

PRELIMINARY OBSERVATIONS ON THE BIOLOGY  
AND FISHERIES OF THE THREAD-FIN,  
*POLYDACTYLUS INDICUS* SHAW IN THE  
BOMBAY AND SAURASHTRA WATERS

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INTRODUCTION

THE thread-fins (*Polynemidae*) constitute an important group of commercial fishes in Indian waters of which *Polydactylus indicus* forms probably the most important species in Bombay and Saurashtra coasts. Except for stray records of the different species of the family in various localities and of a brief study of the breeding season and maturity of *Eleutheronema tetradactylum* by Karandikar and Palekar (1950), and a descriptive account of the larval development of the same species by Sarojini and Malhotra (1952), very little published information is available regarding the distribution, food and feeding habits, maturity, breeding, commercial catches etc. of this important group of fishes. During the two years, 1951-53, a detailed study of the exploratory trawl catches of the cutters, M. T. "Pratap" and M. T. "Ashok", of the Government of India Deep Sea Fishing Station, Bombay, and of the commercial catches of the Japanese trawler, "Taiyo Maru" No. 17, of the Taiyo Fishing Co., Ltd., Bombay, was made, with biological observations on the different groups of fishes as they were hauled up on board the vessels, or, in a few cases, at the dock where the catches were landed. The observations made on *Polydactylus indicus* (locally called *Dara* or *Dhara*) are given in this communication.

Six species of thread-fins recorded from Indian waters (*P. indicus*, *P. plebeius*, *P. sextarius*, *P. heptadactylus*, *P. paradiseus* and *Eleutheronema tetradactylum*) have been reported from Bombay also (Hefford, 1922; Sorley, 1932; George and Desai, 1944). Of these *P. paradiseus* and *P. sextarius* do not seem to occur in the trawl catches probably because of their purely inshore or coastal habitat, while *P. plebeius*, as stated by Hefford (1922), is very rare, only five specimens having been encountered during the two year period of the study. From the point of view of commercial fisheries *P. indicus* is the most important, followed by *E. tetradactylum* and *P. heptadactylus*. Of the thread-fins *E. tetradactylum* is the most highly esteemed in Bombay, being often classed with pomfrets in palatability. *P. indicus* is very popular

in Bombay markets, its average price varying from Re. 0-4-0 to Re. 0-13-0 per lb. excluding the air bladder which fetches Rs. 1-4-0 a piece on an average.

#### DISTINGUISHING FEATURES OF THE SPECIES

The distinguishing characters of the different species of *Polynemus* given by Day (1889) are sufficiently clear for easy identification. *P. indicus* though having five pectoral filaments as in *P. plebius*, is easily distinguished from the latter by the larger number (68 to 79) of scales along the lateral line (56 to 61 in *P. plebeius*). The eyes have a thick transparent covering which in older specimens becomes tough and comparatively opaque. The dorsal profile undergoes considerable change in its curvature as the fish grows old. In specimens up to about 50 cm. in length\* the tips of the dorsal and ventral lobes of the caudal fin are produced into long filaments, each filament being formed of two of the outer rays. This prolongation gets broken off in the later stages, with the result that it is rather difficult to get the correct total length of the specimens. The lateral line, formed of a row of scales with prominent sensory tubes, runs almost straight from the upper edge of the opercle to the base of the caudal fin where it takes a downward bend and continues in the form of a row of minute scales on to the edge of the lower lobe of the caudal fin. The standard length of the fish is taken as the distance from the snout to the downward bend of the lateral line at the base of the tail.

In the fresh condition, the body is dark in colour, particularly on the dorsal side and on the fins. Ventrally it is less dark. In large specimens the colour is often replaced by a golden yellow tinge, often tending to turn reddish.

#### BIOLOGICAL NOTES

##### (a) Food and Feeding Habits.

The stomach contents were analysed quantitatively and qualitatively. As soon as the catch was landed on the deck of the ship specimens, taken at random, were measured and weighed, and their stomach dissected out and preserved with the contents in 5% formalin. These were later examined in the laboratory, the different items of food sorted, identified and the volume of each estimated by the displacement method. 69 Adult specimens ranging from 75.5 to 97.8 cm. and 53 juvenile or immature specimens ranging from 19.1 to 44.3 cm. in length were examined during the present study and their food analysed. Specimens with empty stomach were rather few, being 2 out of 69 (2.9%) in the samples of adults, and 6 out of 53 (11.3%) in the samples of juvenile specimens. Though the fish were hauled up rather quickly from a depth of 13 to 40 fathoms (78 to 240 ft.) no direct evidence of disgorging of food from the stomach at the time of capture was found. The rather low percentage of specimens with empty stomach also probably

\* Unless otherwise stated length mentioned in this paper is standard length.

indicates that disgorging of food does not usually occur during capture. Other fishes, such as *Sciæna diacanthus*, *Otolithus ruber* etc., which are also caught and hauled up along with *P. indicus* were, however, often found to have a portion of the stomach extroverted, with the result that the stomach contents were thrown out. Most of the items of food in the stomach of *P. indicus* were in a fairly fresh condition and therefore relatively easily identified.

The different items of food encountered, their volume and percentage, are given in Table I and illustrated in Fig. 1. Like most of the bottom

TABLE I  
Showing the Items of Food and Their Percentages in the Guts of 69 Adult and 53 Juvenile Specimens of *Polydactylus indicus*

Items of food	Adults		Juveniles	
	Volume in c.c.	%	Volume in c.c.	%
<i>Crustaceans</i>				
Carid prawns .. ..	445.0	22.26	48.5	58.86
Penæid prawns .. ..	343.0	17.16	10.8	13.11
Stomatopods .. ..	288.1	14.41	18.4	22.33
Brachyura .. ..	7.7	0.39	1.8	2.18
<i>Mollusca</i>				
Sepia and Loligo .. ..	21.0	1.05	..	..
<i>Fishes</i>				
<i>Harpodon nehereus</i> .. ..	207.2	10.36	..	..
<i>Coilia dussumieri</i> .. ..	171.2	8.56	..	..
<i>Otolithus</i> sp. .. ..	148.0	7.40	..	..
<i>Otolithoides</i> sp. .. ..	81.0	4.05	..	..
<i>Sciæna</i> spp. .. ..	72.6	3.63	1.1	1.34
<i>Polydactylus heptadactylus</i> .. ..	11.5	0.58	..	..
Elver of eel .. ..	30.2	1.51	..	..
<i>Pseudorhombus</i> sp. .. ..	34.5	1.73	..	..
<i>Saurida tumbil</i> .. ..	11.5	0.58	..	..
<i>Platycephalus</i> sp. .. ..	52.3	2.62	..	..
<i>Trypauchen vagina</i> .. ..	0.9	0.04	..	..
Fish otoliths .. ..	0.2	0.01	..	..
Fish scales .. ..	5.0	0.25	..	..
Partly digested matter .. ..	64.3	3.22	1.8	2.18
Mud .. ..	3.9	0.19	..	..

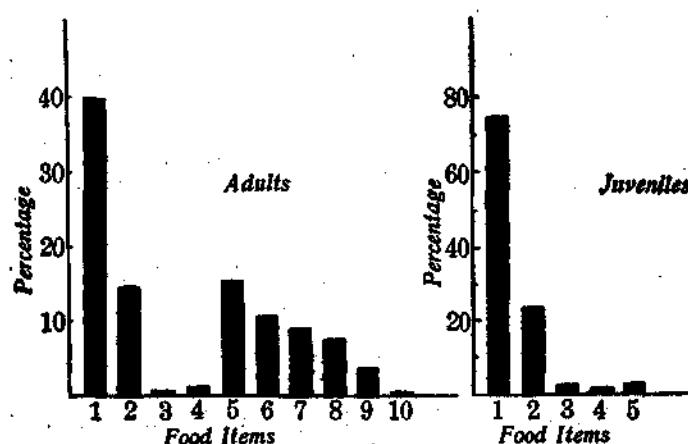


FIG. 1. Food of *Polydactylus indicus*

Adults: (1) Prawns; (2) Stomatopods; (3) Crabs; (4) Molluscs; (5) Sciaenids; (6) *Harpodon nehereus*; (7) *Coilia dussumieri*; (8) Other fishes; (9) Partly digested matter and (10) Mud.

Juveniles: (1) Prawns; (2) Stomatopods; (3) Crabs; (4) Sciaenids; and (5) Partly digested matter.

living marine fishes *P. indicus* is predatory in habit and takes fairly large quantities of food in the adult stages. The largest quantity observed was 147.8 c.c. in a specimen measuring 94 cm. The juvenile or immature specimens are predominantly crustacean feeders. Out of 53 juveniles examined only 2 had fish and fish remains in the stomach, while the remaining had only crustaceans. The food of 20 juvenile specimens from the Gulf of Mannar consisted entirely of crustaceans (Chacko, 1949). In the case of larger specimens, the piscivorous habit is more pronounced and only 15 out of 69 specimens had a purely crustacean feed. The average percentage of crustaceans in the food of adults has come down to 54.22%. But the crustaceans constitute the largest single item of food consumed both in the juvenile and adult fishes. It is of interest that, among the crustaceans encountered in the food, prawns dominated, followed by stomatopods. Crabs were rather rare.

Eleven species of fishes were found among the stomach contents (Table I), the Bombay duck, *Harpodon nehereus* (10.36%) and *Coilia dussumieri* (8.56%) predominating. The sciaenids as a group constituted over 15% of the average feed. Elvers were commonly met with in the stomach, but the rest of the species listed are only occasionally found. A very limited quantity of mud (0.19%) was found in the guts of a few larger specimens (4 out of 69), though in the immature ones this item was totally absent.

*(b) Length-weight Relations.*

Altogether 404 specimens, ranging from 25.3 cm. to 107.2 cm., were examined for this purpose. The measurements of lengths and weights were taken on board the vessels as soon as the catches were hauled up. For the convenience of calculation the whole size range was divided into 17 size-groups of 5 cm. interval. The average weights and lengths of each group were taken from the observed data and with the help of the general formula  $W = KL^x$  (wherein  $W$  is the weight,  $K$  a constant,  $L$  the length and  $x$  the power expressing the relation between the increases in weight and length) the corresponding weights were calculated. The formula expressing the relationship between the weights and lengths of this species between the size range mentioned above is determined to be:

$$W = .02406 L^{3.89325}$$

The agreement between the calculated weight according to the formula and the observed weight is shown in Fig. 2, wherein the calculated weight is plotted in the curve and the observed weights are represented by dots.

*(c) Breeding Season and Maturity.*

Appreciable catches of *P. indicus* are obtained only from regions lying off the mouth of the Gulf of Cutch and the Gulf of Cambay. In both these places, particularly in the Gulf of Cambay, mature specimens begin to appear in the catches during February. In March most of the fishes are mature, though stray specimens with spent ovaries are also caught. By the middle of June spent fishes predominate in the catches. The peak period of breeding therefore appears to be from March to May; *i.e.*, before the onset of the monsoon. Catches during monsoon months contain only spent fishes. It is, however, interesting to observe that no spent fish are caught in the Cutch areas at any time probably because the fishing season for this species here lasts only from December to March, and that the mature specimens caught from Cambay regions are mostly females, males being almost completely absent. Inshore catches of *P. indicus* on the 17th and 18th April 1953 from Satpati, a fishing village about 60 miles north of Bombay, consisted almost entirely of mature males. Likewise, large specimens, reported to be in roe, are caught off Jamnagar in the Gulf of Cutch in March-April and are regularly transported to Bombay. According to Day (1889), the largest specimens of this species are caught in the mouths of large rivers. In the light of these general observations, the possibility of this species breeding inside the Gulf of Cutch and in the

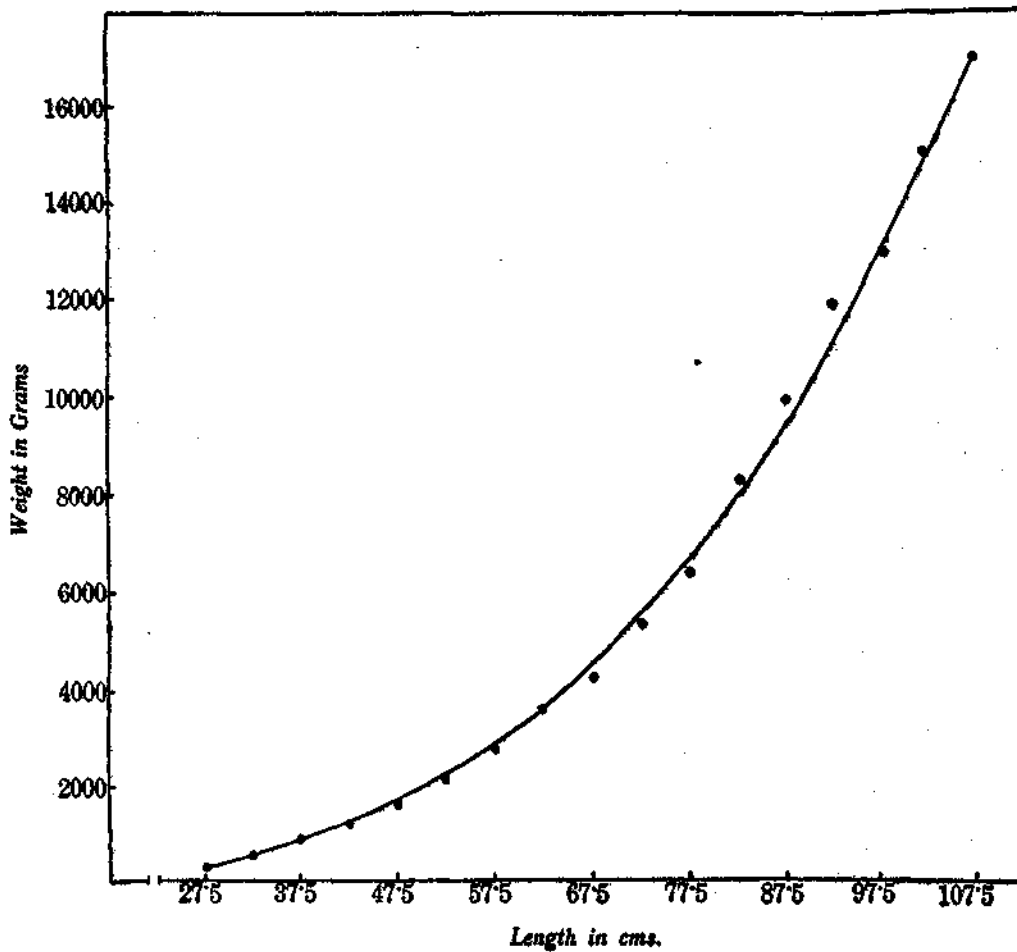


FIG. 2. Curve showing the calculated weight at each length. The observed average weights are indicated by the black dots.

upper reaches of the Gulf of Cambay near the mouths of the large rivers emptying into it, cannot be entirely ruled out. In the absence of detailed data from these localities, nothing definite could, however, be stated about the breeding grounds of the species, the elucidation of which requires detailed investigations.

The smallest mature female observed was 78.4 cm. in length (100.7 cm. total length) and had the ovaries in the stage IV. A sufficient number of males was not available for study, though in a sample of 45 mature males from Satpati the smallest specimen was 82.0 cm. (103.1 cm. total length) in length.

(d) *Distribution.*

*P. indicus* has been reported from both the coasts of India, even though it seems to occur as a commercial fishery only from Bombay northwards up to Karachi. Though it has been recorded from the east coast by Russell (1803), it does not figure in the trawl catches made off the Bengal and Orissa coasts in the Bay of Bengal by the cutters *Baruna* and *Sagarika* of the Government of West Bengal (1951). Devanesan and Chidambaram (1948) observed the occurrence of the species on both the coasts of Madras State. Bhimachar and Venkataraman (1952) have found only *P. plebeius*, *P. heptadactylus* and *Eleutheronema tetradactylum* occurring in the inshore waters off West Hill near Calicut on the West Coast. The present author has, however, obtained a few small immature specimens (31.4 to 37 cm.) of *P. indicus* in the catches from inshore waters off Cranganore, Travancore-Cochin State, during July-August 1953. Enquiries made of the local fishery officials and fishermen south of Ratnagiri indicate that the species is rare in those localities. Pillay (1948) has recorded its occurrence from Kodinar on the Kathiawar Coast. Qureshi and Burney (1952) report the occurrence of *P. indicus* and *P. plebeius* in the trawl catches off the Sind coast.

Apparently a bottom-living fish, showing definite preference for muddy sea bottoms, *P. indicus* figures very prominently in the trawl catches landed at Bombay and occurs in many sizes. During the present study trawling was conducted in areas U, W, X and Y of region I; K, L, M, N and Q of region II; A, B, D, E and H of region III; 3, 4, 5, 10, 11 and 12 of region IV; 13, 17, 18, 19, 20, 24, 25, 26, 30, 31, 32 and 37 of region V; 38, 43 and 48 of region VI and 56, 60, 63, 65 and 66 of region VII (Fig. 5), and a few places off Ponnani, Cochin and Quilon. *P. indicus* was caught in considerable numbers from regions I, II, IV, V and VI; but the catch from regions III and VII was negligible. The highest density of population of this species was in region II in March and April when hauls were taken. 27 Hauls were taken in May 1952 from off Ponnani, Cochin and Quilon at an average depth of 7 to 10 fathoms, but *P. indicus* was not represented in any of these hauls. Trawling in different regions was done in depths ranging from 13 to 40 fathoms, but good catches of *P. indicus* were obtained at depths varying from 15 to 19 fathoms in the Cutch region and from 17 to 22 fathoms in the Cambay region. In all the localities trawled during the period the species was scarce beyond 30 fathoms. The average yield of *P. indicus* per hour's actual trawling in different areas for the period November 1951 to June 1952 in respect of the landings of the cutters M.T. 'Ashok' and M.T. 'Pratap' is given in Table II. These figures, however, are not derived

TABLE II  
The Average Yield of *P. indicus* per hour's Actual Trawling in Respect of the Landings of the Cutters  
M.T. 'Ashok' and M.T. 'Pratap' for the Year 1951-52

Region	II					III				IV					V			
	Areas	K	L	M	N	Q	A	B	D	E	3	4	10	11	12	13	17	18
November 1951	..	—	—	—	—	—	—	—	—	—	—	—	—	3.2	13.8	—	12.0	5.6
December 1951	..	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	48.9
January 1952	..	—	—	—	—	—	×	—	×	3.2	2.4	×	10.3	12.6	19.5	—	—	35.1
February 1952	..	—	—	—	—	—	—	—	—	—	×	—	—	2.6	×	—	—	×
March 1952	..	—	—	205.9	37.7	208.2	—	—	×	—	0.8	2.4	4.1	4.5	×	—	×	9.1
April 1952	..	34.8	38.9	42.1	18.0	—	—	—	—	—	—	—	—	0.7	—	—	×	11.7
May 1952	..	—	—	—	—	—	×	×	—	—	×	—	—	×	—	—	×	6.7
June 1952	..	—	—	—	—	—	—	—	—	—	—	—	—	—	20.7	9.1	—	21.8

Region	V										VI			VII					
	Areas	19	20	24	25	26	30	31	32	37	38	43	48	56	60	63	65	66	
November 1951	..	8.5	14.9	35.7	3.6	2.7	×	×	×	×	—	—	—	×	×	—	—	—	
December 1951	..	52.3	—	57.8	37.4	26.7	31.9	31.3	×	—	—	—	—	—	—	—	—	—	
January 1952	..	8.4	—	39.9	32.8	39.4	5.0	16.2	33.6	—	1.2	12.7	×	×	×	×	×		
February 1952	..	—	—	11.5	19.9	19.1	—	18.9	12.4	—	×	—	—	—	×	—	—	×	
March 1952	..	×	—	13.1	21.9	11.5	2.2	5.2	7.3	×	×	1.9	—	—	—	—	—	—	
April 1952	..	10.2	—	6.1	23.6	6.6	×	1.6	29.3	×	—	—	—	—	—	—	—	—	
May 1952	..	—	—	16.5	7.4	—	×	2.2	×	—	×	—	—	—	—	—	—	—	
June 1952	..	53.8	—	10.7	18.5	—	—	—	—	—	—	—	—	—	—	—	—	—	

× Sign indicates nil catches; — Sign indicates lack of data; Figures expressed in lb. per hour.



from any uniform sampling of all the areas concerned. It is still clear that certain regions are markedly richer than the others in their populations of *P. indicus*.

Though even an approximate estimation of the fish population in a given region of the sea is most difficult, an attempt has been made, on the basis of the data of the catches of the cutters, to estimate approximately the population of *P. indicus* in the areas trawled, taking into consideration the speed of the vessel, the distance covered during the haul, the dimensions of the mouth of the trawl, and the weight of the fish caught. The gape of

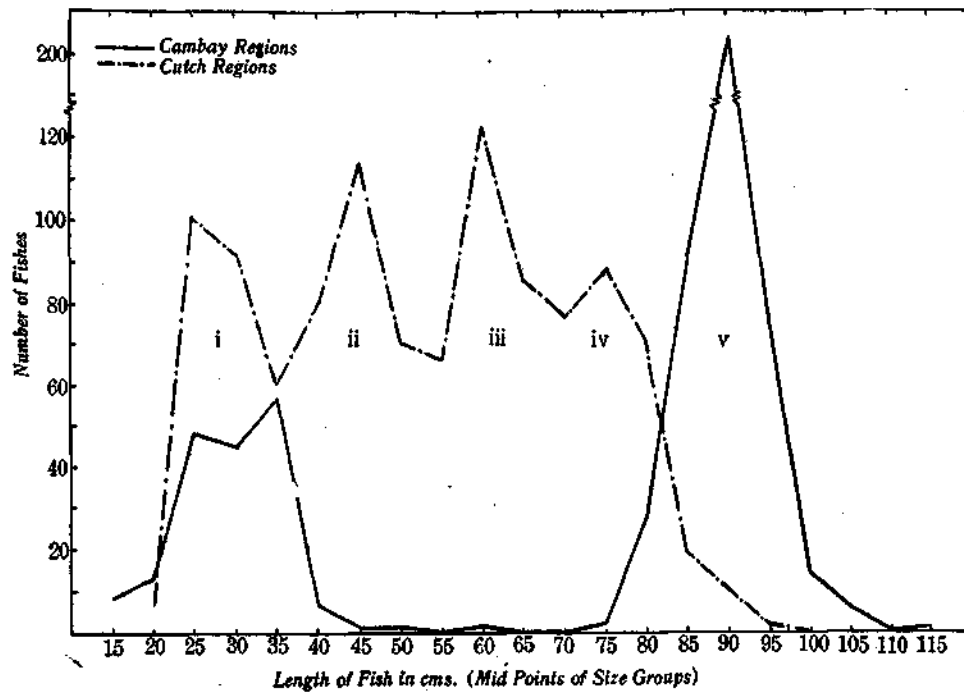


FIG. 3. Frequency distribution of size-groups of *P. indicus* in the Cambay and the Cutch regions.

the net is calculated by taking the warp angle and the length of warp released as 50 ft. Now, as the ship had an average towing speed of 2 knots the actual area covered by the net in one hour is estimated at 0.016 sq. mile (50 ft.  $\times$  2 knots). Thus, from the average yield of the cutters per hour the average weight of *P. indicus* obtained by trawling in one square mile area of the sea bottom to a height equal to the height of the mouth of the trawl is calculated and presented in Table III.

TABLE III

Showing the Average Weight in lb. of *P. indicus* Obtained by Trawling in One Square Mile Area of Sea Bottom

Region	Weight in lb.	Estimated percentage of <i>P. indicus</i> in the region
II	4,025	34.48
III	72	1.30
IV	274	4.28
V	1,270	17.31
VI	478	8.26
VII	nil	nil

Though the above figures cannot be representative of the actual population in the different areas, they give an idea of the relative abundance of the species in the different areas. As the fishes move actively and as the trawl cannot be expected to catch all the fishes in the areas trawled, the actual population in the area should be larger than what is shown in the table; but what proportion of the total population these trawl catches will represent cannot be stated at present.

#### COMMERCIAL CATCHES

Fair quantities of *P. indicus* are frequently landed at Sassoon Dock, Worli, Danda, Versova, Arnala, Satpati and other fishing villages that provide the bulk of the fish supply to Bombay City. Satpati and Arnala are very important fishing villages as far as this species is concerned. Though small quantities are caught in bag nets (*Dol*) the chief method of capture of this species is by drift nets, locally called *Wagur jal* or *Bud jal*. These are strong nets made of hemp with a 4-inch mesh and adapted for use on the sea bottom. The species is very rarely found in the hook and line catches, though according to Day (1889) it readily takes a bait. In the trawl catches, *P. indicus* is quite common and forms nearly a fifth of the total catch. A comparative statement of the catches of *P. indicus* landed by different trawlers in Bombay is given in Table IV.

TABLE IV  
*Catches of P. indicus Landed by Various Trawlers in Bombay*

Name of trawler	Year of operation	No. of days absent from port	Weight of <i>P. indicus</i> in lb.	% in total catch
S.T. 'William Carrick'	1921-22	156	3,254	2.12
S.T. 'Meena'	1948-49	200	46,097	16.16
M.T. 'Ashok' and 'Pratap'	1949-50	242	88,091	21.98
Do.	1950-51	279	94,597	22.26
Do.	1951-52	249	76,329	16.12
'Taiyo Maru', No. 17	Nov. 1951 to Dec. 1952	300	2,66,584	9.31

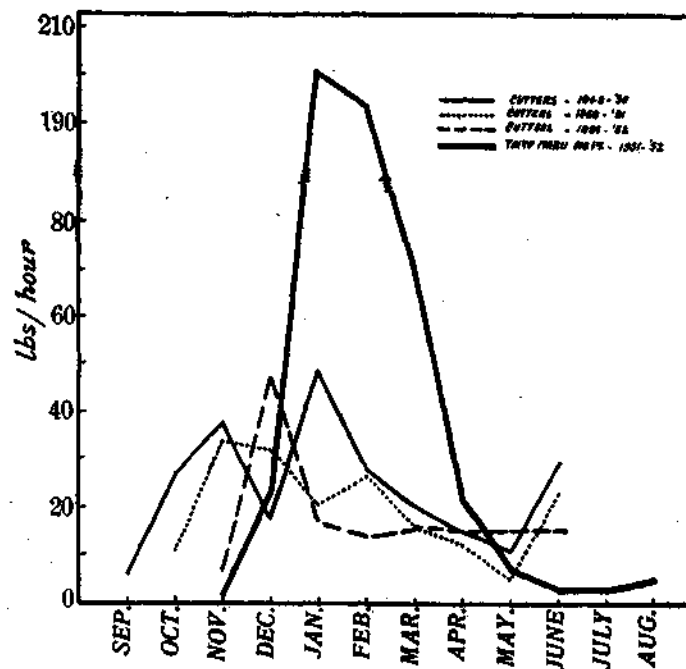


FIG. 4. Graph showing the seasonal variation of *P. indicus* in trawl catches.

Though the landings of S.T. 'William Carrick' were rather poor, recent trawler catches show a much higher percentage of the species. In the catches of 'Taiyo Maru' No. 17, though the actual weight of *P. indicus* caught is

much more than those of the cutters, its percentage in the total landings of the vessel is rather low, probably because, unlike the cutters, the catch of the former included a large percentage of smaller fishes not ordinarily caught in the bigger meshes of the cutters' trawls. It is also probable that this low percentage is due to the fact that 'Taiyo Maru' was for some time working in region III where *P. indicus* is scarce.

The largest single haul of *P. indicus* made by S.T. 'William Carrick' consisted of 17 fishes weighing 435 lb. from area 43 in region VI. In the recent catches of the cutters as well as of the 'Taiyo Maru' No. 17, such large hauls of *P. indicus* were very frequent. The largest catch of this species made in a single haul during the present study was one of 'Taiyo Maru' No 17, consisting of 752 specimens weighing 9,024 lb. (4.031 tons), representing nearly 78% of the catch of that haul. This was from area M in region II, on 10-1-1953 at a depth of nearly 15 fathoms.

#### SIZE VARIATION IN CATCHES

During the period of investigation 1,657 specimens of *P. indicus* trawled from different regions were measured. Though all the hauls were not examined for *P. indicus*, when a particular haul was sampled all the specimens of *P. indicus* in that haul were measured and at least one such haul was studied every day of the voyage. The data thus gathered show considerable variation in regard to size of fish in the catches, though no marked variation in the size of specimens in the different hauls from the same locality on the same day was observed. Even though specimens as small as 5 cm. are obtained from the local bag net or *Dol* catches in a depth of 7 fathoms inside the Bombay harbour at the onset of monsoon, such small specimens never figured in the trawl catches taken from offshore regions of the sea; the length of the smallest specimen obtained in trawl catches was only 15.1 cm. According to Day (1889) *P. indicus* attains a total length of 4 ft. (126.6 cm.) but rarely exceeds 20 lb. in weight. The largest fish obtained during the present study had a total length of 142.3 cm. and weighed 61 lb. Specimens weighing over 20 lb. are, however, fairly common in the trawl catches and formed over 22% of the specimens examined for length-weight relations. It is also a matter of interest that 94.1% of these large specimens were caught from regions IV, V and VI (Cambay regions).

In Fig. 3 which depicts the frequencies of size-groups, five different modes with mid-points 25 cm., 45 cm., 60 cm., 75 cm. and 90 cm. stand out. These size-groups have an interesting regional distribution. The size-groups in the Cutch region (region II) are uniform and consist of the first four

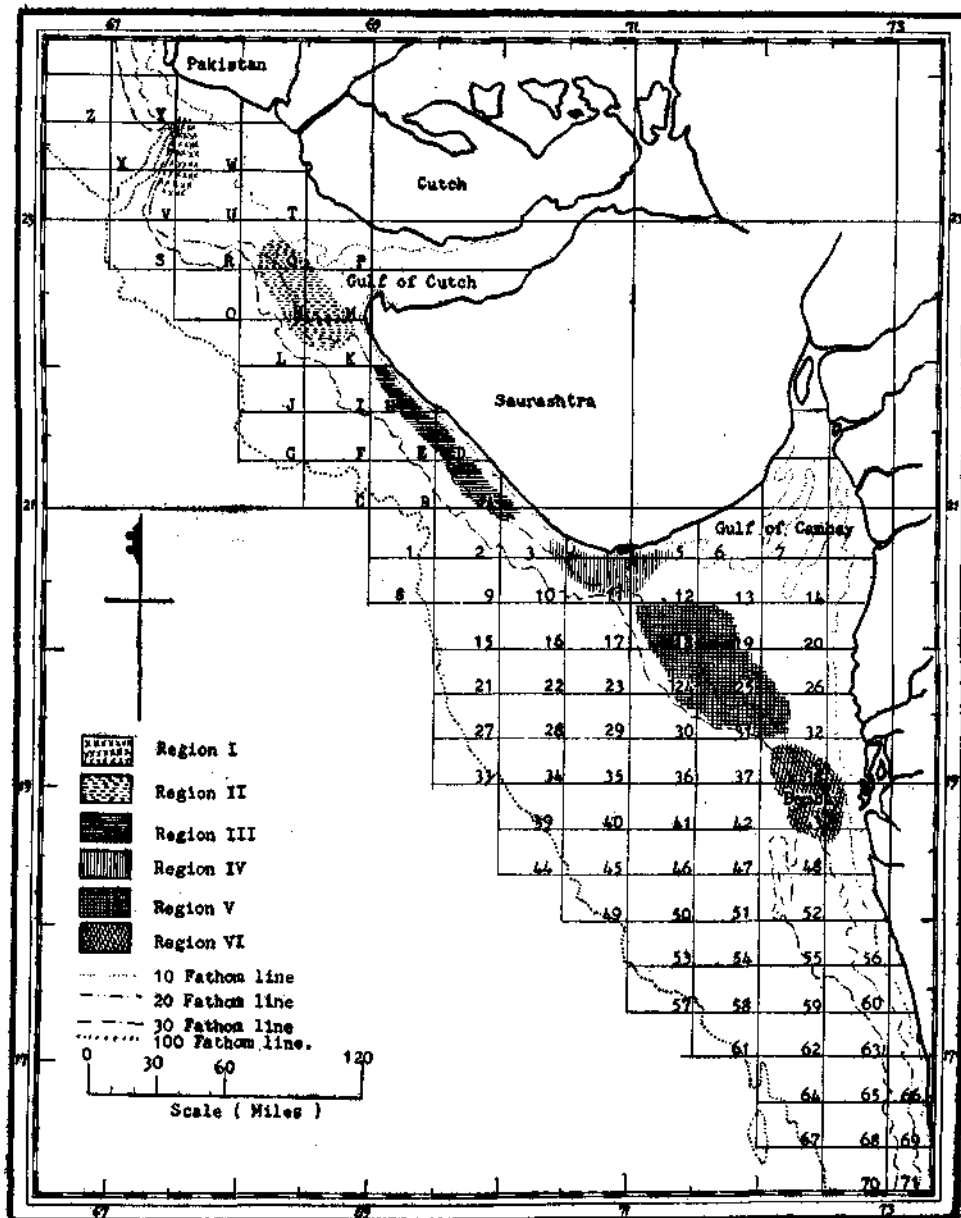


FIG. 5. Areas and regions trawled.

groups (I to IV), whereas those of the Gulf of Cambay region (regions IV, V and VI) are discontinuous in having only groups I and V. Group V is absent in the Cutch region whereas groups II, III and IV are absent from the Cambay region. This peculiar distribution of size-groups seems to suggest

the possibility of some kind of migration of this species to and from these regions.

#### SEASONAL VARIATION IN THE CATCHES

In the local fishermen's catches at Bombay *P. indicus* is obtained all through the year in small quantities except in the monsoon months when there is no fishing. In Satpati, which is the best fishing village for this species, the season begins from February and ends in May. The cutters, M.T. 'Ashok' and M.T. 'Pratap', closed down their operations before the onset of monsoon for their annual repairs with the result that no data about the occurrence of the species during the monsoon months were available; but working in almost the same localities as the cutters, S.T. 'Meena' and S.T. 'William Carrick' brought very poor catches of *P. indicus* during the monsoon months. The Japanese trawler, 'Taiyo Maru' No. 17, which started operations late in 1951, continued to work during monsoon months also and her operations showed very poor catches of *P. indicus* from regions I and II. The statistics of the cutters for 1949-50, 1950-51 and 1951-52 and those of 'Taiyo Maru' No. 17 for 1951-52, analysed month-wise indicate that the catches are at the maximum during November to March (Fig. 4).

The cutters were mainly working in the Gulf of Cambay region and 'Taiyo Maru' No. 17 in the Gulf of Cutch region. In the Gulf of Cambay the season for *P. indicus* appears to be from October to January, with a slight increase in catch during June; but in the Gulf of Cutch the yield is very high from December to March only, and for the rest of the year the catches are very poor. The very high peak of 'Taiyo Maru' No. 17 is largely due to the fact that she was working mostly in the Gulf of Cutch, where, as already stated, the highest density of population of the species was found.

#### SUMMARY

A preliminary general study of the biology and fisheries of the common thread-fin, *Polydactylus indicus* Shaw, was carried out during a detailed investigation of the exploratory trawl catches of the Government of India Deep Sea Fishing vessels, M.T. 'Ashok' and M.T. 'Pratap', and of the commercial trawl catches of the Japanese trawler, 'Taiyo Maru' No. 17, of the Taiyo Fishing Co., Ltd., Bombay.

A systematic study of the stomach contents of random samples of fish revealed pronounced predatory habits. Though crustaceans as a group constituted the largest single item of food consumed, bottom or mid-water shoaling fishes like *Harpodon nehereus*, *Coilia dussumieri* and small sciaenids

also formed the food of the larger thread-fins. Small-sized thread-fins appear to feed almost entirely on crustaceans.

Examination of 404 specimens of this species shows that the formula correlating the length with the weight of the species is  $W = .02406 L^{2.88325}$  within the size range of 25.3 to 107.2 cm.

The breeding season of the fish seems to be from March to May. Sexual maturity is attained at a size of 78.4 cm. and above.

The species forms about a fifth of the total landings of the trawl catches in Bombay. Five dominant size-groups are met with in these catches. Of these, only the smallest and the largest size-groups are found in the Cambay region, while all except the largest size-groups are found in the Cutch region. What happens to the intermediate size-groups in the Cambay region or to the last size-group in the Cutch region cannot be stated, but this peculiar distribution of size-groups indicates the possibility of migration in the life-history of the species.

Maximum catches are obtained during the months of December, January and February. *P. indicus* occurs in large numbers in region II (Gulf of Cutch) where the maximum catch per hour's actual trawling realised by the cutters has been 208.2 lb.

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