A PRELIMINARY STUDY OF THE JUVENILE FISHES OF THE COASTAL WATERS OFF MADRAS CITY

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Introduction

It has generally been observed that in the commercial catches along the Madras coast very young stages of fish occur in enormous numbers during certain months. The present paper deals with the periodicity in the post-larval and juvenile bony fishes obtained from March 1954 to July 1955 collected from the fishing centres at Triplicane North and South, Ayodhya-kuppam, Nochikuppam, Santhome, Kanniappanagar and Royapuram. The majority of the species being of great commercial importance, it is hoped that a record of their very young stages, apparently not older than a few months, as judged by their very small size of about few cm. in length, will help in fixing the approximate period of their breeding and in facilitating interpretation of the different size classes, usually obtained in the commercial catches. Further, it is well known that information on the fluctuations in the abundance of post-larvæ of any commercial fish is of value in determining the magnitude of the forthcoming fisheries.

Methods of Study

In March and April when the young fishes were landed in abundance in the shore-seines operated along the coastal waters of March, 18 samples were collected at random during 1954 and 16 samples during 1955. The juvenile fishes were generally found mixed up with the adults of whitebait, *Anchoviella commersonii*, which formed the main fishery during these months. A few samples of juveniles were collected in other months also when they occurred in fairly large numbers in shore-seines, boat-seines or bag nets, operated on the coast for various food fishes. Altogether 9,282 specimens representing 73 species under 40 families were measured for their total length and arranged in groups of 1 cm. intervals. Their number, range in size and the major size groups are given in Table I. Early growth rate of some species was studied when they occurred in the samples in consecutive months. The feeding habits have been determined by a study of the stomach contents.

TABLE 1

*Juvenile fishes of the Madras Coast**

Species	Months of Occurrence	Size range and major group in brackets—Total length in cm.		Number of specimens examined		Food components
		1954	1955	1954	1955	
Family ELOPIDÆ						
1. *Elops indicus* (Forskål)	April	5–6	..	1	4	Chiefly crustaceans as prawn larvæ and *Acetes indicus* along with bundles of setæ as of polychæte worms
Family CLUPEIDÆ						
2. *Sardinella fimbriata* (Valenciennes)	March and April	4–10 (6)	4– 9 (6)	55	1	Predominantly photoplanktonic organisms, a few copepods and other crustaceans
3. *Sardinella sirm* (Walbaum)	March and April	3– 6 (5)	3–11 (5)	4	203	Phytoplanktonic organisms, a few copepods, other small crustaceans, lamellibranch larvæ and gastropod larvæ
4. *Ilisha indica* (Swainson)	March and April	7– 8 (6)	4– 7 (6)	2	8	Chiefly copepods and a few mysids
5. *Opisthopterus tardoore* (Cuvier)	June	..	3– 8 (6)	..	10	Stomatopod larvæ, prawn larvæ amphipods and mysids

Family DUSSUMIERIIDÆ						
6. *Dussumieria hasseltii* (Bleeker)	March and April	4–10 (5)	5– 9 (7)	79	22	Crustaceans as zœa larvæ, amphipods and copepods
	†December	4– 5 (4)	..	21	..	
	†May and June	6– 7 (7)	..	39	..	
Family DOROSOMATIDÆ						
Sub-family Dorosomatinæ						
7. *Anadontostoma chacunda* (Hamilton Buchanan)	April	5– 6	..	1	..	Prawn larvæ, a few copepods and other crustaceans
Family ENGRAULIDÆ						
8. *Thrissocles mystax* (Bloch and Schneider)	April	4–7	..	2	..	Prawn larvæ, amphipods and a few other crustaceans
9. *Thrissocles setirostris* (Broussonet)	April	7–8	5–8 (8)	1	4	Crustacean food consisting of amphipods, zœa larvæ and *Acetes*
Family CHIROCENTRIDÆ						
10. *Chirocentrus dorab* (Forskål)	March and April	5–12 (7)	5–12 (8)	84	64	*Anchioviella* sp. juvenile *Lactarius lactarius*, young ones of other fish and also small dorabs
			12–24	..	14	
Family SYNODONTIDÆ						
11. *Saurida tumbil* (Bloch)	March and April	7–9 (9)	12	3	1	Young fish and copepods
Family EXOCŒTIDÆ						
12. *Parexocœtus brachypterus* (Rich.)	January	..	6–13 (9)	..	49	Amphipods, copepods, other crustaceans and bits of filamentous algæ

* All obtained in the shore seine catches except otherwise indicated.

† Catch obtained in boat-seines.

TABLE I—(*Contd.*)

Species	Months of Occurrence	Size range and major group in brackets—Total length in cm.		Number of specimens		Food components
		1954	1955	1954	1955	
13. *Cypselurus spilopterus* (Cuvier and Valenciennes)	March and April	4–6	8–10 (8)	2	8	*Acetes indicus*, young prawns, mysids and copepods
Family POLYNEMIDÆ						
14. *Polynemus indicus* (Shaw)	March and April	2–8 (4)	6–10 (8)	32	53	Prawn larvæ, mysids and amphipods
15. *Polynemus sextarius* (Bloch and Schneider)	April	3–9 (7)	2–5 (4)	56	81	Copepods, crustacean larvæ, *Acetes indicus* amphipods and polychæte worms
	June	..	4– 8 (5)	..	84	
	†July	..	4–10 (5)	..	146	
16. *Polynemus sexfilis* (Valenciennes)	March and April	..	5–9 (6)	..	7	Chiefly crustacean food, young prawns, *Acetes*, copepods and zœa larvæ
Family SPHYRÆNIDÆ						
17. *Sphyræna jello* (Cuvier Valenciennes)	March and April	5–7 (6)	6– 8 (6)	10	9	Chiefly young bony fishes, also pteropods, lamellibranch larvæ and gastropod larvæ
18. *Sphyræna obtusata* (Cuvier Valenciennes)	March and April	4–11(6)	5–12 (6)	78	6	Chiefly young bony fish, also copepods, cirrepede larvæ, pteropods, lamellibranch larvæ, gastropod larvæ and few polyzoans

Family MUGILIDÆ						
19. *Mugil* sp.	March and April	3–6 (4)	6–7 (7)	78	3	Large amounts of detritus along with phytoplanktonic organisms, copepods and foraminiferan shells
Family THERAPONIDÆ						
20. *Therapon theraps* (Cuvier)	March	4–6 (5)	..	14	1	Post-larval fishes, young prawns and other crustaceans
21. *Therapon jarbua* (Forskål)	March and April	..	5–6	..	1	Chiefly fish food, also small numbers of amphipods, copepods and lamellibranch larvæ
Family PRIACANTHIDÆ						
22. *Priacanthus hamrur* (Forskål)	March and April	..	5–9 (6)	..	2	Young prawns, other crustaceans and tubiculous worms
Family CARANGIDÆ						
23. *Megalaspis cordyla* (Linnaeus)	April	..	6– 8 (8)	..	3	Post-larval fishes, young prawns and other crustaceans
24. *Decapterus russelli* (Ruppell)	March and April	..	4–12 (10)	..	115	Chiefly crustaceans as *Acetes indicus* and copepods
25. *Selar mate* (Cuvier)	March and April	..	2–12 (8)	..	248	Young prawns, *Acetes indicus* and copepods
26. *Caranx carangus* (Bloch)	March and April	..	5– 7 (6)	..	10	Stomatopod larvæ, other crustaceans and tubiculous polychætes
27. *Alectis indica* (Ruppell)	March and Apr l	4–5	3– 6 (4)	3	5	Zœa larvæ, amphipods cirrepede larvæ and copepods
28. *Carangoides armatus* (Forskål)	April	..	6– 7	..	2	Post-larval fishes and crustaceans as prawn larvæ
29. *Carangoides malabaricus* (Bloch)	March and April	..	2– 9 (9)	..	17	Post-larval bony fishes and crustaceans like prawn larvæ and *Acetes*

TABLE I (*Contd.*)

Species	Months of Occurrence	Size range and major group in brackets—Total length in cm.		Number of specimens examined		Food components
		1954	1955	1954	1955	
30. *Atropus atropus* (Bloch)	March and April	2–8 (5)	..	37	6	..
31. *Chorinemus tol* (Cuvier)	March and April	2–7 (4)	2– 6 (5)	82	38	Post-larval stages of bony fishes as *Lactarius lactarius* and *Anchoviella* sp. also prawn larvæ, *Acetes indicus*, amphipods and lamellibranch larvæ in small numbers
32. *Trachinotus blochi* (Lacépède)	March and April	5–12 (6)	5–7 (6)	41	3	Young ones of *Hippa* (*Emerita*) along with other crustaceans
Family LACTARIIDÆ						
33. *Lactarius lactarius* (Schneider)	March and April	2–9 (6)	2– 6 (3)	52	270	*Acetes indicus* and other crustaceans like prawn larvæ
			2– 5 (4)	..	81	
	June	..	3– 9 (6)	..	21	
Family APOGONIDÆ						
34. *Archamia macroptera*	March and April	5–6	5–7	1	2	Post-larval fishes, young prawns, crustacean larvæ, copepods and mysids
35. *Apogon lateralis* (Bleeker)	March and April	4–5	..	1	..	Amphipods and other small crustaceans
36. *Apogon frenatus* (Valenciennes)	March and April	3–4	6– 8	1	3	Chiefly young prawns, also copepods, other crustaceans and post-larval bony fishes

Family LEIOGNATHIDÆ							
37.	*Leiognathus insidiator* (Bloch)	March and April	2–7 (3)	2– 9 (3)	31	65	Chiefly copepods and other crustaceans, also polyzoans
38.	*Leiognathus ruconius* (Hamilton Buchanan)	March and April	2–6 (4)	2– 7 (4)	21	114	Mainly copepods also cirrepede larvæ, a few other small crustaceans and larvæ of lamellibranchs
39.	*Leiognathus splendens* (Cuvier)	March and April	2–6 (3)	3– 8 (4)	61	118	Copepods and phytoplanktonic organisms
40.	*Leiognathus fasciatus* (Lacépède)	March and April	2–4 (3)	3– 6 (4)	81	508	Copepods and other small crustaceans
41.	*Leiognathus equulus* (Forskål)	March and April	..	3– 8 (4)	..	108	Chiefly copepods, also cirrepede larvæ, lamellibranch larvæ, gastropod larvæ and phytoplanktonic organisms.
42.	*Gazza minuta* (Bloch)	March and April	3–7 (6)	2–10 (3)	101	767	Copepods, other crustaceans and pteropods like *Creseis*
Family GERRIDÆ							
43.	*Gerres setifer* (Hamilton Buchanan)	March and April	2–6 (4)	5– 7 (6)	9	15	*Acetes indicus*, amphipods, copepods and other crustaceans
44.	*Gerres abbreviatus* (Bleeker)	March and April	3–6 (4)	..	109	..	Mainly crustaceans, with copepods dominating. Remains of *Acetes*, amphipods and polychæte worms were present in small quantities
Family MULLIDÆ							
45.	*Upeneus sulphureus* Cuvier	March and April	4–8 (6)	4– 9 (8)	76	183	*Acetes cindius*, copepods and other crustaceans
46.	*Upeneus tæneopteris* Cuvier	April	..	5– 9 (7)	..	41	*Acetes indicus*, *Lucifer* copepods and other crustaceans as prawn larvæ

TABLE I—(*Contd.*)

Species	Months of Occurrence	Size range and major group in brackets—Total length in cm.		Number of specimens examined		Food components
		1954	1955	1954	1955	
47. *Parupeneus indicus* (Shaw)	‡May	..	4– 6 (5)	..	4	Chiefly copepods, *Acetes indicus* and other small crustaceans
Family LUTIANIDÆ						
48. *Lutianus kasmira* (Forskål)	March and April	3–5 (4)	2– 3	38	46	Masses of tubiculous polychæte worms
49. *Lutianus lineolatus* (Ruppell)	March and April	..	3–10 (5)	..	137	Copepods, zœa larvæ, lamellibranch larvæ and gastropod larvæ
Family LETHRINIDÆ						
50. *Lethrinus nebulosus* (Forskal)	March and April	7–9	5– 9	2	4	Young prawns and Copepods
Family NEMIPTERIDÆ						
51. *Nemipterus japonicus* (Bloch)	March and April	3–8 (4)	9–10	25	4	Chiefly prawn larvæ and stomatopod larvæ, also some copepods and amphipods
Family POMODASYIDÆ						
52. *Pomodasys maculatus* (Bloch)	March and April	3–5 (5)	2– 6 (5)	8	196	*Acetes indicus*, *Lucifer*, copepods and cirrepede larvæ
Family SCIÆNIDÆ						
53. *Otolithus* sp.	March and April	3–9 (9)	3– 8 (5)	17	15	*Acetes indicus*, amphipods, copepods and polychæte worms
	June	..	3–12 (5)		8	
54. *Johnius belengeri* (Cuvier)	April	2–7 (3)	2– 4 (3)	52	36	Post-larval bony fishes, young prawns, amphipods, copepods and polychæte worms
	June	..	3– 9 (6)	..	12	
55. *Sciæna dussumeri* (Cuvier and Valenciennes)	April	8–9	2– 6 (3)	1	4	Polychæte worms, copepods and other crustaceans
Family DREPANIDÆ						
56. *Drepane punctata* (Linnaeus)	April	..	4– 6	..	2	Exclusively nemertine worms

Family SIGANIDÆ						
57. *Teuthis javus* (Linnæus)	March and April	2–7 (3)	2– 6 (3)	240	2083	Phytoplanktonic organisms, bits of algal filaments, copepods and cirrepede larvæ
Family ACANTHURIDÆ						
58. *Acanthurus matoides* (Cuvier nad Valenciennes)	March and April	4–6	3– 6	6	14	Composed of detritus in which no food components are distinguishable
Family SCORPÆNIDÆ						
59. *Pterois russelli* (Bennett)	March and April	3–4	3– 4	2	1	Young prawns, mysids, amphipods and copepods
Family TRICHIURIDÆ						
60. *Trichiurus haumela* (Forskål)	March and April	9–10 13–27	8–10 14–25	10	16	Young and post-larval bony fishes and crustaceans like young prawns
Family SCOMBRIDÆ						
61. *Rastrelliger kanagurta* (Cuvier)	February	..	5–11 (9)	..	23	(*a*) In juveniles up to 8 cm. preponderance of phytoplanktonic organisms with fair numbers of small zooplanktonic organisms
	March	13–15 (13)	4–10 (8)	172	44	
	April	4–12 (7)	4–12 (8)	210	316	
	May	4–6 (5)	..	90		
	June	..	11–14 (13)	..	80	
	July	..	9–17 (11)	..	34	(*b*) In juveniles between 9 and 10 cm. predominantly post-larval fishes, stomatopod larvæ and other crustaceans, with very little phytoplanktonic organisms
						(*c*) In juveniles from 10 to 12 cm. predominantly small crustaceans like advanced zœa, *Acetes*, copepods and moderate amounts of phytoplanktonic organisms.

‡ Catch obtained in bag-nets.

TABLE I—(*Contd.*)

Species	Months of Occurrence	Size range and major group in brackets—Total length in cm.		Number of specimens examined		Food components
		1954	1955	1954	1955	
Family SCOMBEROMORIDÆ						
62. *Scomberomorus commerson* (Lacépède)	March and April	4–8 (6)	4–12 (6)	40	75	Exclusively small bony fish, mostly anchovies
63. *Scomberomorus guttatus* (Bloch and Schneider)	September	4–12 (6)	..	30	..	Young bony fishes
Family GOBIIDÆ						
64. *Glossogobius biocellatus* (Cuvier and Valencinnes)	March and April	3– 5 (4)	6– 7	21	1	Copepods and other crustaceans along with phytoplanktonic organisms
Family STROMATEIDÆ						
65. *Apolectus niger* (Bloch)	April		4– 6 (6)	..	4	Chiefly whitish pulpy matter with scales and bones as of lacerated young fish, also a few copepods, *Acetes* and other crustaceans
	June		4– 8 (7)	..	28	
	July†		5–10 (8)	..	123	
	July‡		9–14 (12)	..	65	
66. *Stromateus sinensis* (Euphrasen)	June		4– 7 (5)	..	4	Semidigested unrecognisable lacerated pulpy matter
Family PLATYCEPHALIDÆ						
67. *Platycephalus scaber* (Linnaeus)	March and April	7–8	6– 7	2	1	Chiefly stomatopod larvæ and other crustaceans

Family PESTTODIDÆ 68. *Psettodes erumei* (Bloch and Schneider)	April	2–3	..	1	..	
Family BOTHIDÆ 69. *Bothus pantherinus* (Ruppell)	March and April	3–9 (6)	6– 8 (6)	33	3	Amphipods and polychætes
Family PLOTOSIDÆ 70. *Plotosus canius* Hamilton-Buchnan	March	..	9–10	..	4	Amphipods, isopods, mysids and young prawns
Family GADIDÆ 71. *Bregmaceros maccelellandi* Thompson	December	4–5	..	4	..	Chiefly crustaceans, some with small egg capsules having yolk-laden eggs as of gastropods
Family TRIACANTHIDÆ 72. *Triacanthus brevirostris* Schlegel	April	..	3– 4	..	2	Copepods and crustacean larvæ, with very little of phytoplanktonic organisms
Family TETRADONTIDÆ 73. *Sphœrodon lunaris* (Bloch)	March and April	3–6 (3)	3– 6 (4)	75	21	Young fishes and crustaceans

† Catch obtained in boat-seines.
‡ Catch obtained in bag-nets.

The identification of a large number of very early juvenile stages, particularly in respect of closely related species where the distinguishing features have not been very clear, presented great difficulties and they were identified only up to the genus. Only when definite adult characters could be made out in the young forms, or when post-larval stages conformed to the descriptions given by earlier workers, they were identified up to the species. The classification adopted is after Berg (1940) and the nomenclature after Herre (1953) with slight modifications. Day (1889), Weber and Beaufort, Beaufort and Chapman (1911–51), Smith (1949), Munro (1955), Misra (1947) and Nair (1953) have also been consulted.

Relative numerical abundance of the juveniles of various species in different months.—In the months of March and April the families Siganidæ, Leiognathidæ, Carangidæ, Scombridæ, Lactariidæ and Dussumieridæ were best represented in the commercial catches, their numerical abundance ranging from about 6 to 30% of the total number of fish in the samples. The percentage composition of the juvenile fishes under different families occurring in March-April is given separately for the years 1954 and 1955 in Tables II and III.

TABLE II

Showing the percentage composition of the juvenile fishes under different families occurring in March-April 1954

	Name of family		Percentage composition
1.	Scombridæ	..	20·14
2.	Leiognathidæ	..	12·56
3.	Siganidæ	..	10·22
4.	Carangidæ	..	6·94
5.	Dussumieridæ	..	5·91
6.	Gerridæ	..	5·02
7.	Polynemidæ	..	3·74
8.	Sphyrænidæ	..	3·74
9.	Chirocentridæ	..	3·58
10.	Mullidæ	..	3·24
11.	Tetradontidæ	..	3·19
12.	Sciænidæ	..	2·98
13.	Clupeidæ	..	2·59
14.	Scombermoridæ	..	2·56
15.	Lactaridæ	..	2·21
16.	Lutianidæ	..	1·62
17.	Miscellaneous	..	8·80

TABLE III

Showing the percentage composition of the juvenile fishes under different families occurring in March-April 1955

	Name of family		Percentage composition
1.	Siganidæ	..	30·04
2.	Leiognathidæ	..	24·23
3.	Scombridæ	..	7·17
4.	Carangidæ	..	6·45
5.	Lactaridæ	..	5·37
6.	Polynemidæ	..	5·32
7.	Mullidæ	..	3·28
8.	Stromateidæ	..	3·23
9.	Clupeidæ	..	3·20
10.	Pomodasidæ	..	2·83
11.	Lutianidæ	..	2·64
12.	Chirocentridæ	..	1·12
13.	Miscellaneous	..	5·12

Besides the young stages of the bony fishes which were by far the commonest in the samples represented in Table I, there were in March-April few Elasmobranchs, *viz., Stegostoma varium, Scoliodon, sorrakowah, Narcine burnnea* and *Narke dipterygia* under the families, Orectolobidæ, Charcharinidæ and Torpedinidæ.

Size ranges and rate of growth of the juveniles.—The number of specimens, their size ranges and the major size groups in respect of all the species of the juvenile fishes obtained in the samples are given in Table I. Most of them, not exceeding a few centimetres in total length, could only be the recruits of the previous spawning season. In a few species like *Lactarius lactarius, Polynemus sextarius, Apolectus niger, Rastrelliger kanagurta,* which were represented in the samples collected over a period of several months, the average rate of growth has been studied by the size-frequency method.

It may thus be seen from Fig. 1 that *Lactarius lactarius* was represented in the month of March 1955 by individuals ranging in sizes from 3–6 cm. with the mode at 3 cm. In the months of April and June 1955 the modes were at 4–5 cm. respectively. It is therefore clear that the population has increased every month by an average size of 1 cm.

The frequency diagram (Fig. 2) for different months in respect of *Polynemus sextarius* show an increase in length of only 1 cm. during the period of April-July 1955. Although no appreciable growth is seen from month to month the maximum size for the species in different months indicates a definite increase in growth from 4–8 cm. during the period of April-June and from 8–10 cm. during June-July.

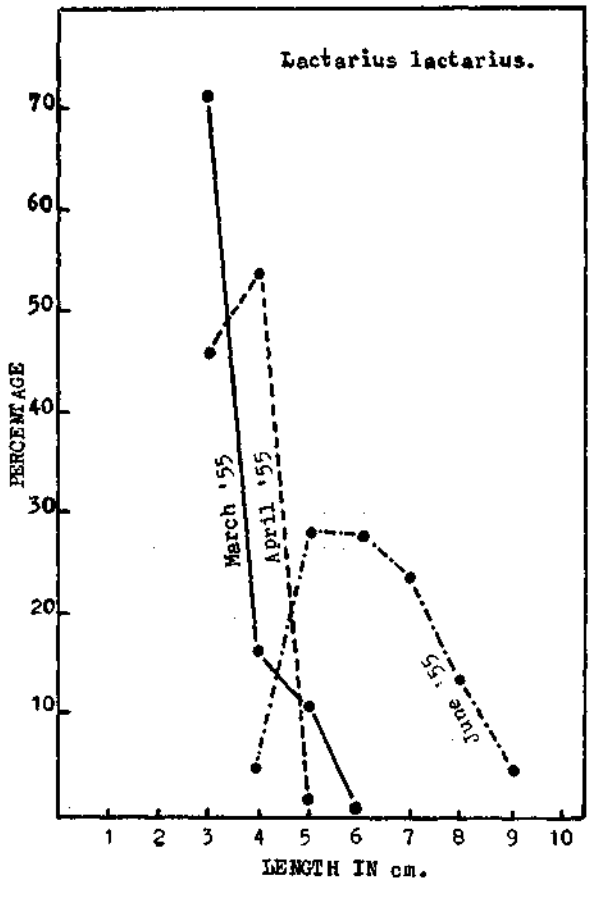

FIG. 1

In *Apolectus niger* a steady increase in length from April-July 1955 is evident from the size-frequency diagram (Fig. 3). In April 1955 the highest frequency size is 6 cm. In June there is a bimodal distribution of the individuals at 7 cm. and 9 cm. In the month of July the same bimodal distribution again occurs at 8 cm. and 12 cm. Apparently there are two distinct broods in the samples obtained in June and July 1955. The older brood of 9 cm.

length of June 1955 which is traceable to the 7 cm. size group of April 1955, seems to have attained a size of 12 cm. in July 1955; the younger brood 7 cm. length in June 1955 seems to have grown to 8 cm. in July 1955.

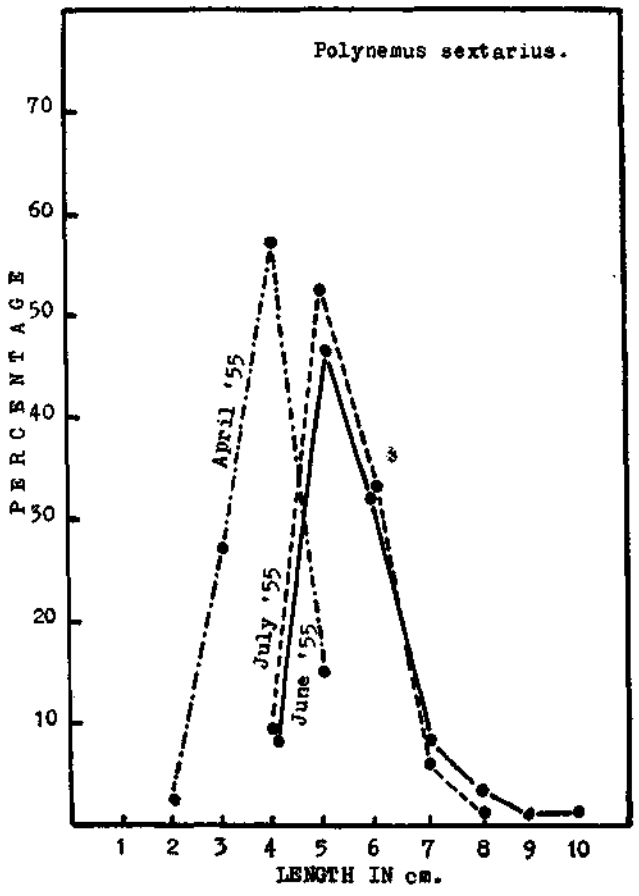

FIG. 2

The mode values of the *Rastrelliger kanagurta* (Fig. 4) may be read as 9 cm. in February, 8 cm. in March, 8 cm. in April, 13 cm. in June and 16 cm. in July. It is fairly clear from these length measurements that the highest frequency size groups of 9 cm. in February 1955 is represented by those at 13 cm. in June. The 8 cm. group occurring in March and April grows to 11 cm. in July. The recruitment to the smaller size groups continues in the months from February to April 1955. The majority size group of 16 cm. in July 1955 is not directly traceable to any of the size groups occurring in the earlier months. They probably represent members of a distinct brood older than the others belonging to the previous year.

Food and feeding habits of the juveniles.—Very little information is available on the food and feeding of the juvenile marine and estuarine fishes of India, the studies on the subject being chiefly confined to the observations of Bapat and Bal (1950 and 1952) on clupeoids and other groups of fishes, Gopinath (1942), Rao and Rao (1957) and Kuthalingam (1956).

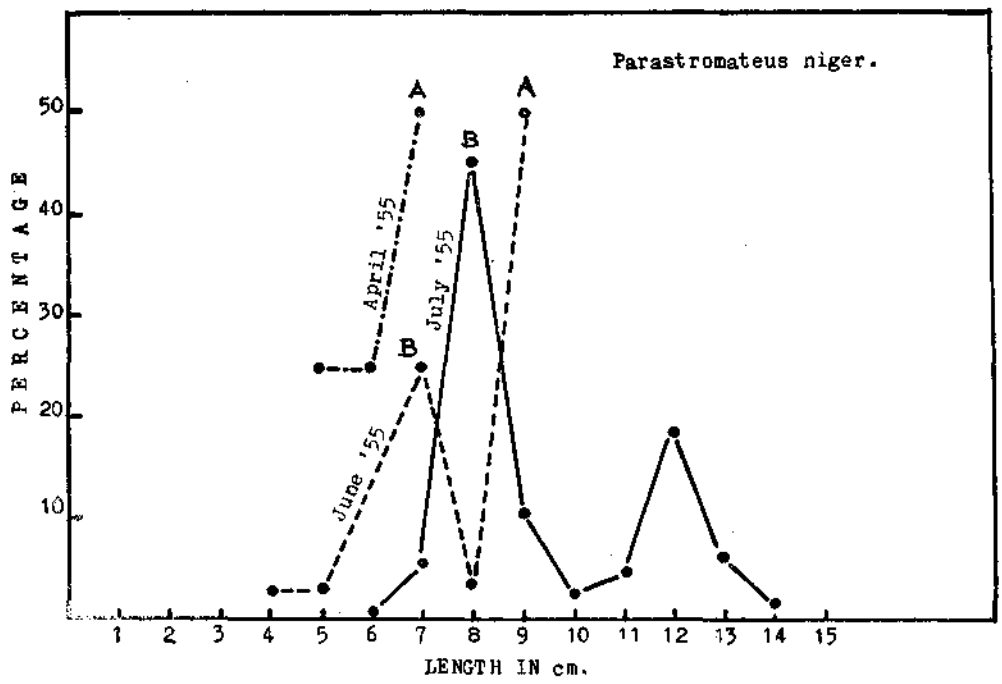

FIG. 3

In the present paper the stomach contents of 73 species of juvenile marine fishes belonging to 40 families have been studied with a view to observe the important components contributing to the food of the species. Observations have been made on material preserved in 5% formalin. Utmost care has been taken to see that any organisms present in the foregut are not mixed with the stomach contents, as the former are likely to be taken accidentally while the fish struggle in the net. Food components obtained from the stomachs were examined microscopically to determine the qualitative composition only. As the juvenile stages of the fish did not occur in the catches all through the year, no attempt was made to study the seasonal variation in their feeding habits. In very general terms it may be stated that no species of marine fish recorded in the list feeds exclusively on a herbivorous or purely phytoplankton diet. As is expected in their very early stages,

the fishes are mostly dependent on planktonic organisms. Some groups exhibit distinct carnivorous tendencies even in their very early stages. A few are very selective feeders on certain groups of zooplanktonic organisms and a few others appear to change their feeding habits with the growth in size. The items constituting the food are recorded against each species within the size ranges given in Table I.

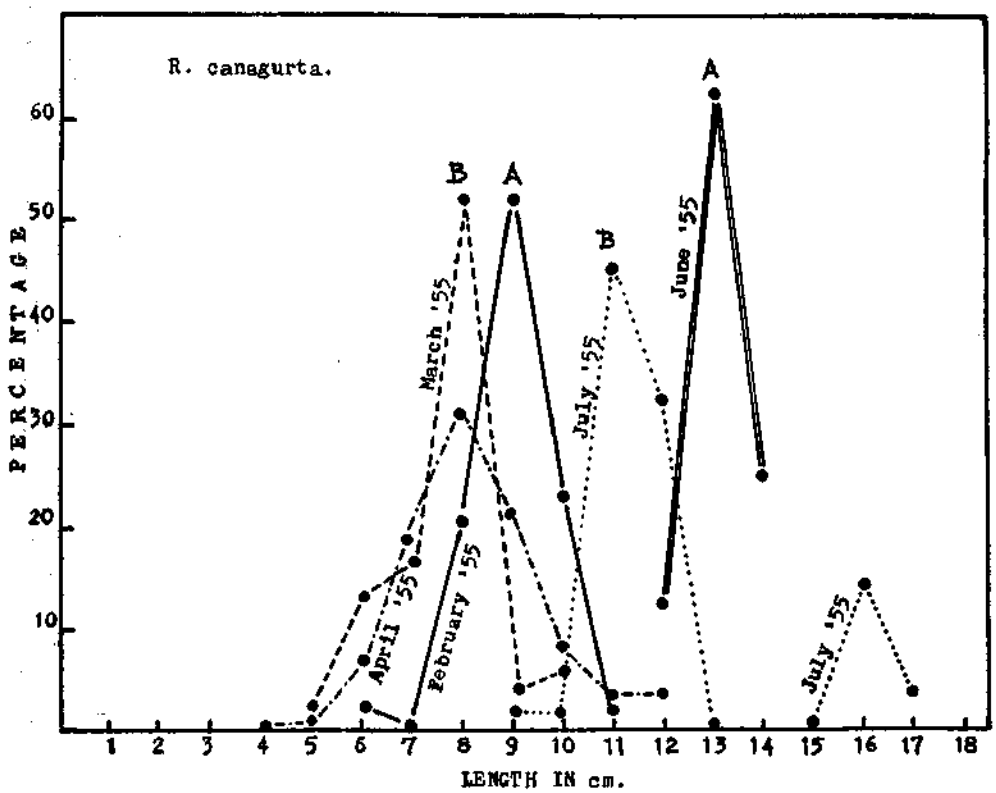

FIG. 4

Spawning periodicity.—The occurrence of young mackerel during March-April months of 1954 and 1955 confirms the observations of Rao and Basheeruddin (1953) that the species breeds during or after the north-east monsoon on the east coast. The appearance of large numbers of young individuals of various species,* besides mackerel, under the smaller size groups

* Subsequent to writing of this paper, one of us (S. B.) has noticed appreciable numbers of *Scomberomorus commerson* (Lacépède) with a size range of 20 to 80 mm. on 24th, 26th and 27th of February and on 3rd and 6th March 1960 in the shore-seine catches at Madras. This seems to be the first record of young *S. commerson* with a minimum size of 20 mm. occurring in the inshore waters of Madras.

shows that there is, in general, an intensive breeding activity in the months following the north-east monsoon which commences by about October and lasts till the middle of December. Panikkar and Aiyar (1939) have observed that the breeding of marine fishes is intense in December-January immediately succeeding the outbreak of the north-east monsoon. The juvenile individuals under large size groups of *Chirocentrus dorab* and *Trichiurus haumela*, judging from their size, are evidently not the result of breeding activity in or about the months in which the monsoon breaks. Some fish eggs and larvæ have been recorded from the coast in months other than those of north-east monsoon. Nair (1952) has recorded the post-larvæ of *Elops indicus*, perhaps a few weeks old from Madras in April. John (1951) has observed the larvæ of *Psettodes erumei* in July from this coast. Prabhu (1953) has observed that *Chirocentrus dorab* spawns in July-August. Bapat and Bal (1950 and 1952) have obtained several species of young fishes below 10 cm. in length during all seasons of the year. While the frequency distribution given in Table I is suggestive of an intensive breeding activity of most of the fishes during the months about north-east monsoon, a more detailed investigation is necessary to fix the period of spawning in each species.

Gopinath (1946) has recorded large number of post-larval fishes from November-April or even to May along the Trivandrum coast. Based on Sewell's (1949) observations that from November onwards a north-east monsoon drift sweeps up the coast of Ceylon and the west coast of India forming a strong coastal current in a northerly direction, Gopinath (1942) has presumed that the post-larval stages arrive from the spawning grounds situated elsewhere to the inshore waters of the west coast which seem to form a nursery. The observations reported here seem to indicate that there are important spawning grounds for these commercial species also in the Bay of Bengal.

Summary

The size frequency distribution and feeding habits of juvenile fishes occurring along the Madras coast from March 1954 to September 1955 are described. There seems to be a regular fluctuation in the appearance of juveniles of certain species.

While *Polynemus sextarius*, the younger brood of *Apolectus niger* and *Rastrelliger kanagurta*, showed a growth rate of 1–3 cm. respectively, *Lactarius lactarius* and the older brood of *Apolectus niger* exhibited the maximum growth rate of 3 cm. during the period of this study.

No species of marine fish recorded here feeds exclusively on a herbivorous or purely phytoplanktonic diet. A few species like *Rastrelliger kanagurta* appear to change their feeding habits with the increase in size.

The appearance of large numbers of young individuals of various species besides mackerel under the smaller size groups shows that there is in general an intensive breeding activity in the months following the north-east monsoon. This perhaps indicates that there are important spawning grounds in the Bay of Bengal.

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