# MARINE FISHERIES INFORMATION SERVICE


*Technical and Extension Series*

No. 31

SEPTEMBER 1981

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE

COCHIN, INDIA

INDIAN COUNCIL OF AGRICULTURAL RESEARCH

**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 Fishery Data Centre 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.* 31: 1981

## CONTENTS



Cover photo : Mechanised vessel landing centre at Malpe, Karnataka.

# COMMERCIAL TRAWL FISHERIES OFF KAKINADA DURING 1969-1978*

**Introduction**

Experimental and exploratory trawling off Kakinada by the Central and State Government organisations was initiated in 1960 but the commercial exploitation of the resources by small-sized trawlers started in 1964. Since then, the industry expanded substantially by increasing both the size and number of the trawlers. The staff attached to the Research Centre at Kakinada have been collecting data in a systematic way on various resources, since the beginning of commercial trawling at Kakinada, to understand the resource characteristics and also to provide the data to various organisations and enterpreneurs interested in the same. The data collected during the 10 year period (1969–1978) are incorporated in this report.

Presently the fishing is conducted in the sea off Kakinada between 16° 35′ N–17° 25′ N latitude and 82° 20′ E–83° 10′ E longitude (fig. 1) at depths ranging from 5 to 80 m. During the earlier years however,

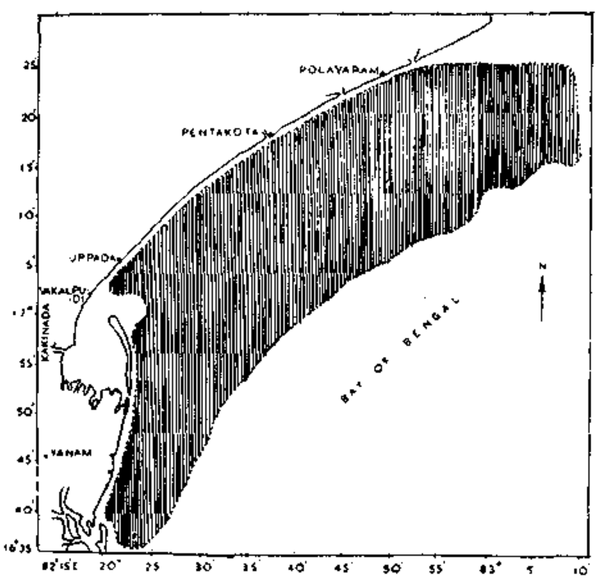


Fig. 1. Map of fishing ground.

the area covered was less (vide:Muthu *et al., Indian J. Fish.*, **22**: 1975.) The boats conduct daily fishing during day time and land the catches by evening but during certain months (November–February) some boats conduct night fishing also and land the catches in the early morning.

**Craft and Gear**

Three types of boats are engaged in fishing in the region. The particulars of the sizes of the boats, engine and the nets used are given in Table 1. The commercial fishery started with small boats *(Pablos)* and subsequently boats of two more sizes were added to the fleet (Table 1) but there was considerable increase in the *Pomfret* and *Royya* boats over the years, whereas similar increase was not noticed for *Pablos* and *Sorrahs* (fig. 2).

**Fisheries**

Data on the catches collected over a period of ten years from 1969 to 1978 (Table 2) show that on an average 6,691 tonnes of fish including 1,666 tonnes of

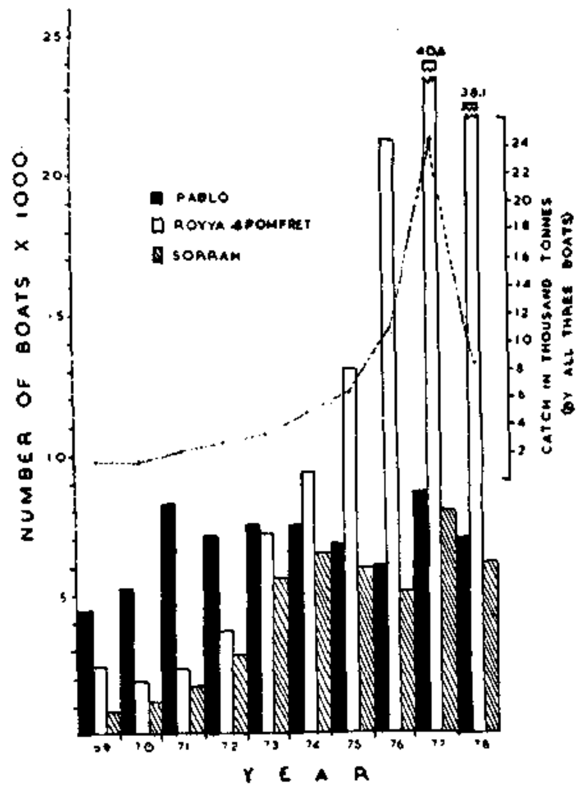


Fig. 2. Details of types of boats operated in different years and estimated total catches.

prawns are landed at this centre annually. There are differences in the seasonal variations of the ground fish abundance on the trawling grounds in different years

* Prepared by the staff of Kakinada Research Centre of CMFRI

**Table 1.** *Details of the Craft and Gear used at Kakinada.*

| Type of Boat | Particulars of the vessels | | | | Particulars of the gear operated | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Length m | Beam m | Draft m | Engine HP | Type of net | Length of Head rope | Mesh size cm | Otter boards | Rigging | Net operation |
| *Pablo* | 9.14 | 2.49 | 0.87–0.97 | 20–30 | 2-seam cotton trawl during earlier years 2-seam and 4-seam trawl made of synthetic monofilament of 0.5–1.0 mm diameter. | 11.89 & 12.95 m | Wings: 7.6 Body: 3.8–5.1 cod end 0.8–2.5 | Shape: oval during early periods Flat Rectangular now. Wt: 35 kg. | Double expanded legs upto a length of 5–10 m | Mechanical winch with G.I. wire rope. |
| *Pomfret & Royya* | 9.75 & 10.0 | 2.9 | 1.07 | 45–60 | –do– | 14.94, 16.5 and 18.29 m In some cases the wings are extended even up to 27.44 m to cover wider area. | –do– | Wt: 40–45 kg. | –do– with a length of 15–20 m. | –do– |
| *Sorrah* | 11.41 | 3.2 | 1.22 | 60–75 | –do– | –do– | –do– | Wt: 45–60 kg. | –do– with a length of 10–20 m. | –do– |

but a peak in January–March period is more or less common to all years (Table 3). Several species contribute to the fishery and the data are collected by separating the catches into 33 groups as given in Table 2. Of these, prawns, sciaenids, ribbon fish, silver bellys, *Decapterus* sp, *Nemipterus* spp, *Psenes* sp, Lizard fish, Bombay Duck and flat fish are the dominant items (in the order of abundance) in the catches. The seasonal variations in the catches of these ten groups for the period 1969–78 (averages) are presented in Table 4.

**Prawns**

Prawns form the most dominant component in the trawl catches accounting for about 25% of the total catches (Table 2). 30 species of penaeid prawns and 7 species of non-penaeid prawns contribute to the fishery. Important species of penaeid prawns in the order of abundance are: *Metapenaeus dobsoni, M. monoceros, M. affinis, Penaeus indicus, P. monodon, Parapenaeopsis stylifera, Solenocera crassicornis, P. hardwickii* and *P. merguiensis*. Among non-penaeid species, *Acetes* spp, *Exopalaemon styliferus, Nematopalaemon tenuipes* and *Exhippolysmata ensirostris* are important. The details regarding the prawn fisheries at Kakinada during the study period have been reported by Sudhakara Rao *et al.* *(Mar. Fish. Infor. Serv. T & E Ser.*, No. 21, 1980).

**Sciaenids**

These fishes occupy second position in regard to abundance. The catches showed an increasing trend till 1972; in 1973 there was a decline but considerable increase was seen from 1974 to 1977; in 1978 again there was a decline to the tune at 86% with only 18.6% decrease in the effort when compared to 1977. There are two peaks in the seasonal abundance, one in April–May and the other in August–September. About 17 species contribute to the fishery with *Johnius carutta, J. dussumieri, J. vogleri, Pennahia macrophthalmus, Atrobucca nibe* and *Otolithus ruber* dominant.

**Ribbon fish**

An estimated annual average catch of 536 tonnes were obtained by the trawlers during the ten-year period. Starting from 1969, the catches showed gradual increase in the next two years but in 1972 there was decline. The catches however increased in 1973 and this increasing trend continued till 1977 but in 1978 there was a decline. Though ribbon fish is a pelagic resource, they are caught in considerable quantities by the trawlers when these fishes move into the trawling ground in large shoals. The data show that these fishes are abundant on the fishing ground during April–June. About 6 species occur in the catches but

**Table 2.** *Estimated catches (kg) of different groups/species by three types of boats combined during different years.*

| Sl. No. | Name of fish | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 | Average for 1969–'78 | Percentage | Rank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | Prawns | 2,68,847 | 4,02,762 | 6,02,524 | 8,65,835 | 8,21,883 | 14,31,896 | 16,25,225 | 24,28,381 | 61,91,004 | 20,25,855 | 16,66,421 | 24.90 | 1 |
| 2. | Crabs | 26,323 | 7,827 | 23,405 | 63,474 | 33,989 | 69,317 | 1,40,292 | 1,14,004 | 2,01,100 | 37,534 | 71,727 | 1.07 | 22 |
| 3. | Cephalopods | 15,705 | 19,056 | 29,068 | 44,265 | 42,877 | 50,959 | 89,279 | 1,05,634 | 2,56,783 | 1,30,916 | 78,454 | 1.17 | 19 |
| 4. | Sharks | 500 | 2,188 | 1,364 | 3,748 | 4,493 | 27,555 | 39,328 | 1,15,695 | 34,060 | 1,98,908 | 42,784 | 0.64 | 28 |
| 5. | Rays | 60,398 | 1,13,482 | 1,29,171 | 64,834 | 76,044 | 1,15,075 | 2,52,079 | 1,97,484 | 1,45,528 | 39,079 | 1,19,317 | 1.78 | 14 |
| 6. | Skates | 20,907 | 26,832 | 25,063 | 46,187 | 15,805 | 18,063 | 44,504 | 11,890 | 1,74,921 | 1,92,647 | 57,682 | 0.86 | 23 |
| 7. | Eels | 24,945 | 29,890 | 22,245 | 43,005 | 64,200 | 1,28,647 | 1,78,448 | 2,51,403 | 2,45,898 | 1,33,825 | 1,12,251 | 1.68 | 16 |
| 8. | Cat fish | 32,612 | 30,185 | 27,841 | 74,540 | 66,186 | 1,40,611 | 1,64,764 | 2,91,417 | 6,59,070 | 1,22,623 | 1,60,985 | 2.41 | 11 |
| 9. | Lesser sardines | 9,036 | 1,989 | 1,824 | 6,438 | 36,905 | 5,608 | 37,236 | 2,76,558 | 54,895 | 22,081 | 45,257 | 0.68 | 27 |
| 10. | White bait | 15,022 | 10,044 | 25,157 | 61,880 | 45,787 | 70,793 | 45,386 | 2,38,706 | 4,66,332 | 2,30,584 | 1,20,969 | 1.81 | 13 |
| 11. | *Ophisthopterus* | 23,625 | 24,880 | 23,670 | 8,431 | 9,930 | 42,680 | 58,287 | 39,214 | 2,60,417 | 63,316 | 55,445 | 0.83 | 24 |
| 12. | *Thryssa* spp | 992 | 16,978 | 19,706 | 53,598 | 46,946 | 84,539 | 1,00,396 | 1,53,823 | 1,14,140 | 1,42,375 | 73,349 | 1.10 | 20 |
| 13. | Other clupeids | 19,456 | 5,628 | 14,979 | 28,056 | 51,508 | 34,256 | 1,04,279 | 1,68,424 | 1,34,793 | 1,77,678 | 73,906 | 1.10 | 21 |
| 14. | Bombay duck | 264 | 7,865 | 22,277 | 59,583 | 88,711 | 95,862 | 1,16,578 | 2,03,910 | 3,38,996 | 8,64,872 | 1,79,892 | 2.69 | 9 |
| 15. | Lizard fish | 16,364 | 36,710 | 63,543 | 83,677 | 23,889 | 1,77,253 | 2,00,791 | 4,07,162 | 7,11,457 | 4,19,814 | 2,14,066 | 3.20 | 8 |
| 16. | Perches | 16,739 | 15,362 | 29,482 | 26,219 | 27,300 | 62,388 | 1,29,245 | 89,002 | 3,66,155 | 1,07,670 | 86,956 | 1.30 | 18 |
| 17. | *Nemipterus* spp | 1,63,665 | 1,28,535 | 1,01,329 | 1,12,739 | 2,07,154 | 2,91,411 | 4,92,932 | 5,27,767 | 13,36,945 | 3,93,341 | 3,75,582 | 5.61 | 6 |
| 18. | Goat fish | 8,937 | 17,571 | 88,983 | 1,49,118 | 64,014 | 2,15,457 | 2,41,444 | 1,46,257 | 2,05,021 | 1,17,179 | 1,25,398 | 1.87 | 12 |
| 19. | *Polynemus* spp | 25,003 | 20,326 | 33,127 | 22,343 | 23,948 | 61,331 | 81,549 | 23,311 | 1,80,900 | 53,845 | 52,568 | 0.78 | 25 |
| 20. | Sciaenids | 1,98,833 | 1,75,444 | 3,34,372 | 4,42,077 | 3,43,202 | 7,63,278 | 7,96,500 | 8,73,076 | 28,38,254 | 3,97,309 | 7,16,235 | 10.70 | 2 |
| 21. | Ribbonfish | 54,458 | 59,391 | 2,36,230 | 1,16,391 | 2,17,514 | 3,71,559 | 3,77,254 | 6,32,449 | 22,23,435 | 10,71,212 | 5,35,989 | 8.01 | 3 |
| 22. | *Decapterus* spp | 26,726 | 2,553 | 1,640 | 12,441 | 3,18,326 | 2,352 | 95,822 | 13,71,888 | 19,83,532 | 99,361 | 3,91,464 | 5.85 | 5 |
| 23. | Other carangids | 19,508 | 35,373 | 28,426 | 32,525 | 13,274 | 53,989 | 40,574 | 30,900 | 70,177 | 74,780 | 39,953 | 0.60 | 29 |
| 24. | Silver belly | 60,555 | 1,12,426 | 2,81,807 | 1,93,775 | 1,62,862 | 2,29,329 | 3,39,729 | 3,23,475 | 28,88,942 | 3,97,141 | 4,99,004 | 7.48 | 4 |
| 25. | *Lactarius* | 59,838 | 40,267 | 45,691 | 48,259 | 20,103 | 1,18,367 | 1,23,662 | 80,973 | 5,42,403 | 70,520 | 1,15,008 | 1.72 | 15 |
| 26. | Pomfrets | 2,342 | 1,973 | 10,922 | 6,019 | 7,271 | 15,757 | 16,804 | 31,521 | 27,370 | 20,245 | 14,022 | 0.20 | 31 |
| 27. | Mackerel | 45,793 | 322 | 72 | 15,657 | 6,974 | 3,068 | 490 | — | 8,048 | 4,879 | 8,530 | 0.13 | 33 |
| 28. | *Sphyraena* spp | 1,620 | 2,245 | — | 7,126 | 15,178 | 4,309 | 3,224 | 24,597 | 38,078 | 18,594 | 11,497 | 0.17 | 32 |
| 29. | *Psettodes erumei* | — | — | 1,172 | 8,615 | 7,931 | 11,058 | 12,829 | 21,242 | 41,375 | 55,060 | 15,928 | 0.24 | 30 |
| 30. | Other flat fish | 29,946 | 39,914 | 35,772 | 65,065 | 78,288 | 1,75,889 | 2,80,466 | 2,88,495 | 5,22,266 | 1,73,280 | 1,68,938 | 2.52 | 10 |
| 31. | *Kurtus indicus* | 7,633 | 16,400 | 14,492 | 35,458 | 12,027 | 64,822 | 50,664 | 1,68,801 | 74,634 | 41,604 | 48,654 | 0.73 | 26 |
| 32. | *Psenes* spp | 14,317 | 23,841 | 28 | — | 4,98,140 | 29,254 | 34,470 | 13,03,983 | 9,45,421 | 3,55,274 | 3,20,473 | 4.79 | 7 |
| 33. | Miscellaneous | 29,330 | 28,081 | 33,295 | 68,081 | 44,604 | 62,138 | 84,618 | 1,14,805 | 2,89,591 | 1,69,512 | 92.406 | 1.38 | 17 |
| | TOTAL | 13,00,239 | 14,56,340 | 23,08,677 | 28,69,459 | 34,97,263 | 50,28,870 | 63,99,148 | 1,10,56,247 | 2,45,71,941 | 84,22,913 | 66,91,110 | | |
| | Effort (hours) | 34,236 | 38,201 | 55,855 | 67,507 | 1,34,119 | 1,77,347 | 1,87,065 | 2,37,339 | 4,14,697 | 3,76,972 | 1,72,333 | | |
| | Catch/hour | 37.9 | 38.1 | 41.3 | 42.5 | 26.1 | 28.4 | 34.2 | 46.6 | 59.3 | 22.3 | 38.8 | | |

**Table 3.** *Quarterly estimated total catches (kg) and catch rates (CPH) in parentheses by three different types of boats during* 1969–1978.

| | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 | 1969–1978 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **PABLO** | | | | | | | | | | | |
| Ist quarter | 1,44,891 (42.21) | 1,19,382 (26.60) | 2,71,754 (33.35) | 4,61,070 (50.46) | 4,94,510 (50.36) | 3,17,373 (16.09) | 2,04,460 (26.21) | 6,40,769 (51.33) | 8,42,083 (52.41) | 1,92,146 (13.78) | 36,88,456 (35.14) |
| IInd quarter | 1,65,015 (28.81) | 2,58,044 (31.50) | 3,39,518 (45.26) | 4,00,047 (38.43) | 2,01,005 (15.10) | 3,21,940 (23.74) | 3,73,340 (28.67) | 2,31,246 (26.54) | 7,81,614 (46.0) | 1,62,422 (13.31) | 32,34,191 (29.50) |
| IIIrd quarter | 1,85,348 (27.84) | 1,80,372 (26.0) | 3,79,977 (36.63) | 2,61,268 (32.14) | 1,51,149 ( 8.99) | 2,84,951 (25.19) | 3,11,230 (25.94) | 2,78,702 (24.32) | 4,93,152 (42.37) | 5,20,833 (47.36) | 30,46,981 (28.66) |
| IVth quarter | 89,920 (21.76) | 1,66,014 (37.0) | 3,45,452 (29.94) | 1,83,855 (25.01) | 1,04,094 (12.07) | 1,92,792 (25.05) | 1,75,560 (19.84) | 1,50,922 (25.33) | 2,73,748 (28.46) | 1,41,139 (21.02) | 18,23,496 (24.33) |
| **POMFRET & ROYYA** | | | | | | | | | | | |
| Ist quarter | 2,38,043 (67.32) | 1,60,448 (53.0) | 61,906 (35.09) | 1,94,922 (61.76) | 5,84,704 (59'09) | 6,81,534 (24.42) | 7,68,598 (43.61) | 38,23,713 (78.96) | 73,18,750 (91.75) | 24,13,210 (21.28) | 1,62,45,828 (52.87) |
| IInd quarter | 1,84,280 (44.35) | 1,26,651 (56.5) | 1,27,160 (52.82) | 2,21,253 (52.31) | 2,65,279 (22.64) | 4,40,680 (29.13) | 7,21,690 (34.19) | 14,40,300 (35.49) | 55,37,692 (60.12) | 10,31,122 (11.25) | 1,00,96,107 (35.38) |
| IIIrd quarter | 81,757 (39.04) | 57,188 (31.2) | 1,67,007 (53.4) | 2,36,132 (40.06) | 1,95,431 (15.50) | 4,63,811 (31.31) | 11,10,380 (38.04) | 15,31,484 (33.73) | 26,25,037 (44.62) | 20,61,974 (43.72) | 85,30,201 (31.61) |
| IVth quarter | 48,334 (45.9) | 72,489 (42.8) | 2,01,792 (60.93) | 1,78,030 (34.74) | 2,27,252 (17.09) | 5,56,016 (34.46) | 7,32,151 (26.50) | 7,46,255 (33.88) | 23,95,173 (37.30) | 7,01,325 (23.69) | 58,58,817 (31.83) |
| **SORRAH** | | | | | | | | | | | |
| Ist quarter | 39,459 (56.61) | 1,21,063 (79.1) | 42,936 (44.17) | 1,94,535 (64.68) | 5,67,706 (84.73) | 5,07,934 (29.14) | 5,98,162 (51.28) | 12,94,008 (90.1) | 17,59,634 (91.39) | 4,25,997 (23.23) | 55,51,434 (59.09) |
| IInd quarter | 19,273 (40.07) | 88,638 (61.60) | 1,06,451 (56.59) | 2,27,802 (60.74) | 2,61,471 (26.83) | 4,55,020 (37.09) | 4,45,744 (37.10) | 3,50,162 (34.44) | 15,16,234 (73.35) | 1,93,271 (12.06) | 36,64,066 (41.42) |
| IIIrd quarter | 63,671 (49.05) | 58,665 (45.0) | 1,06,276 (47.52) | 1,79,195 (43.02) | 2,08,496 (19.10) | 4,81,373 (37.97) | 6,61,960 (43.78) | 3,87,650 (32,35) | 6,22,496 (48.66) | 4,30,396 (40.57) | 32,00,178 (38.51) |
| IVth quarter | 40,248 (38.22) | 47,386 (45.80) | 1,58,448 (61.13) | 1,31,350 (41.70) | 2,36,166 (22.13) | 3,25,446 (32.81) | 2,95,873 (26.74) | 1,81,036 (31.43) | 4,06,328 (31.86) | 1,49,060 (23.66) | 19,71,341 (30.66) |

**Table 4.** *Seasonal variations in the catches of important groups (Average for the period 1969–78) (Values in parentheses are percentages)*

| Name of fish | Jan–Mar Ist Quarter | April–June II Quarter | July–Sep III Quarter | Oct–Dec IV Quarter | Average totals for 10 years. |
|---|---|---|---|---|---|
| Prawns | 4,33,121 (26.0) | 4,58,593 (27.5) | 4,73,104 (28.4) | 3,01,603 (18.1) | 16,66,421 |
| Sciaenids | 1,36,895 (19.1) | 3,36,524 (47.0) | 1,42,707 (19.9) | 1,00,108 (14.0) | 7,16,234 |
| Ribbonfish | 1,27,276 (23.7) | 1,70,011 (31.7) | 1,54,839 (28.9) | 83,863 (15.7) | 5,35,989 |
| Silverbelly | 2,36,190 (47.3) | 1,23,566 (24.8) | 80,298 (16.1) | 58,950 (11.8) | 4,99,004 |
| *Decapterus sp* | 3,87,078 (98.8) | 2,969 (0.8) | 799 (0.2) | 817 (0.2) | 3,91,464 |
| *Nemipterus spp* | 2,13,530 (56.8) | 60,316 (16.1) | 35,274 (9.4) | 66,462 (17.7) | 3,75,582 |
| *Psenes* sp | 2,89,981 (90.5) | 27,902 (8.7) | 1,087 (0.3) | 1,503 (0.5) | 3,20,473 |
| Lizard fish | 92,583 (43.2) | 45,173 (21.1) | 31,956 (14.9) | 44,354 (20.7) | 2,14,066 |
| Bombay duck | 9,690 (5.4) | 15,382 (8.6) | 1,46,658 (81.5) | 8,161 (4.5) | 1,79,891 |
| Flat fish | 65,104 (38.5) | 38,032 (22.5) | 34,852 (20.6) | 30,950 (18.4) | 1,68,938 |

*Trichiurus leptures* is the most dominant, contributing about 70% of ribbon fish catches.

**Silverbellys**

An average of about 500 tonnes are landed annually forming about 7.5% of total landings. The catches of these fishes also showed decline during 1977 and 1978. Although contributing to the fishery throughout the year, they are most abundant during January–March period. Out of 10 species, *Leiognathus bindus* and *Secutor insidiator* are most abundant.

**Decapterus sp.**

These fishes form a seasonal fishery, most abundant during January–March. Like ribbon fish, this species also is pelagic and caught by trawls when large shoals move into the fishing ground. There are wide fluctuations, like many other pelagic resources, in the catches during different years (Table 5). An average of 391 tonnes are landed annually forming about 6% of trawl catches.

**Nemipterus spp.**

The ten year average estimated catches show that about 375 tonnes of these fishes are landed annually forming 5.6% of trawl catches. The data on seasonal abundance show that January–March and October–December are the peak periods for these fishes, the first quarter, however, being more productive. Five species occur in the catches, *N. japonicus* being the most dominant.

**Penses sp.**

This species occurs seasonally and about 90% of the annual catch comes during January–March period. There are wide fluctuations in the catches in different years (Table 5). An average of 320 tonnes are landed annually forming 4.8% of the catches.

**Lizard fish**

The annual estimated catches range from a minimum of 16 tonnes in 1969 to a maximum of 711 tonnes in

1977. From 1969 the catches showed increase till 1972 but in 1973 there was a deep decline. There was improvement from 1974 till 1977, again declining in 1978. These fishes occur in large quantities during January–March period. About 3 species occur, of which *Saurida tumbil* is the most dominant.

**Bombay Duck**

*Harpodon nehereus* occurs seasonally in large quantities. The ten-year data show that this species is abundant during July–September period. The catches showed increasing trend in successive years. Starting with less than 1 tonne in 1969, an estimated 865 tonnes were landed in 1978, the ten year average being 180 tonnes forming 2.7% of the trawl catches.

**Flat fish**

The estimated annual average catch of these fishes is 185 tonnes forming about 3% of total catches. *Psettodes erumei* and *Cynoglossus* spp are the important species. These fishes occur almost round the year but they are most abundant during January–March period.

**Remarks**

In general there was deep decline in the catch per unit effort during 1973 and 1978 for the total trawl catches (Table 2). It is however, observed that the catches showed steady increase from 1969 to 1977 without decline in 1973 and declined only in 1978. So the decline in catch rate in 1973 appears to be brought about by the heavy input of effort, almost double that of the previous year. But in 1978 there is decline in total catch, effort and catch rate.

As already pointed out by Silas *et al., (Bull. Cent. mar. Fish. Res. Inst.,* 27, 1976) and Sudhakara Rao *et al (Mar. Fish. Infor. Serv. T & E Ser.,* 21, 1980), trawling is almost exclusively carried out for prawns because of the export market. This has resulted in extensive coverage of certain parts of the fishing grounds and little or no coverage of other parts, thus affecting the production of other demersal resources. In this connection it may be pointed out that Sriramachandra Murty (Ms: A study of the Sciaenid fisheries off Kakinada along the east coast of India) observed that increase in effort in different years did not bring increased sciaenid catches. Further it has also been shown that in some years, periods of peak effort coincided with periods of poor catches of sciaenid fishes. This increased effort was apparently used to catch prawns in certain parts of the fishing ground. In fact the demand for prawns has also lead to the reduction of the cod end mesh size of the trawl nets (Sudhakara Rao *et al., Mar. Fish. Infor. Serv. T & E Ser.,* 21, 1980) in recent years. Though this has resulted in the increase of the small-sized non-penaeid prawn catch, there is no recognisable change in the length composition of the important groups of finfish caught. This again, is probably, due to the uneven distribution of effort on the fishing ground with the sole aim of catching more prawns. It may be pointed out here that majority of the boats conduct trawling in the inshore waters of 5–20 m depth zone where it is known that the prawns are abundant. If the effort is uniformly distributed on the fishing grounds one would expect large quantities of early juveniles of fish also to be caught at least during certain seasons, on account of reduction in the cod end mesh size.

The boats carry ice in boxes to bring prawns but no such arrangement exists for bringing fin fishes though they constitute about 70% of the catches. This is because the deck-space is not sufficient to keep more boxes with ice and also there is lesser demand for them as compared to prawns. A consequence of this is that in majority of the cases, most of the fishes are spoiled by the time they are landed and hence are not fit for consumption in fresh condition. These fishes are sold at very cheap prices for purposes of salt-curing and sun-drying.

Since the boats are small (Table 1) and have to return to the base every day, the scope for further expansion of the fishing ground is limited. In the light of these observations it is felt that uniform distribution of effort on the existing fishing ground would help increase production of important fin fishes. This, however has to be done keeping the prawn production in view. Another approach would be to introduce larger vessels that can venture into deeper areas which are not covered so far. In any case constant monitoring of the resources would be essential in order to enable appraisal of the fisheries with proper management approach.

# A LOW COST ELECTRICAL RUDDER INDICATOR FOR THE MEDIUM SIZED POWER VESSEL*

It is an electrical instrument to indicate the rudder angle of the vessel in degrees with respect to the bow of the vessel in the wheel house. This helps the man at the wheel in manoeuvring the vessel while sailing in general and particularly in the following occasions:

1. When the vessel is started at open sea after it was stopped for some time, the Rudder indicator helps the operator to know the set position of the rudder, enabling him to reset for the new course without delay. Otherwise the operator has to turn the steering wheel to the maximum of either port or starboard and then turn to the required direction.

2. While sailing on a straight course, the forces of wind and current and their effects on rudder can be noticed with the aid of the Rudder indicator.

3. At times the steering wheel may rotate, but the rudder may not move because of the failure of the coupling system. The Rudder indicator can confirm this situation indicating whether the rudder is moving or not while turning the wheel.

4. If any slack exist in the wire rope, connecting the steering wheel and the quadrant, this can be noticed through Rudder indicator.

5. While encircling a fish school using purse seine, the Rudder indicator helps in making big or small circle as required depending upon the school size.

Considering the utility of the instrument and non-availability of a commercial model in the local market, it was decided to design and fabricate one proto-type of the instrument for Cadalmin IX, a 43′ vessel of the Institute. Accordingly the instrument has been fabricated and tested on board the vessel and found successful. It consists of a rudder angle sensor mounted on the quadrant and a display panel in the wheel house with the appropriate electrical connections. The details of the instrument are described below with circuit diagram.

**Principle of operation and design considerations**

The mechanical movement of the rudder is converted into an electrical signal using a centre tapped potentiometer and fed to an indicator whose pointer movement is synchronised with the movement of rudder with 180° out of phase. The rudder is mechanically coupled to the steering wheel of the vessel which controls the rudder movement through the quadrant. The coupling arrangement is such that when the wheel is turned to the port side in order to turn the vessel to port, the rudder will move towards starboard side. The pointer of the indicator will deflect to the port indicating the direction of the turning of the vessel and vice-versa. The shaft of the angle sensor (potentiometer) is coupled to the quadrant of the vesse mechanically. The body of the pot meter is held by a metal frame fixed to the sides of the hatch. Hence the wiper of the pot meter is free to move when the shaft of the quadrant move. A DC supply of equal and opposite polarity is applied to the end of the pot meter and the common point of the supply source is connected to the centre tap of the pot meter. The centre zero D.C. Volt meter is connected across the centre tap and the wiper of the pot meter. When the steering wheel is rotated the quadrant moves as it is coupled mechanically through wire rope. Simultaneously the wiper of the pot meter moves as it is directly coupled with the quadrant. As the wiper moves the voltage given to the voltmeter is varied linearly. When the vessel is in midship, the position of the wiper is adjusted so as to be at zero volt. When the quadrant moves starboard side the wiper moves along +ve supply and when the quadrant moves port side the wiper travels along –ve supply. Accordingly the pointer of the voltmeter also moves along the starboard and port side respectively from the centre. The movement of the pointer has been calibrated in terms of angles in degrees. The maximum

*Prepared by S. Natarajan

voltage permissible to be applied to the meter is equal to the full scale deflection voltage (FSD) of the meter. Hence the applied voltage to the circuits need be exactly equivalent to the FSD voltage or else the supply can be greater than the FSD voltage but it must be controlled to be equivalent to the FSD voltage, across the meter. Therefore a supply controlling circuit

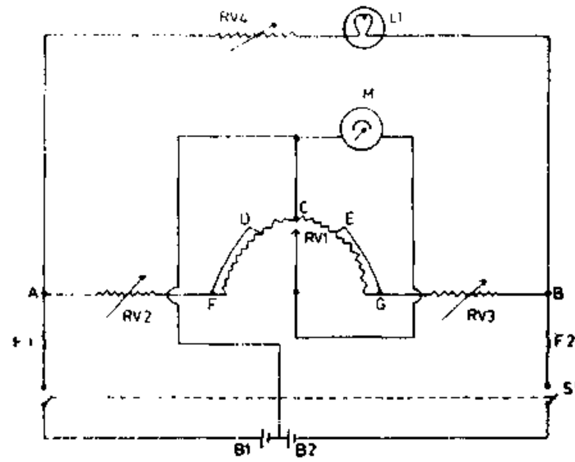


Fig. 1. Circuit diagram of electric rudder indicator

is also required to be incorporated. If the applied voltage is +12 V and the FSD is 3 V, two linear pot meters can be connected in series to the angle sensor, one at each end and the resistance can be adjusted so as to get exactly +3 V when the quadrant is fully starboard side and -3 V when the quadrant is moved fully to the port side. The value of the resistance need be so chosen considering the half section value of the resistance of the angle sensor and the voltage to be dropped across the series resistance, with the tolerance to adjust for the input supply variation. Therefore the minimum power supply required to operate the instrument is twice the FSD voltage plus the expected variation in the input supply source.

**Circuit construction**

$RV_1$ (fig. 1) is the wirewound variable resistance (potentiometer) of 1K ohm 7 watts with a centre tap, functioning as angle sensor. The ends of the sensor are connected to the opposite terminals of two 12 V batteries (Bl, B2) in series through the variable resistance $RV_2$, $RV_3$ of 1K each, dial lamp, fuse Fl, F2 and a double pole single throw switch. The DC voltmeter M of 3 V FSD with centre zero (3-0-3V) is connected across the centre tap of the sensor ($RV_1$) and its wiper. Also the centre tap is connected to common point of the 2 batteries. Ll is the dial lamp (24 V miniature type), connected across the supply through $RV_4$ (5K variable resistance).

**Circuit explanation**

When the switch is put on, it connects the 24 V supply to the circuits. The dial lamp Ll glows. The brightness of the light is controlled by the potmeter $RV_4$ (dimmer control). 24V is applied across $RV_2$, $RV_1$ and $RV_3$ in series. Voltage between centre tap of $RV_1$ and the +ve terminal of the battery is +12 V and the centre tap of $RV_1$ and -ve terminal of the source is -ve 12 V. The movement of the wiper is restricted to 40° either side from centre, C to D and C to E because this is the limit to which the quadrant of the vessel can travel. Hence the rest of the portion of the variable resistance is shorted out in either side (DF and EG). Keeping the wiper at the centre C, the $RV_2$ and $RV_3$ is adjusted to have +3 V between CD and -3V between CE. Now when the wiper is at the centre the meter reads zero. When it moves towards D the meter deflects to the star board side from the centre. When the wiper is moved towards 'E' the pointer deflects towards port side.

The meter has been fixed with a calibrated dial to read the position of the quadrant in degrees upto the maximum of 40° in both port and star board sides. Port and starboard side of the dial has been painted with red and green respectively.

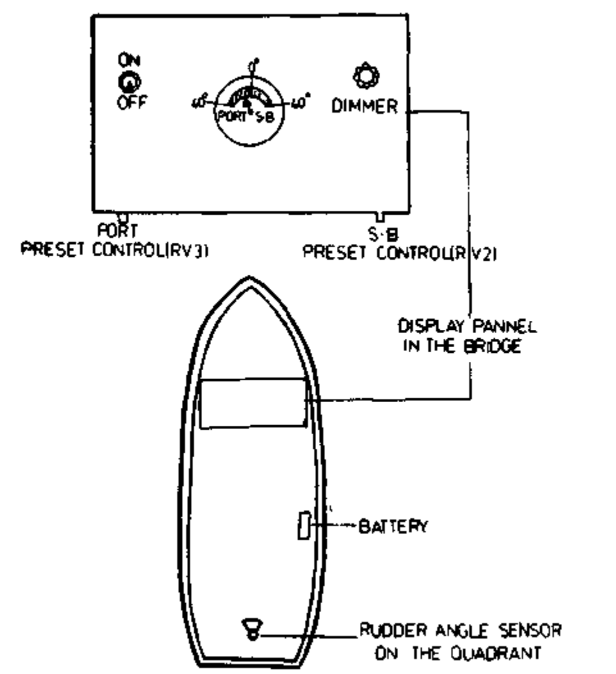


Fig. 2. Location diagram of rudder indicator on board Cadalmin IX

**Installation, test and calibration**

The electrical components $RV_2$, $RV_3$ and $RV_4$ along with the indicator meter are mounted in a perspex box (8″ x 5″ x 2″) and fixed in the wheel house of the boat (Fig. 2 and 3). $RV_1$ is in a 2″ x 2″ x 2″ metal box filled with greese and fixed at the quadrant (Fig. 4). 10 amp 4 core cable connects the 24 V supply from the main box to $RV_1$ pot meter (the sensor), and brings the signal to the indicator. The common point

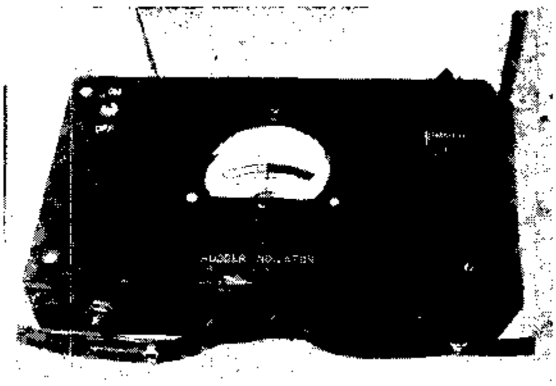

Fig. 3. Display unit

of the battery is connected to the centre tap of the sensor ($RV_1$) by a single core wire. Battery supply is connected from the wheel house to the main box through the switch. Equipment was installed in the vessel Cadalmin IX on 7–4–81 and was calibrated by adjusting $RV_2$ and $RV_3$ to read 40° either side while rotating the steering wheel to the maximum of starboard and port side respectively. Performance test was carried out by sailing the vessel in the open sea and found functioning satisfactorily.

As the vessel Cadalmin IX was equipped with 24 V battery (2 batteries of 12 V each) the rudder indicator was designed to work on 24 Volt. Same system can work with 9 Volts also (6 number dry cells of 1.5 v each), by resetting the present control $RV_2$ and $RV_3$. This has been confirmed by testing at the laboratory.

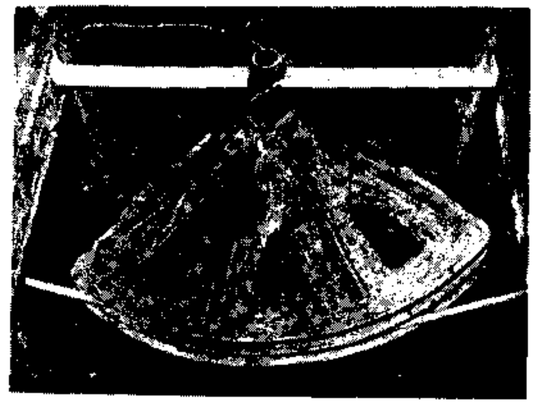

Fig. 4. Angle sensor at the quadrant of the vessel

Therefore if this instrument is required to be installed on board a vessel where 24 V battery provision is not there, it can be operated with 6 number dry cells of 1.5 V each,ie. 9 volt supply with the centre tap. All the required parts for the instrument are available locally. The approximate cost of the materials including the cable is Rs. 350/- only.

**Routine check and maintenance**

Before sailing the vessel, the display should be checked by rotating the steering wheel to the maximum of port and starboard sides to confirm the pointer moves to 40° in both side correspondingly. If not, the preset control $RV_2$ and $RV_3$ are to be adjusted so as to have 40° reading. The position of the rudder angle sensor is required to be checked once in a week to confirm that it is held properly. It is preferred to have general external cleaning daily on and around the angle sensor.

## BARRACUDAS*

The barracudas, otherwise known as sea-pikes of the family Sphyraenidae, are caught in sizeable quantities along the Indian coast. They are reported to occur in all tropical waters. Of the four distinct species reported from the Indo-Pacific region viz., *Sphyraena barracuda* (Walbaum), *S. jello* Cuvier, *S. forsteri* Cuvier and *S. obtusata* Cuvier (Fig. 1), the former two species attain more than 1.5 m in length whereas others grow to a maximum of 40–60 cm, the common size range being 20–30 cm (Fischer and Whitehead, 1974. *Species identification sheets for fishery purposes IV. F.A.O. Rome)*.

*Prepared by K. Mahadevan Pillai

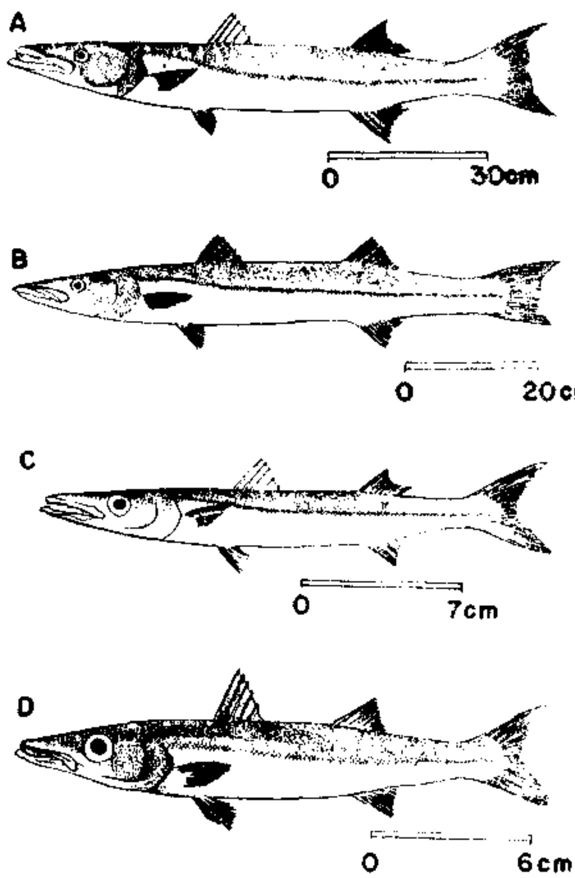


Fig. 1. Common species of barracudas-A. *Sphyraena barracuda* (Walbaum), B. *S. jello* Cuvier, C. *S. forsteri* Cuvier, D. *S. obtusata* Cuvier.

The barracudas possess an elongated and sub cylindrical body with small cycloid scales. Head is long with a projecting lower jaw and a horizontal cleft of mouth. They draw unusual interest because of their sharp teeth which are large, unequal, fang-like and implanted in sockets in both jaws and palatines. Two widely separated dorsal fins, the first with five strong spines and the second originating opposite to ventral are characteristic of these fishes.

They are pelagic in habitat and are caught at varying depths from the surface down upto 40 m. Though they are shoaling species the large individuals are solitary. Due to the swift swimming efficiency they are highly predatory in nature feeding voraciously on other pelagic fishes. It is said that when a group of barracuda have eaten enough, it herds the rest of the shoal it is attacking into shallow water and keeps guard over it so as to consume them at leisure. Large barracudas are said to be most ferocious among predatory fishes. They are dreaded by fishermen in tropical and subtropical seas due to their alleged attack on human beings.

Ovarian development indicates that barracudas may spawn more than once each season. The number of eggs released increase with age and size, ranging from an estimated 42,000 for a first spawning to over 484,000 for older fish. In four days after hatching, the larvae begin to assume adult morphological characteristics, particularly the lower jaw and are capable of feeding.

The barracudas figured prominently in the development of purse seine fishery and were the object of an International Fisheries Commission study along the Californian waters. In order to manage the barracuda resources, the California Department of Fish and Game has even recommended to initiate action to prohibit the landings of any barracuda under 70 cm in total length in both sport and commercial fisheries.

An estimated 16,662 tonnes of barracudas were landed from the entire Indo-Pacific region during 1972. During the period 1969–'80, the maximum landings of barracudas (4,862 tonnes) from the Indian waters were recorded in 1974 (Fig. 2). Out of an estimated landings of 2,265 tonnes in 1979, Tamilnadu contributed the maximum (1,463 tonnes) followed by Kerala (477 tonnes). Most of the larger species are caught in hooks and lines, bottom-set gill nets and drift gill nets while sizeable quantities of smaller varieties are caught by trawlers from the inshore waters along the Indian coast. The large varieties are in good demand due to their delicate flesh and are marketed in fresh conditions.

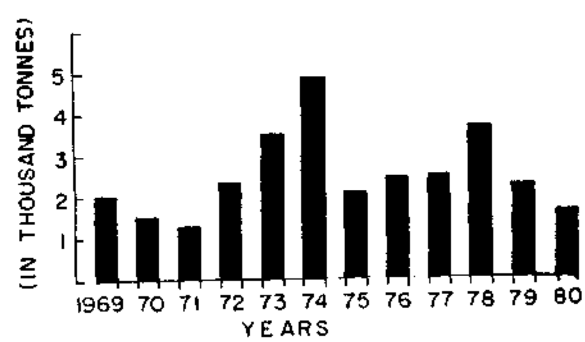


Fig. 2. Annual landings of barracudas in India from 1969 to 1980.

# CULTURE OF FISHES IN POLYTHENE LINED PONDS*

Experiments have proved that prawns and fishes can be cultured in the unproductive sandy sea shore by lining the ponds suitably with black polythene film. (Lal Mohan and Nandakumaran, 1981 *Mar. Fish. Infor. Ser. T & E Ser.* No. 26). Further experiments indicate the possibility of culturing milk fish and pearl spot in this type of ponds, the results of which are presented here.

**Chanos chanos**

The milk fish fingerlings of length of 82 mm weighing 3.5 g were stocked on 8-8-1980 in a 0.025 ha pond at the rate of 5600/ha ie., 140 numbers in the pond. During the first 70 days of stocking the fishes grew about 1 mm/day. The weight increment during the period was 0.42 g/day. Salinity was low during the period ranging between 0.4 to 4.7 ppm. During the next 45 days the fishes registered a growth of 2.1 mm/day and the weight increase was 1.5g/day when the salinity ranged between 1.7-25.7 ppm. The milk fish attained very good growth in this brackish water condition. A growth of 0.7 mm/day and increase in weight of 1.0 g/day was noticed during the ensuing three months when the salinity varied between 29.0-39.4 ppm (Table 1).

The production rate for the first 3 months was 320 kg/ha; at the end of 6 months 880 kg/ha; and when it was harvested after 7 months it was 920 kg/ha. It may be seen that the growth of chanos is faster during the first 6 months (Fig. 1).

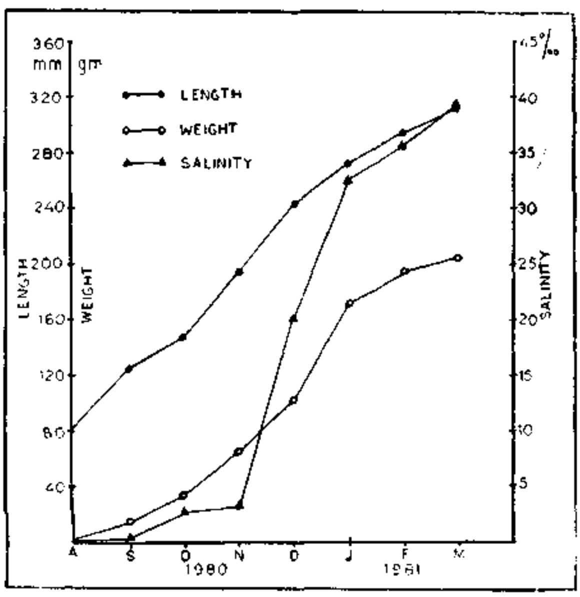


Fig. 1. Growth of Chanos chanos in a polythene lined pond at Calicut.

The fishes were fed with a compounded feed prepared by boiling broken wheat, dry fish and sardine oil mixed at the ratio of 100:10:1. The food was given daily at a rate of 1/10 of the body weight of the stock. The food contained 7.5% protein, 4.8% fat and 77.8% moisture. The fishes were observed to feed on it voraciously. This food, in addition to being cheap and easy to prepare even by the fishermen, does not dissolve and spoil the water.

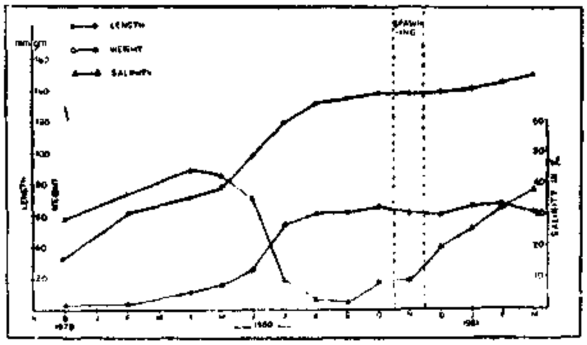

Fig. 2. Growth of *Etroplus suratensis* in a polythene lined pond at Calicut.

The water qualities were tested daily and the temperature inside the ponds varied between 24.5 and 39.0 C. Dissolved oxygen and salinity of the pond ranged between 1.9-6.6 ml/l and 0.4 to 39.4 ppm respectively. The pond had a very good growth of phytoplankton like *Thallasiosira* spp., *Coscinodiscus spp.*, *Merismopedia* spp., *Microcystis* spp. etc.

Final harvest after 7 months was 23 kg of chanos (numbering 120 fish) from a 0.025 ha pond, giving a production rate of 920 kg/ha for 7 months. The survival rate was 86%. The cost economics of the culture experiment is shown in Table 3.

*Etroplus suratensis*

In December 1979 *Etroplus* (pearl spot) fingerlings measuring 30 mm weighing 1.0 g. was stocked in another pond of area 0.025 ha at the rate of 8400/ha. i.e., 210 numbers in the pond. The water conditions

* By R. S. Lal Mohan and K. Nandakumaran

and feed used were more or less similar to the previous experiment.

The monthly increment of length and weight were slow when compared to the milk fish (Fig. 2.) During the first 6 months the monthly increase of length was 8 mm and the weight increment was 2.3 g. Salinity of the pond was high during the period ranging from

Fig. 3. Portion of the harvest of *Chanos chanos* after 7 months from a 0.025 ha polythene lined pond.

24.9–47.3 ppm. During the next 3 months from June to August the growth was 18 mm/month with an increase in weight of 15.5 g/month, showing a much higher

Fig. 4. Portion of the harvest of *Etroplus suratensis* after 15 months from a 0.025 ha polythene lined pond.

growth rate compared to the previous 6 months (Table 2). Due to monsoon the salinity of the pond got reduced from 47.3 to 3.2 ppm.

The growth of the fishes was very slow during the next 7 months which included the breeding season of the fish. The growth was only 2.6 mm/month and the weight increase was only 0.29 g/month (Fig. 2). Salinity during the period ranged from 0.8–38.3 ppm. *Etroplus* was found to breed during November after one year of stocking when salinity rose to 9.9 ppm. However to facilitate spawning, laterite stones and

**Table 1.** *Observations on the growth of Chanos chanos in a .025 ha polythene lined pond.*

| Date (Month) | Length (Mean) mm | Weight (Mean) g | Salinity (Range) ppm | Oxygen (Range) ml/l | Temp. °C (Range) °C |
|---|---|---|---|---|---|
| *August (1980) | 82 | 3.5 | 0.7–1.0 | 4.3–5.9 | 27.4 (25.0–32.0) |
| September | 124 | 16.9 | 0.4–0.8 | 4.6–6.6 | 28.5 (25.0–32.0) |
| October | 148 | 33.0 | 2.4–4.7 | 2.7–5.3 | 28.5 (24.5–32.0) |
| November | 196 | 67.0 | 1.7–5.3 | 3.2–4.5 | 29.5 (26.0–39.0) |
| December | 243 | 103.0 | 18.6–25.7 | 1.9–5.2 | 29.3 (26.0–33.0) |
| January | 277 | 173.0 | 29.0–34.4 | 2.7–4.0 | 29.5 (25.0–34.0) |
| February | 294 | 182.0 | 33.3–39.4 | 3.9–5.2 | 29.0 (27.0–34.0) |
| March | 310 | 202.0 | 38.4 | 4.1 | 29.5 (26.0–34.0) |

* Stocking date 8–8–1980; seeds from the low lying area adjacent to the fish farm.

**Table 2.** *Observations on the growth of Etroplus suratensis in a .025 ha polythene lined pond.*

| Date | Length (Mean) mm | Weight (Mean) g | Salinity (Range) ppm | Oxygen (Range) ml/l | Temp. °C (Mean) range °C |
|---|---|---|---|---|---|
| December '79 | 30 | 1.0 | 24.9–26.1 | 1.6–4.3 | 27.1 (25.0–29.0) |
| February '80 | 61 | 6.1 | 34.5–34.9 | 3.5–6.0 | 29.5 (27.0–32.0) |
| April | 74 | 11.5 | 41.0–47.2 | 3.4–4.3 | 30.8 (25.0–36.0) |
| May | 78 | 14.8 | 33.7–47.3 | 0.7–3.3 | 32.0 (29.0–36.0) |
| June | 100 | 25.5 | 8.1–37.2 | 2.2–4.9 | 28.1 (24.0–34.0) |
| July | 120 | 57.0 | 3.8–6.3 | 2.9–4.9 | 26.6 (24.0–30.0) |
| August | 132 | 61.2 | 3.2–4.6 | 4.4–6.5 | 26.9 (25.0–31.0) |
| September | 135 | 61.2 | 0.8 | 5.4–5.5 | 28.6 (26.0–31.0) |
| October | 138 | 65.7 | 6.7–11.4 | 3.0–6.4 | 27.6 (25.0–32.0) |
| November* | 138 | 61.5 | 7.4–12.3 | 2.5–6.7 | 29.6 (25.0–35.0) |
| December | 138 | 60.8 | 16.8–22.9 | 2.3–5.5 | 29.4 (26.5–33.0) |
| January '81 | 141 | 66.7 | 26.9–32.1 | 1.7–3.8 | 29.0 (27.5–33.0) |
| February | 145 | 66.4 | 30.5–36.0 | 2.6–3.6 | 29.5 (27.0–33.5) |
| March | 150 | 62.6 | 38.3 | 3.6 | 30.0 (26.0–35.0) |

* Spawning

floating bamboo reapers were provided as substrata for the eggs. There was good growth of filamentous algae in the ponds during October to March.

The production rate was 372 kg/ha for the first 9 months. After this period the growth was very slow and the fishes have grown from 138 to 150 mm and weight increment was almost nil. Hence it is better to harvest *Etroplus* after 8–9 months. If spawners and seeds are required they can be kept longer.

After about 15 months 9.5 kg of *Etroplus* was harvested. The production rate works out to 380 kg/ha, which is much lower than that of *Chanos chanos* obtained in the other experiment. The survival rate at the end of 15 months was found to be 72%, which also is lower than *Chanos*. Economics of operation showing the inputs and yield is shown in Table 3.

From these results it would appear that farming the milkfish is much more economical than that of pearl spot in these polythene-lined ponds. However, more data based on large scale operations is needed from these ponds before the economic viability of the culture system is evaluated.

**Table 3.** *Economics of fish culture in polythene lined ponds (Pond area .025 ha)*

| Expenditure | Rs. Ps. | Income | Rs. Ps. |
|---|---|---|---|
| 1. Species: *Chanos chanos* | | | |
| i) Cost of polythene film (@ Rs. 3.50/sq.m. for 250 sq.m.) Sheet can be used repeatedly | 875.00 | Sales of fishes @ Rs. 7.50/kg for 23 kg (920 kg/ha/7 months) | 172.50 |
| ii) Cost of digging : | 800.00 | | |
| Recurring expenses : | | | |
| 1. Food (23 kgs of broken wheat @ 0.80/kg: Rs. 18.40) 2.3 kgs of dry fish @ 3.50/kg: Rs. 8.05 230 ml of sardine oil @ Rs. 16/kg: Rs. 3.68 | 30.15 | | |
| 2. Pumping charges @ Rs. 3.10/hr for 15 hrs | 46.50 | | |
| Total (Recurring) | 76.65 (Rs. 3066/ha) | | 172.50 (Rs. 6900/ha) |
| 2. Species: *Etroplus suratensis* | | | |
| i) Cost of polythene film (Details as above) | 875.00 | Sales of fishes @ Rs. 10.00/kg for 9.5 kgs. (380 kg/ha/15 months) | 95.00 |
| ii) Cost of digging | 800.00 | | |
| Recurring expenses: | | | |
| 1. Food 42 kgs of broken wheat @ Rs. 0.80/kg; Rs. 33.60 4.2 kgs of dry fish @ 3.5/kg: Rs. 14.70 400 ml of sardine oil @ Rs. 16/kg: Rs. 6.40 | 54.70 | | |
| 2. Water pumping charges @ Rs. 3.10/hr for 15 hrs | 31.00 | | |
| Total Recurring expenses | 85.70 (Rs. 3428/ha) | | 95.00 (Rs. 3800/ha) |

A colour film in English entitled 'Mariculture' is available at a cost of Rs. 3,500/- for 16 mm print and Rs. 6,160/- for 35 mm print. For further details please contact Films Division, Ministry of Information and Broadcasting, Government of India, 24, Dr. G. Deshmukh Marg, Bombay-400 026.

# UNUSUALLY HEAVY CATCHES OF RIBBON FISH CLOSE TO THE SHORE AT VISAKHAPATNAM*

Very heavy catches of ribbonfish were observed quite close to the shore at Visakhapatnam for a very short duration. Observations were made on this fishery and certain important biological aspects and the results are presented.

## Fishery

A shoal of ribbon fish, *Lepturacanthus savala* (Cuvier) made its appearance on 7–4–81 at the harbour entrance channel, lasted through the next two days moving northwards towards Lawson's Bay and disappeared by 10–4–81 (Table 1).

On 8–4–81, one shore-seine landed a record catch of 5 tonnes, at Lawson's Bay. Most of the nets landed exclusively ribbonfish. Some shore-seines which did not land ribbonfish on that day landed small quantities of miscellaneous fish eg., juveniles of *Leiognathus* sp., *Gazza* sp., *Sillago* sp., *Sardinella gibbosa, Stolephorus devisi, Rastrelliger kanagurta, Sepia* sp., *Loligo* sp., *Selar crumenophthalmus* etc.

The shore-seines operated within 1 km from the shore (Fig. 1) many units performed 3–5 operations. Small trawlers operating 2–4 km from the shore landed *L. savala* together with *Decapterus dayi* and *Psenes indicus*.

By 9–4–81 the intensity of the ribbonfish catch dwindled. Boat-seines did not land ribbonfish at the harbour channel. Shore-seines did not operate due to a local festival. Small trawlers operating 3–5 km off the coast landed 1.5 tonnes of ribbonfish, alongwith *Nemipterus japonicus, Decapterus dayi* and *Psenes indicus*. On 10–4–81 ribbonfish were not caught by any of the gears.

* Prepared by K. Radhakrishna, S. Reuben and M. V. Soma Raju

**Table 1.** *Details of fishery of Lepturacanthus savala*

| Date | Area | Gear | No. of units | Effort in man hours | Total estimated catch (tonnes) | Catch of *L. savala* (tonnes) | % of *L. savala* |
|---|---|---|---|---|---|---|---|
| 7–4–81 | Harbour Entrance Channel | Boat seine | 25 | 375 | 15.5 | 15 | 98 |
| –do– | Pithapuram Beach | Shore seine | 5 | 150 | 1 (Lesser sardines and misc.) | 0 | 0 |
| –do– | Lawson's Bay | –do– | 12 | 325 | 2.5 (Lesser sardines and misc.) | 0 | 0 |
| 8–4–81 | Harbour Entrance Channel | Boat seine | No operations | | | | |
| –do– | Pithapuram Beach | Shore seine | 1 | 30 | 40 kg (misc.) | 0 | 0 |
| –do– | Lawson's Bay | –do– | 60 | 1800 | 91 | 90 | 99 |
| –do– | Off shore (2–3 km) | Mechanised trawlers | 33 | — | 3.6 | 1.3 | 35 |
| 9–4–81 | Harbour Entrance Channel | Boat seine | 20 | 300 | 2 | 0 | |
| –do– | Pithapuram Beach | Shore seine | No operations | | | | |
| –do– | Lawson's Bay | –do– | ,, | ,, | | | |
| –do– | Off shore (4–5 km) | Small trawlers | 56 | — | 11.1 | 1.9 | 17 |

Fig. 1. Shore seines in operation.

**Biological observations**

The entire catch of ribbonfish was composed of only one species, viz., *Lepturacanthus savala* (Fig. 2). Length measurements of random samples from shore-seine landings of 8–4–81 at Lawson's Bay revealed that the total length ranged from 540 to 750 mm. 67% of the fish ranged from 580–640 mm in total length. The mode was located at 620–629 mm size group. The average weight of the fish was 13.7 g.

Stomach content analysis of the shore-seine sample showed that 18% of the guts were full, 45% were 3/4th full, 23% half full and 14% ¼th full. Empty guts were not encountered in the fish landed by shore-seine, whereas in the boat-seine samples 50% guts were empty and in trawl samples 90% guts were empty.

The food items in the guts were in fairly fresh condition indicating recent feeding. The major food items were *Stolephorus* sp., *Leiognathus* sp., mullets, *Solenocera* sp., and *Acetes* sp. Partly digested fish remains were present in all the guts examined.

Maturity studies indicated that all the fish examined were in spent condition. The ratio between females and males was 81:19 in shore-seine samples, 75:25 in boat-seine samples and 50:50 in trawler samples.

Routine sampling at Lawson's Bay on 14–4–81 showed large quantities of very young *L. savala* measuring 90–170 mm in total length in the shore-seine landings. This would indicate that *L. savala* spawned very recently in the immediate vicinity of Visakhapatnam.

**Remarks**

Ribbonfish do not generally come very close to the shore. As such they are very rarely caught in the shore-seines. They are normally caught in boat-seines operating 3–4 km away from the shore and in trawl nets.

The unusual appearance of ribbonfish so close to the shore (½ – 1 km from the shore), the spent condition of the gonads, the intensity of feeding and the nature of stomach contents show that the fish have hit the shore in search of food after spawning. The similarity of the stomach contents and the miscellaneous catch of the shore-seine vindicate this view.

The appearance of ribbon fish on 7–4–81 in the boat-seines and again in the shore-seines further north and closer to the shore on 8–4–81 indicate that the shoal moved northwards and entered the shore-seine grounds in search of prey. The drop in the catch on 9–4–81 and the total disappearance of the fish on 10–4–81 show that most of the shoal was fished and the remaining shoal moved away from the shore after 8–4–81.

Fig. 2. Ribbon fish, *Lepturacanthus savala* (Cuvier).

The sea surface temperature on 7–4–81 was 21°C, the dissolved oxygen 4.2 ml/l and the phosphate concentration 0.175 $\mu$g at/l. These observations i.e., the relatively low temperature and oxygen concentration and high phosphate levels indicate possible upwelling, which is normal in March–April along the northern Andhra coast. The appearance of *Psenes indicus* and *Decapterus dayi* which prefer colder waters in the fishery would also indicate upwelling. It is possible that the ribbon fish shoal after spawning hit the shore chasing their food consisting of *Stolephorus* sp, *Leiognathus* sp. etc. which might have been moving closer to the shore to avoid the cold upwelled water.

## NEWS—INDIA AND OVERSEAS

**Poaching in Indian waters**

Illegal fishing by foreign fishing vessels in India's exclusive economic zone is increasingly reported, particularly in the Bay of Bengal. According to informed sources, a conservative estimate would be about 250 "pirate" vessels operating at any given time in the zone and these vessels are actually plundering the marine resources of the country.

The coast guard established to curb the poaching is very poorly equipped for the task. It was established under the Ministry of Defence in August 1978 to protect the Indian EEZ and comprises three regional headquarters in Bombay, Madras and Port Blair in the Andaman Islands. Each regional headquarters has about 500,000 sq. km of sea under its jurisdiction with 2 frigates stationed in Bombay, 2 patrol boats in Madras and 3 in the Andamans. One or two patrol vessels will be joining the fleet shortly, but this is too inadequate. Proposals to equip the guard in the next five years with surveillance aircraft, rescue and pollution control ships and light helicopters have been approved. Letters of intent have been placed for 3 offshore and 3 inshore patrol vessels for delivery starting 1981-82. In addition more sophisticated weapons for the guard are being acquired.

**Sonar aid for fishing from China**

The development of a multi-beam fish scanning sonar which would greatly facilitate ocean fishing has been announced in Beijing by a spokesman for the Institute of Acoustics under Academy of Sciences, China. It is reported that the sonar developed by the Shanghai Acoustics Laboratory has 12 receiving beams, covering a sector of 90 degrees and it can be rotated a full 360 degrees.

The sonar can detect fish shoals in either shallow or deep waters and it displays the position, distance and range of fish shoals. According to the spokesman the equipment has been in trial use for three years. It is capable of detecting shoals amounting to 10 to 200 tonnes of fish at a distance of 500 m to 2,000 m.

One Shanghai fishing boat equipped with the instrument is stated to have caught more than 1,000 tonnes of fish in the first two months of this year, an increase of 70 per cent as compared with boats fishing without the aid of the equipment. Another sonar-equipped boat is said to have hauled in 21 tonnes of fish in one operation. The equipment would soon be put into serial production.

**Alcohol to relieve shocks to squids**

Australian scientists at Warrnambool Institute of Advanced Education in Victoria are experimenting with methods to keep squids alive in captivity so that fishermen can keep them alive until they reach the processing plant. This would be of great commercial application as squids lose colour and some of their table quality when dead. One of the methods being tried is to add few drops of alcohol to the seawater holding the squids.

The problem is that the squids are quite excitable and nervous and likely to die of shock. In order to minimise the shock factor, adding one or two per cent of alcohol to the water would be tried. Alcohol has been reported as having a narcotising effect on some squid species—in other words, it puts them to sleep and keep them less susceptible to shock.

World Fishing 29 (11) November 1980

**Antibacterial fish feed additive**

The Veterinary and Agricultural Division of the Wellcome Foundation Ltd. has introduced an antibacterial feed additive for use with farmed fish, as an extension of the successful Tribrissen range.

The product, known as Tribrissen 40 per cent Powder, is recommended for use as a feed additive in the treatment of diseases caused by sensitive bacteria in fish and is particularly effective in controlling furunculosis (*Aeromonas salmonicida* infection) and bacterial haemorrhagic septicaemia.

As with other Tribrissen formulations, the two active ingredients of the 40 per cent Powder produce a double sequential blockade of bacterial synthesis of folinic acid, giving a level of antibacterial activity many times greater than that obtained from either drug alone. The Powder contains Trimethoprim BP 6.7 per cent W/W and Sulphadiazine BP 33.3 per cent W/W in a Calcium Carbonate carrier and may be incorporated into the feed either at the time of manufacture or mixed with manufactured feed prior to feeding at the rate of 30 mg/kg body weight daily.

World Fishing 29 (11): November 1980

Compiled and prepared by M. J. George, S. K. Dharmaraja & G. Subbaraju.
Published by Dr. M. J. George, Senior Scientist on behalf of the Director, Central Marine Fisheries Research Institute, Cochin-682 018 and printed at PAICO, Cochin-31