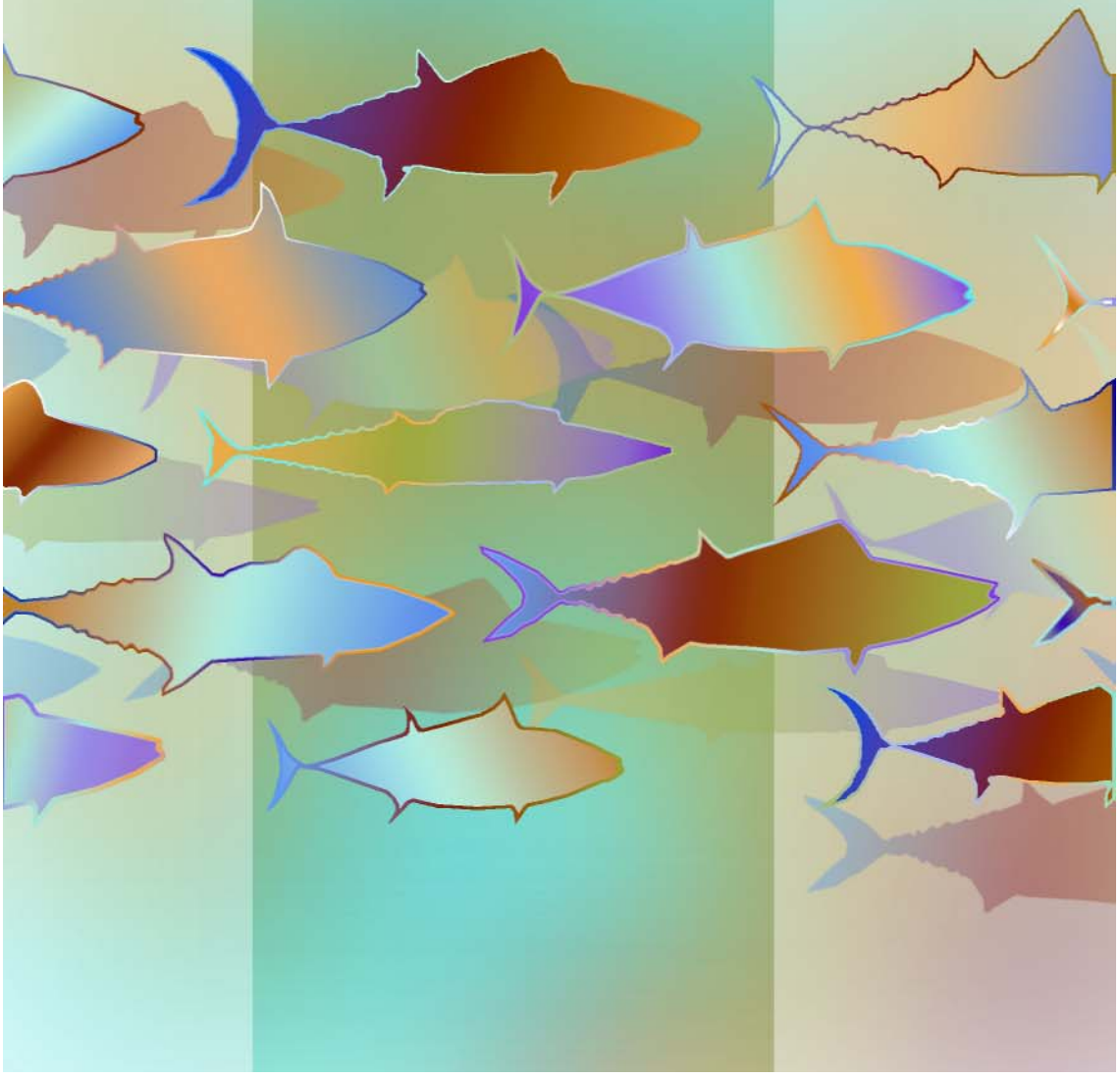
Status of Exploited Marine Fishery Resources of India



STATUS OF EXPLOITED MARINE FISHERY RESOURCES OF INDIA

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Carangids

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1. Introduction

Carangids occupy 9th position with a production of 1.11 lakh tonnes, constituting 4.1% of 2.7 million t of marine fish production in India during 2000. Among the pelagic fishery resources, carangids constitute the fourth important resource and rank next to oil sardine, ribbonfishes and mackerel. This resource is comprised mainly of horse mackerels, round scads, queenfishes, trevallies, leatherjackets and pompanos and has emerged as one of the important resources especially in the mechanised sector. As many as 35 and odd species belonging to 21 genera have been observed to support the carangid fishery along the Indian coast and other species occur in stray catches. Small growing species like Selaroides leptolepis attain a maximum of 185 mm where as queenfishes and jacks grow to 1-2 m. The smaller species usually occur in large schools in shallow waters. Owing to the recent approach of value addition the economic importance of small sized carangids have also increased considerably. Considering the economic and commercial importance of this resource, a detailed account on the fishery, biology and stock assessment of 11 species have been reviewed.

2. Production trends

Carangid fishery in India is sustained mainly by 36 species such as Alectis indicus (Indian thread-fin trevally), A.ciliaris (Redfin trevally), Alepes djedaba (Djedaba trevally), A.para (Golden scad), Decapterus russellii (Round-scad), D.kurroides (Scad), D.dayi (Day's scad), Megalaspis cordyla (Horse mackerel) (Fig. 1), Scomberoides lysan (Talang leather-skin), S.commersonianus (Talang queenfish),

(Fig. 2) S.tala (Deep queenfish), S.tol (Slender queenfish), Trachinotus blochii (Sub-nose pompano), T.baillonii (Bailon's pompano), T.botla (Russel's pompano), Selar boops (Banded scad), S.crumenophthalmus (Bigeye scad) (Fig. 3), Atropus atropus (Kuwesh trevally), Caranx sexfasciatus (Dusky trevally), C.carangus (Black-tailed trevally), C.ignobilis (Yellowfin trevally), C.melampygus (Bluefin trevally), C.kalla (Trevally), C. para (Fig. 4), Coryphaena hippurus (Dolphin fish), Carangoides armatus (Longfin trevally), C.malabaricus (Malabar trevally), C.oblongus (Coach-whip trevally), C.chrysophrys (Long-nose trevally), C.ferdau (Ferdau's cavalla), Atule mate (One-finlet scad), Rachycentron canadus (Black kingfish), Seriolina nigrofasciata (Black-banded kingfish), Elagatis bipinnulata (Rainbow runner), Parastromateus niger (Black pomfret) and Selaroides leptolepis (Yellow-strip trevally).

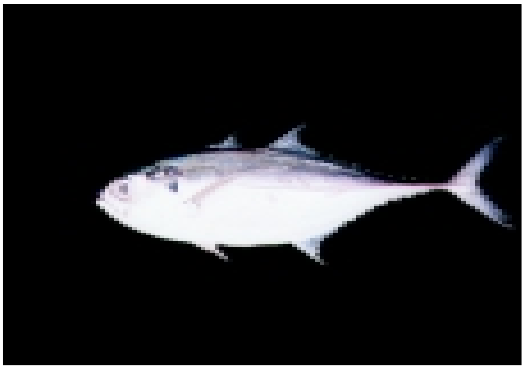

Fig. 1. Megalaspis cordyla

Fig. 2. Scomberoides commersonianus

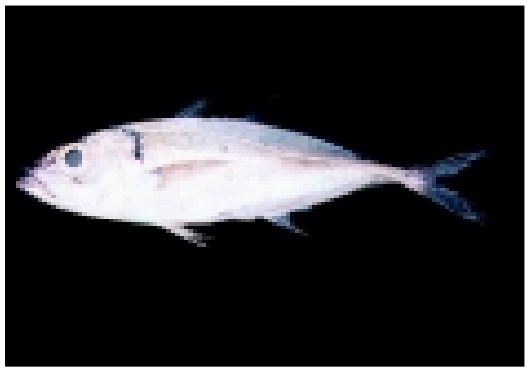

Fig. 3. Selar crumenophthalmus

The landings increased from a meagre 24,560 t in 1969 to a phenomenal 1.97 lakh t in 1995 and decreased to 1.11 lakh t in 2000. The resource constituted on an average 4.3% of the total marine fish production in India (Fig.5). The production of carangids seems to have stabilised after the peak production in 1995. The unit value of carangid at the landing centre varies from Rs. 5/kg for small sized species like S. leptolepis to as high as Rs.180/kg for black pomfret Parastromateus niger and the cost of annual production may be valued modestly at Rs.1.1 billion. The prohibitive high cost of the quality

table fish like the white pomfret and seerfish has forced the common man to prefer carangids and as such they are sought after by middle class people. Among the different maritime states Kerala contributes the highest ie. 40.2% of all India carangid production, followed by Tamil Nadu (16.5%), Karnataka (12.5%), Andhra Pradesh (7.2%), Gujarat (6.4%), Goa (5.2%), Orissa (1.2%), Pondicherry (0.9%), West Bengal (0.6%), Andaman and Nicobar Islands (0.5%) and Lakshadweep (0.1%) (Fig. 6). Among the four major groups the most dominant is the scads forming about 40% followed by the horse mackerel 13%, leatherjackets 5% and the rest 42% by other carangids during 1983-2000 (Fig. 7). During 1985-93, the seasonal abundance of carangids have been found to vary from state to state. Along the east coast, the abundance was observed to be good during I and IV quarters in West Bengal and Orissa. The II quarter was also good in Andhra Pradesh. The production was almost equal during the IV quarter in Tamil Nadu. The trend in Pondicherry was similar to the pattern observed in Andhra Pradesh (Fig. 8). On the other hand the abundance along the west coast appears to be different from that of east coast. In Kerala and Gujarat, the peak period of production was during the last 3 quarters with peak in the III quarter in Kerala and IV quarter in Gujarat. The production was good during I, III and IV quarters along Karnataka and Maharashtra coasts with peak during the III quarter in the former and the IV quarter in the latter state. Uniquely in Goa, the landing was better during I followed by the II quarter (Fig. 9).

Fig. 4. Caranx para

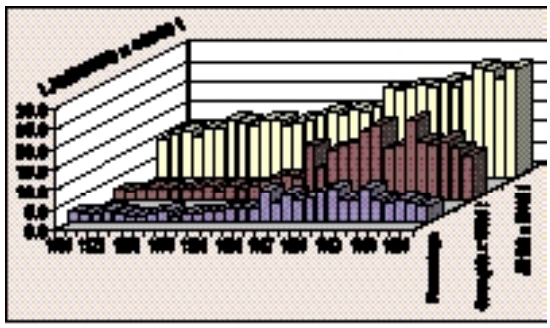

Fig. 5. Estimated total marine fish landings and contribution of carangids during 1983-2000

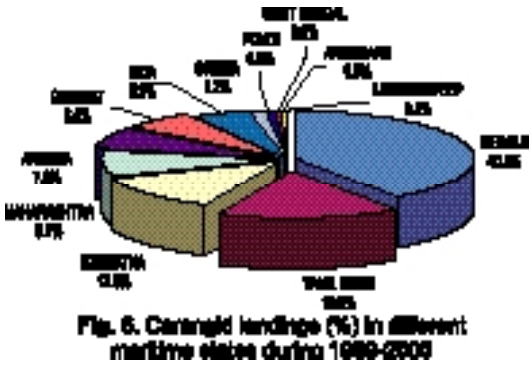

Fig. 6. Carangid landings (%) in different maritime states during 1983-2000

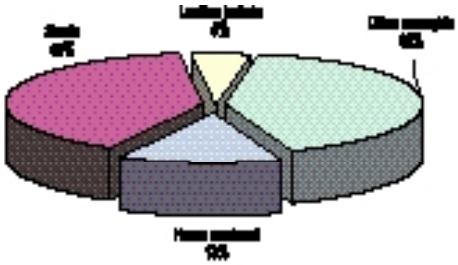

Fig. 7. Percentage composition of different groups of carangids during 1989-2000

Carangids are extensively exploited by a multitude of gears like trawls, drift gill nets, bottom set gillnets, hooks & line, purse seine, ring seine, shore seine, boat seine, bag nets, etc. However, the trawls (68%), gill nets (11.3%), hooks & line (10.8%), purse seine (8.3%) and boat seine (1.5%) appear to exploit the carangids more effectively than the other gears (Fig. 10). Observations reveal that except at Veraval in Gujarat where a perceptible increase was recorded in the landings of carangids, in all other centres like Mangalore, Kochi, Vizhinjam, Tuticorin and Kakinada the production either showed a declining trend or a general decline with fluctuation during 1998-2000.

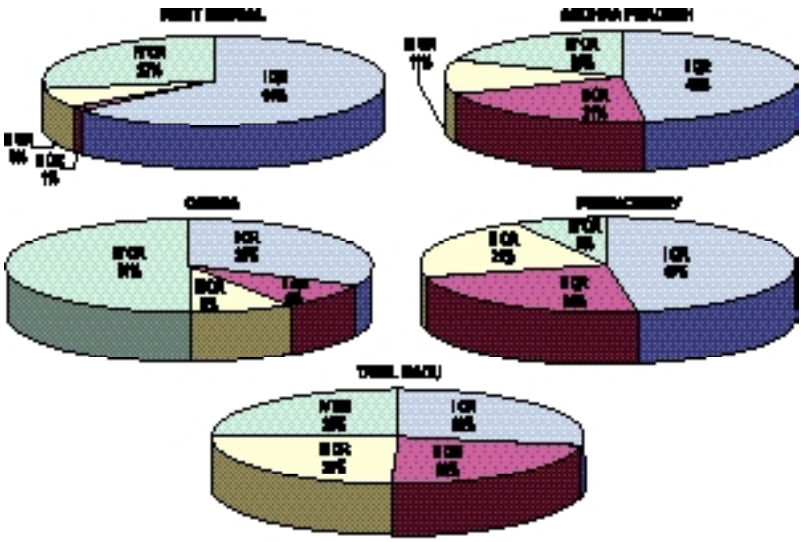

Fig. 8. Quarterwise production of carangids in various states

Species composition

Many species support the carangid fishery along the Indian coasts and the species composition in the catch depends on the selective properties of the gears employed. The non-selective trawls mostly exploited scads such as Decapterus dayi (43.5%), D. macrosoma (6.7%), Selar crumenophthalmus (8.9%), Horse mackerel M. cordyla (6.9%), trevally Caranx para (9.8%), C. carangus (3.6%), Selaroides leptolepis (1.5%) and the remaining 19.1% is constituted by a number of other species. In the

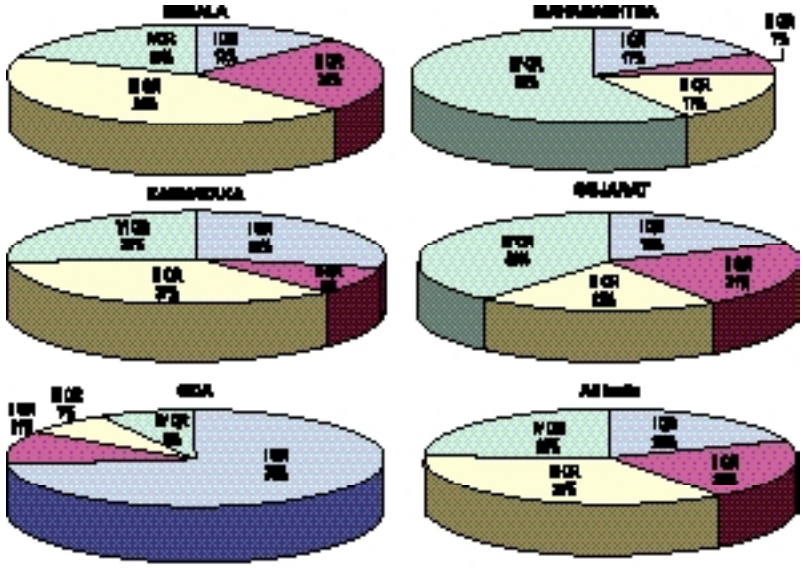

Fig 8. Quarterwise production of carangids - Selected states and All India

gill net landings the dominant species were Megalaspis cordyla (37.3%), Carangoides gymnostethus (6.2%), Caranx sexfasciatus (4%), Scomberoides spp. (8.1%), Elagatis bipinnulata (3.1%), S. crumenophthalmus (2.8%), Scomberoides tala (1.7%) Alepes djedaba (0.7%) and the rest 36.1% by other species collectively. The purse seine landed very few species of carangids and in that A. djedaba was the dominant species (42.7%) followed by C.para (16%), D.macrosoma (16%) and M.cordyla (2.4%). The species composition of the carangid landings of all the gears pooled at different major landing centres along both the coasts are summarised Table 1. As many as 20 species constitute the fishery of some magnitude at different places as evident from the percentage composition. Comparatively the occurrence of more number of species at Tuticorin may be attributed to the unique biodiversity supported by 21 coral islands in the Gulf of Mannar. In general the small sized scads Decapterus spp, Horse mackerel M. cordyla and big eye scad S. crumenophthalmus constitute a fishery all along the Indian coast.

Table 1. Percentage composition of different species landed at various centres along the Indian coast

Species	Tuticorin	Kakinada	Veraval	Mangalore	Kochi
Decapterus spp.	3.8	62.6	34.6	21.1	49.5
Caranx carangus	18.4	14.2	—	5.4	7.7
Decapterus kurroides	—	2.0	—	0.8	—
Selar crumenophthalmus	9.1	6.9	—	—	12.5
Caranx kalla	7.4	—	—	37.1	—
Scomberoides spp.	7.1	2.5	5.7	2.7	0.8
Megalaspis cordyla	5.5	4.2	28.6	20.8	9.1
Alepes djedaba	—	1.0	—	—	10.5
Atropus atropus	—	0.5	3.3	—	—
Alectis spp.	0.3	—	—	—	—
Caranx sexfasciatus	24.0	—	—	—	—
Selaroides leptolepis	3.7	—	—	—	—
Caranx gymnostethus	9.0	—	—	—	—
Caranx tille	0.9	—	—	—	—
Elagatis bipinnulata	4.0	—	—	—	—
Seriolina nigrofasciata	0.1	—	—	—	—
Caranx melampygus	0.1	—	—	—	—
Caranx spp.	—	4.1	—	—	—
Psenes indicus	—	—	4.0	—	—
Alepes para	—	2.0	—	—	—
Other carangids	6.6	3.5	23.7	12.1	9.9

3. Biology

Details on vital population parameters L_∞, K, t_0, M, Z, F, U, 'a' and 'b' values of length-weight relationship, status of exploitation and other biological information for 11 dominant species of carangids studied along both east and west coast of India are summarised in Table 2. Almost all the species studied exhibit faster growth and have a short life span varying from 2 to 6.6 years. Owing to their faster growth, prolonged spawning and continued recruitment these species are able to withstand the higher fishing pressure prevailing at present. Almost all the species are piscivorous and prefer to feed mostly on fishes like anchovies, sardines, Thrissocles spp. Apogon spp. silverbellies and ribbonfish among fishes, squids and cuttlefishes among molluscs and prawns and crabs among the crustaceans. The young ones prefer to feed more on prawns, squids and anchovies and the adult mostly on fishes, prawn, molluscs and crabs. The salient features of commercially important species are summarised below.

Atropus atropus

Size range is 100 – 450 mm and grows to 214, 321, 378 and 412 mm at the end of 0.5, 1, 1.5 and 2 years. Size at 1st maturity is reported to be 210 mm. Spawning

Table 2. Vital biological parameters obtained for different species of carangids from seas around India.

Sl. No.	Species		L_{∞} (mm)	K/yr	t_0 Life span	M	Z	F	U	a	b	Exploitation
1.	Atropus atropus	Veraval	453	1.143	-0.039	1.76	6.45 trawl	4.69	0.73	-1.716	2.8980	Optimal
		N. West coast	440	1.00	2.6 to 3 years	1.26	6.85 trawl	5.58	0.82	3.156^{-05}	2.8587	Optimal
2.	Megalaspis cordyla	Veraval	554	1.0337	-0.0078	1.59	7.78 trawl	6.19 trawl	0.7953 trawl	-3.3914	2.5419	Over
					2.1 to 5 years		4.04 gill	2.48 gill	0.5958 gill			
		Kakinada	710	1.40		1.76	4.26	2.5	0.582			
		East coast	410	0.52		0.84	3.08	2.24	0.73	1.2463^{-05}	2.9404	Under
		N. West coast	525	0.80		1.04	5.12	4.08	0.80	1.2767^{-04}	2.5270	Under
		S. West coast	339	0.60		0.93	2.85	1.92	0.67	5.0973^{-05}	2.7177	Over
3	Caranx carangus	Tuticorin	498	0.7689	-0.0455	1.18	6.54 trawl	5.36		-4.3555	2.8577	Optimal
		T. Nadu & Pondicherry					3.92 gill	2.74				
			444	0.65	3.9 to 4.6 years	0.95	4.51 pooled	3.56	0.79	4.5947^{-05}	2.85492	Under
4.	Selaroides leptolepis	Tuticorin	213	1.4283	-0.0151	2.19	6.10 trawl	3.91		-3.5058	2.3732	Under
		T. Nadu & Pondicherry	202	0.82	2.1 to 3.7 years	1.35	4.88	3.52	0.72	1.7119^{-05}	2.89319	Under
5.	Decapterus russelli	East coast	221	0.71	2.1 to 6.6 years	1.35	2.83	1.48	0.52	5.2715^{-06}	3.11072	Over
		N. West coast	299	0.45		0.83	2.85	2.02	0.71	3.258^{-06}	3.2069	Under
		S. West coast	248	0.78		1.26	3.88	2.62	0.68	4.901^{-06}	3.13243	Under
		Kakinada	215.5	1.4		2.46	6.60	4.15	0.629			Over
6.	Decapterus macrosoma	Kakinada	220	1.05	2.8 years	1.89	3.4	1.51	0.425			Under
7.	Alepes kalla	S. West coast	171	0.83	3.6 years	1.40	3.08	1.68	0.55	3.9715^{-06}	3.24429	Over
8.	Alepes djedaba	Kerala	326	0.61	4.9 years	0.99	5.15	4.16	0.81	4.9144^{-06}	3.14685	Over
9.	Atule mate	Kerala	340	0.85	3.5 years	1.22	3.53	2.31	0.65	7.935^{-06}	3.05156	Over
10.	Caranx para	Mangalore	168	0.7	4.3 years	1.69	2.67	0.98	0.335			Under
11.	Selar crumenophthalmus	Kakinada	280	1.05	2.9 years	1389	3.40	1.51	0.425			Under

takes place in November-December and recruitment is during March to June along the northwest coast.

Megalaspis cordyla

Size range is 200-670 mm and grows to 216, 358, 438, 485 and 515 mm in 0.5, 1, 1.5, 2 and 2.5 years respectively. Feeds on mainly fishes Apogon spp, S. insidiator, Sphyraena spp, Trichiurus spp, Caranx spp, Platycephalus spp, prawns, squids and cuttlefishes. Size at first maturity is 250 mm. Spawning is observed during March-May (recruitment in April-May) along east coast, in July along northwest coast and in January along southwest coast. The recruitment is in October (minor) and January (major) along northwest coast, and April (minor) and July (major) along southwest coast.

Caranx carangus

Size varies from 60-480 mm and grows to 184, 228, 352, 394, 425, 449, 467 and 479 mm by 0.5, 1, 1.5, 2, 2.5, 3, 3.5 and 4 years respectively. Feeds on Stolephorus spp, sardines, Leiognathus spp, prawns, Thrissocles spp., crabs, etc. The young ones thrive on shrimps and adults on fishes, prawns and crabs. Size at first maturity is 220 mm. Spawning occurs in November and April and recruitment in February-March and September.

Selaroides leptolepis

Size ranges from 60-190 mm and grows to 77, 118, 146, 166, 180 and 190 mm in 0.25, 0.5, 0.75, 1, 1.25 and 2 years. Size at first maturity varied from 88-101 mm. Spawning is observed in October and July and recruitment in January and October.

Decapterus russelli

Size range is 70-250 mm and grows to 109, 168, 203 and 209 mm in 0.5, 1, 1.5 and 2 years. Feeds on anchovies, silverbellies, squids, caridian prawns and Acetes spp. Size at first maturity is 137 mm. Spawning is during April and August (recruitment July and November) along east coast and in December and August along west coast (recruitment in June and January).

Decapterus macrosoma

Size range is 110-224 mm and grows to 90, 144, 174, 194, 204 and 211 mm by the end of 0.5, 1, 1.5, 2, 2.5 and 3 years respectively.

Alepes kalla

Size range is 60-170 mm and grows to 59, 97, 122, 139, 150, 157 and 162 mm in 0.5, 1, 1.5, 2, 2.5, 3 and 3.5 years. Size at first maturity is 129 mm. Spawning occurs in October and July and recruitment in April and January.

Alepes djedaba

Size range is 200-360 mm with a mean of 293 mm and grows to 86, 150, 196, 230, 255, 274, and 288 mm in 0.5, 1, 1.5, 2, 2.5, 3 and 3.5 years. Size at first

maturity is 180-189 mm. Spawning occurs in December and September and recruitment in June and March.

Atule mate

Size range is 100 to 300 mm and grows to 118, 195, 245, 278, 300, 315 and 323 mm in 0.5, 1, 1.5, 2, 2.5, 3 and 3.5 years. Size at first maturity is 172 mm. Spawning occurs during April-May and January-February and recruitment in July and October.

Caranx para

Size range is 90-165 mm and grows to 50, 85, 110, 127, 139 and 148 mm in 0.5, 1, 1.5, 2, 2.5 and 3 years respectively.

Selar crumenophthalmus

Size varies from 100 to 265 mm and attains 115, 185, 222, 246, 260 and 268 mm in 0.5, 1, 1.5, 2, 2.5 and 3 years.

Information on the various biological aspects of larger species belonging to the genera Scomberoides and Caranx is meagre, mostly due to the prohibitive cost of samples required for undertaking such studies. The spawning season appears to be protracted. The peak spawning activity and recruitment vary. Most species along the west coast and the northeast coast indicate peak spawning activity during the summer months prior to the southwest monsoon and those along the southeast region spawn intensively during the pre-northeast monsoon season.

4. Stock assessment

Among the eleven species, four of them viz. S. leptolepis at Tuticorin, D. macrosoma and S. crumenophthalmus at Kakinada and C. para at Mangalore are underfished. C. carangus is underfished along the Tamil Nadu and Pondicherry coast and optimally fished off Tuticorin. A. atropus is optimally fished from the northwest region. Species like M. cordyla is partially underfished along both east and west coasts. However, there appear to be overfishing of the species off Veraval and southwest region. D. russelli indicated overexploitation off Kakinada. Others like A. kalla along the southwest, and A. djedaba and Atule mate along the Kerala coasts are over fished.

5. Management

Deployment of different gears in India reveals that almost all of them are employed with specific aim to exploit certain target species. Prawns are the target species in the case of trawl and quality fishes like seerfishes, tunas and billfishes, sharks, barracudas and pomfrets are the target species of drift gill net and hooks & line. The purse seine and ring seine target the major pelagic resources like mackerel and oil sardines along the southwest coast and in respect of dol net it is the Bombay-duck. Many carangid species form only a by-catch in almost all the gears except in small meshed drift gill nets, boat seine and shore seine. The landings by these gears

are negligible. In a situation like this, it is not only difficult but also not possible to propose any specific regulatory measures exclusively for judicious exploitation of carangid resource. The production trend of carangids also exhibits stagnation during the late 1990s as in the case of many other important fishery resources. Major pelagic fishery resources like oil sardine, mackerel, Bombay-duck and ribbonfishes are sustained by more or less single species. Whereas, carangid fishery is sustained by many fast growing species with short life span and that provides them better scope to compete with other resources in the process of species succession. In the event of a decline or absence or replacement of one or more species due to over exploitation by target fishing or any other human and natural interference, the fast growing species tend to fill the vacuum created in the food web. The resource comprised of many such fast growing small species may be expected to rightly fulfil the above requirements. This may be one of the reasons for a continued increase in the over all carangid production in India. However, when certain fishery regulatory measures either on the effort reduction or mesh size regulation for increasing the size at first capture in order to ease the higher fishing pressure are implemented, the same will be equally beneficial to carangid resource also. In a nutshell, out of eleven species studied, only five are over fished and that too in a restricted area. Among these five species, two are partially underfished in certain regions. All the remaining six species are mostly underfished except one or two which are optimally fished. This suggests that there is scope for further increase in carangid production owing to impending increase in the effort input in future, as the effort or gear regulations are yet to be implemented in India in spite of over-exploitation of certain fishery resources.

6. Suggested reading

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