imposing a size limit below which no specified species can be killed, the chief method of protection of food fishes in fresh waters, is by providing a closed season in specified waters during the spawning period; and to provide sanctuaries in spawning grounds of selected species. The breeding habits of fresh water fishes, the places where and the period when they spawn have to be ascertained before Section 6 (4) of the Indian Fisheries Act of 1897 can be invoked to prohibit fishing in any piece of water.

As fish experts in India have remarked that the construction of irrigation works in rivers is detrimental to fisheries by preventing or reducing propagation or perpetuation of stock, it is necessary that investigations are carried out to what extent the construction of a dam is injurious and what remedies can most economically be adopted. After Day's report on fresh water fish, as many as 18 fish ladders

and passes have been constructed in new irrigation projects, but none of them has proved completely satisfactory. It is now recognised that the design and operation of a fish ladder must be adopted to the fish and the physical conditions of the dam for which it is intended. For this a survey of each new project must be made, in regard to migration of fish and proper methods of protecting them and due provision made in the design of the dam.

Stocking and culture may be considered together. Certain food fishes e.g., the carps do not spawn in confined waters. Tanks and ponds have to be replenished with young fish in order to maintain supply at an economic level. The principal stocking methods in India are : (i) simply gathering the fry from streams and putting them in tanks and (ii) collecting floating impregnated eggs of various kinds with a piece of cloth, transporting them to small shallow ponds for hatching and when the fry are sufficiently grown, putting them in tanks. The above methods though widely adopted in Bengal, Assam, Bihar etc., are not very satisfactory because the fry and spawn are not identified and it is not always that the fry of a quick-growing economic fish is put in a tank, and the collection may contain predatory fishes which may prey on the food fishes.

Artificial fertilisation of Hilsa eggs has been tried in Madras and Bengal. Adult breeders, male and female, were netted separately the milt and ova, carefully removed and the eggs fertilised and hatched in specially constructed tanks. The aim was to release millions of young Hilsa in rivers to supplement the number produced in the natural way. The problem of rearing the larval fish to the fingerling stage is being experimented upon. Artificial propagation has been successfully achieved in the case of the exotic game fish-trout. The hill rivers in Madras, Travancore, Punjab, Jammu and Kashmir, the United Provinces etc., are today stocked with fry and fingerlings of trout obtained from the respective hatcheries.

However, it is now recognised that a few spawners produce as much young as a battery of hatcheries and the keeping of adult fish under proper environmental conditions is largely displacing fish hatcheries in western countries.

Assuming that fry of economic species produced in the natural way would be available for stocking tanks etc., it is necessary to make a detailed study of their growth, food, diseases, parasites etc., as also of the number that could be stocked in a tank, and the nourishing properties of the water in different areas. During 1940, there were in the Madras Presidency seven "fish farms" where this type of investigation was undertaken. A fish farm was opened for minor carps at Ootacamund during 1945. The Madras Fisheries Department has initiated a survey whereby irrigation tanks and other inland waters are investi-

gated district by district, and those found suitable are arranged in groups round fish farms and centres where fish breeding and rearing are carried on, and fry of economic varieties stocked. In India large inland fishing resources are owned by Government and leased to private persons for short periods. In order to maintain fishery rentals at a satisfactory level, stocking operations have to be undertaken by Government.

In Madras the exotic fish Gourami and the Pearl spot (*Etroplus suratensis*) have been successfully reared in captivity and their fry supplied to fish farms. Gourami was recently extended to Annamalai. There are stocking centres for Catla at Samalkot, for Chunks at Krusadai, for mullets at Thumalapanta and Moollapalem and recently collection centres have been opened at Adyar and the irrigation channels of the Cauvery, Godavari, Kistna. During 1945-46, about 275,000 fish seeds of Catla, Labeo, Carps, mullets, Gowrami etc., were collected and stocked.

(ii) Technological Research :—Biological and technological research should proceed side by side; the former aims at increasing the catch, while the other aims at its profitable utilisation. The Madras Fisheries department have done a good amount of useful work in the developmental methods for preserving fish. Attention has been bestowed at the Fisheries Technological Research Station, Calicut on such problems as icing, packing and marketing of fish, better curing and drying methods, improved methods of manufacture of fish and shark liver oil and prevention of bacterial attack on salted and dried fish. These have been detailed in this report. Arrangements were completed during September 1947 for starting a big ice factory at Tanur and proposals are under way for more factories and creating cold storage facilities for fish. A survey of spawning grounds of the different kinds of fish is also being conducted.

(iii) Research into the design and equipment of fishing vessels :—As has been shown in Chapter III, the marine fishing vessels and equipment are only suited to exploit a narrow belt of the coastal waters and require improvement. Power boats would be required to extend the area of operation. Such boats have been recently introduced in the Madras Presidency and the work has been described in Chapter III.

Besides there is considerable scope for work on preserving methods for enhancing the useful life of fishing boats and nets and popularising useful methods among fishermen.

(iv) Re-organisation of fisheries research :—Until recently the research work on fish in India cannot be said to be on an organised or systematic scale. By setting up a fish Committee in 1940, the Indian Council of Agricultural Research took the first step to remedy the

defect. According to the report of the marketing of fish in India, a further progress can be made by starting a central research institute in charge of a Director of Fisheries. The institute should primarily be a research organisation and must have the following functions,

- (a) to plan, co-ordinate, conduct and guide all scientific researches in the country on the ecology and bionomics of Indian fishes with a view to elucidate factors which influence their growth, movements, fluctuations and development.
- (b) to conduct an investigation into the present state of the commercial fisheries in India with a view to opening and developing new grounds for the industry,
- (c) to carry out technological aspects of fishing industry ; and
- (d) to ensure the training of research and developmental personnel.

It is understood that that the Government of India are appointing officers to carry out research on every important variety of fish.

In the Madras Presidency, much work has been done, and an organisation set up recently to further expand the activities. Besides work at the biological research stations at Calicut, Krusadi etc., and the research work on the fish farms already referred to, "a Hydro-biological laboratory" was opened at fish lands, Cherput and the foundation was laid by the Hon'ble Food Member Dr. Rajendra Prasad in May 1947.

(c) Socio-economic and other activities.

Development of fisheries as a source of food is naturally the chief object of every fisheries department. The fisher folk in India are in general at a very low stage of social and economic development. As a class they are poor and deeply in debt and are ignorant and illiterate. Facilities for their education are poor, while their absence day and night at sea, places them out of touch with the rest of the population. In Madras, it was felt that the industry could develop along right lines only when the producers (fishermen) are raised in status, intelligence, independence and means. To meet this end, special elementary schools for fisher-children and night schools in important fishing areas, the organisation of co-operative societies and propoganda work in fishing villages against intemperance and extravagance were proposed by the Fisheries department. The Madras Government accepted these proposals and they were given effect to in the districts of Malabar and South Kanara. During 1942 there were 49 elementary schools in the two districts. This number rose to 51 during 1944-45 with 8715 pupils and to 56 during 1945-46 with

9922 pupils. On the East Coast, there were during 1945-46 three schools with 194 pupils. The opening of new schools and the taking over of schools managed by municipalities and Local Boards on the East Coast are under consideration. Coir handicraft is also taught in some of the schools. During 1945-46 the Madras Government sanctioned free mid-day meals to the children of these fishery schools in the East and West Coast. The Fisheries Technological Institute at Tuticorin gives training for the navigation course and the Teacher's course.

Attention is also concentrated in Madras on starting societies for pooling and selling members' catches as fresh or cured fish. Inspectors have also been appointed to organise and supervise co-operative societies for general uplift of the fishermen. There were during 1945-46, 80 fish curing schools on the West Coast, with a paid-up share capital of Rs. 56,171 and a membership of 5506, as against 59, Rs. 51,669 and 3071 respectively in the previous year. The amount of loan outstanding against members was Rs. 51,195 during 1945-46 as compared to Rs. 88,557 in the previous year. More societies are being organised in the East Coast. Societies on the model of Madras have been started in Bombay and similar efforts are being made in Punjab, Bengal, Hyderabad and Baroda.

It may be pointed that the organisation of multi-purpose societies among fisherfolk supervised by fishery officers and linking them with sale societies in consuming areas, will help greatly to relieve the indebtedness of the fishermen and improve also the methods of preparation and marketing of the fish. A few model societies can be organised to demonstrate the usefulness of such societies and they may be subsidized in the beginning until they become self-supporting.

B. PISCI CULTURE

In India every village has got one or more tanks, and many irrigation wells. The perennial tanks and wells are capable, with care and attention and application of right methods, of providing an unfailing supply of good fish. It has been claimed that an acre of water under fish is more valuable than an acre of land. Fish can be "cultivated" just as vegetables are grown in a kitchen garden. In many parts of Central Europe, America and Japan fish culture in ponds and tanks is a part of the agricultural practice. In Japan agriculture is greatly encouraged and the Government bore 70% of the expenses for the selection of spawn etc., when the work was undertaken by prefectures or fishery associations. In the year 1934, there were 163,549 pisci culture establishments in Japan occupying 131,000 acres and yielding fish valued at Rs. 18,650,000.

In Pisci culture, the tank is selected and "prepared" and fry of suitable varieties that grow quickly planted in. The preparation consists in removing predaceous fishes, silt decaying organic matter and coarse vegetation. Regarding fry, carps are universally liked and there are also edible indigenous varieties. The fry of exotic Java fish, Gourami, the pearl spot, fresh water mullets etc., can be obtained in India at small cost. The fry are supplied free of charge by the Department of Agriculture, Punjab. In Madras the following charges were made during 1947:—

Name of fish seed	Price per dozen (fingerlings)
1. Catla Catla	0-12-0
2. Labeo cfrinbriatus	0-8-0
3. Etroplus suretensis	0-6-0
4. Mulletts	0-6-0
5. Charros	1-0-0
6. Megalops	3-0-0
7. Lates	2-8-0
8. Gourami	5-0-0
9. Ophicephalus striotus	0-6-0
10. „ punctatus	0-4-0
11. „ marulius	0-8-0
12. Glossogobius	0-6-0

The fry are transported in specially designed containers and special reduced rates are also given.

Irrigated and flooded fields can also be used for growing fish. In Japan, carp fingerlings are introduced into irrigated rice fields and grow to marketable size by the time the crop is ready for harvest i.e., 4 months. On account of the warmth and richness of the planktonic life the fish assume a size of 18", which normally takes two years in an average perennial tank. The fish does not destroy the crop and in fact helps the cultivator by destroying insect pests.

In India, the fry most abound in the irrigated or flooded locations and generally during the flooded monsoon months in search of food. In the fields that are divided off into embanked spaces in order to distribute the water, the fry obtain an entrance along with the water, which is fortunately at a depth to suit their puny size. Food is abundant and except birds there are no natural enemies for the fish. The water is conducted from fields to fields but the arrangement instead of providing an excellent nursery for the young to develop, has been ignorantly used by man to place traps at every outlet and destroy

the young fish as they drop downwards. With intelligent propaganda and no extra expenditure, the rice fields can be made to yield a "double crop". It was estimated that in Bengal the rice and jute fields alone would yield fish to the value of Rs. 5 crores (pre-war). During the present food shortage, such additional supplies of fish would help usefully to ease the food shortage.

In Madras eleven rural fishery demonstration units were organised by the Fisheries section in February 1945 to cover all the districts, sub-divided into 11 divisions. The functions were to conduct speedy survey of all existing fishery resources, open demonstration fish farms, encourage private enterprise, collect useful data regarding fish bionomics and conduct propaganda. Altogether 1775 pieces of waters, including 98 waters belonging to religious institution were surveyed and demonstration centres and nurseries opened in selected centres of South Kanara, Salem, chittoor, Tanjore, Madura, Tinnevely, Vizagapatam, Chingleput districts and Madras City. Further expansion is in progress.

Fish culture has also a further advantage in that small fishes of most varieties in confined waters destroy mosquito larvae and thus keep down malaria and mosquito borne diseases. Special larvae as **Haploichus**, **Punchax**, **Chela** and **barbus** are supplied by the fish farms in Madras and Punjab, for stocking in Malarial areas. A public health fish unit is working in the fisheries section at Madras for research and expansion of the work.

C. PROPOGANDA.

A very important method of publicity and of education in fishery methods is by means of exhibitions and fairs. Attractive displays of fishes and fishery products and of salt cured marine should be exhibited in all centres, where such forms are not known or popular. There were two aquaria in India one at Madras City and the other at Trivandrum. The Madras City aquarium which was very popular was closed during the war from March 1942, but it will be revived again. In America, the Bureau of Fisheries makes use of portable aquarium to educate the public about marine and fresh water food fishes; the hatching of eggs, pisci cultural methods etc. It would be useful if aquaria are opened also in places like Bombay, Calcutta etc.

Other methods of propaganda consist in advertising and publicity by Government if necessary. In England an advertising campaign known as the 'Eat more fish' was in operation since 1929, inaugurated by the British Trawlers' Association and financed by a levy of one pence per pound sterling on the value of fish landed by owner members. Besides, the Empire Marketing Board took steps to popularise fish as an article of diet through postage and books of recipes.

In India, a number of fish are little utilised by urban consumers either due to prejudice or ignorance, as sharks. Propaganda should be done to popularise such varieties. The Information and Broadcasting department of the Government of India in their "reconstruction Publicity Campaign" had programmed for the following Publicity material namely (1) press advertising to stimulate interest in post war fisheries, (2) broadcasts to explain the nutritive value of fish, (3) a documentary film on fisheries, (4) pamphlets and a magazine which would include fisheries and fish foods. The Department has felt that when post-war schemes on fisheries are taken up, a wholetime Fishery Publicity Officer may be employed in the Information and Broadcasting department working in consultation with the fisheries and marketing departments.

In Madras, the department of Industries and fisheries is carrying out extensive propaganda to educate the public in regard to fisheries and the value of fish as food. There is a fisheries information Bureau at Kilpauk, Madras. An Anglers club has also been organised, and two fishery development Boards. The Department arranges exhibits of fish and fish products, including craft and tackle at all important fairs and exhibitions in the presidency. During 1946, a unique fisheries exhibition in fish farming demonstration and sales was opened by the Hon'ble Minister at the fish lands and fish are sold from this station every thursday. In May 1937, a mermaid fair was organised at Madras City and opened by the Hon'ble Minister for Food, Government of India.

D. STATISTICS

Accurate statistics are required to study fisheries scientifically. In India, collection of fish statistics is rendered difficult partly due to the ignorance or conservatism of the fishing classes, and partly due to the scattered nature of the industry. The Madras fisheries department has been collecting approximate statistics of the catches of sea fish with the help of the curing yard staff. The data of the West Coast are more complete than in the East Coast as the yards in this case, are few in number and scattered. In regard to inland fish, not even a rough idea of the catches is available. It is therefore necessary that fishery departments in provinces and States carry out periodical surveys of fishing resources, the quantities caught and the number of boats, nets and other implements.

The Fisheries department of Madras was publishing from the year 1925 to 1930-31, an annual statement called fish statistics giving the quantities of fish caught and cured in the yards, their values, the types of implements used, the varieties, range of approximate prices etc., for the west Coast. During 1944, Government sanctioned the expansion of the statistical section and also proposals to collect data of inland fisheries. A census of fisherfolk has also been initiated.

SUMMARY

of the report on the Marketing of Fish in India.

“Commercial fishes of India”

In a country of the size of India with its extensive sea-board, perennial rivers and irrigation canals and innumerable rain-fed tanks and **jhils**, the physical and biological conditions under which fisheries exist are very varied.

Fish are caught where available from every piece of water. The chief sources of supply are the coastal margins of the sea, river estuaries and backwaters for marine and estuarine fish, and rivers irrigation and other canals, tanks, inundated tracts, etc., for fresh-water fish. India has a coastline of about 3,220 miles and the total area of the sea which lies between the coast of the 100 fathom line is approximately 115,000 square miles. Only a small portion of this area is worked.

The estuarine and riverine fishing of this country are important and they already supply considerable quantities of fish in many inland areas. In India, only a few of the confined waters, e.g., tanks, lakes, **jhils**, etc., are devoted wholly or in part to deliberate food production (pisci-culture).

In a large sense, the word “Fish” includes not only the finny tribes but also **Crustacea** like prawns, lobsters and crabs, edible **Molluscs**, e.g., oysters and clams, and pearl oysters, chanks and other shells. About fifty of these aquatic animals are commercially important. Pomfrets, seer, perches, certain types of Jew fishes and mullets among sea fishes and Rohu, Catla and several varieties of cat-fishes caught from freshwater, are popular among the consumers. Among marine fishes Sardine, Mackerels, Sharks, and cat-fishes although not so well known are commercially important.

“Fishing gear”

In the sea fishermen catch fish very near the shore and do not go beyond a distance of 5 to 7 miles. The crafts (canoes and **catamarans**) are small and undecked; they usually start in the morning and return in the evening and the practice of staying out for weeks is not practicable. All large rivers, tanks, backwaters and estuarine regions of rivers are intensively fished. As regards nets and other fishing implements, these are such as would help the capture of particular fishes. Bag nets, drift nets, inshore drag nets and long lines are used in marine fishing. For fishing in rivers, backwaters, tanks, etc., spears, traps, baited springs, harpoons and other similar ingenious devices are employed. Cast nets are very commonly used while fishing in shallow waters.

Power fishing of Indian seas has only been tried on an experimental basis on a few occasions. Further experiments to determine the best types of fishing vessel and gear suited to Indian conditions, i.e., a power boat which will catch marketable fish in commercial quantities and at competitive rates, have to be conducted. In view of the magnitude of problems Government will have to carry out these experiments and thus lead the way.

“Supply”

In the absence of reliable statistics it has been possible only to estimate the landing of fish in India. Inclusive of fish caught in estuaries and backwaters the total annual production of marine fish is estimated at 116.7 lakh maunds valued at Rs. 302.7 lakhs. It has been possible to estimate only the marketable surplus of freshwater fish, which amounts to 62.6 lakh maunds valued at 742.3 lakhs rupees per year.

The average cost of sea fish is only Rs. 2—10—0 per maund against Rs. 11—14—0 per maund for freshwater fish.

Madras Province accounts for nearly 40 per cent, and Travancore 22 per cent, of the total sea fish landed. In the former, the area of concentrated production is the West Coast littoral comprising South Canara and Malabar districts. The South-West Coast of India consisting of the maritime districts of the Madras Province and Cochin and Travancore States, with but a coastline of about 430 miles accounts for over 52 per cent of the total marine fish landed in India. The share of Bengal is nearly 15 per cent (the majority of the catch being estuarine), that of Bombay 12 per cent, while those of Orissa and Sind are 2.6 and 1.7 per cent, respectively.

The “Herrings and Anchovies” account for over a third of the total catch of marine fish. “Mackerels and Perches” in which group are included the diminutive but numerically abundant Indian mackerels, the coarse horse mackerels and the large and toothsome bekti comes next with 21.7 per cent of the total catch. Prawns constitute the chief item in the group “Crustaceans” and this group occupies the third rank with 10 per cent. Pomfrets, mullets and Indian salmons, although very popular, are caught only in comparatively small quantities.

Regarding freshwater fish, Bengal leads, her share of the catch being nearly 50 per cent of the total marketable surplus of freshwater fish in India. In Bihar and Assam also freshwater fisheries are important, the shares of these provinces being 15.3 and 11.5 per cent respectively of the marketable surplus of freshwater fish. The

Indus in Sind, the Mahanadi in Orissa and the Ganges with its tributaries in the United Provinces yield 4.3, 5.2 and 2.3 per cent of the Indian total.

Fishing goes on in the sea all through the year except when the weather is squally, which is so when the monsoon winds are strong. Rivers are generally not fished during the rains except in Bengal. Tank fishing is prosecuted with vigour when the level of water in the tanks is low, i.e., during early summer. In general, fish production is concentrated during the period September to February and is lowest between May and July.

Wide Variations from year to year occur in the quantities of marine fish landed as well as in the different species that make up the total catch. There has not been any recent developments in canning, and pickling industries or in the manufacture of fish meal. As far as sea-fisheries are concerned the available data show that the industry has made very little progress in recent years. Regarding freshwater fish the consensus of opinion is that the fisheries are deteriorating. Several reasons are given for this, such as the construction of dams and weirs, silting up of rivers, over-fishing, destruction of immature fish and pollution.

“Imports and exports of fish Products”

There is practically no import of raw fish into India. Considerable quantities of preserved fish, e.g., dried fish (salted or unsalted), wet-salted fish and canned fish and fish products such as Cod liver oil and fish manure of total annual average value of Rs. 16 lakhs are imported. Of these products, all except canned fish and Cod liver oil are imported from adjacent countries like Arabia, Maskat territory, etc. India had an export trade in preserved fish with Ceylon, Burma, Straits Settlements and Hong Kong, valued at over Rs. 75 lakhs per year.

“Per capita consumption”

The average *per capita* consumption of fish in India works to 3.4 lb. per annum, though actual consumption in different tracts varies widely. The highest consumption is observed in maritime tracts on the West Coast. Fish is a very popular item in the diet of a Bengali and the *per capita* consumption in the province is 6.73 lb. Among completely inland areas Assam leads with a *per capita* consumption of 3.64 lb. followed by Bihar with 2.0 lb. The consumption in the Punjab is the least being only 0.09 lb. per annum.

“Utilization”

One half of the total production is consumed as fresh fish : one-fifth is cured by salting, another one-fifth is simply sun-dried while

approximately 10 per cent is converted into fish fertilizers. There are a number of varieties of fish caught from the sea which are little utilized as food either because of unfounded prejudice against them or of the ignorance of the buying public regarding their quality. As a result these varieties have to be converted into industrial products like manure, guano, etc., instead of being consumed as food.

“Preparation for the market”

The marketable surplus of fish caught from rivers, tanks and other inland resources is almost wholly consumed as fresh fish. The preparation of such fish for inland markets in most parts of the country consist in merely eviscerating the fish and washing. Regarding sea-fisheries the position is different. The industry is scattered over a long coastline and fish supplies are irregular. The method of catching, the smallness of boats and certain established customs hinder the adoption of steps which could keep fish free from taint during transit from the moment of catching to the shore. The boats have to stay for hours to get a sufficient catch during which time the fish heaped in them get trodden upon and are exposed to the full glare of the sun. Outside the comparatively high class markets in the coast and a few places scantily served with fish with ice the supplies of fresh marine fish in India is largely tainted. The bulk of the sea-fishes are sun-dried or cured with salt and in this form reach consumers inland.

The Government of India allow salt free of duty for curing fish under certain conditions, fish curing yards-enclosures where salting of fish is carried on, are found in maritime areas; the largest number is in the Madras Province, where over 65 per cent of the production of salted fish in the country is concentrated. It is estimated that 15.5 per cent of the total *sea-fish* caught is salted in fish curing yards 13.4 per cent. being dry-salted and 2.1 per cent. wet-salted. In Bengal, Travancore and Bombay, sun-drying is the popular method of preserving fish. Nearly 31 per cent of the total catch of sea-fish is sun-dried without the application of salt. It is estimated that in all about 60 per cent of the total catch of sea-fish is salted or sun-dried. The corresponding percentage in the case of fresh-water fish is only 1.4.

“Prices”

Fish prices rule high in urban markets, but facilities for getting fresh fish where these are in demand from distant producing centres are yet comparatively undeveloped. In most areas local conditions alone determine the price.

Fishermen get a lower price for fish sold for manufacturing purposes and a higher price for fish sold for consumption as fresh

fish. Certain marine varieties, e.g., pomfrets, seer, beekti and carps and live-fishes caught from freshwater are prized by consumers and fetch higher prices than other economic varieties regarded as somewhat coarse.

“Assembling, storage and distribution.”

The marketable surplus of fish is disposed of by the fisher people (i) either by themselves taking it to the nearest market or assembling centre or (ii) by selling at landing *ghats* to intermediaries who take it to the assembling centres. These intermediaries include agents of middlemen, boat-owners and curers, village merchants and itinerant dealers. Owing to the perishable nature of the commodity, transit from producer direct to the consumers is possible only when the market is within a distance of 10 miles from the producing centre. The fisher people play only a small part in the actual distribution of fish as their financial obligations leave them little choice for disposing of their catches except to the creditors.

Co-operative Societies play only a very minor part in the marketing of fresh and cured fish. The existing societies, with a few exceptions, are simple credit societies.

Many villages and towns have fish markets where fish are assembled and sold, but this often consists of an open space only. In certain cities, the Railway premises serves as a market place for fish arriving by train. There are stalls for retail sale of fish in the municipal and cantonment markets in most of the cities. In the principal towns and cities in Northern India, *adatyas' mandis* serve as wholesale fish markets for freshwater fish.

Fish and fish products are highly perishable; attempts are, therefore, made to dispose of stocks as quickly as possible even at a smaller margin of profit. Fresh fish is not stored in any consuming centre for more than 24 hours. Only in certain parts of Bengal are dried fish stored for use during the time when fresh fish is not available. In other parts of the country 2-3 weeks is the carry-over period during which preserved fish reach the consumers.

The means of transport employed in the marketing of fish are head-loads, shoulder slings, pack animals, bullock carts, boats, and pony carts. Motor lorries and trains are used wherever available. Bicycles being cheap and speedy are quite popular. The transport actually used varies from tract to tract and depends upon local custom, the quantity and type of fish to be handled and the distance which has to be travelled. Fish carried by rail is charged for at half parcel

rate. Baskets, gunny bags, wooden cases and earthen pots are used as containers for fresh fish and coconut, palmyrah and screw-pine leaf mats for packing preserved fish.

Fishermen in most parts of the country are indebted to the middlemen and are practically at their mercy.

The producer's share in the consumer's price is high when fish is sold for consumption in the producing area. It is lowest, being about 30-40 per cent. when the fish is sold in retail at distant markets.

“Reorganisation of fisheries research”

The development of fisheries resources of India engaged the attention of the Government of India for a number of years during the last century and resulted in the passing of the Indian Fisheries Act (Act IV of 1897) and the grant of the concession of duty-free salt for curing fish. The Governments of Madras, Bengal and Bombay (including Sind), United Provinces and the Punjab have, during the last 30 years, established fishery departments to develop their local fisheries. Due, however, to the lack of a co-ordinated policy for developing the marine and riverine fisheries of India as a whole, the efforts of the Provincial Governments have resulted in little practical achievement.

The Fish Committee of the Imperial Council of Agricultural Research which set up in 1940 has been instrumental in directing fisheries research in the Provinces and States and co-ordinating the activities of the Provincial fisheries departments to some extent.

To plan, co-ordinate and guide pure and applied fisheries research in the country and for training the research and development personnel, a central Fisheries Research Institute in charge of the Director of Fisheries Research (India) is urgently required. A Central Fish Utilisation Committee should also be established to develop the knowledge arising out of these researches.

MAIN CONCLUSIONS AND RECOMMENDATIONS

(Report on the Marketing of Fish in India)

I. Codification of existing fishery literature :

From time to time in the past investigations have been carried out in maritime provinces and certain Indian states on fishery problems of local interest. But the literature dealing with these enquiries is very scattered. In order to avoid duplication of work and to chalk out a development programme it is desirable to have the existing information suitably codified and catalogued.

It is recommended that the Imperial Council of Agricultural Research may arrange to get this done by making a suitable grant to a Fishery Expert for the work being done under his supervision.

II. Habits and habitats of food fishes:

Very little information is available regarding the food, migration and spawning habits of the marine and fresh water fishes of India.

It is recommended that investigations into the habits and habitats of the food fishes of India according to a pre-determined plan, approved by the Fish Committee of the Imperial Council of Agricultural Research be taken in hand by the fisheries departments in provinces and States and the information collected be **consolidated** by a central authority, *e.g.*, Imperial Council of Agricultural Research, and published with a standardised nomenclature.

III. Fishing gears:

Several types of fishing vessels and implements are in use. At present the marine fishing vessels are capable of exploiting only the coastal waters from 5 to 7 miles from the shore. The implements, though effective to a considerable extent, are small and their application is limited by the manoeuvrability of the fishing vessels.

The sea is capable of and can stand more intensive exploitation than that carried on at present. But before introducing modern deep-sea fishing methods power boats and more efficient fishing implements, data regarding the nature of the fishing grounds, their potentialities and the suitability of the contemplated gear to local conditions should be collected. A few experiments with trawlers have been conducted in Indian and adjacent waters: these have shown that this method is **not very suitable** for India. Other available modern methods, *e.g.*, seining, drifting and long-lining which enable the catching of surface and mid-water swimmers have to be tried out.

Harbour facilities are meagre in this country: the improved fishing boat, therefore, while having a larger cruising radius, carrying capacity and speed should also be capable of being beached securely and launched against a heavy surf. Several suggestions such as motor boats, cobsles, drifter-trawlers, Danish seine nets, large drift-nets, etc., have been made regarding the types of power boats and fishing implements that might suit Indian conditions. It is recommended that at the end of the present war these should be tried out in a series of carefully planned experiments and as far as possible on commercial lines.



A FISHERMAN HUT - DHANUSHKODI



GUTTING A RAY.

IV Statistics.

Fish statistics for the whole of India are not available. Use may be made of the subordinate officials of the fisheries departments to approximately estimate the quantities of each commercial variety caught, as is done now in the case of marine fish by the fish curing yard staff in the Madras Province.

Information is not also available in respect of the potentialities of chief freshwater fish resources of the country. A survey of the inland fisheries with a view to estimating the quantities of different commercial varieties of fish caught annually from each should be undertaken early.

The annual landings of marine or freshwater fish are subject to wide fluctuations. The statistical enquiry should, therefore, be continuous for at least a period of five years and will have to be repeated quinquennially thereafter. The information collected, as also detailed fish curing yard figures viz., quantities of the different varieties selected, the weight of cured fish produced, etc., should be published in the annual administration reports of the fisheries departments.

It is also recommended that an enquiry be undertaken to ascertain the types of fishing boats and tackle and their numbers used in the whole of India: the information should be consolidated and published by a central authority viz., Imperial Council of Agricultural Research.

V. Fish carriers.

Sailing boats and a few power-propelled launches are used for the rapid transport of fish from fishing vessels or from producing areas, to consuming centres in certain parts of the country. It is recommended that motor boats equipped with an ice-room for storing the fish be operated from suitable bases in the marine and estuarine fishing areas of the country.

Motor boats should be supplemented by motor trucks for road transport and better types of wagons for rail transport. There should be an all-round speeding up of the movements of fish from the producer to the consumer.

VI. Gutting and cleaning.

Eviscerated fish keep wholesome for a longer time than round fish. The entrails and inedible matter account for 15 to 20 per cent of the weight of fish and evisceration, therefore, reduces the weight to be transported. There is, however, some prejudice

against buying dressed fish in certain areas. The fisheries departments should induce fishermen to gut and clean the fish soon after landing and educate the public to accept such fish. When gutting and cleaning is done in an organised manner, it is possible to salvage the inedible matter and convert it into a valuable nitrogenous fertilizer.

VII. Refrigeration and storage of fresh fish.

Freezing and cold storage of frozen fish do not appear economical in this country at present due to the cost involved and low cost of fish.

The use of ice for packing fresh fish during transport is popular and should be encouraged further by making ice available at all important producing centres. Chilled rooms for temporary storage of iced fish should be provided in all large consuming centres. These should accept fish for storage at **daily** rates. They should be situated at the landing **ghats** or in the wholesale assembling markets.

VIII. Fish canning.

The difficulties in the way of establishing a fish canning industry in India are: (i) absence of regular supplies of suitable fish, (ii) lack of good and cheap containers, (iii) a short canning season (iv) a small demand for canned fish from the Indian public.

There are technological difficulties also such as the presence of hard bones which are not softened by the usual processing.

The main operational difficulty, viz., regular supply of fish in prime condition and at cheap rates can be overcome by having a mobile cannery.

There are good prospects for operating four such mobile canneries with bases at Karachi, Bombay, Cochin and Kidderpore (Calcutta).

For stimulating, instructing and aiding private enterprise, the local Governments should maintain canning experts who should also investigate the technical problems connected with the industry. Recipes which would appeal to the Indian taste should be worked out and the possibility of canning crabs, oysters and prawns in addition to fish and the manufacture of fish pastes should be investigated. Canned marine produce should be graded as soon as possible according to certain defined standards.

IX. Smoking.

Smoked fish is not popular with the Indian consumers. Smoking, however, is a simple process and smoked fish can be produced in every fishing hamlet. The process will come in very handy whenever there is a glut in a local market. A variety of products can be obtained by varying the intensity or the duration of smoking. Adoption of this method of cure would enable a larger percentage of the fish caught to be used as food.

Smoked fish readily appeals to European taste. The fact that there are troops stationed in several cantonments all over India opens up the possibility of a large and immediate market for smoked fish in this country. By educative propaganda conducted by fisheries officials in Provinces and States smoking can now be introduced as a method of fish preservation and it would have established itself by the time normal conditions are restored.

X. Fish curing.

There are several practical difficulties in introducing far reaching reforms in the fish curing industry. The following improvements can, however, be effected without much expenditure of time and money.

(i) **Handling in boats:**—Fish should be stunned to death and properly stowed in boats without being trodden upon or needlessly exposed to the sun. Their transport to the shore should be expedited.

(ii) **Cleanliness:**—Cleanliness is of vital importance. The boats and baskets, as well as the curing shed, salting tubs and drying yards should be kept scrupulously clean. To bring about some appreciable improvement it is recommended that the Bombay Government's plan of constructing model curing sheds at Government expense and recovering the outlay by levying a cess on salt sold, be adopted on a wider scale in all Government fish curing yards.

(iii) **Only fresh fish to be used:**—Only fresh and wholesome fish should be used for curing. In other words curing operations should commence as soon as boats have landed their catch.

(iv) **Sun-drying:**—Only thin varieties should be sun-dried. These should be spread on loosely woven bamboo trellis-work which should be supported on raised platforms.

(v) **Curing with salt:**—The defects generally noticed are : (a) the amount of salt used is often insufficient, (b) the fish are left for

too short a period in salt, (c) the fish are not washed clean when taken out of the curing vats, and (d) the fish are dried on the ground so that the underside does not dry properly.

It is recommended that research be undertaken in all maritime Provinces and States to determine the correct proportion of salt for preserving different varieties of fish, types of cure and seasons of the year. The methods of cure should then be standardised and the operations in curing yards—especially in model curing sheds—should be strictly according to the approved method. The Imperial Council of Agricultural Research and the Board of Scientific and Industrial Research should favourably consider the financing of such schemes.

XI. Fish curing yards and duty-free salt for fish curing.

The Government of India allow the use of salt free of duty in fish curing and in other manufacturing processes under certain conditions. In the case of fish curing, the operations have to be conducted in a fenced enclosure and a weighed amount of salt bearing a certain proportion to the quantity of fish presented, is issued to a fisherman. The yard officer, although a servant of the Provincial Fisheries Department, does not exercise any supervision on the curing process. The issue price of salt is high as the local governments recover maintenance expenses of the yards and certain other charges from the curers. New yards are not opened in places where there are reasonable chances of improving the fish business: such applications are entertained only when the curers undertake to provide land, buildings, etc. Fish curing yards were originally established in the interests of public health and by setting up these yards the Central Government was saved the trouble of designing and administering measures against the preparation of salt from sea water—the so-called salt earth.

To improve the quality of salt-cured fish and to increase its quantity it is recommended that:—

- (a) trained personnel be appointed as yard officers,
- (b) they be held responsible for the quality of cured fish produced,
- (c) fish curing yards be opened wherever there are reasonable chances of increased fish business, and
- (d) the issue price of salt be reduced.

XII. Manufacture of fish oil.

The simple process of extracting medicinal oil from shark livers and “body” oil from oily fish should be taught to fishermen.

It is recommended that the production of medicinal oil be developed on a cottage-industry basis, the Provincial Fisheries Departments making necessary arrangements for collecting, testing, blending and marketing the oil. Research should be conducted to discover suitable diluents for blending with the medicinal shark liver oil. “Concentrates” should also be prepared and put on the market.

XIII. Units of sale and basis of price quotations.

In the primary markets of India fish is never weighed. The units of sale for fish vary according to the types of fish, available supplies and the locality. In view of the rapidity with which the quality of the fish deteriorates under our climatic conditions, it is not always practicable to weigh the catch before sale. But the Provincial Fisheries Departments should explore the possibility of using “standard” baskets in producing areas with a view to approximately ascertain the weight of the catch landed. When this has been adopted, it should be easy to induce fishermen to quote prices on the basis of standard weights.

XIV. Co-operative marketing of fish and fish products.

Fish has to be consumed in as fresh a condition as possible, or should be preserved in such a manner that its palatability and nutritive value are not seriously impaired. The economic need of the fishing industry is to secure a more uniform supply: it cannot be secured by regulating the quantities landed; it has therefore to be found in the process of marketing. The fishermen play only an insignificant part in the disposal of the catches; the marketing is almost entirely in the hands of middlemen.

Fishermen are at a very low stage of social and economic development and are hopelessly indebted to the middlemen.

Due to the high cost of ice and the vast distances to be transported the possibilities of a marked rise in the consumption of fresh fish—especially sea fish—in the interior of the country are very limited. There is already a fair demand for preserved fish in the interior of the country. With wise propaganda it would not be difficult to popularise the consumption of preserved fish in areas where this type of food is still unfamiliar provided better methods of salting and drying fish are adopted in the producing areas.

The cost of adopting improved processes is beyond the means of an individual fisherman. The solution, therefore, lies in the formation of Fishermen's Co-operative Societies. These should be multi-purpose Societies. Firstly, they should arrange to provide all the daily necessities of the fishermen. Secondly, they should accept payment by fishermen in kind, *i.e.*, fresh fish and they should dispose of the pooled

catch of the member fishermen either as fresh or cured fish. The Societies should always aim at producing a superior article for the market. In the South Canara district of the Madras Province a few such Societies have been started and they are working very successfully. It is recommended that the Provincial Fisheries Departments should actively encourage the formation of producers' Societies. Specially trained Co-operative Inspectors should be drafted to supervise their working. These Societies should be linked with Co-operative Sale Societies in consuming areas for marketing the products.

RECOMMENDATIONS OF THE FAMINE INQUIRY COMMISSION IN REGARD TO FISHERIES

(Summary).

Being approximately equivalent to meat in protein value and a source of certain vitamins and mineral salts, fish is a food of high nutritive value. It has got special value in a country like India where the supply of meat and milk is small, and it is a good supplement to ill-balanced cereal diets, and must be given a prominent place in the protective group.

The present supply of fish in India is totally inadequate, and the production of 658,700 tons works to a daily supply of 0.2 oz., while 2 to 4 oz. may be regarded as a desirable intake. Indian *per capita* consumption is 3 to 4 lbs. as compared to 40 lbs. in Great Britain and production can with advantage be increased 10 times.

The conclusions and recommendations of the Famine Inquiry Commission were as follows:—

- (i) In India, where the *per capita* intake of meat and milk is small, fish has got a special importance as a supplement to ill-balanced diets. The present supply of fish is totally inadequate; the development of fisheries is one of the most promising means of improving the diet of the people.
- (ii) Basic biological and ecological research is needed so that resources can be fully estimated, the most valuable fishing grounds discovered and charted, and plans for development based on accurate knowledge of piscine distribution, migration and life history.
- (iii) Other kinds of research are also necessary. The whole problem of suitable fishing craft and tackle requires investigation. Extensive research is needed to improve inland

fisheries, communications, transport and marketing facilities must be studied and investigations made into the methods of preserving and processing fish.

- (iv) The fish liver oil industry should be based on a firmer basis.
- (v) The Indian Central Fish Committee and the Central Fishery Research Institute proposed by the Fish Committee of the Policy Committee No.5, on Agriculture, Forestry and Fisheries can fulfil many of the same functions in regard to fisheries as the Indian Council of Agricultural Research does in the field of agricultural development.
- (vi) The fishery departments of Provinces and States, where such departments exist, have in a majority of cases accomplished little because of inadequate resources and lack of scientific data. If progress is to be made, it is essential that Provincial Governments should have, not only a strong Directorate including well-trained experts and the necessary research units but also an adequate and efficient subordinate ground staff.
- (vii) The lack of trained workers of all grades is the most serious 'bottle neck' to be circumvented. State scholars should be sent abroad to study the preservation and processing of fish and other subjects of importance to the development of the industry and on their return be employed in the Provinces and states. It may also be necessary to employ a number of experts from abroad.
- (viii) There is also a great deal which can be done immediately to increase the supply of fish. An increased supply during the next few years is very desirable, in view of the present difficult food situation and the scarcity and high prices of protective foods generally.

APPENDIX I.

COMMERCIALY IMPORTANT FISHES WITH THEIR SCIENTIFIC, POPULAR AND THE MORE COMMON INDIAN NAMES. (i) SEA FISHES.

Name of fish.	Popular name. (English)	Bengali.	Canarese.	Malayalam.	Marathi.	Sindhi.	Tamil.	Telugu.	Special names in certain regions (The name of the locality is given within brackets).
<i>Carcharias gangeticus</i> .	Ground shark of the rivers.	Hangar.	Bugga karuvai, Baliai.	Voliya sravu.	Waghsheer.	Ania-mohr, Mangra, Saifer.	Murdan sora.	Sorra.	
<i>Galeocerdo rayneri</i>	Shark.	...	Pil-thatte.	Pullian sravu.	...	Karh.	Valuvansora.	Kettalum.	
<i>Zygaena blochii</i>	Hammer-headed shark.	Julia, Magar.	Kebichatte.	Kannankodi.	Zori, Kanere.	Boother.	Komban sora.	Sappa sora, Kama sora.	
<i>Pristis cuspidatus</i>	Saw fish	Khanda Magar	Chakku-thattee	Valu sravu Makara sravu	Kandere	Liaro	Velamin, Illupa	Yahla, Hathuthi meenu	
<i>Rhynchobatus djedden-sis</i> .	Skate	...	Etti-balliar	Varithalai	Ranja	Kair, Kahareg	Kachu uluwai	Walawah tanke, Nulu-lavi	Lang (Bombay) Fadka (N. Canara).
<i>Trygon sephen</i>	Sting ray	Shankush	Kottai thorake	Kottivalan, Padayan therandi	Goval pakat	Pitan	Attuvalan tirukkai	Belugiri tenku	
<i>Muraenesox talabonoides</i> .	Eel	Bam	...	Pambu-meen	Wam, Bale	...	Vilangu, Kuzhippambu Kotah Mandai	...	
<i>Arius dussumieri</i>	Cat-fish	...	Mogam shede	Valia-etta	Shingala	...	Jedi Jella	Jedi Jella	
<i>Arius sona</i>	do	...	Shede Karli	Oonan etta	do	Khago	Keluthi	Jellalu	
<i>Chirocentrus dorab</i>	Silver-bar fish	Khanda	...	Mullu-Vala	Karli, Datali	Pussunt	Mulluvalai	Mulluvalava	
<i>Clupea longiceps</i>	Oil Sardine	...	Baige	Nalla-mathi	Haid, Torli	Lowar	Paichalai, Nonalai	Noona Kavallu	Lee-gur (Baluchistan), Buthai (S. Canara).
<i>Clupea fimbriata</i>	Sardine	Khaira	Pedi, Erebai	Chala-mathi, Cuttay-charlay	Pedwa, Washi	Kich-uklonar	Sudai	do	Charree-addee (Hindi)
<i>Clupea ilisha</i>	Hilsa fish	Hilsa	Paliya Manangu	Paluva Manangu	Pala Kati	Pulla, palo	Ullam Poruva, Nethal	Palasah Poravallu	Pussai (Oriya).
<i>Engraulis purava</i>	Anchovy	...	do	do	Kati	...	...	Engallu	Tampara (Oriya).
<i>Engraulis telara</i>	Gangetic anchovy	Phansa Teltampri	Bangada	Aila	Kaula gedar,	Obid gedar, Bagada	Kumla, Kangal	Kamangoda-chalu	
<i>Scomber microlepidotus</i>	Indian mackerel	...	...	Bummili	Bombil, Bummalo Towar	...	Vangaravasi	Vanamattlu	
<i>Harpodon nehereus</i>	Bombay duck	Nehare, Lotia Bijram	...	Varimeen	Surmai	...	Vanjiram, Seela	Vanjiram	
<i>Cybbium guttatum</i>	Seer	...	Khulkul, Jhavar Arkulai	Ayakora	Tuvar anjari	Kirgan	Mavulasi	Konema Yellari	
<i>Cybbium commersonii</i>	do	Champa	...	Chamban, Para, Kooli-para	Tuvar anjari	...	Koduva, Paineemcen	Pandu-chapa, Dadhara	
<i>Lates calcarifer</i>	Beckti, Cockup	Begti	Koliji	Chemballi, Nari-meen	Fitadali, Khajura, Guri	Dangra Dandio, Jitara	Sevalai	Savallu	
<i>Trichiurus haumela</i>	Ribbon fish	Rupa patia	Pambole	Thalayan	Piturtkti, Bala, Wagti Labi	Choorce-machi	Parai Van-gadai	Para	
<i>Caranx crumenophthalmus</i> .	Horse mackerel	...	Thiriyande, Parei	Chamban, Para, Kooli-para	Katali, Tiraka Chandava, Halwa (black)	Sanaf	Karal	Karalu	Tunkachandee (Oriya)
<i>Equula splendens</i>	"Silver belly"	...	Kanaikurichi	Thali mullan	...	...	Vavval	Chandura	Saranga (Bombay), Bahal (Oriya).
<i>Stromateus spp.</i>	Pomfret	Chanda	Manji, Thondrette, Chandratya (black)	Avoli	Chandava, Halwa (black)	Pitu usarga	...	...	
<i>Plagusia spp.</i>	Flat-fish, "sole"	Kukurjibh, Kantal-patta	Nangu	Manthal	Rhepti, Shivra	Chouthees, Chail	Aral	Jerreepotoo	
<i>Mugil speigleri</i>	Grey mullet	Bhangon	Shevta, Pare	Thirutha, Maalan	Mangin boir	Bhoj	Anthumeen, Madavai Menalai	*Bonthalu, Kanisalu	Majni (S. Canara), Nakora (Oriya).

* A kind of carp is called "BHANGAN" in the Punjab.

COMMERCIALY IMPORTANT FISHES WITH THEIR SCIENTIFIC, POPULAR AND THE MORE COMMON INDIAN NAMES—(contd.)
(i) SEA FISH—(contd.)

Name of fish	Popular name (English)	Bengali.	Canarese.	Malayalam.	Marathi.	Sindhi.	Tamil.	Telugu.	Special names in certain regions (The name of the locality is given within brackets).		
<i>Polynemus tetradactylus</i>	Indian salmon	Guchhia, Sahal	Vaneenu	Baneenu	"Rawas," Chelachi	"Seer"	Pozhakkala	Maga	—		
<i>Polynemus paradiseus</i>	Tapsi, Mango fish	Tupsee machh	...	...	Dodywa rawas	...	...	...	—		
<i>Sciaena diacanthus</i>	Jew-fish	Poa, Poma	Balde	Kora	"Ghol"	"Rawas"	Kathalai	Gorasalu, Gorakalu	—		
Prawns	...	Chingri	Segadichotla, Etri	Chemneen, Konchu	...	...	Yera	Royyalu	—		
Crabs	...	Kankara	Aedi	Nandu	Khekra	...	Nandu	Pitha	Kankada (Oriya)		
(ii) FRESH WATER FISHES											
Name of fish	Popular name (English)	Assamese	Bengali	Hindi	Marathi	Oriya	Punjabi	Sindhi	Tamil	Telugu	Special names in certain regions.
<i>Anguilla bengalensis</i>	Eel	—	—	—	Adhir	—	—	—	Seram pambu * Vellangoo * Valai, Tele	—	Salaia, Cuchia (Chittagong).
<i>Wallago attu</i>	Fresh-water shark	Poil, Barali	Boyal, Keyali	Boalee, Parhin, Lanchi	Shivada, Pari, Puram	—	Mulley	Poikeemulla, Jerikee	—	Wallagah	Sareng (Manipur), Painda (Rohrak), Patatan (Hyderabad Deccan) Vala (Malabar)
<i>Bagarius yarrelli</i>	Fresh-water shark	Bagh-machh, Goreah	Bahari	Boonch Goonch	Mutandai, Tharota	Sahlun	—	—	—	Rahti-jellah	Vaghair (Purana), Kheerd (Poona).
<i>Clarias Magur</i>	Magur	—	Magur	Mangri	—	Maghurah	Kug-ga	—	—	Marpoo	Maroof (Hyderabad Deccan), Pangsa (Nathapur).
<i>Pangasius burchanani</i>	Pungas cat-fish	—	Pungwas, Pungas	Pariasi	—	Jellum	—	—	Kovail-Oolakeluthai, Kitchan.	—	—
<i>Silundia gangetica</i>	Silond cat-fish	—	Silun, Dhain	Baikar, Banspati	—	Ji-lung	Silond	—	Ponatti	Wanjou	Silondia vacha (Calcutta).
<i>Macrones secungala</i>	Air-cat-fish	Air, Auri	Aor	Ari, Pogal	Singala, Singhata	Alli, Addi	Chajia, Singoo, Singharee	—	Cumbootur kelurti	Multi-jellah	Tengra, Tengen (United Provinces).
<i>Eutropichthys vacha</i>	Burchwa	Bacha, Basa	Vacha	Sugwaba-choya	—	—	—	Chellee	—	—	Tunti, Caingun (Lakshmipur), Katla (Purnea), Chappal mache
<i>Notopterus</i>	Feather-back	Seetul, Kandla	Chital	Mohi	—	—	—	Gundun	Ambuttan wahlah. Setha-kendai.	—	Hyderabad Dn., Wallakrattah. (Mysore).
<i>Etroplus suratensis</i>	Pearl spot	—	—	Pitukas	—	Cundahla	—	Pitukas	Karsar, Uduppatti	Cashimara	Karimeen, Palathi (West Coast), Malan (Malabar).
<i>Mugil corsula</i>	Mullet	Keski	Elanga, Arwari, Ingelee	Undala, Andwari	—	Kakunda	Hurdwahre	—	—	Sowrah	Koochina-Muri (Canara), Wrahl (Malabar).
<i>Opyiocephalus striatus</i>	Snake-headed fish	Shaul, Gojhal	Shol	Murrul, Sowra, Dherimuri	Dakku	Sola	Dhoalee, Carrodah	Charkoor	Veralu, Carruppu veralu	—	—
<i>Anabas scandens</i>	Climbing perch	Kai, Khayi	Coi, Corvu	Kobhai	—	—	—	—	Panierikendai, Sennal. Teli	—	Undee-colee (Malabar).
<i>Saccobranchius fossilis</i>	—	Singhi Shini Rohit, Rui	Singhi	Singi Rohu	Bitchuka-Machi	Singee	Noor-i-e	Lohar	—	—	—
<i>Labeos</i>	Labeo rohita	—	Ruee	—	Tambada-massa	Ruhu	Pohu, Tappra, Dhambra	—	—	—	—
	Labeo Kanoshi	Mahlee, Kaliara	Kalabasu, Kunda	—	Kanoshi	Kala-Beinse	Dhai, Kallahan, di	Dihee	—	Nallagandu meenu	Dai (Cutch) Rohu (Hyderabad Dn.), Kuri Meenu (Canara), Tambra (Cutch)
<i>Catla-Catla burchanani</i>	Catla	Bau, Dhekeru	Catla	Chepti, Catla, Boassa	—	Bhakura	Theila, Theil	Taylee	Theppumeenu	Borchee	—
<i>Mrigal-Cirrhina namrigala</i>	Hamilton's carp	Mirka, Mirga	Mrigala	Boassa Mirgala	Mirgha	Mirgali	Mori, Morakha, Narani	Mor-ah-kee	—	—	—
<i>Barbus-Barbustor</i>	Mahaseer	Bura patra, Jun-chingri	Putor	Naharm	Khadchi, Masta, Mahsala	Kajra	—	Kurreah, Petia	Kendi, Borin	Pedha-Polika	Halla-minu (Mysore), Meruval (Malavalam).
Prawns	...	Chingri	Golda-chingri, Mocha-chingri	—	—	—	—	—	Yera	Royyalu	Gingah (Deccan), Konjan (Cochin).
Crabs	...	Crab	Patikunda	—	Kekka	Kankada	—	—	Nandu	Pitha	—

* Young one are called *Latta*.

APPENDIX II

Total catches of fish in the West Coast.

(000 Railway Maunds).

Year	1941	1942	1943	1944	1945
	-1942	-1943	-1944	-1945	-1946
South Kanara Dt.:					
Tharapathy ...	31	—	—	—	85
Kirimageswar ...	—	251	136	48	56
Maravante ...	—	—	—	29	62
Gangolly ...	135	201	108	54	151
Hangarakotta ...	53	127	164	114	274
Malpe ...	102	492	242	165	535
Polippu ...	—	—	—	—	52
Udayavara ...	64	213	153	93	360
Hosabetta ...	13	51	36	31	55
Kamp ...	—	—	—	—	52
Baikampadi ...	28	73	40	26	41
Thannarbavi ...	16	20	27	24	26
Bokapatnam ...	38	54	66	24	45
Mangalore ...	28	56	27	19	39
Ullal ...	30	28	36	37	32
Mayeswar ...	446	44	48	41	30
Kumbla ...	29	37	44	211	98
Adkatabailu ...	25	32	41	43	51
Kasargod ...	15	9	12	25	—
Bekal ...	35	33	67	91	83
Punjavi ...	—	—	—	44	48
Hosdrug ...	94	56	114	114	93
Hulki ...	32	72	72	83	68
Thaikadapuram ...	37	63	82	43	49
Total ...	849	1912	1515	1359	2385

Total catches of fish in the West Coast.—contd.

Malabar District:

Madai ...	114	176	187	251	182
Mattool ...	7	16	14	13	15
Azincode ...	20	26	27	14	22
Cannanore ...	88	101	108	75	124
Edakkad ...	16	36	51	26	30
Tellicherry ...	93	118	134	97	85
Thalarji ...	24	48	35	28	34
Madakkara ...	29	30	16	18	23
Madappalli ...	26	53	60	40	44
Badagara ...	86	151	130	111	76
Malati ...	28	43	41	20	41
Quilandi ...	68	158	129	139	157
Padiappa ...	64	67	67	58	83
Calicut ...	124	218	218	134	156
Bey pore (N. & S.)	49	54	26	78	76
Parappanangadi ...	79	124	102	86	148
Thannoor ...	161	221	193	245	182
Puthiakadapuram ...	21	27	24	26	31
Paravanna ...	39	90	34	60	62
Kootanji ...	71	107	121	76	122
Ponnani ...	78	118	107	83	78
Puthuponnani ...	14	67	69	40	36
Veliangadu ...	14	26	25	27	46
Palapatti ...	36	57	61	78	92
Mannalamkannu ...	27	46	41	101	68
Puthenkadapuram ...	33	42	30	75	50
Blangod ...	52	64	73	128	97
Kaduppuram ...	55	65	89	164	70
Vadhanhapalli ...	31	31	29	41	35
Nattika ...	21	26	17	11	14
Karimpuran ...	48	32	30	35	42
Kodumbi ...	20	14	8	17	16
Edakalazhiyur ...	—	—	4	79	81
Kadambrundy ...	—	—	—	2	51
Total ...	1636	2452	2300	2476	2469

APPENDIX III

[Foreign imports of dry salted and unsalted fish into the
Madras Presidency. (Cwt.)]
Pre-war dry salted and unsalted

Year.	1935-36	1936-37	1937-38	1938-39	1939-45	Average.
From						
Iraq ...	—	—	—	1564	2	315
Ceylon ...	528	379	128	261	825	420
Arabia ...	146	321	4741	93	5468	2160
Maldives	3	5	17	—	—	5
United Kingdom	4	74	285	—	—	70
Turkey ...	2219	1713	—	2913	—	1370
Netherlands	—	—	—	—	—	—
Iran ...	—	—	—	—	—	—
St. Settlements	—	—	—	—	—	—
Burma ...	—	—	—	—	—	—
Total ...	2901	2492	5171	4831	6297	4340

Fish Dry Salted.

	1940-1941	1941-1942	1942-1943	1943-1944	1944-1945	Average.
From						
Iraq ...	—	—	—	—	—	—
Ceylon ...	—	—	26	1	...	5
Arabia ...	122	—	—	—	—	25
Maldives	—	—	—	—	—	—
United Kingdom.	—	—	—	—	—	—
Turkey ...	—	—	—	—	—	—
Netherlands	—	—	—	—	—	—
Iran ...	—	11	—	—	—	—
St. Settlements	—	10	—	—	—	5
Burma	—	5	—	—	—	—
Total ...	122	26	26	1	—	35

Fish Dry unsalted.

	1940-1941	1941-1942	1942-1943	1943-1944	1944-1945	Average.
Ceylon ...	669	28	—	5	13	140
Iran ...	3457	1101	—	—	—	910
Iraq ...	—	3	—	—	—	10
Maldives ...	—	—	39	—	—	—
Muskot ...	—	—	—	1903	—	380
	4126	1132	39	1908	13	1440

APPENDIX IV.

FOREIGN IMPORTS OF TINNED AND CANNED FISH INTO THE MADRAS PRESIDENCY.—(Cwt.).

From	1935-1936.	1936-1937.	1937-1938.	1938-1939.	1939-1940.	Average 1940-1941.	1941-1942.	1942-1943.	1943-1944.	1944-1945.	1945-1946.	1946-1947.
United Kingdom	598	642	425	402	227	459	138	24	...	4	...	...
Canada	...	248	179	268	172	191	252	372	...	...	506	657-
Norway	...	164	137	112	76	139	13	2	...	...	...	...
Japan	...	129	451	480	389	333	419	365	...	...	...	...
United States of America	...	276	491	375	377	401	385	135	...	...	...	...
Others	...	130	22	41	48	70	7	35	17	...	...	...
Total	...	1722	1570	1678	1289	1593	1214	933	Nil	4	506	657
Value (Rs.)	74670	69550	73340	70410	56280	...	62670	49630	5590	390	25920	5258

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APPENDIX V.

Foreign exports of dry salted and unsalted fish from the Madras Presidency.—(Pre-war).

Year.	To		Settle-ments.	F.M.S.	St.		Value (Rs).
	Ceylon.	Burma.			Others.	Total.	
1935-1936	211,732	70,081	40	13	6	281872	Lakhs. 49.51
1936-1937	225,805	32,100	32	—	—	257937	37.97
1937-1938	190,569	60,005	105	7	—	250686	45.62
1938-1939	186,004	63,779	299	53	1	250135	46.55
1939-1940	189,393	53,814	328	41	1	243577	41.71
Average	200,701	55,956	161	23	1	256841	44.27

Fish Dry Salted (Cwt.)

1940-1941	101,631	442	52	—	102,125	14.62
1941-1942	87,197	911	39	27	88,174	4.18
1942-1943	121,878	...	...	...	121,878	25.52
1943-1944	190,859	...	...	...	190,859	62.15
1944-1945	28,624	...	...	...	28,624	37.68
1945-1946	43,992	...	...	...	43,992	24.85
Average	95,697	226	15	5	95,942	29.83

Fish Dry Unsalted (Cwt.)

1940-1941	66,674	61,696	775	33	129,178	27.16
1941-1942	96,547	63,478	1593	239	161,857	29.06
1942-1943	172,317	...	...	...	172,317	39.59
1943-1944	153,833	...	...	...	153,833	76.42
1944-1945	287,422	...	...	...	287,422	170.93
1945-1946	365,509	...	...	...	365,509	195.58
Average	190,384	20,862	395	45	211,686	89.79

**APPENDIX V—(contd.)
FISH WET SALTED.**

Year.	To Ceylon.	Others	Total Cwt.	Value (Rs.) Lakhs.	Year.	To Ceylon.	Others	Total Cwt.	Value (Rs.) Lakhs.
1935—36	...	...	8,056	0.63	1940—41	...	...	16,213	0.83
1936—37	...	...	4,160	0.33	1941—42	...	...	24,908	1.00
1937—38	...	...	4,090	0.39	1942—43	...	...	27,127	1.09
1938—39	...	1	5,224	0.42	1943—44	...	...	12,729	0.71
1939—40	...	...	6,927	0.51	1944—45	...	...	29,228	3.77
					1945—46	...	...	73,454	11.08
Average	5,691	...	5,691	0.46	Average	30,613	...	30,613	3.08

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TOTAL DRY & WET SALTED.

Year.	Cwt.	Value Rs. Lakhs.
1940—1941	231,303	41.78
1941—1942	250,031	43.24
1942—1943	294,195	65.11
1943—1944	344,692	138.57
1944—1945	316,046	208.61
1945—1946	409,501	220.43
	307,383	119.62

APPENDIX V—(contd.)

EXPORTS BY SEA TO OTHER PROVINCES.

Dry Fish salted & unsalted.					Wet Salted (Cwt.)		
Year.	To		Total Cwt.	Value (Rs.) Lakhs.	Bombay.	Total Cwt.	Value Rs. (Lakhs)
	Bombay.	Bengal. Others.					
1935—1936	...	11,527	62	4	11,593	0.63	1935—36 ... 4912 4912 0.26
1936—1937	...	5,968	71	...	6,039	0.39	1936—37 ... 1808 1808 0.11
1937—1938	...	3,109	67	...	3,176	0.26	1937—38 ... 304 304 0.02
1938—1939	...	2,716	217	...	2,933	0.32	1938—39 ... 442 442 0.03
1939—1940	...	849	18	...	867	0.21	1939—40
Average	...	4,834	87	1	4,922	0.36	1493 1493 0.08

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APPENDIX V—(contd.).

EXPORTS BY SEA TO OTHER PROVINCES—(contd.)

Year.	Fish dry salted.			Fish dry unsalted.			Fish wet salted.		
	Bom- bay.	Bom- gal.	Others.	Total.	Value (Rs.)	Lakhs.	Bom- bay.	Others.	Total.
1940—41 ...	593	79	...	672	0.06	46	0.01	39	39
1941—42 ...	285	10	...	295	0.02	154	0.02	470	470
1942—43 ...	617	...	...	617	0.04	719	0.11	517	517
1943—44 ...	5499	5	...	5504	0.86	589	0.18	310	310
1944—45 ...	5037	...	...	5037	1.26	969	0.33	673	673
1945—46 ...	22423	7732	...	30155	7.08	4493	2.84	1264	1264
	5743	1304	...	7047	1.55	1162	0.58	546	546

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APPENDIX VI

(g) FISHING GEAR USED IN THE MALABAR AND SOUTH CANARA AREA (BACK-WATER FISHERIES).

Type of fishing implements.	Vernacular Name.	Dimensions.			Material	Cost (Rs.)	Number of men or boats required.	Description and mode of operation.	Kinds of fish caught.	Remarks.
		Length	Breadth or depth.	Size of mesh.						
I. Fixed or stationary nets.	(i) Valuvalai or unni-kuthu vala.	20'-30.' Circumference at mouth about 30' (a conical bag net with a long and tapering cod-end).	...	...	Cotton, tanned with the bark of "Odyan-maram."	...	...	There is a thick coir-rope along the mouth of the net. Stout rings are attached to this rope. Each net is held in position by two stakes, 3-4 ft. apart, driven into the muddy bottom. The rings are slipped on these stakes. The net is set when the ebb tide has commenced. During strong tide many fishes enter the backwaters. Of these many are unable to swim against the strong current and are washed to the banks of the backwater where these nets are placed. Valuvalai is generally set in series and is very effective if there is a strong current.	Prawns, small cat-fishes, seer, sardine etc.	These nets are used in Cochin and Travancore backwaters. The setting of the net follows the phases of the moon.
	(ii) Endi balai.	27' (Rectangular).	10'	2"	Cotton.	5	4 men.	Transverse bamboo poles are tied to the ends of the rectangular net and the net laid flat on the bottom of the backwaters. Fish is driven to the region above the submerged net with the help of a scare-line. The net is then suddenly lifted.	Grey mullets.	Very common in Kundapur (Coondapur).

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DESCRIPTION OF FISHING GEAR USED IN THE MALABAR AND SOUTH CANARA AREAS(BACK-WATER FISHERIES)—*contd.*

Type of fishing implements.	Vernacular Name.	Dimensions.			Material	Cost (Rs.)	Number of men or boats required.	Description and mode of operation.	Kinds of fish caught.	Remarks.
		Length	Breadth or depth	Size of mesh.						

II. Bag net.	Chevitru vala (Bag net whose mouth is kept open by a half loop of bamboo.)	6'	Length of chord of half-loop 5'. Height of chord of half-loop 3 feet.	1/2'	Cotton.	5	1 man.	The net is set in 2-3' of water with the horns of the half-loop resting on the ground and the bag facing the current. As soon as fish enters the bag the mouth is closed and the net lifted.	Miscellaneous small fish and prawns.	Cochin backwaters.
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III. Drift nets.	Kolavala.	900'	15'	8"	Hemp.	...	1 canoe and 4 to 5 men.	Used at nights in the estuarine parts of backwaters, near the sea-ward channels. Buoys are attached to the head rope at 2 ft. intervals and heavy stone sinkers to the foot-rope. Fish are gilled and also enmeshed in the folds of the net.	All types of sea-fishes, chiefly seer, pomfret, cock-up, etc.	...
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IV. Drag net.	(i) Vadi vala. (ii) Ola vala. (iii) Teli-kannivala. (iv) Partu-kannivala.	Wide variations.			1/2-2" Cotton thread.	...	...	These bag-like nets are made by doubling a piece of netting lengthwise and sewing the two ends. Cross-sticks, globular floats or even empty cans strung together are employed to keep the mouth open. These nets are set in shallow water and dragged towards the shore.	Miscellaneous catch.	...
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V. Cast net (stringed).	Vichuvala (various local names).	Large variations.	3/8"-3/4"	Cotton tanned with an infusion of "pachika bark."	5 to 25 depending on dimensions and size of mesh.	1 boat & 3-4 men.	All cast nets are conical in shape with an opening at the apex through which the hauling-in line passes. This line subdivides into several secondary strings inside the cone. The peripheral cord is weighted with lead. When cast the peripheral margin first meets the water and describes a circle. This then rapidly sinks owing to the presence of weights. When the net has reached the bottom the hauling-cord is pulled till the lead weights converge and meet, forming another cone inside the big one. Thus is effected the imprisonment of several fishes in the circular ring-shaped marginal pouch.	All kinds of fishes, pelagic and demersal.	
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VI. Dip nets.	(i) Kaivalai (Hand dip net). (ii) Chinese dip net or Cheena vala.	2' (Suspended from the ends of two curved sticks which cross at right angles in the middle. 30-35' square (shallow bag net with a narrow cod-end).	2' 1/4"-1 1/2"	Cotton.	2-3	1 or 2 men.	A cord is tied to the crossing of the mouth sticks and the net is lowered vertically into the water. When fishing for crabs a strong smelling bait is tied at the centre of the net.	The huge net is stretched from crossed bamboo poles in the same manner as in the hind net described above. For working the net a complicated counterpoised framework is necessary. The net is vertically lowered into the water and raised.	All kinds of surface swimming fishes.	Seen in large numbers in the Cochin backwaters.
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VII. MISCELLANEOUS :

- (1) Harpoon. Charuli.
 - (2) Crossbow. Parangipathi.
 - (3) Blow-gun. Thumbithan.
 - (4) Hand line. Kaichoonda.
 - (5) Rod and line. ...
 - (6) Basket traps. Kudu or Ottal.
- A sharp one barbed missile with a line attached, thrown with strong force at a shark or dog-fish.
A sharp one barbed missile shot into the water with the aid of a contrivance looking like a cross bow.
A hollow bamboo tube plugged at the bottom with a barbed missile with an attached line. The dart is ejected with strong force at a fish, generally, a murrel, by powerfully blowing at the open end of the bamboo tube.
Line made up of Sunn hemp. The hooks are of European manufacture. Bait : Prawns.
A light elastic bamboo 8 feet long serves as rod. The line is of cotton. Snoods made from fibres of 'Kitul' palm-tree. Small hooks with one barb used. Bait : Prawns.
Various types, all made of bamboo. These sieve out the fish in a stream of water passing through the basket. Some varieties are used to imprison fishes located in the shallow water.

FISHING GEAR USED IN THE GULF OF MANNAR AREA (FROM CAPE COMORIN TO POINTCALIMERE, CONSISTING OF THE GULF OF MANNAR AND THE PALK STRAIT BAY).

Type of fishing implements.	Vernacular Name.	Dimensions.			Material	Cost (Rs.)	Number of men or boats required.	Description and mode of operation.	Kinds of fish caught.	Remarks.
		Length	Breadth or depth.	Size of mesh.						
I. Fixed or Stationary net.	Kalamkatti valai.	...	...	...	...	...	...	The net is best used during the high tide periods with strong westerly winds. When the tide has receded to its full extent a gill net is buried in a shallow trench excavated in the sand near the water's edge. The incoming tide passes over the buried net and brings in its quota of fishes; then at the turn of the tide the net is raised above the water and staked in this position. A screen is thus erected to prevent the escape of fish with the receding tide and when the water is well down the fishes are taken in baskets.	Grey mullets.	Good haul are made in June and July.
II. Seine net.	Vangu valai.	Bag 54', Wings 75', Screens 75', Rope 108'	30', 30', 9'	$\frac{1}{4}$ "-1" — 1'-2'	...	...	2 men.	It is a small seine-type net plied in the shallow lagoons. The catch is almost wholly utilised by the line fishermen for bait.	Prawns.	
III. Trawl-type nets.	Madi valai.	...	...	...	Cotton. Hemp. Coir.	75	2 catamarans & 6 men	A primitive trawl net. Two catamarans each with one end of the net aboard, sail on a parallel course maintaining a definite distance between them. This arrangement enables the mouth of the net being kept open. The catamarans close up when the net is to be hauled.	Miscellaneous catch consisting of sardine silver-bellies, etc.	This net is mostly used during the N.E. Monsoon.
IV. Drift nets.	(i) Vala valai.	144'	30'	1-1 $\frac{1}{4}$ "	Light cotton unbarked. 321	...	1 boat and 3 to 4 men.	Each fishing boat carried a fleet of seven nets. The upper edge is buoyed with large wooden floats and the lower weighted with small stone sinkers. The boat with the net trailing behind it is allowed to drift.	Silver bar fish (Chirocentrus dorab).	This is the most important fishing net and fisher in this region.
	(ii) Kola valai.	84'	33'	$\frac{1}{2}$ '	Cotton, unbarked.	15-20	1 boat and 3 to 4 men.	Small drift net used in the same manner as Vala Valai but operated nearer the shore. A fleet consists of 8-9 nets, used from September to middle of February.	Sardines & anchovies.	
V. Trolling.	...	...	...	...	...	...	...	In this region a number of fishermen are engaged in what is called 'trolling'. The method appears to be sailing in a boat with a line to which bait is attached the bait being dragged along the bottom.	Seer fish.	The best food fish (seer) is almost wholly obtained by trolling.
VI. Inshore linging.	...	...	...	...	...	...	...	Practised from November to March, i.e., during the N.E. Monsoon and after. The line is set as usual with several snoods each containing a hooked bait. Large and small fishes are caught. Bait : Prawns.		
VII. Off-shore ling.	...	...	...	...	...	...	...	These fishermen venture for out into the sea. Usually practised in rocky banks covered with sea-weeds or among coral and spongy colonies. Long lining is not possible in such uneven places and so hand lines are used. Bait : Prawns.		

FISHING GEAR USED IN THE COROMANDEL COAST AREA (FROM POINT CALIMERE ALONG THE EAST MADRAS COAST TO THE PULICAT LAKE, A POINT ABOUT 100 MILES TO THE NORTH OF MADRAS.)

Type of fishing implements.	Vernacular Name.	Dimensions.			Material	Cost (Rs.)	Number of men or boats required.	Description and mode of operation.	Kinds of fish caught.	Remarks.
		Length	Breadth or depth	Size of mesh.						
I. Bag nets.	(i) Mada valai (also called Mara valai, Eda or Yeda valai, Nida vala and Kambi valai).	60'	48'	2 1/2" near a mouth to 1" near the apex.	Cotton twine near the apex.	250	4 catamarans and 14 men.	The net is a shallow bag with a wide rectangular mouth. A thick rope (foot-rope) is provided on one side. This rope carries two stone sinkers at the two ends. Coir headropes along the remaining 3 sides and 2 hauling-lines attached to two loops in the foot-rope complete the equipment. The net is used in conjunction with "fishlures" called <i>Kambi</i> . These consist of strings of coconut leaves attached to a rope and moored in the sea at the commencement of the fishing season. The <i>Kambi</i> is kept in position with wooden buoys and stone sinkers. Fish are attracted by the shade provided by the <i>kambi</i> and crowd round it. By clever manoeuvring the fishermen slip the net... under the <i>kambi</i> rope and hoist the net quickly along with the <i>kambi</i> without frightening the fish. There would be more than a dozen <i>kambi</i> for each net.	Miscellaneous pelagic fishes. Also shoals of pomfrets, etc., are seen the net is used without a <i>kambi</i> ; the moving shoal then takes the place of the stationary <i>kambi</i> .	When shoals of pomfrets, sardine etc., are seen the net is used without a <i>kambi</i> ; the moving shoal then takes the place of the stationary <i>kambi</i> .
(ii) Thuri valai.		Length of bag—40' wings—70'	Nil	1 1/2" near cod-end 2 1/2" in the wings.	Cotton for the bag and wings. The cod-end is sometimes made of hemp.	200	2 catamarans and 8 men.	A primitive trawl net where the mouth is kept stretched by two catamarans sailing in a parallel course at an appropriate distance apart. The net is first shot across the current. The catamarans then turn about and row parallel to each other along with the current. The net is thus dragged along the bottom.	Demersal fishes, e.g., soles, catfishes, rays, etc.	
(iii) Eru valai.		A conical bag net. Dimensions variable but the net is a small one.	Nil.	1 1/2"	Cotton.	15-20	1 catamaran and 4 men.	Shot from catamarans but not dragged. The mouth of the bag always faces the shore. This net is designed to operate at a higher level than the bottom near the scouring Thuri valai and is fitted with numerous floats which help to keep it near the surface.	Prawns and other shoaling fishes which come near the shore.	
II. Seine nets	(i) Kola valai.	Length of bag—12' wings—45' Diameter near mouth—3'	Nil.	1 1/4"	Cotton.	20	2 catamarans and 6 men.	The mouth of the bag is kept distended with 100 wooden rods fixed to the head and foot ropes. Numerous wooden floats are attached at regular intervals to the head-rope. Two catamarans start from the same point each with one half of the net, make a circuit and come together again. A pelagic shoal is surrounded during this operation. When hauling commences the wings prevent the shoal from scattering.	Pelagic shoaling fishes.	

FISHING GEAR USED IN THE COROMANDAL AREA (FROM POINT CALIMERE ALONG THE EAST MADRAS COAST TO THE PULICAT LAKE, A POINT ABOUT 100 MILES TO THE NORTH OF MADRAS)—(contd.).

Type of fishing implements.	Vernacular Name.	Dimensions.			Material	Cost (Rs.)	Number of men or boats required.	Description and mode of operation.	Kinds of fish caught.	Remarks.
		Length	Breadth or depth.	Size of mesh.						
III. Inshore drag nets.	Peria valai.	Length of bag—21' Net—36' Wings—700'	36' 45'	...	Hemp.	350	One <i>padagu</i> and 10 to 15 men.	The bag-like portion is in two sections, a wide funnel-shaped <i>melavalai</i> and a rectangular cod-end <i>madai</i> . The two ends of the <i>melavalai</i> long "leader-wings" of netting are attached. The mouth of the bag and the wings are provided with stout head and foot-ropes. Floats are attached to the head-rope at regular intervals. The net is shot near the surf-beaten shore from a special boat called <i>padagu</i> ; and, by rowing round in a circle a shoal is enclosed and trapped. The net is then dragged towards the shore.	Shoaling fishes like mackerels, ribbon fish, silver-bar fish and prawns.	<i>Padagu</i> is built of planks without frames or ribs and is well adapted to take the severe knockings from the surf.
IV. Gill net.	(i) Vala valai.	150-180'	16-20'	2"	Light cotton.	...	One catamaran and 4 men.	The net is provided with floats and sinkers as in drift nets elsewhere. A fleet consisting of 4 pieces is used. The depth is adjusted not to exceed 40 feet. Dark nights are chosen so that the fish might not easily see the obstacle in their path.	Pomfret, seer, cock-up, Indian salmon, etc.	
	(ii) Kanni valai.	256'	16'	3-4"	Hemp.	20	do.	Similar to above.		
	(iii) Thirukkai valai.	120'	12-18'	5"	Hemp.	20	do.	Construction similar to Vala valai. Thirukkai valai is of coarse mesh and is adjusted for bottom fishing.	Shark. Skates, rays and saw-fishes.	
V. Lines.	Lines with a terminal lead sinker and two snoods are used in the Coromandal coast. The size of the hook and the bait depend upon the kind of the fish sought. Long lining is not practised as in Malabar. A species of <i>eunoid</i> worm found in the sand below half tied level is a popular bait.									

FISHING GEAR USED IN THE TELUGU AREA (FROM PULICAT LAKE NORTHWARDS TO PURI IN ORISSA, INCLUDING THE CHILKA LAKE).

Type of fishing implements.	Vernacular Name.	Dimensions.			Material	Cost (Rs.)	Number of men or boats required.	Description and mode of operation.	Kinds of fish caught.	Remarks.
		Length	Breadth or depth.	Size of mesh.						
I. Bag nets.	(i) Pedda valai	bag 39' sides 960'	18' 27'	1 1/2" 2-4"	...	...	...	...	...	...
	(ii) Iruga valai	Bag 22' sides 50'	7' 12'	...	...	...	...	...	...	...
	(iii) Katta valai.	180'-240'	60'-75'	...	...	...	...	...	...	...
	(iv) Kavala valai.	Diameter of the mouth 30'-60' (A circular mouth). Circumference of the mouth—75'	...	...	...	...	...	...	...	...
II. Pouch trap.	Siru valai.	...	...	7/8"	Cotton.	...	6 to 8 men.	The net is a wide-mouthed shallow pouch with a small bag-like cod-end attached to the middle of the blind or hinder end. 30-40 wooden floats are attached to the head-rope. There are no sinkers. This net is set by tying to two posts driven in the bed of the back-water or estuary, in water about 3 feet deep. Two persons keep the ground rope at the bottom by treading on it. A group of people by shouting, splashing and dragging a scare-line drive the fish towards the mouth of the net.	This net is used in the Chilka lake.	
III. Cast net.	Bhakti Jal. Khepa.	1200' 37'	9' 18'	7-8" 2"	Cotton.	...	...	...	...	Used in the Chilka lake.
	Noli.	320'	3'	3-5"	...	...	...	...	...	...
	Menjia Jal.	320'	1 1/2'	7/10"	...	...	...	...	...	...
IV. Lining.	...	Length of line 300-600'	...	...	...	...	...	Long lining and single hook lining also practised. Bait : Prawns.	...	...
	...	Length of hooks 1-7"	...	...	...	...	...	...	...	...

DESCRIPTION OF FISHING GEAR USED IN THE MALABAR COAST AREA (FROM CANNANORE IN THE NORTH TO CAPE COMORIN, THE SOUTHERNMOST POINT OF INDIA).—(contd.)

Type of fishing implements.	Vernacular Name.	Dimensions.			Material	Cost (Rs.)	Number of men or boats required.	Description and mode of operation.	Kinds of fish caught.	Remarks.
		Length	Breadth or depth	Size of mesh.						
I. Seine nets.										
(i) Seine nets.	(i) Odam vala (also called Peru vala and Paituvala.)	(a) 40-45' Circumference at mouth = 150'. (b) 60-80' (c) Each 160'	...	(a) 1/5-1/2" (b) 8-9" (c) 3"	Cotton. Coir. Coir.	150'-250	Two large canoe and a crew 14.	The net is made in 3 parts (a) a wide-mouthed cotton bag (Vala) (b) a coir-net platform, Keezha vala, in front of the mouth (c) two long wings one on either side of the mouth. A stout warp is attached to the free end of each wing. Several wooden floats (large and small) are attached to the head-rope. On the foot rope a big stone is hung from each corner of the Keezha vala. Half of the net is loaded into each of the two canoes. When a shoal is sighted, the canoes separate paying out the net. After moving in a semi-circle the canoes approach again. The shoal is first encompassed within the wings and then forced into the bag.	Shoaling pelagic fishes—chiefly sardine, mackerels silver-bellies, mullets, ribbon fish etc.	
	(ii) Vakku vala.	Length of bag = 48' Length of platform = 66' Length of wings = 125'	...	1/2" 7-9" 1-3'	Hemp.	...	2 boats & 10 to 15 men.	Very similar to the Odam vala described above. The operation is also similar. The net is stronger, being of hemp; but the meshes are large and the weight is not unmanageable.	Big Cat-fishes Jew-fishes, etc.	
	(iii) Kolli vala. ("Killer net").	60' 50'	18' 30'	5/8" 1"	Hemp. Hemp.	30-50 80-100	2 boats & a large crew.	These are of two kinds. Mathi-Kolli vala for sardine and Aiyala-Kolli vala for mackerels. The design is similar to the Odam vala described above; but the platform and sides here are of small mesh cotton instead of coir and the wings are also small. The Kolli vala can be manoeuvred into position more easily than the Odam vala. The shoals are literally frightened and huddled into the net by the loud noise and the splashing resorted to by the fishermen.	Sardine with the Mathi-Kolli vala & mackerels with the Aiyala-Kolli vala.	The use of Kolli vala is forbidden by local fishermen's pan-chayats in several villages in Malabar.
II. Drift nets.										
(i) Kandadi vala.	(i) Kandadi vala.	55'	18'	2"	Hemp. 2 1/2-3"	40	1 boat &	Used in fleets of 8-10 pieces laced together. Construction and operation similar to the drift nets described under South-Canara area.	Seer, whit-ting, cat-fishes, sharks, rays etc.	Principal season for small size fish—October to December; for sharks etc. January to March.
(ii) Odu vala.	(ii) Odu vala.	40'	16'	2 1/2-3"		35	4 to 6 men.			
(iii) Nariyan vala.	(iii) Nariyan vala.	30'	17'	4"		50				
(iv) Sravu vala.	(iv) Sravu vala.	24'	18'	8"		125				
(v) Thirandi-vala.	(v) Thirandi-vala.	70'	17'	6"		50				
III. Gilling nets.										
(i) Aiyala chala vala.	(i) Aiyala chala vala.	48-60'	30-36'	7/8-1"	Cotton.	50	Two canoes & a large crew.	Two canoes each with 6-8 pieces of net required. When a shoal is seen approaching the shore, the crew place together the two sets of nets and row rapidly on opposed semi-circular courses. The shoal is thus trapped in a fence-like ring of netting. By making a terrible amount of noise the fish are scattered towards the net. During the impact they get firmly gilled.	(i) For mackerels. (ii) For sardines.	The use of chala vala is also forbidden in some villages.
(ii) Mathia chala vala.	(ii) Mathia chala vala.	36-90'	12-18'	3/8-5/8"	Cotton.	50				

**DESCRIPTION OF FISHING GEAR USED IN THE MALABAR COAST AREA (FROM CANNANORE IN THE NORTH TO CAPE COMORIN
THE SOUTHERNMOST POINT OF INDIA).—(contd.)**

Type of fishing implements.	Vernacular Name.	Dimensions.		Material	Cost (Rs.)	Number of men or boats required.	Description and mode of operation.	Kinds of fish caught.	Remarks.
		Length	Breadth or depth						
IV. Cast net.	Vichu vala.	Large variations in size and mesh dimensions.		Cotton.	5-25 according to dimensions and size of mesh.	1 boat and 3 men.	The construction and operation same as the Vichu vala used in Malabar backwaters. The size of mesh varies according to the kind of fish it is intended to catch. The nets are also named accordingly. The common varieties are Churuku vala, Pakku vala and Thiruda vala.	Sardine, mackerel, prawns, lactarius, etc.	
V. Hand nets.	Arippu vala or Vattu vala.	Small bag shaped net.	1/4"	Cotton.	3	...	This hand net is used to dip out prawns. An oval piece of bamboo or cane is fixed around the mouth.	Prawns and small fishes.	
VI. Long lining.	(i) Cheria beppu or Ayiram chundu.	Line = 1,000-3,500' long. Hooks of length 1 to 2" attached every 5-6 ft. from 9" snoods.		Cotton, tanned with an infusion of "panachika bark."	...	...	The line is buoyed up at each end and small floats are attached at intervals. Stone sinkers are attached to the two ends of the complete line. The length of the buoy line is adjusted to suit the depth of water fished. Bait: pieces of sardine, mackerel, prawns, etc.	Cat-fish, seer, Indian Saldian, mon, cock-up sharks, rays etc.	"Ayiram Chundu", 1,000 hooks
	(ii) Valia beppu.	Length of line = 600-1,200.' Hooks suspended at 60' intervals from iron-wire snoods 18" long. Hooks measure 9" and are very strong.		Cotton treated with "panachika bark."	...	...	The line is set as described under Cheria beppu. Bait: large pieces of fish or sometimes beef. This line is set very near the bottom, some 7-8 miles away from shore.	Large sharks rays and dolphins.	...
VII. Harpoon.	Chartuli.	Length of shaft = 8-10.' Length of the single barbed iron point = 8".		Attached to a line 240' in length.		1 canoe and 3 to 4 men.	The shaft is thrown with great force at large fishes, e.g., sharks, rays etc., and the fish landed with the help of the attached line.	Sharks, large rays, dolphins etc.	Harpoons are carried by line fishermen & used whenever an opportunity presents itself.

NOTE.—The attention of the net fishermen on the Malabar and South Canara coasts is "concentrated" almost entirely on the capture of shoaling fishes, migratory and pelagic. Scant regard is given to the meeting of demersal fishes—a branch of the industry left almost entirely to the line fishermen, who form however a very small proportion of the fishing community (Homell).

DESCRIPTION OF FISHING GEAR USED IN THE SOUTH CANARA AREA (FROM THE SOUTHERN BOUNDARY OF THE BOMBAY PRESIDENCY DOWN TO THE MOUTH OF BALIPATAM RIVER, NEAR CANNANORE.

PRESIDENCY DOWN TO THE MOUTH OF KANDAMALAI									
Dimensions.									
Type of fishing implements.	Vernacular Name.	Length			Size of mesh.	Material	Cost (Rs.)	Number of men or boats required.	Description and mode of operation.
		Breadth or depth							
I. Fixed or stationary nets.	(i) Gorati balai.	45'	Length of each cross-stick (i.e. the vertical height of mouth = 8-9".	Width of mouth. 15-18". Depth of each pocket = 18-22".	1/2-5/8"	Cotton.	...	2 to 20 men depending on the number of pieces used.	A long piece of netting is doubled upon itself lengthwise and sewn at the ends. The mouth is crossed by 30-40 short sticks which break it (mouth) up into small deep pockets. Floats (Generally empty tin cans) are attached to one edge of the mouth. Generally 8 pieces are laced end to end. The men extend the net between them to the widest extent, in the form of a crescent, run with it for a short distance and then close up.
	(ii) Endi	27'		10'	2"	Cotton.	5	4 to 6 men.	The net is a rectangular strip; each end of which is tied to a transversely placed bamboo pole. The net is placed flat in shallow waters, on the bottom. Fish is driven towards the region where the net lies submerged by persons dragging a "scareline." When the scareline arrives close to the net, the men who tend the net suddenly raise it from the bottom. Used in shallow estuaries.
									Mulletts.
									A scareline is generally bunches of coconut leaves strung on a coir-rope.
									Mulletts, prawns etc.
									This is a specialized form of the Konda valai used in Coromandal coast.
									Remarks.

DESCRIPTION OF FISHING GEAR USED IN THE SOUTH CANARA AREA (FROM THE SOUTHERN BOUNDARY OF THE BOMBAY PRESIDENCY DOWN TO THE MOUTH OF BALIPATAM RIVER, NEAR CANNANORE.—(contd.)

Type of fishing implements.	Vernacular Name.	Dimensions.			Material	Cost (Rs.)	Number of men or boats required.	Description and mode of operation.	Kinds of fish caught.	Remarks.
		Length	Breadth or depth.	Size of mesh.						
II. Bag net.	Vai balai (also called Nalu balai & Maribalai).	(a) Length of bag = 36" at mouth = 120'. (b) Wings = 90. x 60'.	of the Circum- 15-20'	(a) 3/8-7/8" (b) 1/2-1 1/4"	(a) Cotton. (b) Coir.	250 1750 3500	Two canoes with a total crew of 10 to 14 men. One boat, "padangu" and 70 to 80 men.	The net is similar to the "Odam vala" described in detail under "Malabar" area. For description and mode of operation refer to the Rampani under "Konkan" area.	Shoaling pelagic fishes such as sardine, mackerel, ribbon-fish etc.	A very important net
III. Inshore Drag net.	Rampani.	1800'	15-20'	1 1/2-1 3/4"	Sun-hemp.					
IV. Drift nets.	(i) Kandadi balai. (ii) Acha balai. (iii) Aibur-la balai. (iv) Shoraka balai.	108' 75' 60-75' 75'	18' 9' 9' 9'	2-3" 2 1/2-4" 2 1/2" 6"	Hemp.	About 35	1 boat & 3 to 4 men.	The nets are used in fleets. Floats are attached to the head-rope and stone-sinkers are hung from the foot-rope. A long cord is tied to one end of the head-rope. The free end of this cord is carried in a canoe, which along with the net drifts with the current.	Seer, Pomfret, catfishes, small sharks, rays etc.	The mesh dimensions are adjusted to gill particular fishes : Shoraka balai for instance is intended to catch sharks & rays.
V. (a) Gillig nets.	Patti balai.	72'	30-36'	7/8-1"	Cotton	15	Two canoes with a crew of	Two canoes each with 7-8 pieces of netting start from the shore. When a shoal is sighted, the crew lace together the two sets of netting & row rapidly in semicircular courses away from each other, in an endeavour to enclose the shoal in a vertical wall of netting. The crew then frighten the fish inside the enclosure. The fish scatter in all directions and get firmly gilled when they dash against the net. 5 or 6 pieces are joined together when in use. The net is anchored in position by placing heavy stones on the foot-ripe. Generally set in shallow water at about dusk. The head-rope is kept afloat with the help of light wooden floats. The net is hauled up next morning and any fish that has been gilled is removed. This is the largest of all the casting nets used in the South-Canara coast. The other cast-nets used are (a) Nangu balai, (b) Parla balai, (c) Tikkala balai, (d) Tik-kanda balai. All these nets are constructed on the same plan ; only the mesh dimensions are different. For description and mode of operation refer to "Vichu vala" under Malabar.	Mackerels lactarius etc.	
(b) Anchored gilling net.	Kanda balai.	45-75'	6-9	1-1 1/2-2-3"	Hemp.	10	...	These net are peculiar to Malpe and Hossabettu.		
VI Cast net.	Deb balai.	Diameter at mouth = 40'		3/4"	Cotton	...	...	Sardine & mackerel.		
VII. Long lines.	Cheria beppu.	Line = 1800' Hooks = 1.2" Snoods = 9"		...	...	...	...	Catfish, seer, Jew fish, cock-up, small sharks etc.		
	Valia bappu.	...	...	...	...	...	...	Refer to Malabar coast area.		

FISHING GEAR USED IN THE COROMANDAL COAST AREA (BACK-WATER FISHERIES).

Type of fishing implements.	Vernacular Name.	Dimensions.			Material	Cost	Number of men or boats required.	Description and mode of operation.	Kinds of fish caught.	Remarks.
		Length	Breadth of depth	Size of mesh.						

I. Fixed or Stationery nets.

(i) Kala valai.	40'	2-1/2'	6"	Hemp.	...	...	...	The net is set in the fairway of a channel leading from a back-water to the sea. It is tied to strong poles driven in the sand. During high tide when sea-water rushes over the bar, many fishes show a tendency to pass out against the current. Those that come into contact with the net are gilled.	*Mullet, cock-up etc.	...
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(ii) Katru valai.

Length variable.	...	Submerged net—2-1/2"	Cotton.	...	...	...	...	Two lines of nets are hung from two parallel series of stakes. The first series projects a foot above the surface of water at high tide. The stakes in the second series, coming 2-3 feet behind the first, are 2-3 feet longer. A course set tied to the first row of stakes lies submerged like a screen. A second net is hung by its upper edges from the longer series of stakes. The lower edge of this net is looped up and tied to the same stakes a few inches above the water level. Thus a slack longitudinal pocket is produced between the two rows of stakes. Fish encountering the submerged net try to clear the obstruction by leaping out of the water. They strike the curtain of net behind and fall into the pocket.	Mullet, also cock-up which is gilled in the meshes of the submerged net.	This net is a very important one in the backwaters. It is usually set in the evening and the fish collected in the morning.
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II. Small drag nets.

(i) Konda valai.	60'	Depth back to front 5 1/2-9'	3/7-7/8"	Cotton.	5	4 men when one piece is used; x x 4-when used collectively (x—number of pieces).	A long broad strip of netting is sewn at the sides. The upper and lower margins of the mouth are connected and distended with "spreader sticks." The lower margin of the net is dragged along the bottom of the shallow back-water or along the roots of water weeds. This net dislodges fishes that burrow in the soft mud. Several units of this net may be linked together and set in the form of a crescent facing a shore. In this method of collective fishing, the net is not dragged, but fishes are driven into the area enclosed by the net by fishermen dragging a "scareline" (strips of palm leaves attached to a cord). The crescent closes into a circular enclosure and by collapsing portions of the net the fish are egged on into the pockets.	Prawns and small fishes.	A very useful net in the shallow backwaters.
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30-40 "Spreader sticks" which are shorter than the width of the net.

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III. Gill.

(i) Kalla.	180-240'	2-1/2'	3"	Light cotton.	...	...	...	Worked in teams and used wherever water is more than 2-1/2' deep in the early hours of the morning. Both ends are left free and hence the net is slack and is swayed by the current. Fish get caught in 2 ways (1) gilled when trying to swim through; (2) by being entangled in the meshes. In Ennur backwaters the net is used as a stationery net. The ends are tied to 2 poles, but the net is not kept tightly stretched. Fish are driven towards the net with a scare-line.	Cock-up, Mullet, lactarius, etc.	Kanni valai, Kottuvalai, Pusai & Kendal valai are names of other similar nets.
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FISHING GEAR USED IN THE COROMANDAL COAST AREA (BACK-WATER FISHERIES)—(contd.)

Type of fishing implements.	Vernacular Name.	Dimensions.			Material	Cost (Rs.)	Number of men or boats required.	Description and mode of operation.	Kinds of fish caught.	Remarks.
		Length	Breadth or depth.	Size of mesh.						
IV. Casting net.	(ii) Koduva valai.	12'	36"	5-5 1/2"	Cotton.	5-6	5 boats and 20 to 40 men.	The construction of the net is very similar to the Konda valai 50 units are employed in collective fishing, arranged end to end in a semi-circle in the shallow water 2-2 1/2' deep. Fish are drawn into the semi-circular wall of netting by dragging a scareline, by shouting and splashing.	Cock-up.	<i>Lates carter</i> is called <i>Ko-due</i> in Tamil.
	Vichu valai.	The circumference at the mouth and the height of the cone variable.	1/2"		Cotton.	5	One boat and 2 to 3 men.	Stringed variety with 20 radial cords attached to the lower circular margin of the net. The margin of the cone is weighed with heads of iron or lead. Operated in a manner similar to other casting nets.	Prawns, small fishes.	Eral valai, Sama valai, Thoni valai and Mani valai are different names for cast nets. These different only in size of mesh.
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V. "Pouch trap," "Hemispherically shaped nets with enormous circular mouths and shallow basin-shaped net bodies" (Hornell).	Iriga valai.	Circumference at mouth —120'			2"	Cotton.	4 to 6 men.	One portion of the mouth of the net is kept floating on the surface, while the diametrically opposite section is held on the bottom of the back-water somewhat in advance of the floating end. Fish is driven into the pouch by making all sorts of frightening noise. This accomplished the lower edge is hurriedly scooped up from the bottom and brought into contact with the elevated head-rope.	Mulletts.	Other "pouch traps" in use are Sinna iria valai, Kal-thartu valai.
	VI. Hoop net.	Diameter of ring = 2'			3"	Cotton.	2	Shallow conical bag suspended from an iron ring. The bait, a dead frog, is tied across the mouth. The net is lowered to the bottom of the backwater and examined after an interval of several hours.	Crabs.	...
199										
VII. Long lining.	Tamani kayaru.	Length of line = 600-900'; Thickness = 1/4" snoods 18" at every 6'; Length of hooks = 1-1 1/2".			...	Coir rope.	...	Line buoyed up with light wooden floats. The two ends are fixed to 2 bamboo posts driven into the mud. Bait : prawns.	Cat-fishes.	...

APPENDIX VII

Quantities of fresh fish and cured fish made therefrom in different
Curing Yards—(00 Railway Maunds).

Name of Yard.	Fresh fish.			Cured fish.		
	1941-	1942-	1943-	1941-	1942-	1943-
	1942	1943	1944	1942	1943	1944
South Kanara Dt. :						
Kirimayeswar ...	139	525	312	85	315	193
Gangolly ...	232	793	348	204	498	258
Hangarakotta ...	328	841	527	199	519	302
Padinutanse ...	39	156	92	25	100	59
Malpe (2 Yards). ...	742	2212	1397	610	1536	877
Kidiyur ...	68	224	109	44	141	63
Udeiyavara ...	305	1060	594	186	633	355
Mulki ...	106	296	249	63	181	157
Hosa Bettu ...	47	206	89	29	125	55
Baikampadi ...	61	168	106	36	99	64
Thammerbavi. ...	46	131	94	28	82	59
Bokapatnam ...	81	111	108	48	75	65
Mangalore ...	109	148	125	61	93	73
Ullal ...	142	174	189	83	109	116
Mayeshwar ...	326	253	249	201	154	154
Kumbla ...	224	262	268	132	150	159
Adakathambadu. ...	118	87	179	78	52	108
Kasargod ...	29	25	17	26	15	11
Bokal ...	182	120	231	108	69	139
Pallikeri ...	39	65	59	5	41	35
Hosdrug ...	433	324	644	244	198	382
Total ...	3866	8182	6074	2495	5985	3684

Name of Yard.	Fresh fish.			Cured fish.		
	1941-	1942-	1943-	1941-	1942-	1943-
	1942	1943	1944	1942	1943	1944
Malabar Dt. :						
Thirukadapuram	189	174	250	109	104	150
Madayi ...	672	1012	1207	485	629	912
Mattul ...	48	86	85	30	54	53
Alikod ...	57	91	116	33	55	67
Cannanore ...	415	641	644	249	377	397
Edakkad ...	70	186	175	39	110	107
Tellicherry ...	395	731	832	247	417	531
Talanji ...	80	147	146	47	86	87
Madakkar ...	46	92	99	29	56	59
Madapalle ...	110	318	288	86	249	225
Badagara ...	423	733	668	259	449	390
Melardi ...	91	168	153	56	104	92
Quilandy ...	303	719	699	195	455	426
Pandiappa ...	132	400	352	87	239	227
Calicut ...	317	573	520	184	347	300
Bey pore (2 yards)	152	184	153	97	113	95
Parappanangadi.	341	515	494	230	296	297
Tanur ...	959	1665	922	561	945	539
Padiakarapuram.	47	123	80	27	72	47
Paravanangadi.	159	387	170	98	222	104
Kuttayi ...	192	528	446	113	302	261
Ponnani ...	345	602	533	207	348	314
Puduponnani ...	76	145	120	47	85	71
Veliangod ...	56	130	120	36	81	75
Palapatti ...	247	389	394	160	248	257
Mannalamkunni.	135	279	197	86	167	117
Puthengada- puram.	183	210	189	117	127	121
Blangod ...	355	461	408	238	300	269
Kadapuram ...	277	343	365	163	213	231
Vadanapalle ...	78	94	114	46	64	71
Nattika ...	44	78	58	28	48	37
Kudumbi ...	42	49	36	27	31	23
Kalimbram ...	111	105	92	62	64	56
(5 Yards) Tha- rapathu, Mara- vantha, Panjavi, Elathur & Edu- kaziyyur	...	...	55	—	—	39
	7147	12358	11180	4480	7456	7051

**Quantities of fresh fish and cured fish made therefrom
in different Curing Yards—(00 Railway Maunds)—contd.**

	Fish brought for curing.				Cured fish got.			
	1942	1943	1944	1945	1942	1943	1944	1945
Vizagapatnam :								
P.K. Palem ...	100	70	102	37	66	38	56	22
Iskalapalem ...	118	63	84	33	64	35	47	18
Battigallura ...	113	61	74	47	54	35	48	26
Pandipundi ...	122	155	141	66	69	87	83	36
Althada ...	116	117	109	72	67	67	62	41
Guppidapetta ...	109	79	65	54	61	44	38	29
Kammavaripeta.	73	90	45	25	41	51	26	14
Pukilapetta ...	217	124	24	22	103	...	14	13
Mukkam ...	92	90	45	59	54	51	24	31
Bimilipatam ...	92	114	55	60	51	60	30	32
Kolthuru ...	86	74	54	39	48	40	30	21
Mathgomanpeta.	109	103	67	67	60	54	41	37
Lawdson's Bay.	73	144	159	54	38	69	88	28
Gangavaram ...	278	375	179	59	132	207	100	32
Jularipeta ...	33	39	286	12	19	26	159	7
Padimadaka ...	116	130	97	49	68	76	55	28
Polavaram ...	75	96	80	60	45	66	50	50
Razipetta ...	102	181	125	68	58	100	76	43
Gedduru ...	70	48	79	44	39	29	46	25
Total Vizaga- patnam Dt.	2046	2054	1870	927	1153	1129	1073	533
East Godavari :								
Pentakota ...	113	148	108	66	77	74	63	36
Mulapeta ...	139	375	190	68	109	127	106	37
Komapapapeta.	160	358	256	134	88	207	145	74
Uppada ...	197	432	364	189	107	242	205	104
Total ...	609	1313	918	457	381	650	519	251

APPENDIX VIII.

MONTHLY VALUES OF FRESH FISH IN THE EAST COAST (Circles per Imperial Maund) ON LANDING.

	Sharks.	Cat fish.	Sardine.	Jew fish.	Mackerel.	Pomfret.	Seer.
1941.	Rs. As.	Rs. As.	Rs. As.	Rs. As.	Rs. As.	Rs. As.	Rs. As.
January	2 0	3 0	2 5	2 0	2 1	2 12	4 9
February	2 4	2 12	3 13	2 3	2 10	2 11	4 7
March	2 6	2 9	1 14	2 1	3 0	3 8	4 5
April	3 2	2 4	3 0	2 2	2 7	3 12	4 1
May	...	...	...	...	...	...	...
June	...	...	...	...	...	...	...
July	2 14	2 14	2 1	2 4	2 6	2 15	4 5
August	2 0	2 15	2 11	2 5	2 3	3 9	4 3
September	2 10	2 13	2 11	2 6	1 13	3 7	3 9
October	2 8	3 4	1 12	2 5	2 6	3 12	3 10
November	2 10	3 8	1 9	2 4	2 7	3 9	3 8
December	2 4	3 0	2 1	2 5	2 6	3 4	3 5

MONTHLY VALUES OF FRESH FISH IN THE EAST COAST (Circars per Imperial Maund)
ON LANDING—(contd.)

	Sharks.	Cat fish.	Sardine.	Jew fish.	Mackerel.	Pomfret.	Seer.
1942.	Rs. As.	Rs. As.	Rs. As.	Rs. As.	Rs. As.	Rs. As.	Rs. As.
January	2 2	3 12	1 14	2 4	2 8	3 5	4 6
February	2 9	3 0	1 13	2 1	2 8	3 13	4 12
March	2 6	2 10	2 0	2 6	2 15	3 6	4 11
April	2 3	2 13	2 0	2 3	2 11	3 7	2 13
May	2 10	2 12	2 6	2 4	2 1	3 7	2 13
June	2 6	2 13	2 6	2 4	2 1	3 7	2 13
July	2 7	2 14	2 5	2 10	2 0	3 9	4 14
August	2 8	2 14	...	2 0	2 0	3 11	4 2
September	2 8	2 8	2 2	2 7	2 3	3 13	3 14
October	2 3	3 0	2 2	2 8	2 10	4 8	6 11
November	2 3	3 1	2 3	2 8	2 2	4 3	5 6
December	2 7	3 2	2 3	2 2	1 11	3 8	4 9
1943.							
January	3 0	3 4	2 3	2 2	2 3	4 0	4 8
February	2 10	3 7	2 2	1 10	2 8	4 0	5 0
March	3 0	3 8	2 0	2 5	2 11	4 0	3 11
April	...	3 8	2 2	2 2	2 3	4 2	4 0
May	...	3 14	2 11	2 2	1 11	4 5	4 3
June	...	3 6	2 14	2 0	1 11	3 9	4 7
July	...	3 4	2 0	2 3	2 12	4 3	5 13
August	...	3 5	2 0	2 9	3 0	4 8	5 0
September	...	4 0	...	2 8	2 1	4 11	4 2
October	...	...	3 0	2 8	2 14	3 13	4 13
November	...	4 2	2 1	2 8	2 4	5 0	4 5
December	...	4 0	2 6	2 6	2 3	4 14	3 14
1944.							
January	...	4 5	2 7	3 6	2 8	5 15	4 8
February	...	4 4	2 12	2 6	3 3	6 3	4 12
March	...	4 13	3 7	4 6	5 10	6 2	7 4
April	...	3 4	3 2	3 9	4 1	6 4	9 4
May	...	5 0	3 15	3 14	6 14	9 6	6 13
June	...	5 1	2 12	3 14	5 6	6 4	5 1
July	...	4 8	3 1	4 11	...	8 0	6 3
August	...	5 13	4 6	4 0	7 9	5 10	5 1
September	...	4 3	2 14	4 11	10 0	6 0	5 10
October	...	4 7	4 8	4 10	5 14	6 3	7 10
November	...	4 10	3 13	5 0	5 2	6 6	8 8
December	...	7 13	3 14	5 1	4 8	7 8	12 4
1945.							
January.	...	14 9	5 0	5 0	5 5	7 7	17 7

APPENDIX IX.

MONTHLY VALUES OF FRESH FISH IN THE WEST COAST—(Rs. per Imperial Maund).

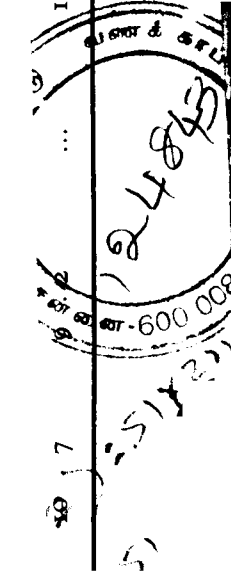
1941.	Sharks.	Cat fish.	Sardine.	Jew fish.	Pomfret.	Mackerel.	Seer.
	Rs. As.	Rs. As.	Rs. As.	Rs. As.	Rs. As.	Rs. As.	Rs. As.
January	2 5	2 10	1 2	3 0	2 8	1 11	3 10
February	2 6	2 6	1 11	2 6	2 13	2 0	3 2
March	2 10	1 15	1 5	1 10	3 0	2 4	3 13
April	2 7	1 10	...	2 2	4 0	2 10	3 0
May	2 10	2 8	3 0	1 3	3 15	2 6	...
June	2 11	2 10	2 8	2 2	...	3 3	...
July	2 8	2 6	3 2	1 8	...	2 8	...
August	3 1	3 5	3 0	1 7	4 13	2 1	3 6
September	2 5	2 13	1 14	1 3	2 15	1 4	2 12
October	2 8	2 3	1 2	1 2	3 4	1 6	3 1
November	2 5	1 10	1 0	2 2	3 0	1 4	3 1
December	2 7	1 14	1 7	1 13	2 1	1 6	3 6

1942.

January	2 6	2 7	1 5	1 10	2 7	1 10	2 12
February	2 5	2 8	1 5	2 1	1 0	2 0	2 4
March	2 4	2 0	1 12	2 8	3 8	2 5	2 7
April	2 8	2 0	...	1 14	1 8	2 14	2 0
May	2 9	2 9	2 8	1 13	4 8	2 6	...
June	2 5	2 9	3 8	1 5	2 6	2 5	1 8
July	2 10	2 4	5 0	5 13	2 11	3 0	...
August	2 8	2 11	1 2	1 6	3 0	2 2	...
September	2 8	1 0	2 0	1 8	2 5	1 13	...
October	2 8	2 8	1 10	1 8	2 3	1 5	...
November	2 10	2 5	1 13	1 2	2 10	1 4	...
December	2 6	2 10	2 5	2 10	...	1 4	...

1943.

January	2 5	3 0	1 13	4 8	...	1 3	...
February	2 6	2 11	1 6	2 3	2 8	1 10	...
March	2 8	2 14	...	2 2	6 5	1 15	...
April	2 13	3 6	...	3 2	9 0	2 10	...
May	2 12	3 11	...	2 0	9 11	2 14	...
June	3 10	3 10	...	3 0	...	4 0	...
July	3 1	2 1	...	2 6	...	...	...
August	3 2	2 4	...	2 8	1 15	2 6	4 3
September	3 0	2 13	...	2 2	2 10	2 10	4 2
October	3 0	2 8	2 0	2 5	3 1	1 10	3 11
November	3 4	2 10	1 11	2 15	4 0	1 10	5 6
December	3 7	2 6	2 9	3 6	4 0	2 5	4 8



MONTHLY VALUES OF FRESH FISH IN THE WEST COAST—(Rs per Imperial Maund)—contd.

	Sharks.		Cat fish.		Sardine.		Jew fish.		Ponifret.		Mackerel.		Seer.	
	Rs.	As.	Rs.	As.	Rs.	As.	Rs.	As.	Rs.	As.	Rs.	As.	Rs.	As.
1944.														
January	4	3	3	14	2	10	3	14	5	15	3	2	8	14
February	5	1	3	8	2	14	5	7	5	0	4	5	8	10
March	5	10	3	6	...	...	3	8	5	1	5	8	12	8
April	4	6	6	6	...	...	6	6	...	...	5	0	6	10
May	5	8	7	10	1	10	3	0	13	5	8	3	...	...
June	6	0	6	2	...	...	4	1	8	8	10	0	...	...
July	9	1	5	9	...	...	7	0	11	1	...	...	...	...
August	6	13	10	2	...	...	5	0	15	11	6	2	...	...
September	5	11	6	5	...	...	3	14	7	6	4	14	6	3
October	5	5	5	5	1	11	2	5	4	6	3	0	7	0
November	5	11	6	5	1	6	6	12	...	...	3	6	7	2
December	5	8	5	9	2	13	7	12	13	0	3	6	5	10
1945.														
January	6	10	5	10	7	4	8	5	6	0	4	8	13	5
February	4	14	7	9	...	...	9	0	10	8	5	7	12	12
March	8	0	8	5	1	0	7	14	22	6	6	7	4	15
April	8	14	7	0	...	...	5	0	30	13	8	2	...	...
May	9	6	7	11	...	...	4	3	26	14	8	5	...	...
June	11	10	5	14	...	...	7	6	30	10	...	...	...	...
July	11	11	7	8	...	...	5	2	...	...	10	2	...	...
August	11	3	9	6	...	...	3	15	26	0	9	5	11	0
September	8	6	7	12	1	8	5	4	11	9	5	12	9	15
October	7	0	6	3	14	2	3	4	6	3	2	8	8	0
November	7	10	6	15	16	0	3	8	6	0	2	6	10	8
December	8	0	7	13	16	0	5	13	6	0	4	15	11	11

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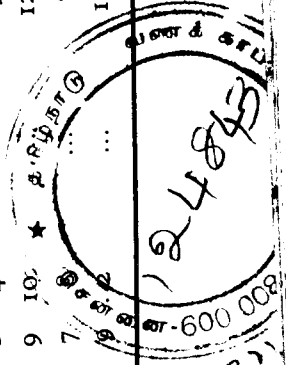
1946.

January	8	10	9	9	8	3	9	2	15	8	4	12	13	8
February	8	14	9	12	7	8	9	7	30	0	5	2	15	11
March	9	2	6	11	10	15	9	0	51	0	5	3	...	...
April	9	2	8	1	8	0	13	11	...	...	6	4	...	...
May	13	8	11	12	17	11	4	0	26	8	6	14	...	...
June	11	2	30	0	8	0	...	...	...	...	12	0	...	...
July	11	7	4	9	11	2	4	12	...	...	10	9	8	0
August	9	3	6	3	16	8	2	6	...	...	14	8	...	...
September	7	14	9	0	...	...	3	10	10	8	4	13	9	3
October	6	15	7	2	6	4	3	8	8	8	3	12	8	13
November	8	5	5	6	9	7	5	0	8	0	3	12	10	7
December	8	2	9	2	9	5	3	3	12	2	6	0	11	14

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1947.

January	7	7	4	8	10	5	...	...	8	2	4	13	10	3
February	8	12	6	8	11	14	10	0	...	...	4	2	9	0
March	7	15	8	4	...	...	9	8	31	11	4	2	7	0
April	8	9	9	10	...	...	12	0	43	14	6	1	7	0
May	9	2	7	8	...	...	7	0	23	4	5	3	...	...
June	...	...	...	...	...	...	10	5	56	0	5	0	...	...



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