

# **Management of Scombroid Fisheries**

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# Status of exploitation of seerfishes in the Indian seas

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## ABSTRACT

Seerfish production from the Indian seas during the past five decades from 1950s to 1990s, showed an increasing trend. The annual catch increased from 4,505 t in 1953 to 54,876 t in 1998. The average annual catch during the five decadal periods varied from 7,278 t in 1950-'59 to 41,575 t in 1990-'99 contributing 1.5% and 1.75% respectively to the total marine fish catch of India. However, the rate of increase through the successive decades decreased indicating the attainment of optimum level of production currently. During 1950-'59, the east coast contributed more (60%) than the west coast (40%), which changed to 36:64 during 1990-'99. Among the maritime states of India, Gujarat (25.88%), Maharashtra (16.09%), Tamilnadu (13.59%), Kerala (13.07%) and Andhra Pradesh (12.68%) were the prime seerfish producers during 1990-'99. Gill net (64.8%) was the dominant gear, followed by trawl (17.4%) and hooks and line (4%) with an average catch rate of 8.1 g/unit, 0.24 kg/hr and 3.7 kg/unit respectively during 1995-'99. Among the five species, the fishery was sustained only by two species viz., the king seer *Scomberomorus commerson* and the spotted seer *S.guttatus*. While, the king seer was predominant along south-eastern, south-western, mid-west coast regions, the spotted seer was more abundant along northeastern and northwestern areas. Fourth quarter recorded peak landings along both coasts of India. *S.commerson* of 40-126 cm sizes were caught in greater abundance by large mesh sized gill nets (120-170mm) and hooks and line whereas, fish below the minimum size at first maturity formed the bulk of the catch of small mesh sized gill nets and trawl nets. For *S.guttatus*, fishes of 20-54 cm size groups supported the fishery in gill net and trawl.

## INTRODUCTION

India is one of the leading seerfish producing countries of the world. During 1973-'93, it ranked third in world seerfish production and first among the countries bordering Indian Ocean (Devaraj *et al.*, 1999). Seerfish fishery assumes greater importance owing to their high economic returns especially to the traditional gillnet fishery sector. During 1999, the seerfish catch from the Indian seas was valued around 2.26 billion rupees. The fishery is represented by five species, four belonging to the genus *Scomberomorus*, viz., the king seer *S.commerson*, the spotted seer *S.guttatus*, the streaked seer *S.lineolatus* and the Korean seer *S.koreanus* and one species of *Acanthocybium*, the wahoo, *A.solandri*. Historical information on the Indian seerfish fishery is available in the studies of Krishnamoorthi (1957);

Nayar (1958); Kaikini (1961); Chacko *et al.* (1962); Jones (1962); Silas (1962); Devaraj (1977, 1986); Muthiah (1982); Bal and Rao (1984); Rao and Kasim (1985); Kasim and Khan (1986); Deshmukh and Shriram (1987) and Yohannan and Balasubramanian (1989). Recent studies include that of Kasim and Hamsa (1989); Thiagarajan (1989); Yohannan *et al.* (1992); Pillai *et al.* (1994); Devaraj *et al.* (1999) and Muthiah *et al.* (1999). The present paper deals with updating the available information on the status of seerfish exploitation in the Indian seas during 1995-'99.

**MATERIALS AND METHODS**

Published catch statistics alongwith state-wise, gear-wise, quarter-wise and species-wise catch data collected by the Fisheries Resource Assessment Division of CMFR Institute formed the main database to study the present status of the fishery. Also, data on catch and effort, species composition and length composition of seerfish collected from eight centres – four each from the east coast (Visakhapatnam, Kakinada, Chennai, Tuticorin) and west coast (Kochi, Calicut, Mangalore, Veraval) of India during 1995-'99 were used for the study. As the resource is exploited by different crafts and gears (gill nets, hooks and line and trawls operated by non-mechanised/mechanized/motorized boats, canoes, catamarans etc.), the efforts expended by each category of units were standardised. For different types of gill nets and hooks and line the efforts were standardised keeping the mechanized gill netters and hooks and line as the standard unit following the method adopted by Silas and Pillai (1985).

**RESULTS**

**Status of the fishery**

**All-India:** Seerfish landings in India showed an increasing trend during the past five decades, (1950-'59 to 1990-'99). The annual catch varied from a mere 4,505 t in 1953 to an all time peak of 54,876 t in 1998. The estimated

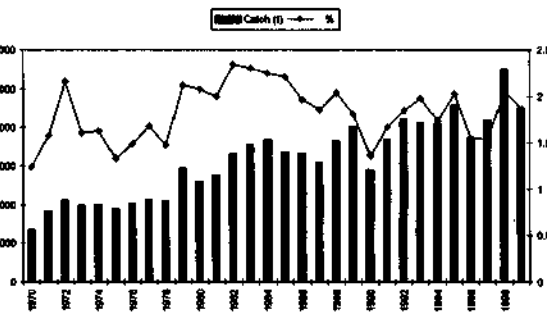


Fig. 1. Annual production and percentage composition of seerfish in the total marine catch of India

average annual production was 7,278 t, 10,499 t, 20,300 t, 33,297t and 41,575 t contributing 1.15%, 1.28%, 1.62%, 2.07% and 1.75% during 1950s, 1960s, 1970s, 1980s and 1990s respectively (Fig.1). The rate of increase through successive decades decreased indicating the attainment of optimum level of production.

During 1950s, the east coast of India landed more seerfish (60%) than the west coast. During 1960s it was found to be 59:41, which changed to 50:50 during 1970s, 37:63 during 1980s and then currently (1990s) to 36:64. Thus, though the production increased along both coasts, the improvement along the west coast was remarkable.

#### **State-wise production**

**East coast:** During 1970-'79, the average annual seerfish production was 10,165 t, which increased to 12,283 t during 1980-'89 and further to 14,954t during 1990-'99. However, its percentage contribution to the total all-India seerfish catch decreased from 50 % during 1970-'79 to 36% during 1990-'99. Among east coast states, Tamilnadu topped in production, contributing 37.94%, followed by Andhra Pradesh (35.41%), Orissa (15.70%), West Bengal (6.04%), Andamans (3.77%) and Pondicherry (1.13%) during 1990-'99.

**West Bengal:** Seerfish landings increased from a meagre 32 t in 1977 to 1,779 t in 1991 with an average annual catch of 611 t during 1976-'99. The average annual catch of 492 t during 1980-'89 increased to 904 t during subsequent decade. During 1990-'99 the state contributed 6% to the total seerfish catch from the east coast and 2.2% to the all-India seerfish production.

**Orissa:** The catch fluctuated from 651 t in 1985 to 3,285 t in 1999 with an annual average catch of 1,851 t during 1976-'99. The annual average catch during 1980-'89 was 1,584 t, which increased to 2,348 t during 1990-'99. Its contribution to the total seerfish catch from east coast was 15.7% and 5.6% to the all-India seerfish catch.

**Andhra Pradesh:** The annual catch ranged from 2,600 t in 1988 to 8,072 t during 1970-'99. The average annual production of 4,138 t during 1970-'79 shot up to 5,296 t during 1990-'99. It contributed 35.4% to the total seerfish catch from east coast and 12.6% to all-India seerfish catch.

**Tamilnadu:** During 1970-'99 the catch fluctuated from 2,926 t in 1970 to 9,230 t in 1998 with an average annual production of 5,074 t. During 1990-'99, with an annual average catch of 5,673 t the state topped in seerfish production from the east coast (37.9%) and ranked third (13.5%) in the all-India seerfish catch.

**Pondicherry:** During 1970-'99 the production varied widely from 23 t in 1975 to 555 t in 1999. It contributed 1.1% and 0.4% to the total seerfish catch from the east coast and all-India respectively.

**Andamans:** The annual production fluctuated from 38 t in 1979 to 844 t in 1989 during 1970-'99. The average annual catch of 79 t during 1970-'79

progressed to 564 t during 1990-'99. This island territory contributed 3.7% to the total seerfish catch from east coast and 1.3% to the all-India seerfish catch.

**West coast:** The average annual catch of 10,126 t during 1970-'79 doubled to 20,833 t during 1980-'89 and further to 26,794 t during 1990-'99. Consequently, its share to all-India seerfish catch increased to 64.2% during 1990-'99 from 49.9% during 1970-'79. Gujarat contributed 40.3%, followed by Maharashtra 25.0%, Kerala 20.3%, Karnataka 7.4%, Goa 6.5% and Lakshadweep 0.3% during 1990-'99.

**Kerala:** The catch fluctuated very widely from 1,386 t in 1972 to 10,162 t in 1988 with an average annual production of 4,953 t during 1970-'99. The average annual production of 3,540 t during 1970-'79 progressed to 5,864 t during 1980-'89, but decreased marginally to 5,455 t during 1990-'99. During 1970-'79 it ranked first in seerfish production from the west coast (35%) as well as in all-India (17.4%), but relegated to third position in west coast (20.3%) and fourth place in all-India (13.0%) during the last decadal period, 1990-'99.

**Karnataka:** During 1970-'99 the production was low at 776 t in 1975 and high at 6,826 t in 1982. The average annual production doubled from 1,646 t during 1970-'79 to 3,480 t during 1980-'89 but declined to 1,984 t during 1990-'99. The catch formed 7.4% and 4.8% of the total seerfish catch of the west coast and all-India respectively during 1990-'99.

**Goa:** The annual landing varied from 36 t in 1970 to 2,955 t in 1998 with an annual average of 913 t during 1970-'99. The decadal average catch almost doubled from 328 t during 1970-'79 to 650 t during 1980-'89 and further increased to 1,761 t during 1990-'99. Its contribution to the total seerfish catch from west coast was 6.5% and 4.2% to all-India production.

**Maharashtra:** The production fluctuated from 1,496 t in 1970 to 10,346 t in 1998 with an annual average of 4,974 t during 1970-'99. The average annual yield of 2,243 t during 1970-'79 increased steadily to 5,962 t during the next decade and further to 6,717 t during 1990-'99. During 1990-'99, it ranked second in the seerfish production from the west coast (25%) and also in all-India (16%) during 1990-'99.

**Gujarat:** During 1970-'99, the annual production fluctuated from as low as 686 t in 1974 to an all time record of 17,910 t in 1995. The average annual catch of 2,316 t during 1970-'79, increased to 4,820 t during 1980-'89 and further shot up to 10,806 t during 1990-'99. It ranks first in seerfish production from the west coast (40.3%) and all-India (25.8%) currently (1990-'99).

**Lakshadweep:** During 1970-'99 the annual catch varied from 21 t in 1980 to 99 t in 1982. The annual average landing stabilized around 55 t during 1970-'79 and 1980-'89 and improved to 71 t during 1990-'99.

#### Seasonal variations

Quarter-wise percentage of seerfish landings in different maritime states of India during 1995-'99 are shown in Table 1. It is seen that there was no clear catch trends along the east coast states as compared to the west coast. Along the east coast, the IV quarter contributed higher landings (31%) followed by III quarter (29%), I quarter (25.5%) and II quarter (14.5%). The landing was higher during I quarter in Andhra Pradesh (30.9%), III quarter in West Bengal (47.8%), Tamilnadu (39.4%), Pondicherry (51.9%) and during IV quarter in Orissa (60.9%). Along west coast IV quarter contributed maximum catches (44.7%), followed by I quarter (27.5%), III quarter (15.5%) and II quarter (12.1%).

#### Gear-wise catch, effort and catch rate

On all-India basis gill nets accounted for 64.8%, trawl 17.4%, hooks and line 4.0% and the rest (13.9%) by other gears such as purse seines, shore seines, boat seines, longlines and trolling (Table 2).

**Gill net:** The estimated all-India average annual standard gill net effort of 3.54 million units (boat days) yielded 28,701 t of seerfish at the catch rate of 8.1 kg/unit. The east coast with the standard effort of 2.75 million units produced 10,878 t at the catch rate of 4 kg/unit. The west coast accounted for 17,823 t for the standard effort of 0.79 million units at the catch rate of 22.5 kg/unit (Table 3).

**Hooks and line:** During 1995-'99 this gear landed 1,752 t for an estimated all-India average annual standard effort of 0.477 million units t at the catch rate of 3.7 kg/unit. It landed 839 t at the catch rate of 2.3 kg/unit along the east coast and 913 t and 8.3 kg/unit respectively along the west coast (Table 3).

**Trawl:** During 1995-'99 the estimated average annual all-India production by trawl was 7,693 t for the standard effort of 31.985 million hours of trawling at the catch rate of 0.24 kg/hr. The landing from east coast was 1,608 t at a catch rate of 0.15 kg/hr and 6,085 t and 0.29 kg/hr respectively from the west coast (Table 3).

**Other gears:** During 1995-'99 the other gears contributed an average annual catch of 6,154 t. The east coast recorded 1,930 t and the rest from the west coast (Table 3).

#### Species composition

During 1995-'99 the species composition of the all-India seerfish catch was *S.commerson* (62.82%), *S.guttatus* (36.55%), *S.lineolatus* (0.59%)

and *A.solandri* (0.04%) (Table 4). *S.commerson* dominated over *S.guttatus* in the south-west coast (92:8%) and south-east coast (76:24%). *S.guttaus* was found more abundant than *S.commerson* in the north-east coast (51:49%) and north-west coast (57:43%). *S.lineolatus* and *A.solandri* were more common in the south-east coast.

#### Status of fishery at selected centres

Seerfish production, effort and catch rate in various gears at different centres viz., Visakhapatnam, Kakinada, Chennai, Tuticorin (east coast of India), Kochi, Calicut, Mangalore and Veraval (west coast of India), during 1995-'99 are presented in Table 5. The estimated annual average landing was 159 t at Visakhapatnam, 402 t at Kakinada, 561 t at Chennai, 621 t at Tuticorin, 353 t at Kochi, 69 t at Calicut, 916 t at Mangalore-Malpe and 1,321 t at Veraval.

Gill net was employed for seerfish exploitation at all centres. During 1995-'99, it was the major gear for seerfish production at Kakinada (87.5%), Kochi (94.9%), Calicut (100%) and Veraval (73.7%) and contributed a sizeable proportion at other centres, Tuticorin (37.5%) and Mangalore-Malpe (44.3%). The effort ranged from 2,599 units at Chennai to 30,327 units at Veraval. The production rate in large mesh size gillnet was highest at Chennai (84.6 kg/unit) and lowest at Calicut (22.3 kg/unit). The average annual catch in the small mesh size gillnet *podivalai* at Tuticorin was 36 t for the effort of 6,104 units at the catch rate of 5.9 kg/unit and 56 t at the catch rate of 4.4 kg/unit in *silknet* at Visakhapatnam (Table 5).

During 1995-'99, the trawl accounted for major catches at Tuticorin (44.9%) and Mangalore-Malpe (45.7%). The average annual production from the six centres (Kakinada, Chennai, Tuticorin, Kochi, Mangalore-Malpe and Veraval) varied from 17 t at Kochi to 419 t at Mangalore-Malpe and the catch rate ranged from 0.8 kg/unit at Kochi to 15.2 kg/unit at Mangalore-Malpe (Table 5).

Hooks and line contributed sizable catches at the east coast centres only. During 1995-'99 the average annual production varied from 73 t at Tuticorin to 226 t at Chennai with highest catch rate of 42.7 kg/unit at Chennai.

During 1995-'99 purse seine landed an annual average catch of 91 t at Mangalore-Malpe and 1 t at Kochi.

#### Peak period of production

Monthly production trends indicated peak catches were made during March-April at Visakhapatnam, January-March at Kakinada and Chennai, July-August at Tuticorin, September at Kochi, September-October at Calicut, October at Mangalore-Malpe and December-January at Veraval (Table 5).

The species composition at different centres indicated that

*S. commerson* was the most common species and supported the fishery at all centres (Table 6). This species dominated the catch at all centres except the northern most centres along both coasts viz., Visakhapatnam and Veraval where *S. guttatus* was the major species. The other two species, *S. lineolatus* and *A. solandri* occurred in insignificant quantities at Kakinada and Tuticorin. *A. solandri* was also recorded from the Mangalore coast.

#### Size distribution

*S. commerson*: Size of *S. commerson* in the large mesh size gill net (65-170 mm) at Chennai, Tuticorin, Kochi, Calicut, Mangalore and Veraval ranged from 14 to 146 cm with the dominant modal length varying between 52 and 86 cm (Table 7). Fishes of 40-98 cm length range mainly contributed to the fishery (constituting 75-98% of the estimated number of fish). The proportion of fish below the minimum size at first maturity ( $L_m$ ) of 70 cm ranged from 33.7 % at Kakinada to 85.3 % at Calicut. (Table 7).

In the small mesh (60-100mm) gill net (*podivalai*) at Tuticorin, the length range was 10-78 cm with the dominant modal length at 30 cm (Table 7). Fishes in the size range of 18-54 cm mainly contributed to the fishery (98%). Young fishes (<34 cm) constituted bulk of the catches (71% of the estimated numbers) and almost all fishes were below the minimum size at maturity.

In trawl net, the size varied from 10 cm to 110 cm at different centres, Veraval, Mangalore-Malpe, Tuticorin and Kakinada (Table 7). The dominant modal length ranged between 14 and 46 cm. Fish of 10-70 cm size dominated the catch (75-98%). Almost all fishes caught were below the minimum size at first maturity.

The hooks and line caught relatively large sized fishes. The length range was 38-142 cm with the dominant modal length at 66 cm at Tuticorin and 82 cm at Chennai (Table 7). The fishery was mainly sustained by fish measuring between 50 and 126 cm. Exploitation of immature fish was 30.4% at Tuticorin and 44.7% at Chennai.

*S. guttatus*: The size range was 12-70 cm in gillnet with the dominant modal length varying from 40 to 44 cm at different centres (Table 8). Fish of 28-60 cm size mainly contributed to the fishery. Proportion of fish below the minimum size at first maturity (34 cm) varied from 7.4% at Chennai to 32.5% at Kakinada.

In trawl net, the length varied from 8 cm to 62 cm with modal length varying between 32 and 40 cm at all centres except Kakinada where the modal length was at 12 cm (Table 8). Fish in the size range of 12-48 cm sustained the fishery. Immature fishes constituted 32.9 % at Veraval to 93.9% at Kakinada.



## DISCUSSION

Though the fishery showed increasing trends during the past five decades (1950-'99), the rate of increase through the successive decades decreased, indicating the attainment of near optimum level of production. The pronounced increase in seerfish production during 1970s and 1980s was due to the introduction and subsequent intensification of mechanization of crafts and use of synthetic fishing materials for fabrication of efficient gears (Devaraj *et al.*, 1999). During 1990s, the intensification of mechanized trawling into multiday operations in deeper waters up to 100 m depth contributed to enhance the production. Though the production increased along east and west coasts of India, the increase along the west coast was more pronounced. Consequently, the east coast, which produced 60% of the all-India seerfish catch during 1950s, now contributes only 36%. The annual average catch during 1970s, 1980s and 1990s increased in all states except Kerala and Karnataka where the production declined during 1990s.

Studies on the seasonal variations indicated low seasonal catch trends along the east coast during 1995-'99, as compared to west coast. The first to fourth quarters contributed annual catches in the ratio of 26%, 14%, 29% and 31 % respectively along the east coast and 27%, 12%, 16% and 45% along west coast. Similar trends were reported earlier by Muthiah *et al.* (1999) based on the data for 1989-'94.

Devaraj *et al.* (1999) while assessing the exploitation of seerfish stocks in the Indian waters have reported that during 1989-'94 gill net, hooks and line, trawl and other gears landed 65.1%, 11.5%, 6.9% and 16.5% respectively. The present studies using the data for 1995-'99 showed that the contribution by gill net was steady at 65%, that of hooks and line decreased to 4% while that of trawl increased to 17%.

Devaraj *et al.* (1999) have estimated the all-India standard gill net effort at 1.447 million units, hooks and line at 0.944 million units (boat days) and 16.954 million standard trawling hours. Following the same method, the present estimates of 3.541 million gillnet units, 0.477 million hooks and line units and 31.985 million trawling hours during 1995-'99 show that the gill net effort has increased by 144.7%, trawl effort by 88.7%, whereas that of hooks and line decreased by 49.5%. Consequently the catch rate in gill net has come down to 8.1 kg/unit from 17.2 kg/unit during 1989-'94 while, that of hooks and line increased to 3.7 kg from 2.8 kg during the previous period. In the case of trawl, in spite of 88.7% increase in effort, the catch rate was steady at 0.24 kg/hr, more or less same as during 1989-'94 (0.26 kg/hr) period.

Peak catches were made during January-April along the east coast centres at Visakhapatnam, Kakinada and Chennai, during July-August at

Tuticorin, September at Kochi, September-October at Calicut, October at Mangalore-Malpe and December-January at Veraval along west coast. This indicates that seerfish stocks may migrate from the east coast towards south Tamilnadu coast during July-August, further move to south-west coast (Kerala) during September, mid-west coast (Karnataka and Goa) during October-November and north-west coast (Gujarat) during November-January and support the fishery in the respective regions.

Studies on the species composition made on an all-India and Centre-wise basis, show that the all-India seerfish catch was constituted by *S.commerson* (62.82%), *S.guttatus* (36.55%), *S.lineolatus* (0.59%) and *A.solandri* (0.04%) during 1995-'99 as compared to the species composition of *S.commerson* 55.32%, *S.guttatus* 43.92%, *S.lineolatus* 0.58% and *A.solandri* 0.18% during 1982-'94 (Muthiah *et al.*, 1999). This shows that the exploitation of the first species is on the increasing order and the latter in the decreasing trend. The present findings further confirm the dominance of *S.commerson* along the south-east and south-west coasts of India and *S.guttatus* along the north-east and north-west coasts of India.

Trawls and small meshed gillnets exploit seerfishes at smaller lengths, below the minimum size at first maturity as compared with large meshed gill nets and hooks and line. Almost all fish caught by the small mesh gill nets and trawls are immature and may lead to depletion of spawning stocks and recruitment overfishing. Similar observations were reported by Kasim and Hamsa (1989), Pillai *et al.* (1994), Yohannan *et al.* (1992), Devaraj *et al.* (1999) and Muthiah *et al.* (1999). Reducing the fishing intensity by these gears is not a practical proposition considering the multi-species target. The only alternative is to increase the mesh size of these nets for escape-ment of juveniles and immature fish. Since the capture of small sized fishes is minimum in the large meshed gill nets and hooks and line, these two gears may be encouraged for further expansion of the fishery in the deeper waters.

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Table 1. Average quarter-wise seerfish landing (%) in different maritime states of India during 1995-'99

State/Quarter	I	II	III	IV
West Bengal	20.44	1.61	47.82	30.12
Orissa	29.55	2.96	6.57	60.93
Andhra Pradesh	30.98	18.84	20.89	29.29
Tamilnadu	20.89	16.42	39.44	23.24
Pondicherry	22.52	11.90	51.94	13.64
<b>East coast</b>	<b>25.55</b>	<b>14.48</b>	<b>29.00</b>	<b>30.97</b>
Kerala	19.45	17.34	18.98	44.22
Karnataka	23.02	9.61	14.04	53.33
Goa	17.82	21.32	30.48	30.38
Maharashtra	18.34	7.70	16.32	57.63
Gujarat	37.89	11.58	11.64	38.89
<b>West coast</b>	<b>27.50</b>	<b>12.18</b>	<b>15.59</b>	<b>44.72</b>
<b>All-India</b>	<b>27</b>	<b>13</b>	<b>20</b>	<b>40</b>

Table 2. Gear-wise catch of seerfishes (t) in different maritime states of India during 1995-'99 (figures in parentheses indicate %)

State/Gear	Gill net	Hooks & line	Trawl	Other gears	Total
West Bengal	672 (93.20)	0 (0)	48 (6.66)	1 (0.14)	721
Orissa	1961 (87.86)	127 (5.69)	105 (4.70)	39 (1.75)	2232
Andhra Pradesh	3271 (64.01)	308 (6.03)	336 (6.58)	1195 (23.39)	5110
Tamilnadu	4749 (68.43)	387 (5.58)	1119 (16.12)	685 (9.87)	6940
Pondicherry	225 (89.29)	17 (6.75)	0 (0)	10 (3.97)	252
<b>East coast</b>	<b>10878</b> <b>(71.31)</b>	<b>839</b> <b>(5.50)</b>	<b>1608</b> <b>(10.54)</b>	<b>1930</b> <b>(12.65)</b>	<b>15255</b>
Kerala	3252 (69.00)	627 (13.30)	507 (10.76)	327 (6.94)	4713
Karnataka	1522 (66.17)	13 (0.57)	447 (19.43)	318 (13.83)	2300
Goa	885 (39.33)	0 (0)	277 (12.31)	1088 (48.36)	2250
Maharashtra	2847 (41.10)	32 (0.46)	1871 (27.01)	2177 (31.43)	6927
Gujarat	9317 (72.48)	241 (1.87)	2983 (23.20)	314 (2.44)	12855
<b>West coast</b>	<b>17823</b> <b>(61.36)</b>	<b>913</b> <b>(3.14)</b>	<b>6085</b> <b>(20.96)</b>	<b>4224</b> <b>(14.54)</b>	<b>29045</b>
<b>All-India</b>	<b>28701</b> <b>(64.79)</b>	<b>1752</b> <b>(3.95)</b>	<b>7693</b> <b>(17.37)</b>	<b>6154</b> <b>(13.89)</b>	<b>44300</b>

Table 3. Estimated standard effort, catch (t) and catch rate (kg) of seerfish landed by various gears during 1995-'99 in different maritime states along the east and west coasts of India. (1unit=1boatday)

State/Gear	Gill net			Hooks & line			Trawl			Other gears (t)	Total by all gears (t)
	Effort (unit)	Catch (t)	CPUE (kg)	Effort (unit)	Catch (t)	CPUE (kg)	Effort (hours)	Catch (t)	CPUE (kg)		
West Bengal	176010	672	3.82	-	-	0.00	660235	48	0.07	1	721
Orissa	1257387	1961	1.56	230815	127	0.55	455578	105	0.23	39	2232
Andhra Pradesh	346141	3271	9.45	38465	308	8.01	2382799	336	0.14	1195	5110
Tamilnadu	907225	4749	5.23	93654	387	4.13	7353492	1119	0.15	685	6940
Pondicherry	63474	225	3.54	4211	17	4.04	0	0	0.00	10	252
<b>East coast</b>	<b>2750237</b>	<b>10878</b>	<b>3.96</b>	<b>367145</b>	<b>839</b>	<b>2.29</b>	<b>10852104</b>	<b>1608</b>	<b>0.15</b>	<b>1930</b>	<b>15255</b>
Kerala	70134	3252	46.37	91510	627	6.85	4567207	507	0.11	327	4713
Karnataka	67985	1522	22.39	200	13	65.00	3254908	447	0.14	318	2300
Goa	27378	885	32.33	0	0	0.00	404438	277	0.68	1088	2250
Maharashtra	194979	2847	14.60	6635	32	4.82	5638553	1871	0.33	2177	6927
Gujarat	430107	9317	21.66	11415	241	21.11	7268089	2983	0.41	314	12855
<b>West coast</b>	<b>790583</b>	<b>17823</b>	<b>22.54</b>	<b>109760</b>	<b>913</b>	<b>8.32</b>	<b>21133195</b>	<b>6085</b>	<b>0.29</b>	<b>4224</b>	<b>29045</b>
<b>All-India</b>	<b>3540820</b>	<b>28701</b>	<b>8.11</b>	<b>476905</b>	<b>1752</b>	<b>3.67</b>	<b>31985299</b>	<b>7693</b>	<b>0.24</b>	<b>6154</b>	<b>44300</b>

Table 4. Species composition of seerfish catch (%) in different maritime states during 1995-'99

State/Species	<i>S.commerson</i>	<i>S.guttatus</i>	<i>S.lineolatus</i>	<i>A.solandri</i>
West Bengal	1.89	97.97	0.14	-
Orissa	64.70	35.30	-	-
<i>North-east coast</i>	49.37	50.60	0.03	-
Andhra Pradesh	56.36	42.08	1.48	0.08
Tamilnadu	89.47	7.81	2.60	0.12
Podicherry	79.14	20.86	-	-
<i>South-east coast</i>	75.51	22.31	2.08	0.10
<i>East coast</i>	<b>70.45</b>	<b>27.79</b>	<b>1.68</b>	<b>0.08</b>
Kerala	97.14	2.68	0.11	0.08
Karnataka	80.50	19.35	-	0.15
Goa	91.46	8.54	-	-
<i>South-west coast</i>	91.63	8.24	0.05	0.08
Maharashtra	39.05	60.95	-	-
Gujarat	45.83	54.16	-	0.01
<i>North-west coast</i>	43.46	56.54	-	0.003
<i>West coast</i>	<b>58.81</b>	<b>41.15</b>	<b>0.02</b>	<b>0.03</b>
<b>All-India</b>	<b>62.82</b>	<b>36.55</b>	<b>0.59</b>	<b>0.04</b>

Table 5. Annual average effort, catch (t) and catch rate (kg) landed by various gears at different centres during 1995-'99

Centre/Gear	Gill net			Trawl			Purse seine			Hooks & line			Peak period of production	Total seerfish catch (t)
	Effort (unit)	Catch (t)	CPUE (kg)	Effort (unit)	Catch (t)	CPUE (kg)	Effort (unit)	Catch (t)	CPUE (kg)	Effort (unit)	Catch (t)	CPUE (kg)		
Visakhapatnam	12614	56	4.44	-	-	-	-	-	-	23407	103	4.40	Mar-Apr	159
Kakinada *	16155	352	21.79	57437	50	0.87	-	-	-	-	-	-	Jan-Mar	402
Chennai	2599	220	84.65	43716	115	2.63	-	-	-	5288	226	42.74	Jan-Mar	561
<b>Tuticorin</b>														
<i>Paruvalai</i>	6708	233	34.73	34084	279	8.19	-	-	-	11231	73	6.50	Jul-Aug	621
<i>Podivalai</i>	6104	36	5.90											
Kochi	7171	335	46.72	21866	17	0.78	2312	1	0.43	-	-	-	Sep	353
Calicut	3089	69	22.34	-	-	-	-	-	-	-	-	-	Sep-Oct	69
Mangalore	10415	406	38.98	27647	419	15.16	15984	91	5.69	-	-	-	Oct	916
Veraval	30327	974	32.12	74301	347	4.67	-	-	-	-	-	-	Dec-Jan	1321

\* Data for 1998-'99 only

Table 6. Species composition of seerfish catch (%) at different centres during 1995-'99

Centre/Species	<i>S.commerson</i>	<i>S.guttatus</i>	<i>S.lineolatus</i>	<i>A.solandri</i>
Visakhapatnam	43.13	56.87	-	-
Kakinada	56.38	42.86	0.03	0.73
Chennai	64.14	35.86	-	-
Tuticorin	91.65	4.56	2.50	1.29
Kochi	99.22	0.78	-	-
Calicut	100.00	-	-	-
Mangalore	91.76	8.05	-	0.19
Veraval	29.71	70.29	-	-

Table 7. Size distribution of *S.commerson* by different gears at different centres

Centre	Size range (cm)	Dominant modal length (cm)	Fishery-support-group (cm)	%	% of young fish (<34 cm)	% of fish < size at first maturity (<70 cm)
<b>Gear: Gill net</b>						
Kakinada	14-146	86	18-110	97.54	24.07	33.70
Chennai	26-114	70	42-98	89.59	4.46	62.90
Tuticorin	34-134	74	50-98	90.76	0.26	41.51
Kochi	26-130	74	42-98	97.86	0.40	55.71
Calicut	30-120	52	40-88	91.68	6.34	85.31
Mangalore	22-114	62	40-92	94.18	0.58	73.05
Veraval	28-118	70	48-96	74.49	1.90	54.71
<b>Gear: Podivalai</b>						
Tuticorin	10-78	30	18-54	97.93	71.03	99.99
<b>Gear: Hooks and line</b>						
Chennai	38-134	82	50-106	96.53	-	44.68
Tuticorin	50-142	66	58-126	98.12	-	30.39
<b>Gear: Trawl</b>						
Kakinada	10-86	14	10-34	96.89	96.89	99.89
Tuticorin	10-110	18	14-50	90.19	59.45	98.12
Mangalore	12-100	24	18-64	98.28	71.50	99.80
Veraval	28-108	46	42-70	75.30	5.09	84.88



Table 8. Size-distribution of *S.guttatus* by different gears at different centres

Centre	Size range (cm)	Dominant modal length (cm)	Fishery-supporting group (cm)	%	% of young fish (<18 cm)	% of fish < size at first maturity (<34 cm)
<b>Gear: Gill net</b>						
Kakinada	12-68	44	34-54	66.99	21.99	32.48
Chennai	24-70	40	34-60	91.60	-	7.40
Mangalore	20-58	42	36-48	85.64	-	12.26
Veraval	16-62	44	28-54	96.54	0.05	25.76
<b>Gear: Trawl</b>						
Kakinada	8-54	12	12-28	79.10	60.42	93.85
Chennai	16-60	32	22-40	89.94	2.03	74.19
Mangalore	16-58	36	20-42	94.10	1.31	51.25
Veraval	20-62	40	30-48	80.25	-	32.91