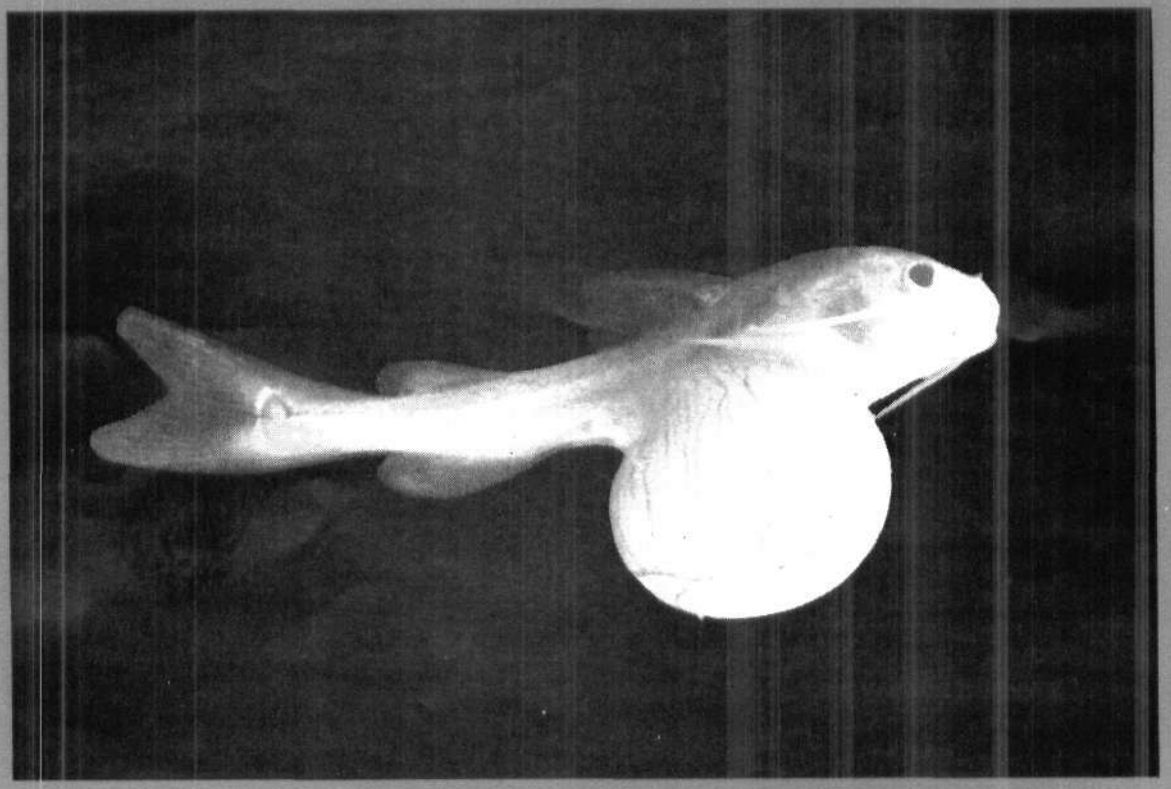
MARINE FISHERIES INFORMATION SERVICE



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Technical and Extension Series

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THE MARINE FISHERIES INFORMATION SERVICE: Technical and Extension Series envisages the rapid dissemination of information on marine and brackish water fishery resources and allied data available with the National Marine Living Resources Data Centre (NMLRDC) and the Research Divisions of the Institute, results of proven researches for transfer of technology to the fish farmers and industry and of other relevant information needed for Research and Development efforts in the marine fisheries sector.

Abbreviation - *Mar. Fish. Infor. Serv., T & E Ser.*, No. **84**: 1988

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Front cover photo:

Newly hatched larva of cat fish, *Osteogeneiosus militaris* taken out from the mouth of a male brooder.

Back cover photo:

A view of the Tuticorin Fisheries Harbour.

MARINE FISH CALENDAR

VI. TUTICORIN*

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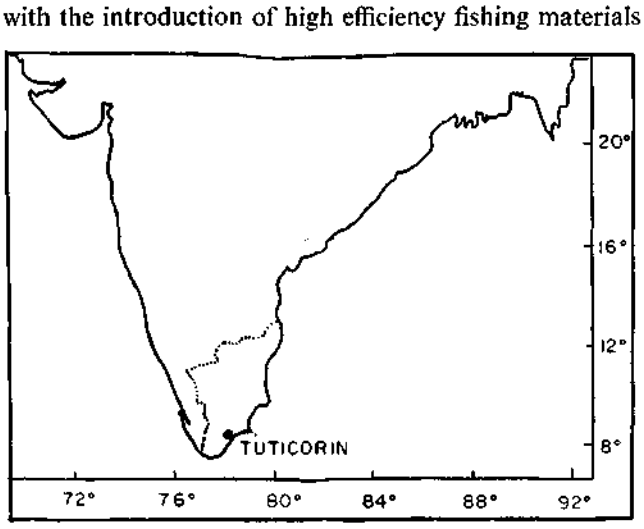
Introduction

Tuticorin is one of the well known, age old, fishery ports of India especially by virtue of the production of valuable, good quality, natural pearls and chanks in addition to marine fish production. Early in the 1911–'15 period the marine fish production here was to the tune of 663,592 pounds (296.3 tonnes) fetching an amount of Rs. 46,929. The fishermen strength was 520 who operated conventional 'valavalai', 'kolavalai', 'madivalai', offshore lining, inshore lining, trolling and other minor nets with the traditional fishing crafts like Tuticorin type of plank built boats called 'Vallam' and 'catamarans'. Percentage composition of important fisheries was ribbon fishes (34.3%), sardines (10.9%), jew fishes (9.5%), perches (8.8%), rock cods (5.8%), seer fishes (3.9%), sea breams (3.8%), sharks and rays (3.7%), red mullets (2.4%), anchovies (2.3%) *etc.*

Towards 1960 a vast transformation occurred in the fishing industry. As the historical pearl fishery of 1955–'61 almost waned into non-existence and the chank fishery being the monopoly of the State Government, fishing for different marine fish took an impetus resulting in a gradual change in the pattern of fishing with the introduction of high efficiency fishing materials like nylon nets and HDP twines in places of conventional hemp and cotton and linen yarns. In 1955–'56 period the total marine fish landing in Tuticorin was 35,000 maunds (392 t) caught by 'kolavalai', Dunlop twine nets, hand lines, R.C. lines, 'valavalai', 'madivalai', whiffing and long lines. During 1964–'65 and 1965-'66, the landing was 752.2 and 1,213.6 t respectively. Of this lesser sardines alone constituted the bulk of the catch accounting for 12.1%. Next in importance were the Indian sprats (9.6%), sea breams (6.7%), rock cods (6.7%), anchovies (6.4%) and seer fish (5.9%). There were distinct seasons for seerfish, tunnies, barracuda and carangid fisheries by troll lines (June – September). Hand lining for serranids, lutianids and lethrinids was brisk till March commencing from October.



Post 1970 period brought about a significant change in the quality and quantity of landings. New dimensions were introduced by seasonal prawn fishing by mechanised boats during July–October. On an average, 240 t of prawns and 1,650 t of fish were landed during early seventies by the mechanised trawlers in addition to 4,200 t landed by traditional fishing crafts. Drift nets landed 61% of the traditional catch, set gill nets 19.5%, line fishing 18.6% and seines 0.9%. In all, 973 net fishermen and 240 line fishermen were in the fishing activity.

Consequent to the improvement in the efficiency and longevity of the fishing gears by the introduction of synthetic fishing materials and prolific expansion of the mechanised trawlers, the artisanal and subsistence fishery metamorphosed into small-scale fishing industry. The construction of minor fishing harbour and interest shown by Kerala fish exporters served as a fillip towards the intensification of fishing activity. The important marine fishery resources of the region are (i) pelagic fishery resources such as clupeids (lesser sardines, Hilsa, Chirocentridae, *etc.*), seer fish, tuna, barracudas, sharks, anchovies, carangids, belones, bill fishes, *etc.*, (ii) Major demersal resources namely perches (lethrinids, rock cods, snappers, *scolopsis etc.*, sciaenids, nemipterids,

* Consolidated by N. Gopinatha Menon and K. Balachandran, CMFRI, Cochin.

silver bellies, *Thrissocles*, cat fish, pomfrets and rays, (iii) molluscan fishery resources like chanks, pearl oysters, edible oysters, squids, cuttle fishes, octopuses *etc.*, (iv) crustacean resources comprising of prawns, lobsters, and crabs and (v) seaweed resources.

Present assessment of fishery resources reveals that in a year 19,850 t of fish are landed by trawlers and 9,275 t by traditional fishing units. Silver bellies are the most dominant in trawl net catches constituting 2,900 t and the important species are *Leiognathus bindus, L. dussumieri* and *Secutor insidiator*. Lesser sardines comprising 2,250 t are constituted by *Sardinella fimbriata, S. gibbosa, S. albella* and *S. sirm*, and are landed mostly by drift gill net called 'Chalai valai'. The king seer *Scomberomorus commerson* forms not less than 90% of total seer fish catch and the rest by the streaked seer, *S. lineolatus* and spotted seer, *S. guttatus*. This resource is exploited mostly by drift gill nets, hand lines, long lines, trolling and to some extent by trawlers. The annual average catch of seer fish is 374 t. Though seer fish occur throughout the year the peak period of abundance coincides with the tuna season during July – September. *Auxis thazard, Euthynnus affinis, Sarda orientalis* and *Thunnus tonggol* support fishery of tuna and annually 502 t are landed. Perches of the area are lethrinids, *Epinephelus* spp. *Diagramma* spp. *Drepane* spp. serranids, *Scolopsis* spp., *Pomadasys* spp., *Nemipterus* spp. *etc.* The last three groups along with lethrinids are landed in good quantity by trawlers and the bigger perches are landed by drift gill nets and hooks and line. On an average 5,712 t of perches are landed in a year. *Sphyraena obtusata* is landed abundantly by trawlers from inshore water, whereas from deeper waters drift gillnets and hooks and line land *S. jello* and *S. picuda* and the annual catch of barracuda is to the tune of 685 tonnes.

The once popular shore-seine fishing which was one of the important gears for landing shore hugging coastal fishes including lesser sardines has almost vanished from this region following the intensification of mechanised fishing. Over the two decades, mechanised fishing has changed not only the fishing pattern but also the constituent catches. The progress of fishing industry can still be augmented by motorising the plank built boats and 'catamarans'. As early as in 1958, Tuticorin type 'vallam' was recognised by FAO as suitable for motorization which is now fast catching up as more and more 'vallams' and even 'catamarans' are being motorized. In addition to this, the introduction of high opening bottom trawl for pair trawling operations through FAO sponsored Bay of Bengal Programme (BOBP) has induced greater interest among the fishermen and already on an average ten pairs of trawlers are engaged in this new type of fishing. The catch is constituted mostly of valuable large size quality fishes like lethrinids, rock cods, snappers, seer fish, pomfrets, horse mackerel and carangids. Introduction of such new dimensions into fishing coupled with the higher rate of yield/sq. nautical mile of this water especially of demersal resources is bound to revolutionise the fishing pattern and enhance the marine fish productions in good proportion.

CARANGIDAE

Popular English Name	:	Trevally/Scad
Vernacular Name (Tamil)	:	'Parai'
Annual average catch	:	736.1 t
Percentage in total catch	:	2.5
Fishing methods and their contribution	:	Trawl net : 2.49% Drift net : 0.03 %
Period of occurrence	:	Aug. – Feb.
Depth of occurrence	:	20 – 50 m

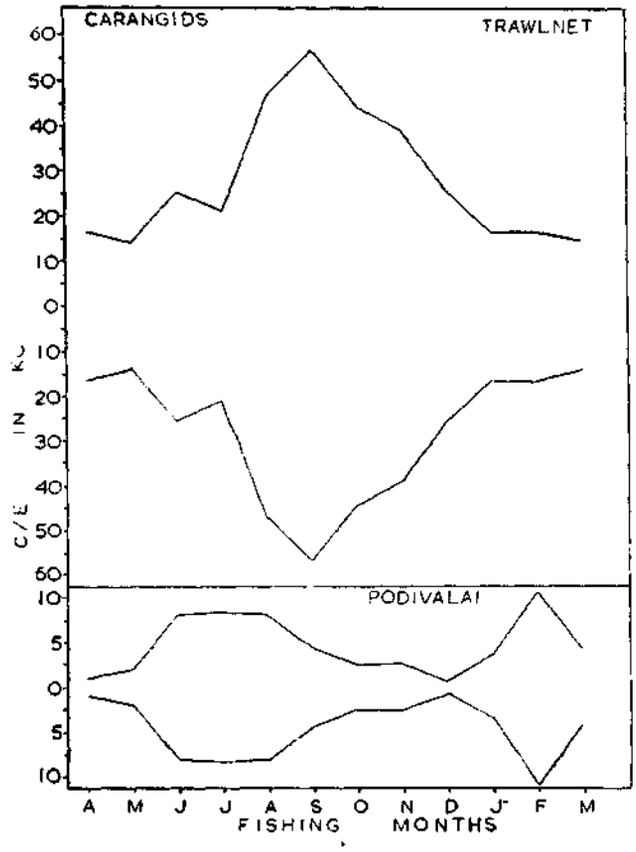


Fig. 1. Seasonal abundance of carangids in trawling and drift gill net grounds.

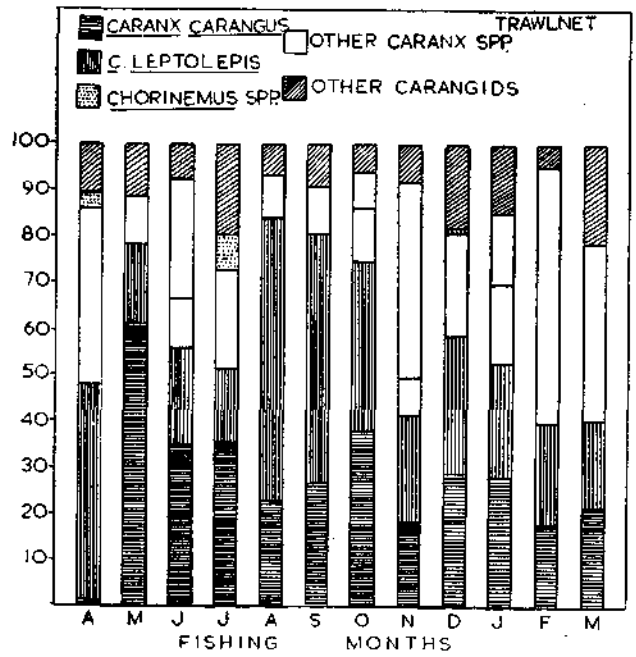


Fig. 2. Monthly species composition of carangids landed by trawlers.

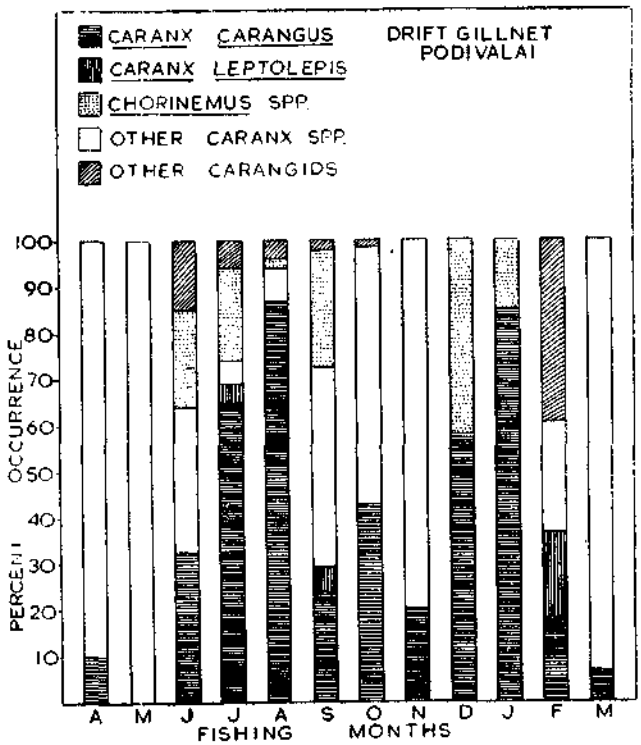


Fig. 3. Monthly species composition of carangids landed by drift gill net.

SCOMBRIDAE

Popular English Name : Seer fish
Vernacular Name (Tamil) : 'Neimeen'/'Vanjiran'/'Cheela'
Annual average catch : 374.4 t
Percentage in total catch : 1.3
Fishing methods and their contribution : Drift gill net : 0.7%
Trawl net : 0.4%
Hooks & line : 0.2%

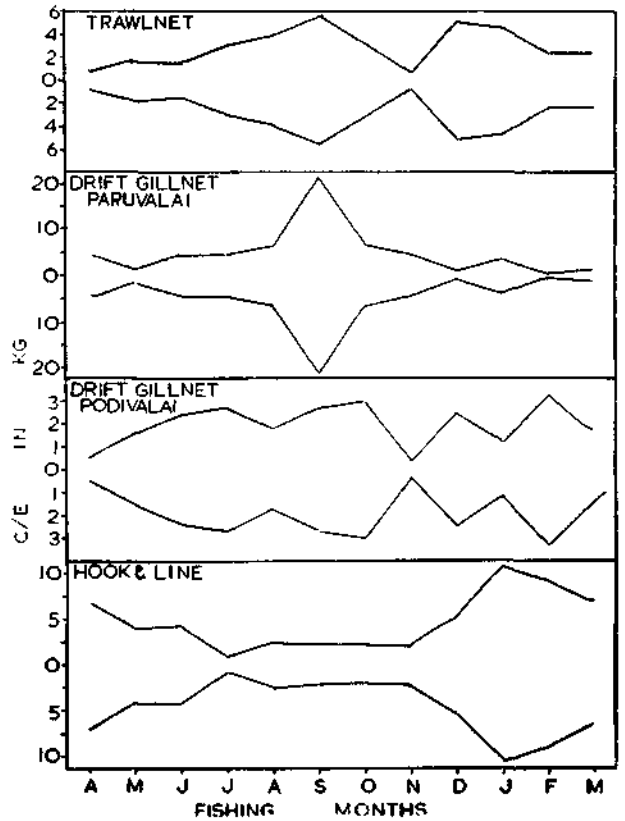


Fig. 4. Seasonal abundance of seer fishes in different fishing grounds.

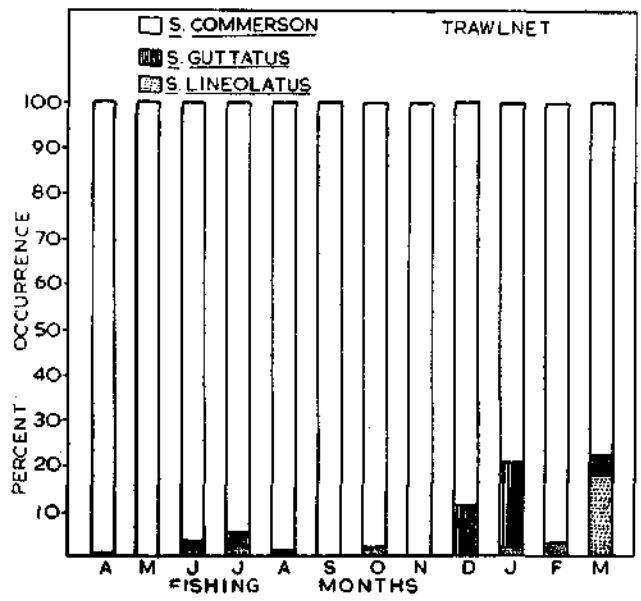


Fig. 5. Monthly species composition of seer fish landed by trawlers.

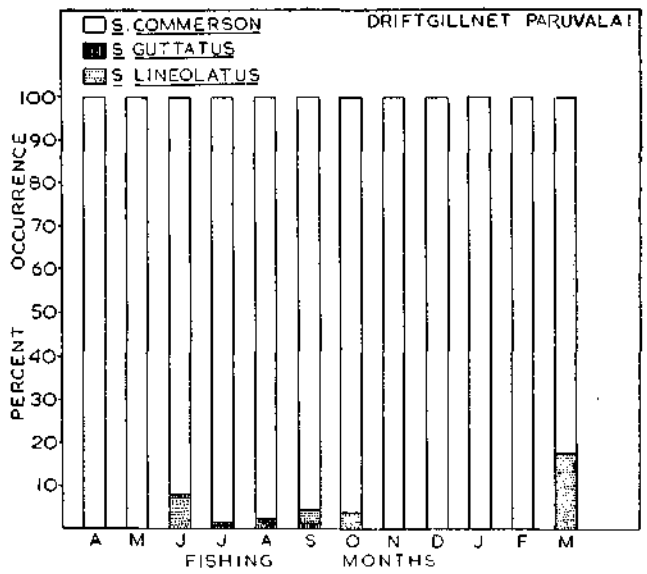


Fig. 6. Monthly species composition of seer fish landed by drift gill net (Paruvalai).

Fig. 7. *Scomberomorus commerson.*

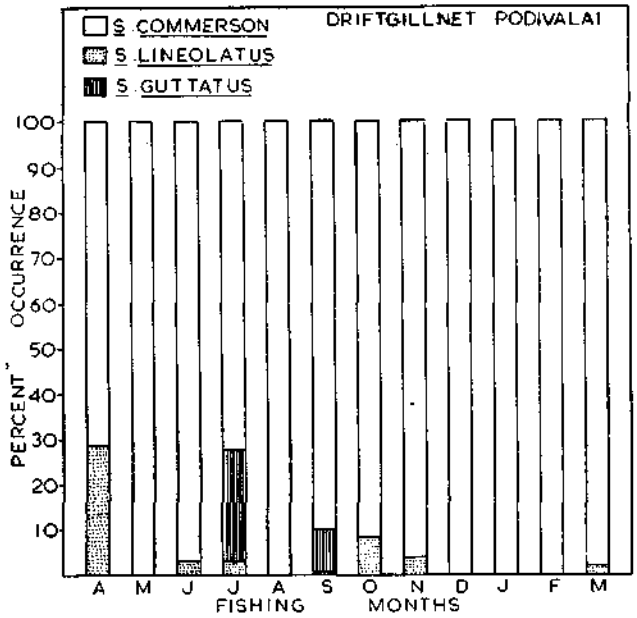


Fig. 8. Monthly species composition of seer fish landed by drift gill net (Paruvalai).

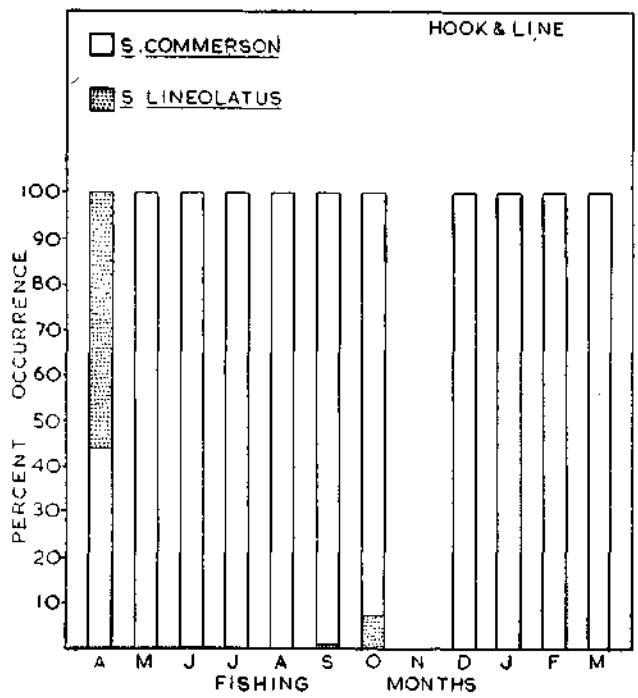


Fig. 9. Monthly species composition of seer fish landed by hook and line.

Scientific Name	:	*Scomberomorus commerson*
Vernacular Name	:	'Nettayan'/'Cheela'
Gear	:	Drift gill net/Hooks and line/Trawl net
Percentage in the catch of the group	:	Drift net ('Paruvalai') : 96.2 Drift net ('Podivalai') : 92.7 Hooks & line : 94.2 Trawl net : 92.4
Peak period of occurrence	:	Jun. - Oct. and Jan.-Mar.
Depth of occurrence	:	20 – 60 m
Length range in commercial fishery	:	100 – 1,400 mm
Size at first maturity	:	—
Spawning season	:	Nov. – Jan.

Tunas & Bill fishes

Popular English Name	:	Tuna
Vernacular Name (Tamil)	:	'Surai'
Annual average catch	:	502.4 t
Percentage in total catch	:	1.7
Fishing methods and their contribution	:	Drift gill net : 1.7%

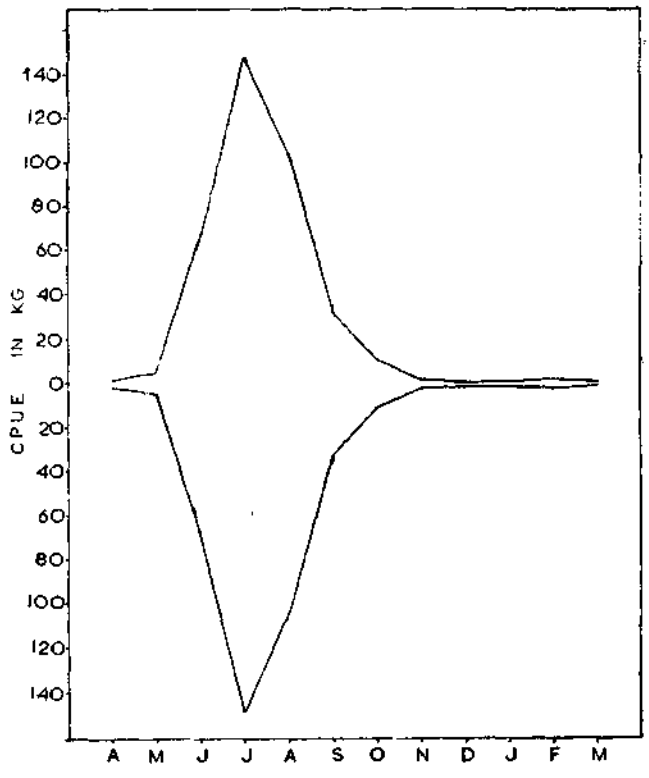


Fig. 10. Seasonal abundance of tuna and bill fishes.

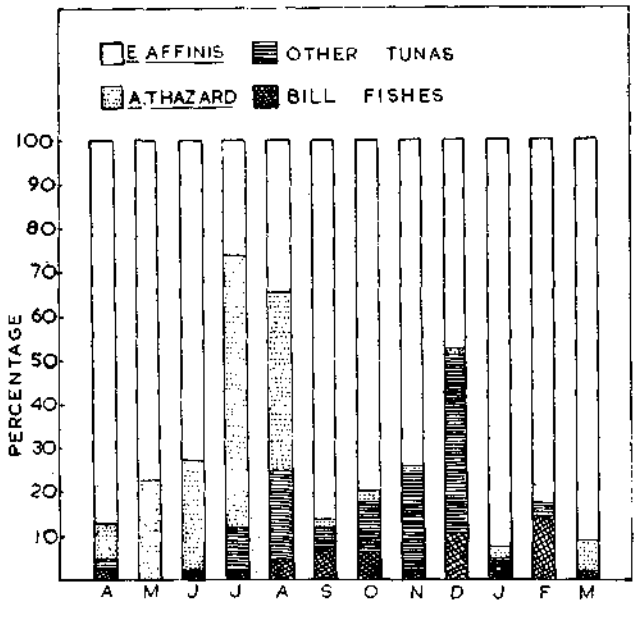


Fig. 11. Monthly species composition of tuna and bill fishes landed by drift gill net.

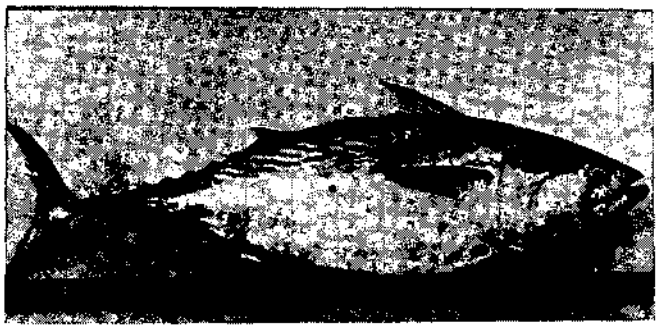


Fig. 12. *Euthynnus affinis.*

Scientific Name	:	*Euthynnus affinis*
Vernacular Name	:	'Parunsurai'
Gear	:	Drift gill net
Percentage in the catch of the group	:	70.7
Peak period of occurrence	:	Jun. – Aug.
Depth of occurrence	:	30 – 40 m
Length range in commercial fishery	:	440 – 600 mm
Size at first maturity	:	480 mm
Spawning season	:	Sep. – Nov.

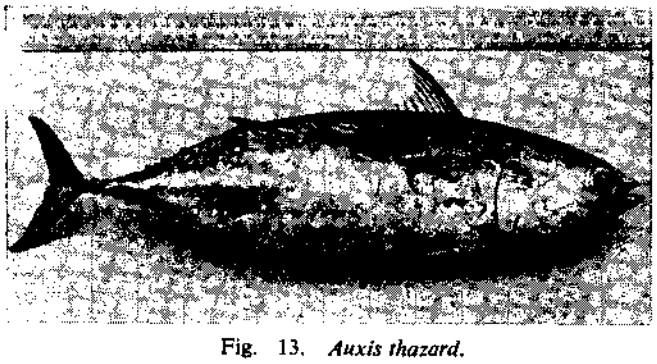


Fig. 13. *Auxis thazard.*

Scientific Name	:	*Auxis thazard*
Vernacular Name	:	'Elisurai'
Gear	:	Drift gill net
Percentage in the catch of the group	:	14.6
Peak period of occurrence	:	Jun. – Aug.
Depth of occurrence	:	30 – 40 m
Length range in commercial fishery	:	300 – 420 mm
Size at first maturity	:	300 mm
Spawning season	:	Sep. – Mar.

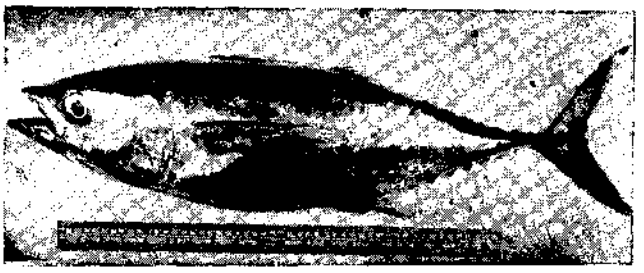


Fig. 14. *Thunnus albacares.*

Scientific Name	:	*Thunnus albacares*
Vernacular Name	:	'Keelavalai'
Gear	:	Drift gill net
Percentage in the catch of the group	:	7.0
Peak period of occurrence	:	—
Depth of occurrence	:	30 - 40 m
Length range in commercial fishery	:	—
Size at first maturity	:	—
Spawning season	:	—

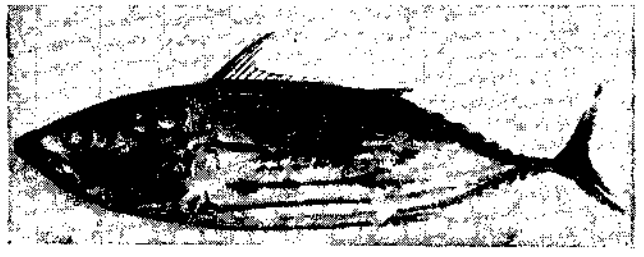


Fig. 15. *Katsuwonus pelamis.*

Scientific Name	:	*Katsuwonus pelamis*
Vernacular Name	:	'Varisurai'
Gear	:	Drift gill net
Percentage in the catch of the group	:	1.1
Peak period of occurrence	:	—
Depth of occurrence	:	30 - 40 m
Length range in commercial fishery	:	—
Size at first maturity	:	—
Spawning season	:	—

Scientific Name	:	*Thunnus tonggol*
Vernacular Name	:	'Eutavalai'
Gear	:	Drift gill net
Percentage in the catch of the group	:	0.7

Fig. 16. *Thunnus tonggol.*

Peak period of occurrence	:	—
Depth of occurrence	:	30 - 40 m
Length range in commercial fishery	:	—
Size at first maturity	:	—
Spawning season	:	—

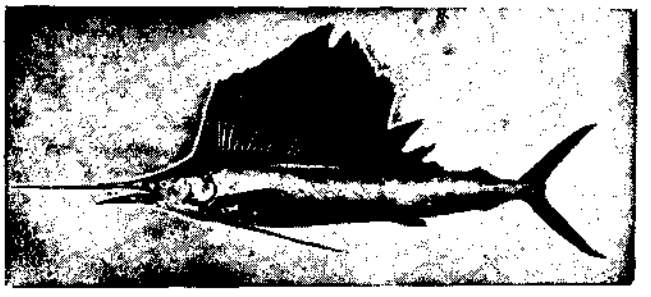


Fig. 17. *Istiophorus platypterus.*

Scientific Name	:	*Istiophorus platypterus*
Vernacular Name	:	'Kopperakkulla'
Gear	:	Drift gill net
Percentage in the catch of the group	:	4.1
Peak period of occurrence	:	—
Depth of occurrence	:	30 - 40 m
Length range in commercial fishery	:	—
Size at first maturity	:	—
Spawning season	:	—

CLUPEIDAE

Popular English Name	:	Sardine
Vernacular Name (Tamil)	:	'Salai'/'Choodai'/ 'Keerimeen chalai'/ 'Paisalai'
Annual average catch	:	3,855.2 t
Percentage in total catch	:	13.2
Fishing methods and their contribution	:	Gill net : 13.2%

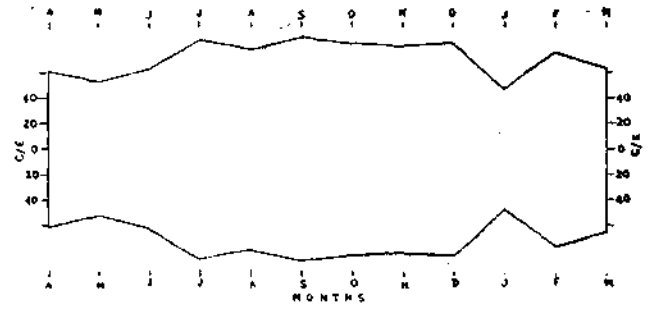


Fig. 18. Seasonal abundance of sardines by indigenous fishing units.

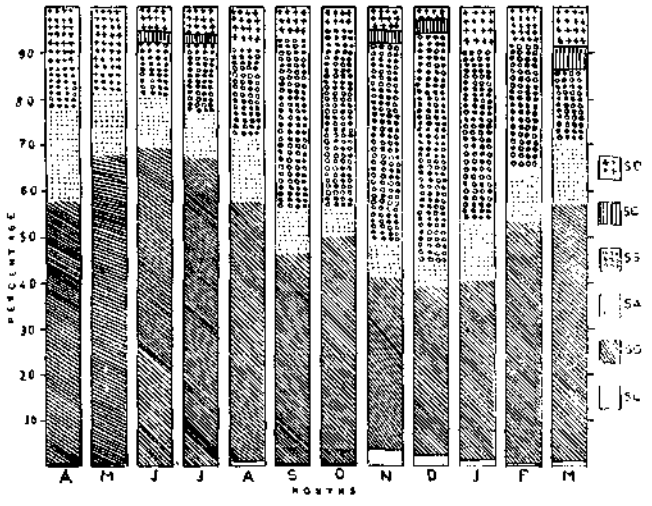


Fig. 19. Monthly species composition of sardines landed by indigenous fishing units (SD – *Sardinella dayi;* SC – *S. clupeoides;* SS – *S. sirm;* SA – *S. albella;* SG – *S. gibbosa* and SL – *S. longiceps).*

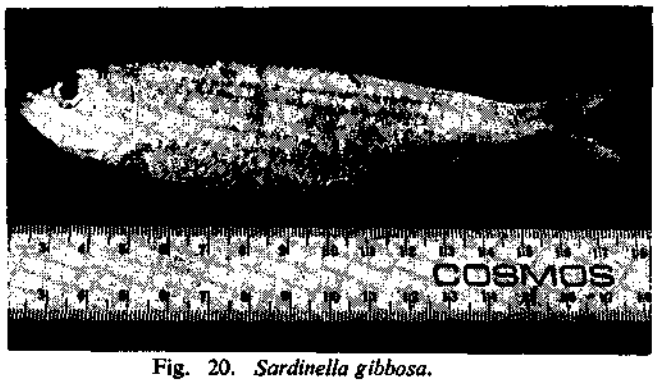


Fig. 20. *Sardinella gibbosa.*

Scientific Name	:	*Sardinella gibbosa*
Vernacular Name	:	'Salai'
Gear	:	Gill net
Percentage in the catch of the group	:	52.1
Peak period of occurrence	:	May – Jul.
Depth of occurrence	:	5 – 10 m
Length range in commercial fishery	:	100 – 180 mm
Size at first maturity	:	120 mm
Spawning season	:	June

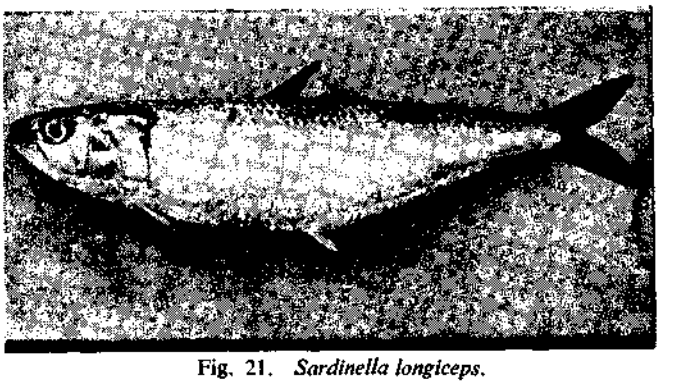


Fig. 21. *Sardinella longiceps.*

Scientific Name	:	*Sardinella longiceps*
Vernacular Name	:	'Peisalai'
Gear	:	Gill net
Percentage in the catch of the group	:	0.9
Peak period of occurrence	:	Nov. – Dec.
Depth of occurrence	:	5 – 10 m
Length range in commercial fishery	:	120 – 165 mm
Size at first maturity	:	140 mm
Spawning season	:	March

Fig. 22. *Sardinella dayi.*

Scientific Name	:	*Sardinella dayi*
Vernacular Name	:	'Choodai'
Gear	:	Gill net
Percentage in the catch of the group	:	7.3
Peak period of occurrence	:	Apr. – May
Depth of occurrence	:	5 – 10 m
Length range in commercial fishery	:	100 – 165 mm
Size at first maturity	:	120 mm
Spawning season	:	Feb.

Scientific Name	:	*Sardinella sirm*
Vernacular Name	:	'Karimeen chalai'
Gear	:	Gill net
Percentage in the catch of the group	:	27.8
Peak period of occurrence	:	Nov. – Dec.
Depth of occurrence	:	5 – 10 m
Length range in commercial fishery	:	145 – 220 mm
Size at first maturity	:	170 mm
Spawning season	:	August

Scientific Name	:	*Sardinella albella*
Vernacular Name	:	'Choodai'
Gear	:	Gill net
Percentage in the catch of the group	:	10.8
Peak period of occurrence	:	April
Depth of occurrence	:	5 – 10 m
Length range in commercial fishery	:	100 – 165 mm
Size at first maturity	:	110 mm
Spawning season	:	June

ON THE AVAILABILITY OF TUNA LIVE-BAIT FISHES AT VIZHINJAM*

Introduction

The success of tuna fishing by pole and line depends mainly on the availability of live-bait fishes. About 230 species of fishes representing 34 families are being used as live-baits in the pole and line fishing to capture Skipjack tuna throughout the Pacific, Atlantic and Indian Oceans with varying degrees of success and many other species are no doubt employed as live-bait but not reported in literature. In India an acute shortage of live-bait fishes has been faced in recent times in the Lakshadweep waters. In view of this a preliminary survey was made at Vizhinjam from May, 1986 to April, 1987 to find out their availability, and a brief report is given here with a view to suggesting future programme to be undertaken from this area.

Characteristics of an ideal live-bait

The most desirable characteristics of a good bait fish are: 1) highly reflective lateral surface, (2) surface swimming with rapid erratic motion, (3) tendency to return to the vessels when broadcast, (4) length below 15 cm, preferably 6–8 cm with elongate body, (5) abundance, availability to the fishery and the ease with which it can be handled and (6) hardiness and survival for extended periods in captivity.

* Prepared by P.S.B.R. James, CMFRI, Cochin and S. Lazarus and C. S. Gopinadha Pillai, VRC of CMFRI, Vizhinjam.

Bait fishes available at Vizhinjam

Vizhinjam (8°22′30″ N and 76° 59′ 15″ E) falling almost in the same meridian as that of Minicoy, offers a variety of small sized fishes having the above mentioned characteristics of bait fishes. Some forms like *Stolephorus* spp., *Sardinella* spp., and post larvae and juveniles ('Nonnavu') of other commercially important groups of fishes have a regular fishery in this area. Percoid fishes represented by families Pomacentridae, Apogonidae and Labridae are encountered in this area mainly in the 'paar' (coral) regions, but they are not represented in appreciable quantities in the commercial landings and hence species composition and catch data are not given in this report. Bait fishes available at Vizhinjam with their seasons of occurrence are given in Table 1.

Among the fishes listed in Table 1 the following forms namely *Caesio caerulaureus, Dipterygonotus leucogrammicus, Labroides dimidiatus, Pomacentrus pavo, Apogon sangiensis, Chromis caeruleus* and *Pranesus duodecimalis* are used as live-baits in the pole and line fishing in the Lakshadweep area. Of these *Caesio caerulaureus* is available in its juvenile stage ranging in sizes from 89–145 mm during February–March in the boat seine catches at Vizhinjam. *Dipterygonotus leucogrammicus* is available during March in sizes ranging from 43–57 mm, similar to that of the size available

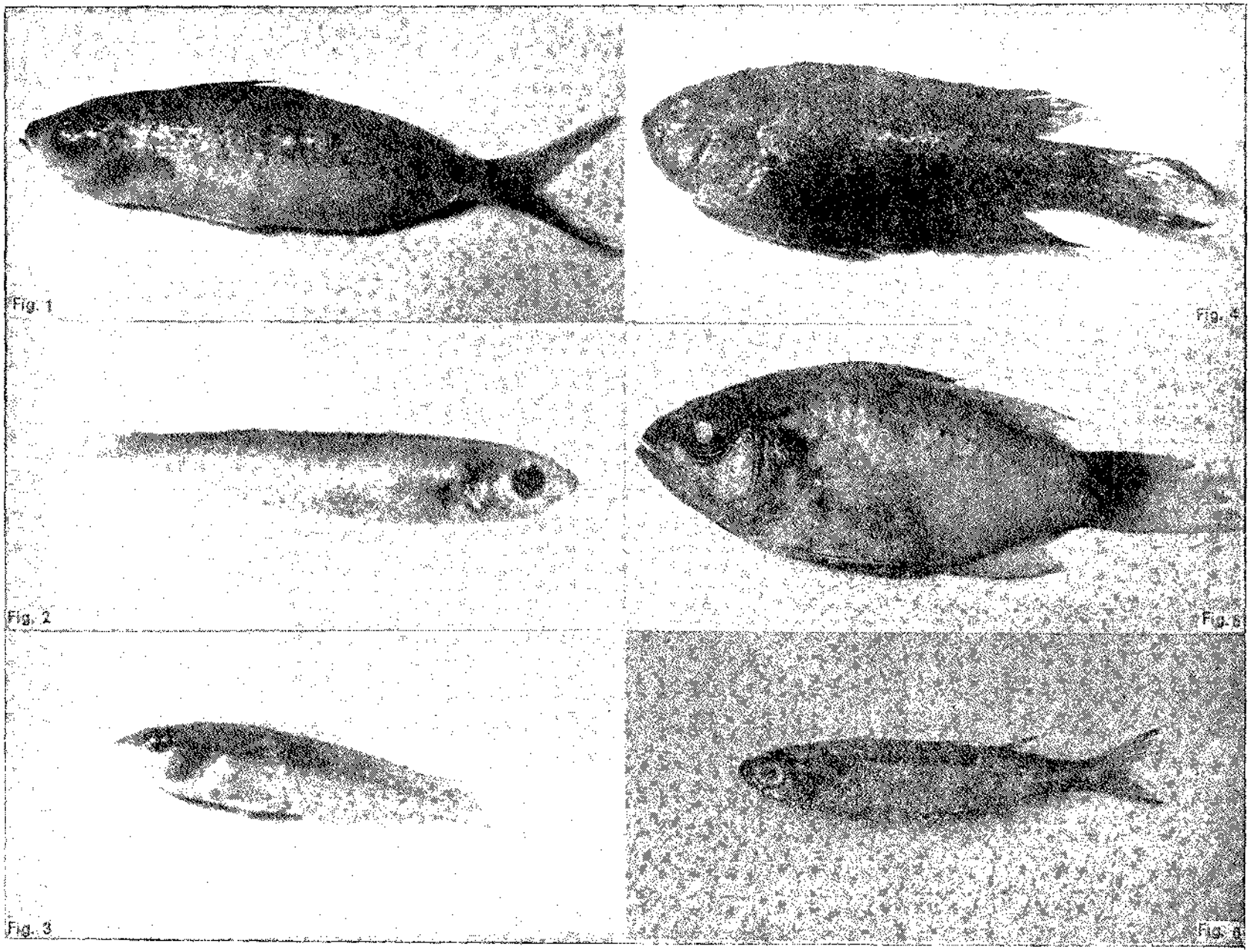


Fig. 1. *Caesio caerulaureus* 114 mm (TL)
Fig. 2. *Dipterygonotus leucogrammicus* 56 mm (TL)
Fig. 3. *Labroides dimidiatus* 45 mm (TL)
Fig. 4. *Pomacentrus pavo* 91 mm (TL)
Fig. 5. *Apogon sangiensis* 110 mm (TL)
Fig. 6. *Pristotis duodecimalis* 105 mm (TL)

Table 1. *Bait fishes available at Vizhinjam and the seasons of their occurrence*

Family	Species	Size range (mm)	Season of occurrence
Caesiodidae	*Caesio caerulaureus*	85 – 145	January – March
Emmelichthyidae	*Dipterygonotus leucogrammicus*	43 – 57	March – April
Labridae	*Labroides dimidiatus*	35 – 45	February – March
Pomacentridae	*Pomacentrus pavo*	75 – 90	February – March
	Chromis caeruleus	115 – 122	January – March
Apogonidae	*Apogon sangiensis*	112 – 115	March – April
Atherinidae	*Pranesus duodecimalis*	25 – 76	April – October
Ambassidae	*Ambassis gymnocephalus*	20 – 88	October - February
Clupeidae	*Stolephorus spp.* (7 species)	10 – 140	April – October/December
	Sardinella spp. (5 species)	20 – 215	April – August and October – December

in the Lakshadweep area. Luther *et al.* (Symp. Coastal Aquaculture, 3: 861–875, 1984) reported that *Pranesus duodecimalis* occurs in large quantities in the Vizhinjam area during April to October. According to them this fish has a high rate of survival in captivity. Other types of live-bait fishes reported here occur in this area in stray numbers.

The glassy perch *Ambassis gymnocephalus,* has all the characters of a live-bait and is available in large quantities in this area right from the egg stage onwards. An attempt to transfer this fish to the Lakshadweep Island waters and to try them as bait for pole and line fishing for tuna appears to be worth considering.

Bait fish gears

Bait fishes are caught mainly by seine nets (boat seine and shore seine). They are also fished by gill nets and hooks and line ('Achil') at certain seasons. The juvenile fishes are caught by a small meshed shore seine called *'Nonna vala'*.

Remarks

The studies of Kuthalingam *et al. (Proc. Natl. Sem. Cage Pen culture,* 87–88, 1983) and Luther *et al.* (*op. cit.,* 1984) have given some idea about the survival rates of some of the bait fishes in captivity. However, collecting the bait fishes from the commercial catches and keeping them in floating cages seem to be a laborious task. So it is time to think about artificially breeding the important bait fishes by collecting the brood stock from the wild. In addition, surveys should be conducted in the nearby areas also to identify suitable resources of live-bait fishes and develop methods to transport and maintain the stock for later use in the tuna fishery. Attempts should also be made to identify alternate species which could be used as live-baits. *Ambassis gymnocephalus* is one such species which could be experimented with. The present study indicates that the species like *Caesio caerulaureus, Dipterygonotus leucogrammicus* and *Pranesus duodecimalis* deserve further studies.

OLIVE RIDLEYS LANDED AT PAMBAN REPORTED*

Landing of 7 and 6 Nos. of *Lepidochelys olivacea* on 7th & 9th January, 1988 respectively at Pamban caught in trawl net from the Gulf of Mannar off Dhanushkodi at a depth of 12–15 m has been reported. The carapace length of the turtles varied from 61 to 70 cm and the width from 55 to 62 cm.

* Reported by C. Kasinathan, Mandapam Reg. Centre of CMFRI, Mandapam Camp.

PHYTOPLANKTON BLOOMS ALONG THE INDIAN COASTS—SOME HIGHLIGHTS*

Introduction

Blooms of plant origin are known to occur under various conditions in the inshore regions. These may take place, often with cyclical regularity in any particular area when some optimum conditions of temperature, salinity, sunlight, nutrients *etc.* prevail in the marine environment. The bloom usually takes place rather suddenly and may spread with amazing speed, sometimes changing the colour of the surface waters into red, green or hay colour. The blooms will be normally monotypic.

The most important factor for the phytoplankton blooms is the presence of high quantities of nutrients in the surface waters which may be due to the process of upwelling or run off from land. Thus it has been observed that the majority of blooms appear during monsoons or soon after.

The southwest coast of India is known for intense upwelling during the southwest monsoon period. During this period the nutrient rich subsurface water is brought to the surface, which provides congenial condition for high productivity at the primary level, sometimes leading to the flowering of certain species of phytoplankters.

Trichodesmium though totally non-toxic, can cause fish kills when it occurs in blooms by clogging the gills. Usually fish tend to avoid such thick blooms as these are not much favoured as food and ingested only accidentally. Destruction of corals can also take place due to the depletion of oxygen when thick dumps of *Trichodesmium* decompose.

The CMFRI has been continuously monitoring the pattern of productivity at the primary and secondary levels in the inshore fishing grounds at important fish landing centres along the coasts of India. During the course of these investigations phytoplankton blooms have been recorded regularly from the selected centres. The present article embodies a critical appraisal of the blooms observed at Karwar, Mangalore, Cochin, Vizhinjam, Tuticorin and Madras from 1982 to 1987.

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Observations and results

Noctiluca miliaris, Coscinodiscus sp. and *Fragilaria oceanica* are the three common species which appear in blooms regularly. There are some other phytoplankters also which bloom occasionally at restricted areas. These include species of *Ceratium, Chaetoceros, Rhizosolenia, Biddulphia, Skeletonema, Thalassionema, Thalassiosira subtilis, Thalassiothrix* and *Trichodesmium.* The organisms which bloomed at various centres in different years under study are given in Table 1.

Noctiluca miliaris appeared in blooms in some place or other in all the years under consideration. The period of blooming of this species was found to be between August and April of every year except in Madras where it occurred in June, 1984 also. At Karwar during a two year period under observation, *N. miliaris* occurred in blooms in September, 1982. At Mangalore it occurred continuously for four months from November, 1986 to February, 1987. At Cochin though observations were on from 1984 onwards only, blooms of *N. miliaris* were seen in three months (February, March and June) in 1986 and April, 1987. At Vizhinjam, August to November was the period for the blooms of *Noctiluca.* Thus in 1982, the bloom occurred in October but in 1983, it was during August and September. Blooms were not observed during 1984 and 1985 but appeared again in November 1986. A striking peculiarity observed in the occurrence of blooms of *Noctiluca* was that while at Mangalore and Vizhinjam blooms appeared during November–December, in 1986 and November in 1987 respectively, at Cochin during some years the bloom took place in February, March and June. Thus it is seen that *Noctiluca,* as a rule, appears in blooms during the post monsoon and premonsoon seasons when the water temperature is comparatively high and required amounts of nutrients are present in the surface waters especially during the post monsoon period.

From Madras reports were received with regard to the blooms of *Ceratium* sp. in 1982 (May & June) and 1984 (April & May). However, from 1985 to 1987 flowering of this species had not been reported from Madras.

Blooms of *Coscinodiscus* sp. had been reported from the northern parts of the southwest coast of India namely Karwar and Mangalore and Madras on the

Table 1. *Details of occurrence of phytoplankton blooms at different centres during* 1982 – '87

Species		1982	1983	1984	1985	1986	1987
1. *Noctiluca miliaris*	Karwar	Sep.	—	No	No	No	No
	Mangalore	—	—	—	—	Nov., Dec.	Jan., Feb.
	Cochin	No	No	—	—	Feb., Mar., Jun.	Apr.
	Vizhinjam	Oct.	Aug., Sep.	—	—	Nov.	—
	Madras	Aug., Sep.	No	Jun.	—	—	—
2. *Ceratium* sp.	Madras	May, Jun.	No	Apr., May	—	—	—
3. *Coscinodiscus* sp.	Karwar	Jan., Dec.	Jan., Feb.	No	No	No	No
	Mangalore	—	Mar.	—	Nov.	Feb., Mar.	—
	Madras	—	No	Apr., Sep., Dec.	Jan.	—	—
4. *Fragilaria oceanica*	Cochin	No	No	Jul.	Jul.	Jul.	Jun., Aug.
	Vizhinjam	Jul.	—	—	Jun.	—	—
5. *Chaetoceros* sp.	Karwar	Feb.	—	No	No	No	No
	Vizhinjam	Aug.	—	—	—	—	—
6. *Rhizosolenia* sp.	Mangalore	—	—	—	Nov.	—	—
	Vizhinjam	—	—	—	Jun.	—	—
	Madras	May, Jun.	No	—	—	—	—
7. *Biddulphia* sp.	Mangalore	—	—	—	Nov.	—	—
8. *Skeletonema* sp.	Mangalore	—	Feb.	—	—	—	—
	Madras	Jun.	No	—	—	—	—
9. *Thalassionema* sp.	Vizhinjam	—	—	—	Jun.	—	—
10. *Thalassiosira subtilis*	Vizhinjam	—	—	—	—	—	Jun.
11. *Thalassiothrix* sp.	Madras	Apr.	No	—	—	—	—
12. *Trichodesmium* sp.	Tuticorin	—	—	—	Aug., Oct.	Aug.	Apr., May
	Madras	Jun.	No	Apr.	—	—	—

No = No observation.
— = Not present.

east coast. At Karwar it occurred during both the years of observation. In general November-March was the period of bloom for this species. During January and December in 1982 it appeared in blooms at Karwar. From December, 1982 the bloom continued up to March, 1983 at this centre. At Mangalore out of six years under consideration, the *Coscinodiscus* sp. was in bloom during 1983 (March), 1985 (November) and 1986 (February & March). On the east coast, the bloom took place in April, September and December in 1984 and January in 1985 in Madras. From the data obtained it could be seen that the period of bloom for *Coscinodiscus* sp. was almost the same as that of *Noctiluca miliaris* though they were not seen in blooms simultaneously in any year.

Fragilaria oceanica is a typical phytoplankton which appears in blooms during the monsoon season especially in the southern parts of the southwest coast of India. Ever since regular sampling started in Cochin, the species occurred in blooms in one of the months of June, July or August. While in 1984, '85 and '86 it occurred in dense blooms in July, in 1987 it was abundant during June and August. At Vizhinjam, however, *Fragilaria oceanica* was in bloom occasionally, in 1982 and 1985. But the phenomenon appeared in June in both the years.

Chaetoceros sp. was found in blooms at both Karwar and Vizhinjam in 1982. However, the period of occurrence was totally different, being in February at the former centre and August at the latter. Similarly, *Rhizosolenia* sp. was another species which was in bloom in different periods at two different centres. At Mangalore while the bloom was in November in 1985, at Vizhinjam it was in June of the same year. Blooms of *Skeletonema* sp. was observed once only at Mangalore in February, 1983 and at Madras in June, 1982.

Five other species of phytoplankton which appeared in blooms at the various centres under observation were restricted to any one of the centres during a particular year or years. Thus *Biddulphia* sp. was in blooms at Mangalore in November, 1985, *Thalassionema* sp. and *Thalassiosira subtilis* at Vizhinjam in June, 1985 and 1987 respectively. *Thalassiothrix* sp. was the fourth species in this category which appeared in blooms in Madras in June, 1982.

Trichodesmium sp., the fifth species was reported only from the lower east coast. The period of bloom varied from year to year. Thus in Tuticorin it appeared during August and October in 1985, while in 1986 in August only. In 1987 the bloom occurred in the premonsoon months of April and May. In Madras the two occasions on which *Trichodesmium* were in bloom were June, 1982 and April, 1984.

An evaluation of the environmental features during the period of blooms at the respective centres revealed the following. At Karwar, the *Noctiluca* blooms appeared when there was a drastic reduction in salinity values (19.34‰). *Coscinodiscus* sp. and *Chaetoceros* sp. were in blooms in salinities ranging from 32.40 to 34.43‰. When the blooms occurred the surface temperature was relatively low and between 25.6 and 27.5°C. The dissolved oxygen content was well above optimum level and ranged between 3.79 and 4.25 ml/l.

When the blooms occurred at Mangalore, the temperature was rather high and ranged between 27.5 and 33.5°C. The salinity was also relatively high and varied from 33.97 to 35.3 ‰. The dissolved oxygen values were considerably low in November, 1985 (2.80 ml/l), when *Coscinodiscus* sp., *Rhizosolenia* and *Biddulphia* were in blooms and February (2.53 ml/l) and March, 1986 (2.76 ml/l) when *Coscinodiscus* sp. was in blooms.

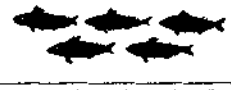
At Cochin when *Noctiluca* bloom occurred, the surface temperature varied between 27.0 and 31.5°C. The salinity was also relatively high with a minimum of 32.25 and a maximum of 35.75‰. However, *Fragilaria oceanica* appeared in blooms in low temperature and salinity. The lowest temperature was 22.2°C while the maximum registered was 31.5°C. Most of the temperature values were below 30°C. The salinity values showed a wide range, the lowest being 10.55 and the highest 35.75‰.

Vizhinjam was the centre where single species and mixed species blooms occurred in the different years. When *Noctiluca* blooms occurred at this centre there was no unusual environmental conditions present in the sea. The temperature ranged between 27.80 and 30.00°C, while the salinity varied from 30.6 to 35.68‰. When the mixed bloom of *Fragilaria oceanica, Rhizosolenia* sp, and *Thalassionema* sp. occurred in June, 1985, the temperature was as low as 26°C. However, during another mixed bloom with *Thalassiosira subtilis* as the dominant form in June, 1987 the surface temperature was 24.0°C. During any of the above blooms the salinity registered values between 33.5 and 35.68‰. The dissolved oxygen values always remained well above the optimum level and ranged between 4.50 and 4.85 ml/l.

When the blooms of *Trichodesmium* sp. were noticed from 1985 to 1987, in the Tuticorin waters the surface temperature fluctuated between 28.5 and 31.0°C and salinity between 32.8 and 34.84‰. The oxygen values were fairly high and ranged from 4.62 to 5.15 ml/l. The temperature and salinity values recorded during both the years when this species was in bloom in Madras were almost the same around 28.5°C and 31.0‰ respectively.

An examination of the environmental parameters in relation to blooms for Madras revealed the following. In general, the salinity values were considerably less when blooms occurred. The surface temperature was low (24.38°C) when the bloom of *Noctiluca miliaris* appeared in 1982. However, in 1984 the surface temperature was relatively high (28.4°C) and salinity low (33.6‰). When *Coscinodiscus* sp. was in blooms the surface temperature and salinity showed lower than normal values. *Rhizosolenia* sp., *Skeletonema* sp., and *Thalassiothrix* sp. were also in blooms in low saline cool water.

A close consideration of the foregoing facts indicates that the occurrence of phytoplankton blooms is a regular phenomenon in the coastal waters, than incidental. While it is possible that the interaction of environmental parameters act as triggers for the sudden outbursts of blooms, it is difficult to pin point any one parameter as responsible for this. May be a combination of various parameters is necessary to create an optimum condition for the flowering of any one species. Perhaps it might be a sudden increase or decrease in the values of certain environmental features that act as triggers for an organism to multiply at an explosive rate. Further works, particularly on the effects of blooms on fisheries are under progress.



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