

# Evolution of Fisheries and Aquaculture in India



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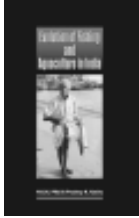
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**Table 15.** Estimated shrimp culture production in India ('000 t)

State	1990-91	1991-92	1992-93	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99	1999-2000	2000-2001	2001-2002	2002-2003
West Bengal	12.50 (35.22)	13.80 (34.50)	16.30 (34.68)	16.50 (26.61)	25.00 (30.18)	23.45 (33.22)	19.95 (28.22)	15.12 (22.61)	18.33 (22.18)	19.96 (25.31)	21.08 (21.71)	26.80 (26.03)	28.27 (24.51)
Orissa	4.10 (11.55)	3.80 (9.50)	4.30 (9.15)	3.30 (5.32)	4.80 (5.79)	6.00 (8.50)	6.81 (9.63)	5.00 (7.48)	6.00 (7.26)	3.17 (4.02)	7.36 (7.58)	8.96 (8.70)	10.28 (8.91)
Andhra Pradesh	7.35 (20.71)	9.70 (24.25)	12.80 (27.23)	26.00 (41.94)	34.00 (41.04)	27.14 (38.46)	30.58 (43.26)	34.08 (50.96)	44.86 (54.29)	41.86 (53.08)	53.10 (54.69)	51.23 (49.76)	59.19 (51.33)
Tamil Nadu	0.45 (1.27)	0.70 (1.75)	1.10 (2.34)	2.00 (3.23)	3.00 (3.62)	1.09 (1.55)	1.13 (1.60)	1.20 (1.79)	1.82 (2.20)	2.90 (3.68)	3.79 (3.91)	4.71 (4.60)	4.99 (4.33)
Pondicherry	N.A.	N.A.	N.A.	N.A.	N.A.	0.01 (0.01)	0.03 (0.04)	0.02 (0.03)	0.02 (0.02)	N.A.	N.A.	N.A.	N.A.
Kerala	8.93 (25.14)	9.50 (23.75)	9.75 (20.74)	11.50 (18.55)	12.00 (14.48)	9.00 (12.75)	8.23 (11.64)	7.29 (10.90)	7.66 (9.27)	6.70 (8.50)	7.33 (7.55)	5.54 (5.38)	7.57 (6.56)
Karnataka	1.00 (2.82)	1.10 (2.75)	1.15 (2.45)	1.50 (2.42)	2.50 (3.02)	2.05 (2.90)	2.30 (3.25)	2.64 (3.95)	2.69 (3.26)	2.80 (3.55)	2.73 (2.81)	3.50 (3.40)	2.62 (2.27)
Goa	0.25 (0.69)	0.30 (0.75)	0.35 (0.74)	0.40 (0.65)	0.45 (0.54)	0.55 (0.78)	0.58 (0.82)	0.59 (0.88)	0.59 (0.71)	0.84 (1.07)	0.97 (0.99)	1.20 (1.16)	0.71 (0.62)
Maharashtra	0.80 (2.25)	0.93 (2.33)	1.05 (2.23)	0.30 (0.48)	0.40 (0.48)	0.74 (1.05)	0.52 (0.74)	0.70 (1.05)	0.41 (0.49)	0.33 (0.42)	0.32 (0.32)	0.32 (0.31)	0.64 (0.55)
Gujarat	0.13 (0.35)	0.17 (0.43)	0.20 (0.43)	0.50 (0.81)	0.70 (0.84)	0.55 (0.77)	0.57 (0.81)	0.24 (0.35)	0.26 (0.31)	0.30 (0.38)	0.42 (0.44)	0.68 (0.66)	1.05 (0.91)
Total	35.50	40.00	47.00	62.00	82.85	70.57	70.69	66.87	82.63	78.86	97.10	102.94	115.32

Figures in parentheses represent the percentage of the total

Source: modified Anon., 2001, 2002 and Jose, 2003

**Table 16.** Statewise yield of shrimp culture in India (kg ha<sup>-1</sup>)

State	1990- 91	1991- 92	1992- 93	1993- 94	1994- 95	1995- 96	1996- 97	1997- 98	1998- 99	1999- 2000	2000- 01	2001- 2002	2002- 03
West Bengal	369	407	472	483	726	676	457	356	435	474	501	570	576
Orissa	579	512	554	505	565	545	600	441	750	396	920	1100	1142
Andhra Pradesh	1225	1197	1347	1333	985	543	507	574	631	589	748	640	829
Tamil Nadu	1800	1458	2075	1904	1500	379	1764	1780	1674	2668	3488	1900	1375
Pondicherry	–	–	–	–	–	270	1227	909	1227	–	–	–	–
Kerala	686	723	727	830	851	614	561	499	520	456	498	380	553
Karnataka	400	433	447	577	714	585	657	746	755	786	767	1140	862
Goa	466	571	636	696	750	846	892	907	907	1292	1486	1290	763
Maharashtra	444	498	530	137	166	1033	563	722	960	775	739	1070	1391
Gujarat	100	736	555	1052	1000	618	574	236	810	949	1342	1260	1193
Total	545	586	664	751	819	593	521	472	582	556	684	660	758

Source: modified Anon., 2001, 2002 and Jose, 2003

Andhra Pradesh contributed substantially to the overall increase in shrimp production, primarily due to increase in the area despite the disease problem and reduction in stocking rates. The shrimp production in the state increased eight times to reach 59,000 t (more than half of national production) in 2002-03 followed by West Bengal, Orissa, Kerala, Tamil Nadu and Karnataka. The shrimp farms in the other shrimp growing states produced less than 1000 t annually.

The shrimp yield in India over the past decade has not followed a regular trend (Table 16). It reached a maximum of 819 kg ha<sup>-1</sup> in 1994-95 and declined to 472 kg ha<sup>-1</sup> in 1997-98. Finally, during 2002-03, it was 758 kg ha<sup>-1</sup>. Among the states, the maximum yield was in Tamilnadu for most of the years (1.48-3.49 t ha<sup>-1</sup>) except in 1995-96 and 2002-03 due to disease outbreak. For other states, mostly it remained below 1t ha<sup>-1</sup>, barring few years for Andhra Pradesh, Gujarat, Maharashtra, Pondicherry and Goa. There has been significant development in the extent of brackishwater area brought under culture in the state of Andhra Pradesh but the disease problems arising out of unsustainable culture practices have resulted in stagnation of expansion of farm areas and reduction in productivity. Presently, most of the large farms run by corporate bodies have closed down due to very high overheads, disease problems, public litigations and protests by environmental groups over issues like salination of land and freshwater aquifers adjacent to shrimp farms, through seepage. The farming community has now become more responsive to the concepts of environment friendly and sustainable aquaculture. Disease problems are being overcome through adoption of closed system of farming (recirculation system, zero water exchange) in grow outs, application of probiotics, secondary aquaculture of selected fishes like mullets, milkfish, molluscs and seaweeds in reservoirs and drain canals, adoption of indigenous, good quality seed and feed and reduction of stocking density to 5-6 nos m<sup>-2</sup> in the farms.

Farming of *P. monodon* in freshwater ponds has shown fast growth and high production and it has been adopted in Andhra Pradesh and Kerala. Advanced molecular techniques like Polymerase Chain Reaction (PCR) for early and rapid detection of viral pathogens which cause disease outbreaks are used to prevent disease problems in the growout system.

Fluctuating marine fish production combined with increased demand for shrimp in global market, successful demonstration of modified extensive shrimp culture and establishment of commercial hatcheries along the east coast of India have led to rapid development of shrimp farms with a production of 5-10 t ha<sup>-1</sup> crop<sup>-1</sup> in 4-5 months. Farmed shrimp production

increased from 40000 t in 1991-92 to 82850 t in 1995-96 but subsequently slumped to about 66858 t in 1997-98 as the fast pace of development ignored the sustainability factor, which resulted in disease outbreak, crop failures, environmental degradation and social tensions (Varghese, 2001). The farmed shrimp production has improved now and has reached 115320 t (Table 17).

The exports of shrimp increased from 50000 t (1985-86) to 135000 t (2002-03). In value terms the magnitude of increment was much higher i.e. from Rs 3298 million to 46083 million (Table 17). During this period the share of cultured shrimp in exports increased from 33 to 60% in quantity and from 49 to 86% in value.

**Table 17.** Trend of shrimp exports and contribution by aquaculture

Year	Shrimp exports		Cultured shrimp			Percent contribution	
	Quantity (t)	Value (Rs million)	Production (t)	Export (t)	Value (Rs million)	Shrimp Export	Export value
1985-86	50349	3298.2	—	—	—	—	—
1986-87	49203	3779.3	—	—	—	—	—
1987-88	55736	4257.8	—	—	—	—	—
1988-89	56835	4703.3	28000	18300	2293.0	33.00	48.78
1989-90	57819	4633.1	30000	19500	2597.0	33.72	58.57
1990-91	62395	6633.2	35500	23075	3764.0	36.98	56.77
1991-92	76107	9661.6	40000	26000	5447.6	34.16	55.81
1992-93	74393	11802.6	47000	30550	7662.5	41.06	64.93
1993-94	86541	17707.3	62000	40300	12889.3	47.14	72.79
1994-95	101751	25102.7	82850	53853	18662.3	52.92	74.35
1995-96	95724	23560.0	70573	47992	15316.9	50.96	64.09
1996-97	105426	27017.8	70686	45945	16425.6	43.58	60.80
1997-98	101318	31405.6	66868	43454	20860.0	42.90	66.42
1998-99	102484	33449.0	82634	53712	25110.0	52.41	75.07
1999-2000	110275	36452.2	78860	54000	27820.0	48.96	76.32
2000-01	111874	44815.1	97100	65894	38700.0	58.90	86.35
2001-02	127709	41399.2	102940	74826	35450.0	58.80	85.63
2002-03	134815	46083.1	115320	80996	37938.6	60.08	82.33

Source: Ganapati and Viswakumar, 2001 (modified & updated)



## Contribution of inland sector in fish production

### Freshwater

The species-wise inland fish landings over the period 1991- 1998 are summarised in Table 13 (Anon., 1996 b, 2000). The major contributing fish species in inland catch were the Indian major carps, namely, *Catla catla*, *Labeo rohita*, *Cirrhinus mrigala* and *L. calbasu*. They account for 54-58% of inland fish catch in India. The other dominant freshwater fishes (19.86%) include *Hilsa ilisha*. Remaining categories have less than 10% share in total inland catch. During the past two decades, the inland aquaculture fish production has increased from 0.51 to 2.69 million t, while that of inland capture fisheries has declined from 0.59 to 0.50 million t (Anon., 1996a,b; Anon., 2000; Gopakumar *et al*, 1999; Dehadrai, 2003).

**Table 13.** Inland fish production in India ('000 t)

Year	Major carps	Minor carps	Exotic carps	Murrels	Catfishes	Other freshwater fishes	Total
1991	905.88 (54.72)	100.42 (6.07)	134.39 (8.12)	58.84 (3.55)	-	455.88 (27.54)	1655.41
1992	922.62 (54.27)	102.36 (6.02)	139.33 (8.20)	60.15 (3.54)	-	475.60 (27.98)	1700.06
1993	1047.19 (54.24)	62.86 (3.26)	186.44 (9.66)	75.13 (3.89)	-	558.99 (28.95)	1930.61
1994	1120.17 (55.18)	64.36 (3.17)	197.69 (9.74)	90.76 (4.47)	15.50 (0.76)	541.44 (26.67)	2029.92
1995	1200.20 (54.17)	109.43 (4.94)	214.84 (9.70)	93.93 (4.24)	52.85 (2.39)	544.30 (24.57)	2215.54
1996	1348.12 (57.61)	97.60 (4.17)	238.07 (10.17)	94.94 (4.06)	85.13 (3.64)	476.18 (20.35)	2340.04
1997	1395.09 (56.80)	101.27 (4.12)	261.54 (10.65)	105.50 (4.29)	91.16 (3.71)	501.73 (20.43)	2456.29
1998	1511.58 (58.13)	139.00 (5.35)	226.08 (8.69)	109.69 (4.22)	97.38 (3.75)	516.50 (19.86)	2600.23

The figures in parentheses represent percentage of total

Source: modified Anon., 1996 b, 2000



The contribution of aquaculture sector in the total inland fish production has increased sharply from 46.36 to 84.33% (Table 14). This increase is primarily due to the tremendous rise in freshwater aquaculture production (from 0.3 to 2.7 m t). The share of freshwater aquaculture in total inland fish production has also increased from 27.95 to 65.83%. Despite this increase, there is scope for further increase in inland fish production by way of horizontal expansion and higher productivity per unit area.

**Table 14.** Inland fish production in India (\*000t)

Type of fisheries	1984-85	1989-90	1994-95	2002-03
Capture	591.74 (53.64)	396.50 (28.28)	334.03 (15.93)	500.00 (15.67)
Aquaculture	511.50 (46.36)	1005.50 (71.72)	1762.70 (84.07)	2690.00 (84.33)
Fresh water	308.30 (27.95)	779.40 (55.59)	1392.30 (66.40)	2100.00 (65.83)
Brackishwater	203.20 (18.41)	226.10 (16.13)	370.40 (17.67)	590.00 (18.50)
Total inland fish production	1103.20	1402.00	2096.70	3190.00

Figures in parentheses represent percentage of total inland fish production

(Katiha and Bhatta, 2002 and Dehadrai, 2003)

### Brackishwater

The contribution of brackishwater capture fisheries to total production is not significant. The capture component was dominant in shrimp production till 1980s but in nineties the contribution of culture sector became noticeable, more so with the zero growth trend in capture sector. At present, shrimp culture accounts for about 50% of the total production. Shrimp culture has become a saviour to maintain and enhance Indian shrimp production and thereby the exports. The shrimp culture production was estimated as 115 thousand t (Table 15). It is evident from the table that the area remained almost the same after 1997-98, but the production went up from 70 to 115 thousand t by 2002-03. There has been a steady rise in production from shrimp culture till 1994-95, but thereafter, it dropped till 1997-98 to pick up again in 1998-99. Now the rising trend is continuing. This may be due to the adoption of improved culture practices. It clearly indicates the potential for enhancing shrimp production and productivity in India.

The tiger shrimp (*Penaeus monodon*) has the major share in shrimp culture production followed by the white shrimp (*P. indicus*) and banana shrimp (*P. merguensis*).