



MARINE FISHERIES INFORMATION SERVICE

TECHNICAL AND
EXTENSION SERIES

No.24
October 1980

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
COCHIN, INDIA

INDIAN COUNCIL OF AGRICULTURAL RESEARCH

PURSE SEINE FISHERY — IMPERATIVE NEED FOR REGULATION*

Introduction

Purse seiners have been operating in the waters off Goa during the past few decades. Increase in their numbers, coupled with the introduction of more mechanised boats for trawling has created a considerable imbalance between the traditional small scale fisheries—the 'Rampani' operators and the mechanised boat operators. The sudden introduction of a large number of purse seiners in the Karnataka State was first viewed with jubilation on account of the market spurt in the landings of pelagic fish such as sardine and mackerel, and also in the manner in which a good number of 'Rampani' operators were involved in the new method of fishing. Despite the calamitous fire which resulted in the destruction of 41 purse seine boats in Malpe in July, 1979, (as reported in the "Mar. Fish. Infor. Serv. T & E Ser.", No.9, 1979) the number of purse seiners in the Karnataka State today numbers over 200. During the last two seasons, due mainly to the non-availability of the pelagic fishes during part of the year along Karnataka Coast, two major shifts in the pattern of the fishery were evident. First was the conversion of some of the purse seiners into trawlers for fishing demersal or ground fishes and the second was the deployment of about 60 purse seiners along the Kerala Coast during the fishing season.

One of the disquieting aspects of purse seining noted along the Karnataka Coast in 1979 was the unusually large catch of oil sardine in ripe running condition during the first week of June. Further, due to the heavy landing of the mackerel its price ruling at Rs. 3,500/ tonne during the last week of May, declined to Rs. 1,500/ tonne in the first week of June. The Central Marine Fisheries Research Institute (CMFRI) which has been monitoring the exploited resources along the coasts of India had given a timely warning to the State of Karnataka about the heavy incidence of spawners in the purse seine catch and projected the need for imposing restrictions in the operation of purse seiners. Subsequently, the Hon'ble Minister of Fisheries of the Govt. of Karnataka made an appeal to the purse seine fishermen to abstain from fishing

from the first week of June to last week of September, 1979, in view of the fact that the spawning of oil sardine and mackerel occurs from May to August. Again, on the 2nd June he earnestly sought the co-operation of the fishermen to refrain from catching oil sardine in ripe running condition (spawning fish) in the interest of conservation of the fishery. This was followed by a statement by the Deputy Director (Fisheries), Mangalore, in which he cautioned the purse seine fishermen that the Government would step in and take suitable measures in this matter if the fishing is continued during the spawning period of the fish. However, the fishing went on unabated largely due to the lack of proper implementation.

In 1980, the fishing season started along the Karnataka Coast with a reasonably good catch of pelagic fish by the purse seiners. However, during the last week of September and first week of October, another detrimental feature in the purse seine fishery was evident. This involved the large scale capture of the marine catfish *Tachysurus maculatus*. This is one of those fishes in which the males play an active role in parental care by carrying the eggs inside their buccal cavity. Sexual segregation at the time of incubating the eggs in the buccal cavity by the males, a peculiar behaviour in this species as in other members of the genus *Tachysurus*, resulted in an almost selective fishing by the purse seines on this potentially vulnerable component of the species and also the millions of incubating eggs. This is yet another case which calls for exercising strict control and regulation on purse seine fishery. The following is an account of the magnitude of the destruction caused by the indiscriminate fishing by the purse seiners on a single resource—*T. maculatus*.

Catfish catches by purse seines

First hand information at the purse seine fishing centres at Mangalore, Malpe and Gangoli (Fig. 1) was obtained by the personal visits to these centres during the last week of September and first week of October to specially investigate the problem of such destructive fishery of an inshore fish stock by the purse seine gear. The magnitude of the problem might be evident from Table 1 which indicates that about 37 tonnes of cat-

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fish eggs were destroyed during the purse seine fishery with no possible estimation of the quantity of eggs that would have fallen through the meshes of the purse seine during the operational phase and the brailing of fishes and eggs to the deck of the carrier boats and to the purse seine boats.

Table 1. Total landings (estimated) of the catfish (*T. maculatus*) and their eggs (tonnes) at three centres in Dakshina Kannada Coast.

Period	Centre	No. of operations (from purse seine boats)	<i>T. maculatus</i> Adults	<i>T. maculatus</i> Eggs	Total fish catch
29 Sept.- 30 Oct.	Mangalore	1139	204.9	16.0	1776.1
26 Sept.- 31 Oct.	Malpe	1833	241.5	14.0	3530.8
1-31 Oct.	Gangoli	1228	82.0	7.6	3282.0

All specimens of *T. maculatus* landed were males. They were found in the size range 210-396 mm with two modes at 285 and 346 mm (Fig. 2). The weight of the fish ranged between 220-580 g. (Fig. 3). When captured they were in the non-feeding condition as their oro-buccal cavity was filled with the developing eggs which are quite big in size compared to the eggs of other fishes. Maximum number of eggs found in the oro-buccal cavity was 56 and eggs had a mean diameter of 14.6 mm and average weight of 1.195 g (Fig. 4). On an average, 614 eggs made up one Kg. No relation was observed between the number of eggs

carried by the male fish and fish size (Fig. 5). Besides the bulk of fish had spewed some of the eggs at the time of capture and consequent struggle in the net and on deck. The percentage of oval, opaque ova with no signs of development were extremely few; but eggs in different stages of development were undergoing incubation in the oro-buccal cavity of the male fish. The estimated total number of eggs landed during the period based on the total weight of eggs has been found to be 23 million.

At present, no information on the percentage of survival at the time of hatching or on the recruitment into the fishery, is available. The fact that almost all incubating eggs were found to be fertilised and in various stages of development is suggestive that the hatching rate with such parental care would be high. This is also equally significant and should ultimately reflect in the recruitment of different year classes.

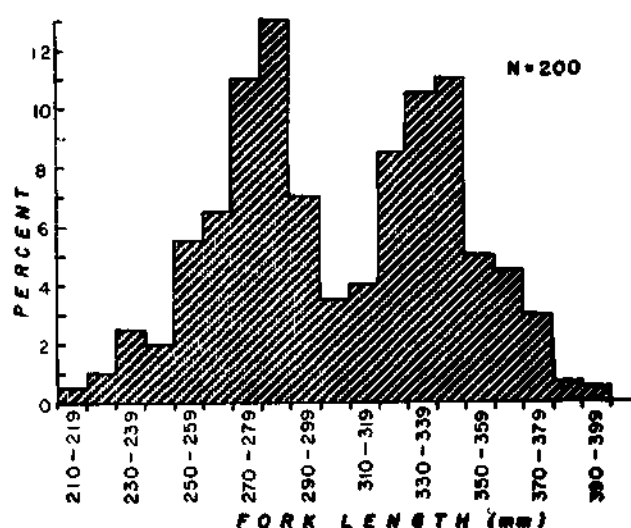


Fig. 2. Length frequency distribution of *T. maculatus* (males, incubating eggs) collected during September-October, 1980 from Mangalore.

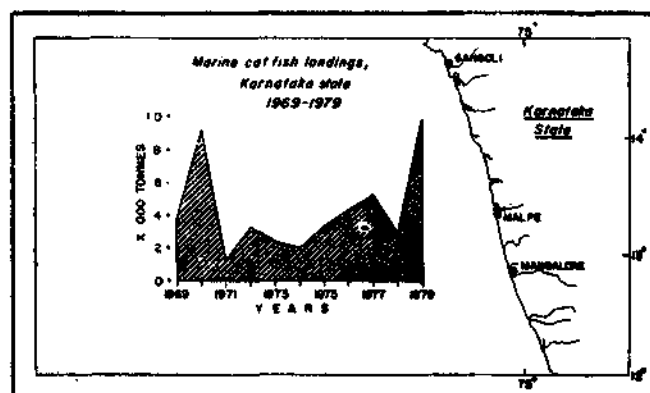


Fig. 1. Map showing the purse seine landing centres along the Karnataka Coast visited during the period September-October, 1980. Marine catfish landings along the Karnataka Coast during 1969-1979 is also shown.

Marine cat fish landings along the Karnataka Coast during 1969-1979 is presented in Fig. 1. A detailed analysis of the catch data of *T. maculatus* taken by the purse seine during the period September-October, 1980, at different centres is presented below:

Mangalore (Table 2)

A total of 204.9 tonnes of *T. maculatus* (males, with incubating eggs in the oro-buccal cavity) and 16.0 tonnes of eggs were landed during the period 29 September to 30 October 1980 in 1139 purse seine operations. The area of operation was off Mangalore-Suratkal

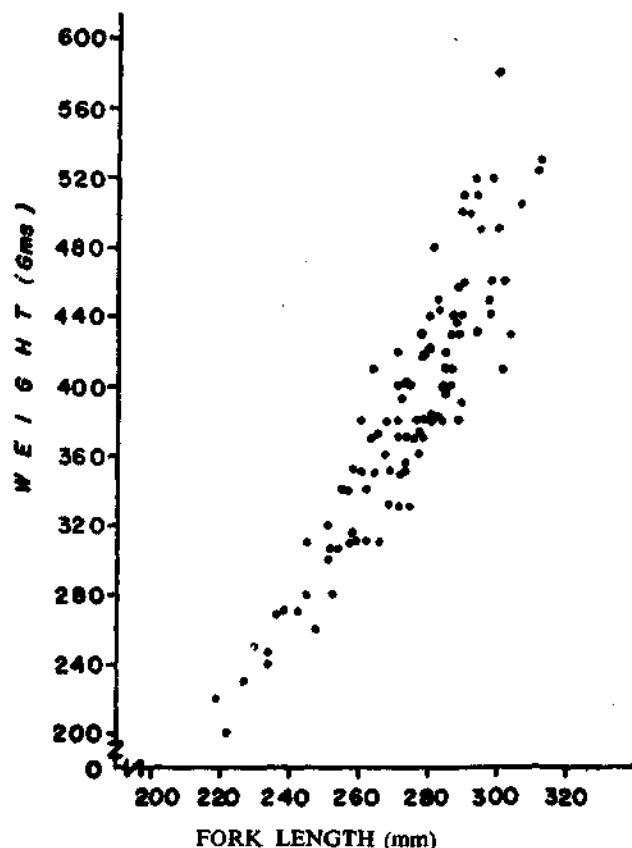


Fig. 3. Length-weight relation of *T. maculatus* (males, incubating eggs) collected during September-October, 1980 at Mangalore.

Coast at a depth range of 25-35 m. Fresh fish has been sold at the rate of Rs. 500 to Rs. 600 per tonne. Very small quantity of the eggs (a few kg. from the first few carrier boats) were disposed at the rate of Rs. 0.50/kg. and the rest were distributed free or discarded. Fish in fresh condition were transported to places such as Chikmangalore and Hazzan where the plantation workers relish it.

Malpe (Table 3)

241 tonnes of adults and 14.0 tonnes of eggs of *T. maculatus* respectively were landed at Malpe in more than 1800 purse seine operations during 26 September to 31 October, 1980. Purse seiners operated at the depth range of 32-37 m off Malpe. 75% of the fishes landed were dried and the rest were sold in fresh condition at the rates of Rs. 1,750/- and Rs. 1,500/- per tonne respectively. Eggs landed were discarded due to the lack of demand.

Gangoli (Table 4)

Total landings of *T. maculatus* adults and eggs amounted to 82.0 and 7.6 tonnes respectively during the period 1st to 30 October, 1980. 1228 purse seine operations were conducted in the depth range of 25-35 m,

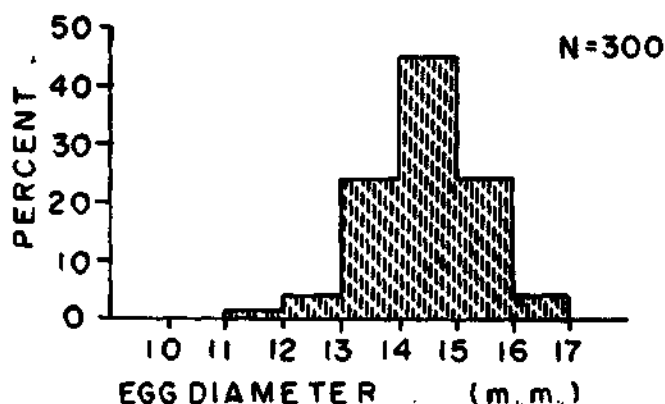


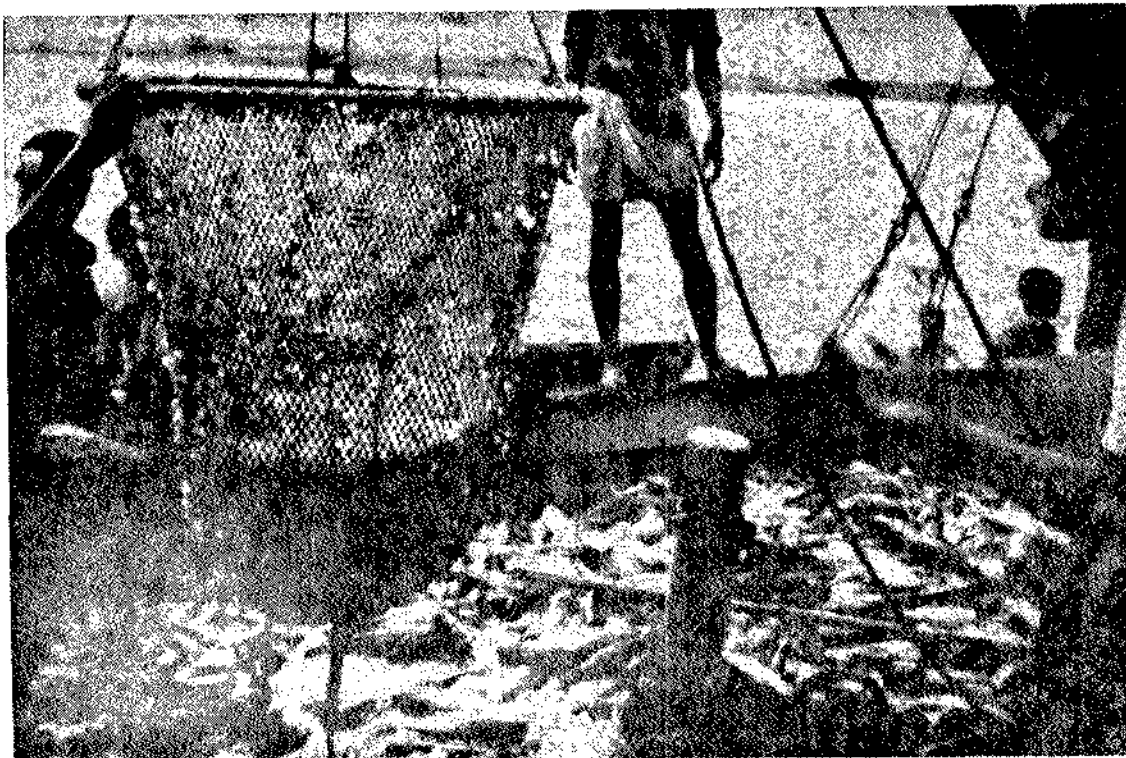
Fig. 4. Size (Diameter) distribution of the eggs collected at Mangalore during September-October, 1980

SW, W and NW off Gangoli. 95% of the landings were dried and the rest sold as fresh fish. Dried fishes were disposed at the rate of Rs. 1,346 per tonne and fresh fish Rs. 830 per tonne. As at Malpe, the eggs landed were discarded.

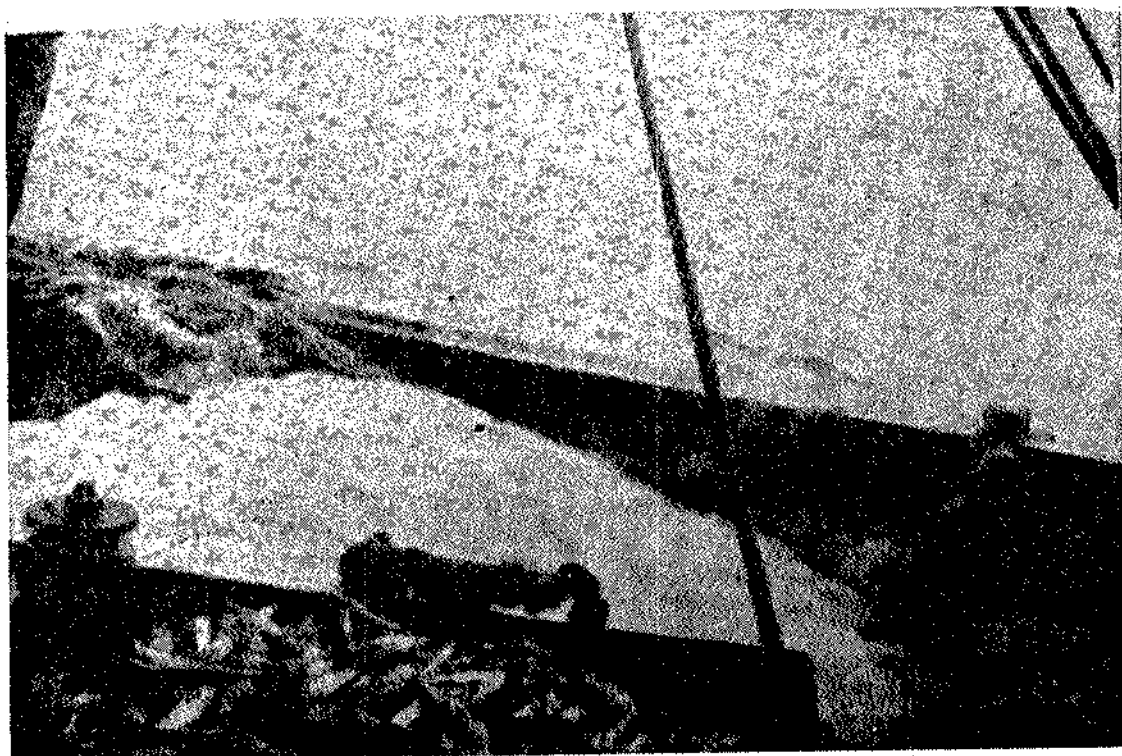
The Need for Regulation in Purse Seine Fishery

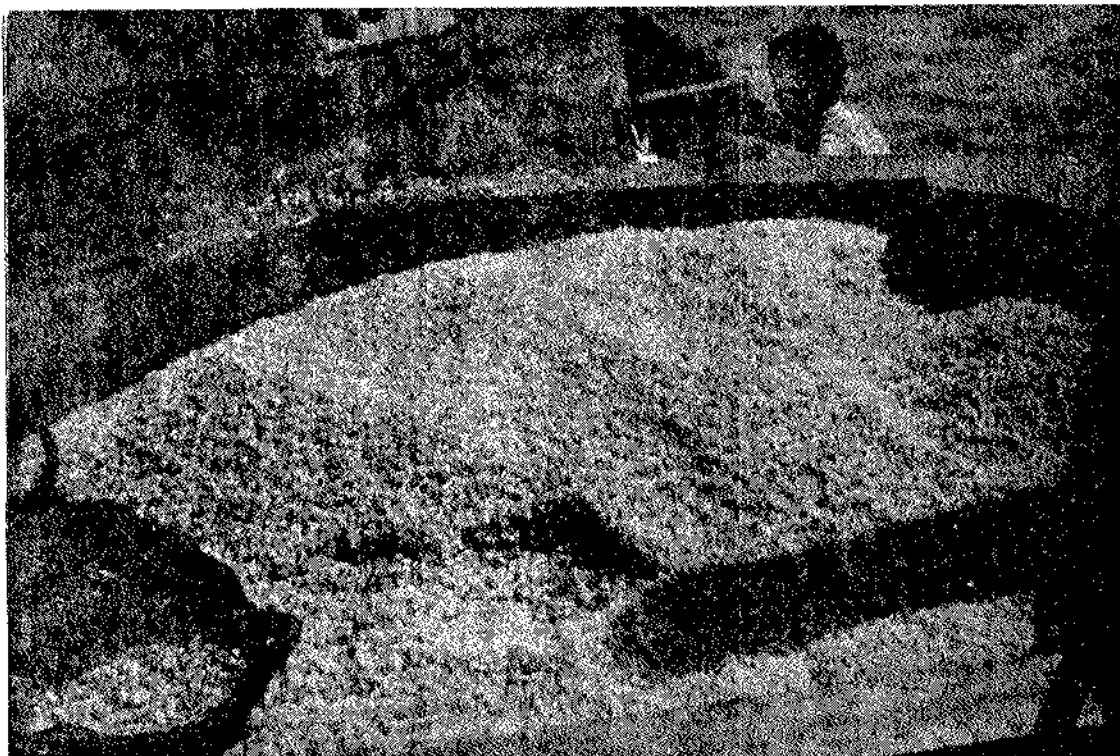
The fact that such huge quantities of incubating fish (*T. maculatus*) were caught and the consequent heavy destruction of eggs should be a matter of grave concern. Such wasteful and destructive fishing could irreparably damage the resources. There is imperative need for having an effective machinery to see to it that recurrence of such destructive fishing, which would affect the fishes are not permitted by proper regulation in limiting not only the number of boats operating purse seines but also the type of resource they could tap by fixing proper quotas. Enquiries with the purse seine fishermen indicated that they could clearly identify catfish shoals from other shoaling fishes before encircling operation is carried out. Hence it would not be difficult to avoid fishing catfishes with incubating eggs, or oil sardine and mackerel in ripe running condition.

Thus in the recent past, these two instances of destructive fishing using purse seine gear has come to our notice. The problem has to be viewed in the proper perspective in view of the heavy catches by this gear. In this context, we are reminded of the intensive and indiscriminate purse seine fishery of the pelagic fish stocks in other parts of the world which have resulted in the partial or complete depletion of some of the major pelagic fish resources. Good examples are the Californian sardine fishery, the herring fishery of the North Sea and the mackerel fishery of the North Sea and the British waters. It is suspected that intensive fishing pressure combined with an environmental



Handling of catfish eggs



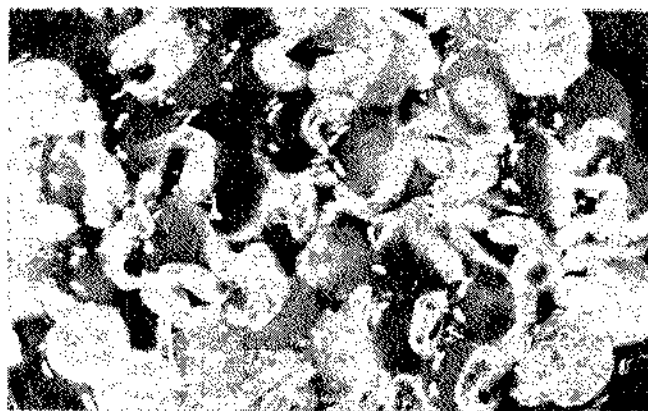


on board the vessel

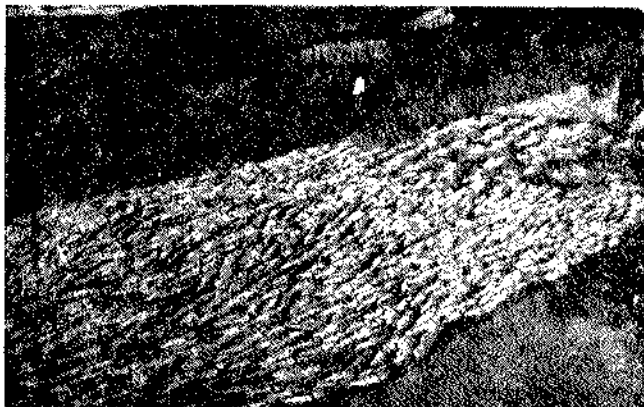




Eggs inside the buccal cavity



Hatching of catfish eggs



Sundrying of catfish



Dried catfish

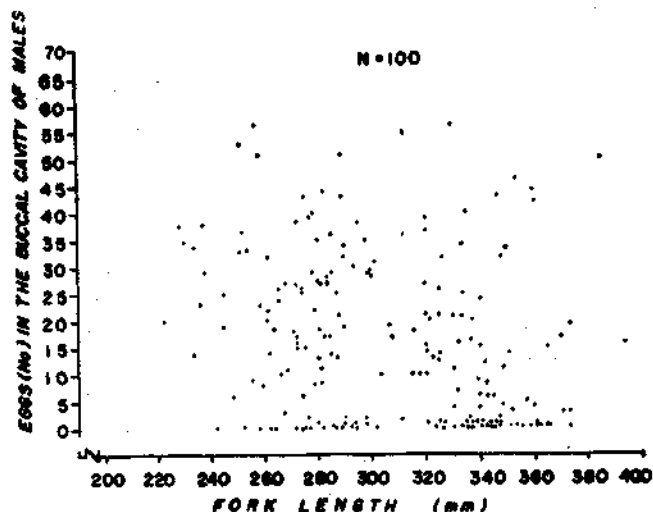


Fig. 5. Relation between the number of incubating eggs in the oro-buccal cavity of the male of *T. maculatus* and the size of the fish.

aberration in the form of *El Nino* current has been responsible for the catastrophic destruction of the Peruvian anchovetta stocks in the early seventies. At present, strict voluntary closed seasons and restrictions in purse seine fishery for tunas such as the young ones of yellowfin, albacore and skipjack tuna in the Pacific have helped the rational exploitation of the stocks. Regulation of the purse seine fishery for the Barrent Sea capelin is yet another example worthy of mention here. Landings of capelin has been prohibited during the summer months, and during the subsequent months a 'minimum legal size' has been imposed on the purse seine fishery by the Norwegian Government. Another example of the depletion of the stocks by the intensive purse seining is that of Japanese sardine fishery the catch of which failed because of the recruitment failure under pressure of fishing.

While every effort should be made to maximize production bearing in mind judicious exploitation to attain stability of production, it is not wise to be complacent when at selected centres excessive or wasteful effort is exerted, threatening the natural resources. It is imperative that there is a strict National Regulatory Policy on the introduction and use of purse seines in our coastal waters. The matters which require attention are:

- (i) Identification and determination of the magnitude of specific resources (single-/eg. mackerel/or multiple-/eg. anchovies/species fishery) for which purse seine could be used and the number of purse seiners to be operated from a particular base for the exploitation of the said resource(s);

- (ii) To prevent frequent shifting of the base of operation of purse seine boats which may be aimed at violating other regulatory control measures and strict control on licensing of purse seine boats from specified bases only;
- (iii) Mesh regulation of the gear and restriction on the size of the species in the fishery and the introduction of 'minimum legal size';
- (iv) Delimitation of the areas and periods for operation of purse seine for a specific resource;
- (v) Control on the basis of annual or seasonal catch quota to be fixed for the fishery at specified bases;
- (vi) Closed seasons for purse seine fishery during periods of spawning of pelagic fishes; and,
- (vii) Prompt filing of duly filled-in fishing log indicating details of effort, fishing operations, (catch-both quality and quantity) and transport by carrier boats and purse seine boats.

Since purse seining with the type of boats in existence (43-48 foot and larger size boats) could be carried out either within or outside the territorial limits from the continental shelf waters, the agency to implement the regulatory measures either at national level or state level should be clearly specified. This may also be viewed in the context of the decision that may result from the law of the sea conference and extended national jurisdiction of Exclusive Economic Zone governing use of coastal water fishery resources.

At present information on the magnitude of the stocks of sardines, mackerels and anchovies in areas of purse seine operations is available. Intensive exploitation of these resources by traditional gear has shown that the fluctuation in the standing stock available in the inshore fishery are due to the fishery independent factors. However, in the present context of the purse seine fishery operating in areas of most of the distributional range of different species in the shelf waters, the whole question of fishing effort in relation to standing stock assumes a new dimension.

In this connection it may be relevant to point out that proper data acquisition on a day-to-day basis from all the purse seine boats for continuous monitoring of the catch and effort becomes essential. The Fishery Data Centre of the Central Marine Fisheries

Table 2. Catch data of *T. maculatus* at Mangalore

Date	No. of units (Purse seine operations)	<i>T. maculatus</i> (tonnes)		Total fish landings	% of <i>T. maculatus</i> (adults)
		Adults	Eggs		
29- 9-1980	75	72.4	5.0	88.5	81.8
30- 9-1980	75	18.5	0.3	101.9	18.2
1-10-1980	75	—	—	186.7	—
3-10-1980	75	—	—	108.9	—
4-10-1980	75	0.3	—	105.3	0.3
6-10-1980	75	—	—	176.5	—
7-10-1980	75	50.0	1.5	216.7	20.1
9-10-1980	75	—	—	216.7	—
10-10-1980	75	27.1	1.0	215.3	12.6
13-10-1980	75	0.8	—	43.4	1.7
14-10-1980	75	11.3	0.01	23.1	48.7
16-10-1980	80	—	—	141.3	—
24-10-1980	84	11.0	—	34.0	32.3
29-10-1980	75	4.5	0.1	64.0	6.3
30-10-1980	75	9.5	—	53.8	17.7
TOTAL:	1,139	204.9	7.91	1,776.1	—

Table 3. Catch data of *T. maculatus* at Malpe

Date	No. of units (Purse seine operations)	<i>T. maculatus</i> (tonnes)		Total fish landings	% of <i>T. maculatus</i> (adults)
		Adults	Eggs		
26- 9-1980	936	241.5	14.0	1,375.6	17.6
15-10-1980					
16-10-1980	66	—	—	202.0	—
17-10-1980	59	—	—	51.6	—
18-10-1980	54	—	—	71.0	—
19-10-1980	56	—	—	97.5	—
20-10-1980	64	—	—	93.5	—
21-10-1980	54	—	—	67.2	—
22-10-1980	59	—	—	77.5	—
23-10-1980	62	—	—	73.0	—
24-10-1980	48	—	—	59.9	—
25-10-1980	52	—	—	212.0	—
26-10-1980	60	—	—	195.0	—
27-10-1980	49	—	—	162.0	—
28-10-1980	52	—	—	55.0	—
29-10-1980	49	—	—	70.0	—
30-10-1980	52	—	—	310.0	—
31-10-1980	61	—	—	358.0	—
TOTAL	1,833	241.5	14.0	3,530.8	—

Table 4. Catch data of *T. maculatus* at Gangoli

Date	No. of units (Purse seine operations)	<i>T. maculatus</i> (tonnes)		Total fish landings	% of <i>T. maculatus</i> (adults)
		Adults	Eggs		
1-10-1980	46	—	—	85.6	—
2-10-1980	46	—	—	237.0	—
3-10-1980	48	0.6	—	252.8	0.2
4-10-1980	48	—	—	288.6	—
5-10-1980	48	26.6	—	132.5	20.0
6-10-1980	52	18.8	—	271.6	6.9
7-10-1980	51	—	—	318.4	—
8-10-1980	46	—	—	54.4	—
9-10-1980	48	20.9	—	20.9	100.0
13-10-1980	46	6.9	—	6.9	100.0
16-10-1980	50	—	—	161.9	—
17-10-1980	40	—	—	44.8	—
18-10-1980	40	—	—	85.8	—
19-10-1980	45	—	—	246.5	—
20-10-1980	45	—	—	75.0	—
21-10-1980	52	5.1	0.4	30.5	16.6
22-10-1980	52	—	—	65.8	—
23-10-1980	45	—	—	30.4	—
24-10-1980	45	—	—	85.6	—
25-10-1980	45	—	—	75.4	—
26-10-1980	50	—	—	58.5	—
27-10-1980	45	—	—	54.0	—
28-10-1980	45	—	—	73.3	—
29-10-1980	50	3.1	—	167.4	1.9
30-10-1980	50	—	—	247.1	—
31-10-1980	50	—	—	111.3	—
TOTAL	1,228	82.0	0.4	3,282.0	—

Research Institute is being strengthened. The department of fisheries of all the maritime states should take proper view of the immediate and long term implications for developing purse seine fishery for specific resources and play an effective role in not only formulating suitable regulatory measures but also in implementing the same for the judi-

cious exploitation of our fish stocks. Implementation of progressive mechanisation and diversification in the fishery without such measures may not be conducive for the development of our marine fisheries. Added to this, the possibilities of heavy pressure on critical stages such as spawning stocks would certainly affect subsequent recruitment into the fishery.*

*Since going to press, the Government of Kerala has promulgated an Ordinance—the Kerala Fisheries Regulation Ordinance, on November 29, 1980.

