SOME ASPECTS OF THE FISHERY AND BIOLOGY OF *POLYDACTYLUS INDICUS* (SHAW)

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Introduction

One of the commercially important fisheries of the Bombay and Saurashtra waters is that of *Polydactylus indicus* locally known as 'Dara'. Preliminary observations on the biology and fishery of *P. indicus* have been recorded by Mohamed (1955). The food and feeding habits of this species are described by Karekar and Bal (1958). The present investigations were undertaken with a view to obtaining more information regarding the fishery and biology of this important species. This paper deals with the data collected on the catches of trawlers working from Bombay, during the years 1950–57, supplemented by observations made at a few of the other centres where a good fishery for this fish exists. During this period different types of trawlers were operating from Bombay. *Taiyo Maru No.* 17 operated Otter-trawl from 1951–54. The Cutters *M.T. Ashok* and *M.T. Pratap* used Otter-trawls during 1950–53 and then they together formed into a pair of Bull-trawlers from 1953–57. In addition to these, two more pairs of Bull-trawlers, namely, *Satpati-Pilotan* and *Arnalla-Paj* started operating during 1956–57.

Material and Methods

P. indicus occurs in the Bombay and Saurashtra waters, extending from Bombay up to the Gulf of Cutch. For the length and growth studies, specimens brought by the trawlers from the Dwarka region were utilized in view of the fact that the quantities of this fish landed by the trawlers from other regions were very negligible and often erratic. During the seven years commencing from 1950, the number of months of fishing in the Dwarka region during one fishing season ranged from two to six and each of the Otter-trawlers as well as a pair of Bull-trawlers had been able to make only two voyages per month. Hence, the length-frequency measurements are limited in number and restricted to a few months in each year. To obtain comparative data, some measurements have been made on the catches from Satpati (60 miles north of Bombay), Sachana near Jamnagar (Saurashtra) and also on the specimens brought to the local market and Government cold storage at Sassoon Dock (Bombay) for freezing.

Maturing specimens from the Bombay, Cambay and the Gulf of Cutch regions have been examined to study the spawning behaviour and fecundity of this fish.

THE 'DARA' FISHERY OFF THE BOMBAY AND SAURASHTRA WATERS

The Bombay and Saurashtra waters have been divided into five regions, namely, Bombay, Cambay, Veraval, Porbandar and Dwarka, as indicated in Fig. 1. Each region is further divided into a number of rectangles of

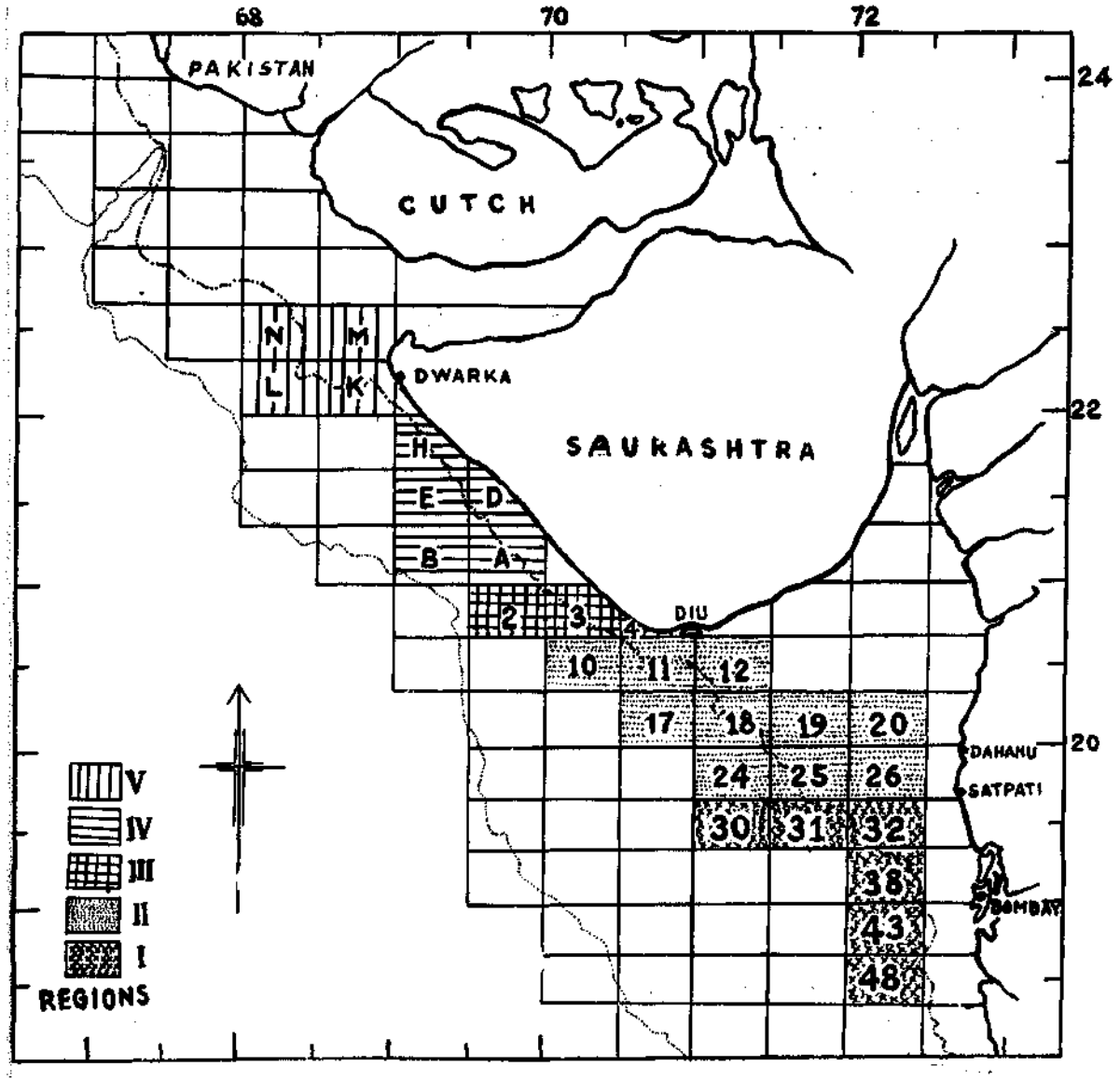

FIG. 1. The areas and regions of the Bombay and Saurashtra waters fished by the trawlers.

600 sq. miles each and have been termed as areas. They are denoted either by numbers or by letters for convenience.

The areas fished (Jayaraman *et al.*, 1955) fall into the following regions:

I.	Bombay Region	48, 43, 38, 32, 31, 30.
II.	Cambay Region	26, 25, 24, 20, 19, 18, 17, 12, 11, 10.
III.	Veraval Region	4, 3, 2.
IV.	Porbandar Region	A, B, D, E, H.
V.	Dwarka Region	K, L, M, N.

The fish landed by the trawlers *M.T. Ashok* and *M.T. Pratap* from 1950–51 to 1956–57 has been examined for 'Dara' and the estimated quantity of 'Dara' landed in each year in relation to the total catch has been given in Table I.

TABLE I

Percentage of 'Dara' in the total landings of M.T. Ashok *and* M.T. Pratap *from* 1950–51 to 1956–57

Year	Total landings in kg.	'Dara' landings in kg.	Percentage of 'Dara'
1950–51	187,298	42,900	22·9
1951–52	213,435	34,833	16·3
1952–53	199,339	25,484	12·8
1953–54	366,875	95,145	25·9
1954–55	212,570	26,115	12·3
1955–56	326,028	61,835	19·0
1956–57	182,194	45,540	25·0

It may be seen from the above table that 'Dara' fishery supported by only one species forms one of the major trawl fisheries on the Bombay and Saurashtra Coast. During the seven years under study, the catches fluctuated from 12·8 to 26·0% the average being 19·1%. The maximum quantity of 'Dara' amounting to nearly a quarter of the total catch were landed during 1953–54.

In order to make the results of trawling in different regions comparable the catch per hour of trawling in terms of kilogrammes has been calculated and presented in Table II. During 1950–51, the trawlers restricted their fishing activity to only three regions namely, Bombay, Cambay and Veraval; the maximum of 39,435 kg. of 'Dara' was caught from the Cambay region giving an average of 10·1 kg./hr. of fishing. A further examination of the area-wise analysis shows that even in this region most of 'Dara' were caught from areas 18, 19, 24, 25 and 26, indicating thereby the relative richness of these areas.

TABLE II

Catch per hour of 'Dara' fishing in kg. from the five different regions by the Cutters M.T. Ashok *and* M.T. Pratap, *during* 1950–51 *to* 1956–57

Year	Mode of operation	Catch per hour of 'Dara' fishing in kg.				
		I	II	III	IV	V
1950–51	Otter-trawling	5·8	10·1	4·7	No fishing	
1951–52	Do.	4·2	8·7	0·6	0·5	29·2
1952–53	Do.	2·9	4·0	3·0	0·0	21·4
1953–54	Bull-trawling	4·8	5·2	0·3	1·5	195·0
1954–55	Do.	0·0	3·9	4·7	2·5	322·5
1955–56	Do.	1·0	7·3	1·7	0·3	269·6
1956–57	Do.	0·5	0·0	0·0	3·3	187·6

During the next two years, *i.e.*, from 1951–52 to 1952–53 the Cutters worked in all the five regions. During these years the maximum 'Dara' catches were obtained from the Dwarka region with an average of 29·2 kg. and 21·4 kg. per hour of fishing. From 1953–54 onwards the Dwarka region continued to be the best fishing ground for 'Dara' in all the successive years. The 'Dara' catches during these years were of very high order, *i.e.*, 94,377 kg. in 1953–54; 25,444 kg. in 1954–55; 60,246 kg. in 1955–56 and 45,455 kg. in 1956–57. The average catch per hour of trawling in these years worked out to 195·0 kg., 322·6 kg. and 187·6 kg. respectively. This sudden improvement in 'Dara' catches may possibly be due to the change over of the fishing method from Otter-trawling to Bull-trawling.

A study of Table II clearly indicates the abundance and high productivity in region V in respect of 'Dara' as compared to the other regions. A detailed study of the area-wise distribution of this region as presented in Fig. 2 shows that the areas K and M contributed more 'Dara' although small quantities were also taken from areas L and N. The depth in areas K and M varies between 20 and 51 metres.

The fishermen of Satpati and Dahanu undertake 'Dara' fishing as a major fishing operation from December to April by using bottom-set gill-nets. They land 'Dara' in large quantities from the Bombay and Cambay regions.

Coming to the size of 'Dara' in the landings, it is seen in the local as well as in the trawl fishing that Bombay and Cambay regions yield large-sized 'Dara' in the maturing condition. Specimens of 'Dara' with gonads in advanced stages of development have not been recorded from these regions; however, spent ones do occur in small numbers. Young immature ones popularly known as 'Chelna' have been noticed only as stray specimens in the fish landings and do not form a fishery in these regions. In April 1956 *M.T. Ashok* landed immature 'Dara' from area No. 11 (Diu Head) in the Cambay region. Those 'Chelna' caught in one haul weighed 644 kg. and entirely comprised of the 34·5 cm. size-group. It may be of interest to emphasize here that the catches from Dwarka region, the richest trawling ground for 'Dara', comprise entirely of an immature stock of 'Dara' varying between 23·0 and 96·5 cm. in length. Only once, however, *M.T. Ashok* landed a specimen of 103·3 cm. in length from this region (January 1957).

Table III shows the percentage of fully grown 'Dara' and the immature 'Chelna' in the various trawler landings from 1950–51 to 1956–57.

It is obvious from this table that excepting the first three years of the operation of the Cutters, the percentage of immature 'Chelna' is very high and varies from 92·0 to 99·0%.

The low percentage during the three years from 1950–51 to 1952–53 is probably due to the fact that they did not fish in the Dwarka region during 1950–51 and in the next two years they fished there during the dwindling season for this species.

A detailed analysis shows that the high percentage of 'Chelna' in the trawler catch was mainly from the Dwarka fishing grounds. It appears that the Dwarka region serves as a nursery ground for this species. The best season for exploiting this ground appears to be from November to March and after that the fishery dwindles.

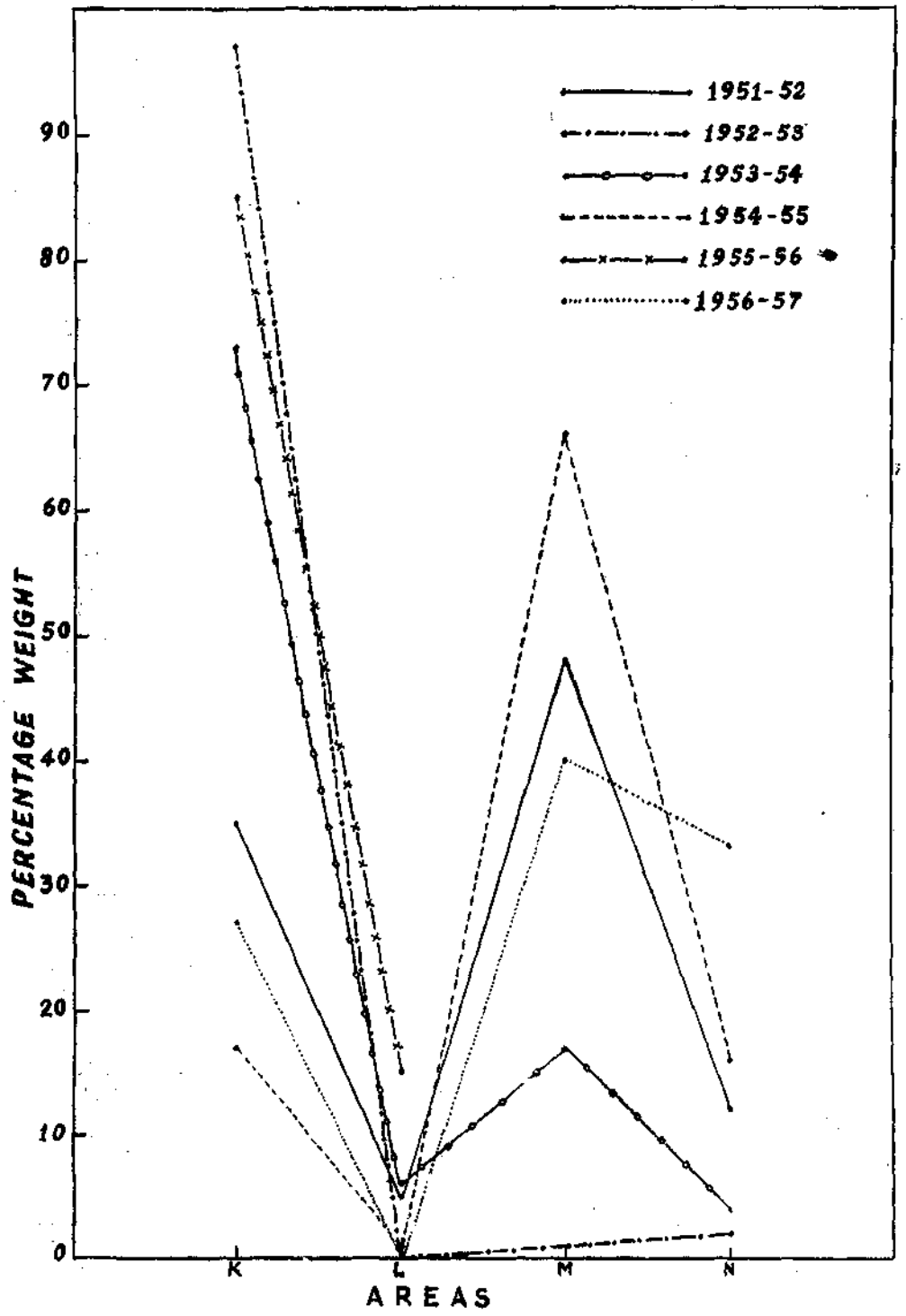

FIG. 2. Percentage distribution of 'Dara' in the different areas of Dwarka region during 1950–51 to 1956–57.

TABLE III

Percentage of fully grown ('Dara') and immature ('Chelna') individuals of P. indicus *in the total landings of* Taiyo Maru No. 17, M.T. Ashok *and* M.T. Pratap *and New India Fisheries Trawlers from* 1950–51 *to* 1956–57

Name of the vessel	Mode of operation	Year	Quantity of 'Dara' landed in kg.	Fully grown 'Dara'		'Chelna'	
				kg.	%	kg.	%
Taiyo Maru No. 17	Otter-trawling	1951–52	95,864	7,472	7·8	88,392	92·2
	Do.	1952–53	164,723	10,254	6·2	154,469	93·8
	Do.	1953–54	128,690	3,773	2·9	124,917	97·1
M.T. Ashok and *M.T. Pratnp*	Do.	1950–51	42,900	42,900	100·0	..	..
	Do.	1951–52	34,833	29,432	84·5	5,401	15·1
	Do.	1952–53	25,484	16,087	63·2	9,397	36·8
	Bull-trawling	1953–54	95,146	769	0·8	94,377	99·2
	Do.	1954–55	26,145	698	2·7	25,447	97·3
	Do.	1955–56	61,835	538	0·9	61,297	99·1
	Do.	1956–57	45,540	40	0·1	45,500	99·9
New India Fisheries Trawlers	Do.	1956–57	267,313	7,040	2·6	260,273	97·4

At Sachana, a fishing village in the Gulf of Cutch near Jamnagar, there exists a 'Dara' fishery from February to May when bottom-set gill-nets are employed in fishing. Large-sized mature and spawning 'Dara' specimens have been observed in these catches in the month of April.

Table IV indicates the 'Chelna' catch in kg. per hour of fishing and its percentage in the total catch by the Cutters in each year from 1951–52 to 1956–57. It is noticed that there is no appreciable decline in the 'Chelna' fishery of this region and that the productivity has been uniformly maintained.

It is too premature to correlate this high percentage of 'Chelna' yield from the Dwarka region with the decline in the 'Dara' fishery observed in

TABLE IV

'Chelna' catch in kg. per hour of fishing and its percentage in the total landings from Dwarka region by the Cutters M.T. Ashok *and* M.T. Pratap *during* 1951–52 *to* 1956–57

Year	Mode of operation	Fishing hours	Total catch in kg.	'Chelna'		
				kg.	c/h	%
1951–52	Otter-trawling	185·1	15,659	5,401	29·2	34·7
1952–53	Do.	439·7	26,263	9,397	21·4	35·7
1953–54	Bull-trawling	483·9	302,223	94,377	195·0	31·2
1954–55	Do.	78·9	69,575	25,447	322·5	36·5
1955–56	Do.	224·9	164,548	60,626	269·6	36·8
1956–57	Do.	248·3	146,663	45,455	187·6	30·9

recent years in the waters nearer Bombay. The reasons for this have not been obvious as the identity or otherwise of the two 'Dara' stocks has yet to be established. Detailed studies on raciation and migratory habits of this species may throw more light on this problem.

LENGTH-FREQUENCY STUDIES

The thread-like prolongations of the caudal lobes found in this fish even above 50·0 cm. in length are invariably broken. Therefore, the measurements are taken in terms of furcal length instead of total length. The specimens measured, varied between 5·0 and 119·0 cm. in length. For the length-frequency studies the lengths are grouped with 10·0 cm. intervals.

P. indicus landed at Versova, Satpati and Dahanu are not suitable for the growth studies as the gear used by these fishermen is a bottom-set gill-net (locally known as 'Waghur Jal'). It is a highly selective gear with a mesh size approximately 19·0 cm. knot to knot and 'Dara' of only above 80·0 cm. in length are caught in this.

Table V gives an idea of the percentage of different sizes obtained in this gill-net. It is noticed from this that the 89·5 to 99·5 cm. size-group appears to be predominant in this catch.

TABLE V

Percentage frequency of P. indicus *in the local landings during* 1954–56

Size-group in cm.	Cold storage (Bombay)		Satpati fishing village		Sachana (Saurashtra)	
	No.	%	No.	%	No.	%
80·5– 89·5	120	14·0	32	21·0	10	7·0
89·5– 99·5	712	81·0	108	70·0	109	78·0
99·5–109·5	47	5·0	13	9·0	20	15·0

The 'Dol' a bagnet operated from Sassoon Dock, Worli, Danda Versova, etc., around Bombay brings stray specimens of young *P. indicus*. They appear in the catch in insignificant numbers and rarely form an appreciable percentage. In these catches 'Dara' as small as 5·6 cm. in length have been noticed. Fish up to 21·0 cm. in length have been noticed quite often; the largest, so far observed, measured 28·6 cm.

In all 3,376 specimens of *P. indicus* were measured from the Dwarka region from November 1953 to January 1957. This period includes four successive fishing seasons for 'Dara' by the trawlers. In view of the fact that the fishing has been restricted to only a few months during each season, it is difficult to explain the significance of different modes occurring in the size-frequency graphs. However, an attempt has been made to see whether a reasonable picture could be obtained.

In 1953–54, the 'Dara' season commenced in November 1953 and extended up to April 1954 covering a period of five months. Fig. 3 shows the size-frequency distribution during these five months. The mode '*c*' at 74·5 cm. in November 1953 disappears completely from this region in the coming months. In January and February 1954 the mode '*a*' at 34·5 cm. represents the first year class, attaining this size during the first year. The mode '*b*' at 54·5 cm. and '*c*' at 74·5 cm. in March 1954 can be said to be the second and third year classes. The growth during the second year is perhaps in the order of about 20·0 cm. in length. The mode 'a^+' at 44·5 cm. in April 1954 is the one which has completed its first year and is in the second year. Probably it may be the one and a half year old group. Based on the above assumptions, the mode '*c*' at 74·5 cm. of November

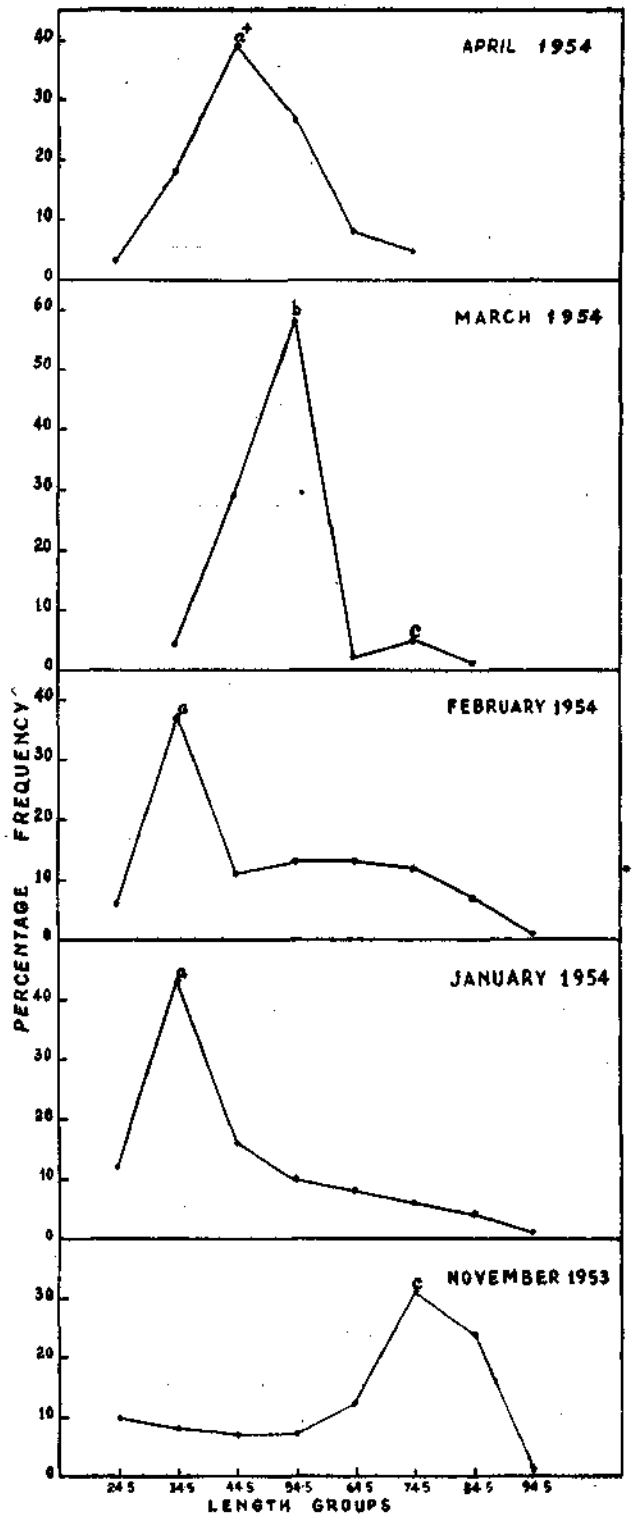

FIG. 3. Monthly size-frequency distribution of 'Dara' by the trawlers during 1953–54.

1953 can be considered as representing the third year class, the growth from second to third year also being in the order of about 20·0 cm.

In the second fishing season (Fig. 4) 'Dara' were landed during January and February 1955. In the January catch 'Dara' appeared in two size-

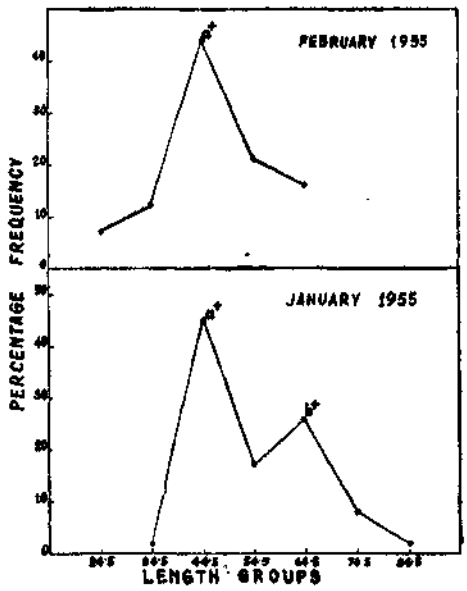

FIG. 4. Monthly size-frequency distribution of 'Dara' by the trawlers during 1955.

groups—one of the advanced first year class 'a^+' at 44·5 cm. and the other of advanced second year class 'b^+' at 64·5 cm. The February 'Dara' catch consisted of only advanced first year class.

During the third season (Fig. 5) *P. indicus* were recorded in December 1955, January and February 1956. During all these months, the catch comprised of two size-groups—one of the first year class with the mode 'a' at 34·5 cm. and the other of the advanced two or two and a half year class with the mode 'b^+' at 64·5 cm.

During the fourth season (Fig. 6) in November 1956 the second year class, in December 1956 the advanced first year and in January 1957 the first and second year classes were noticed.

AGE COMPOSITION OF THE CATCHES

From the data available for four seasons, it seems likely that the Dwarka 'Dara' catch consists of three-year classes, namely, the First, Second and Third year classes. However, the intermediate classes of advanced one year

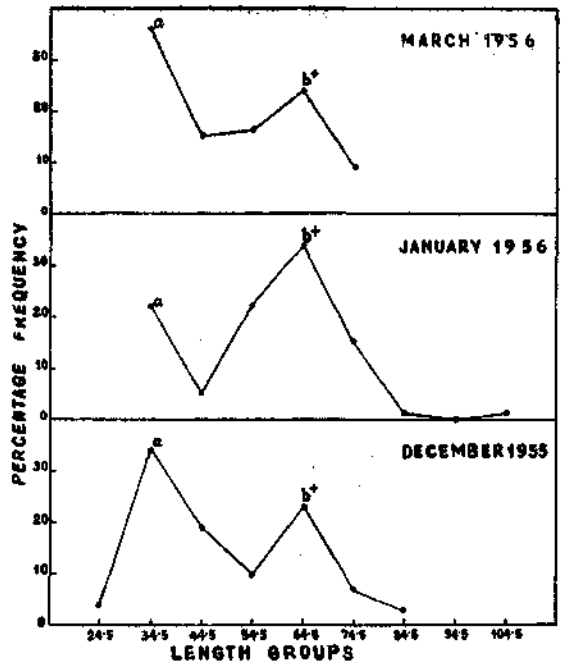

FIG. 5. Monthly size-frequency distribution of 'Dara' by the trawlers during 1955–56.

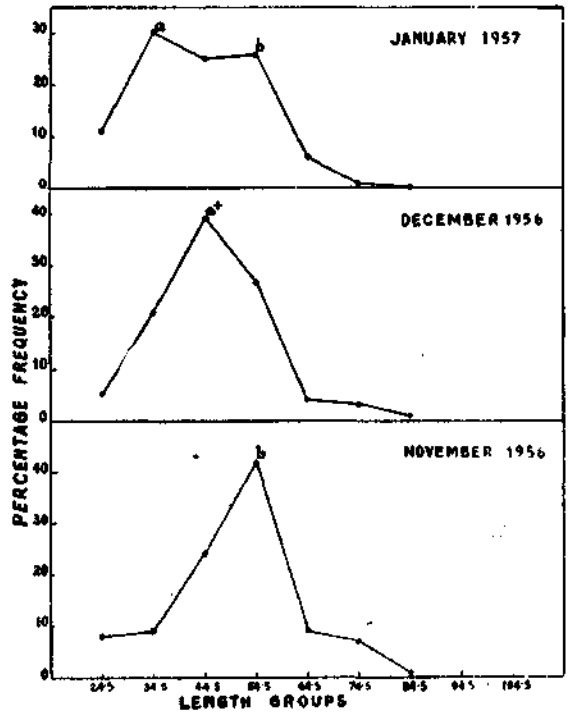

FIG. 6. Monthly size-frequency distribution of 'Dara' by the trawlers during 1956–57.

and advanced two-year classes which may as well be called as one and a half and two and a half year classes also appear. In any case excepting the only one specimen of 103·3 cm. caught by *M.T. Ashok*, fish above three years have not been obtained in the catches from this region. The fish obtained in the bottom-set gill-nets at Satpati, Dahanu, etc., from Bombay and Cambay areas and Sachana consist of sizes above 80·0 cm. Assuming that the stocks of 'Dara' in all the five regions is homogeneous, the dominant size-group of 89·6 to 99·5 cm. from the Bombay and Cambay areas may be assigned to the fourth year class.

Spawning Season of *P. indicus*

The non-availability of mature and running *P. indicus* during the course of these investigations has made it difficult to trace its spawning season. Moreover, it is not possible to examine the gonadial condition throughout the year as the season lasts for a period of five to six months. Therefore, for studying the spawning periodicity of *P. indicus*, the ova diameter measurements had to be adopted. In this work, four stages of maturity have been recognized in the development of the ovary as against the seven stages described by the International Council for Exploration of the Sea. The four stages have been described below with the corresponding stages described by the International Council for ready reference.

	Stage		Corresponding stages according to I.C.E.S.
I.	Immature	The ovary is slender, thread-like and white in appearance. Ova are not visible to the naked eye. Ova are transparent with distinct nuclei in the centre. They measure from 0·0 to 0·30 mm. in diameter.	I & II
II.	Maturing	The ovary is enlarged and yellow in colour. The eggs are granular in appearance and are visible to the naked eye. The ova are yellow and opaque—some in the commencement of formation of yolk and others full of yolk. Their size ranges from 0·31 to 0·62 mm. in diameter.	III & IV
III.	Spawning	The ovary is full and light yellow in colour. It is in the oozing stage and the ova are liberated with the slightest pressure. The ripe ova are completely transparent with a single oil globule. The size of the ova varies from 0·63 to 1·10 mm. and oil globule varies from 0·26 to 0·40 in diameter.	VI
IV.	Spent	The ovary is flabby and blood shot in colour.	VII

Remnants of the yolky eggs remain.

Stage V, described by the International Council for Exploration of Sea, was not availed for study during the course of this investigation. Hence, this stage could not be considered here.

Four specimens were examined for the study of ova diameter measurements. Three of them were in the maturing stage, collected one each in February 1956, June 1956 and September 1957 from the Bombay and Cambay regions. The fourth specimen collected at Sachana near Jamnagar in April 1954 was in the spawning condition. The frequency polygons of ova diameters from these four specimens of *P. indicus* have been shown in Fig. 7.

During February three modes '*a*', '*b*' and '*c*' at 0·14, 0·38 and 0·62 mm. are seen. In April also three modes can be made out. The mode '*c*' in February corresponds to the maturing ova and can be traced in April as ripe ova. In April the mode '*c*' is not prominent and is represented in two small modes. This may be due to the fact that the specimen being in the oozing condition, most of the ripe ova had already fallen from their follicles into the formalin. Therefore, it appears that the ova in respect of modes '*c*' and 'c^+' in April form one crop. The other two modes '*a*' and '*b*' of this month are at 0·22 and 0·54 mm. respectively. In June the mode '*b*' persists at 0·54 mm. and a fresh batch of immature eggs go to form a new mode 'a^+' at 0·14 mm. In September also the mode '*b*' persists at 0·54 mm. This month again a new batch of eggs is proliferated from the germinal layer to form a mode 'a^+' at 0·14 mm.

According to the spawning habits of the fishes described by Dejong (1939) and Prabhu (1956) it is seen from Fig. 7 that *P. indicus* spawns twice in a year. The April crop represented by the modes '*c*' and 'c^+' forms the first batch of eggs to be spawned. Moreover, in June spent individuals occur in good numbers. This fact is also supported by Mohamed (*loc. cit.*). And during monsoon the young ones appear as stray specimens in the landings of Sassoon Docks. These evidences prove the first spawning season of 'Dara' extending from April to June.

The possibility of having the second spawning season for 'Dara' can be supported by four factors. Firstly, the frequency polygons of ova diameters show the persistence of the mode '*b*' of maturing eggs at 0·54 mm. from April to September. This suggests the possibility of another spawning season for 'Dara' sometime between September and February for which the maturing eggs of mode '*b*' will be responsible. Secondly, in January 1956 and subsequently in January 1957 two young *P. indicus* of 6·0 and 5·6 cm. respectively in furcal length were collected from Versova. From

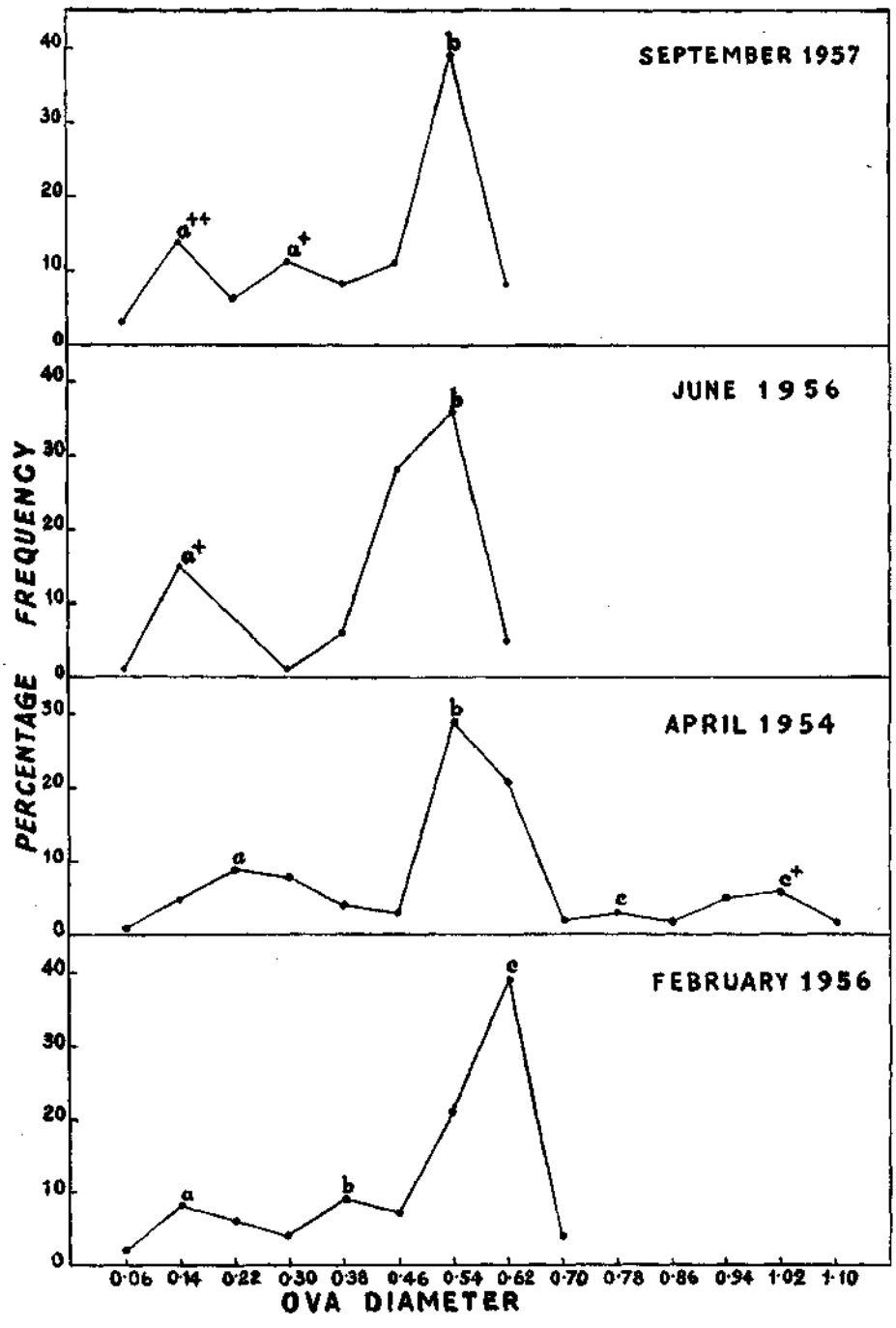

FIG. 7. Frequency polygons of ova diameter of *P. indicus*.

the probability that *P. indicus* spawns twice and also from the appearance of the young ones for the second time in January in a year it is suggested that the second spawning season appears to be during October to December. Thirdly, Gnanamuthu (1958) states that *P. indicus* enters the Madras inshore waters in September and breeds in November. The pro-larvæ become post-larvæ in forty-eight hours after hatching and grow into juveniles in thirty days. This may also be true in the case of the 'Dara' fishery of the Bombay coast regarding its second spawning season. And lastly, the probability that *P. indicus* spawns twice a year is further corroborated by the occurrence of what may be described as one year and one and a half year or two years and two and a half year classes at the same time in the Dwarka landings as described previously.

During the course of this study no spawning specimen was landed either by the trawlers or by the local fishermen from Bombay and Cambay regions, in spite of the fact that huge quantities of 'Dara' were landed during the last seven years. Mohamed (*loc. cit.*) has reported that mature specimens caught from Cambay regions are mostly females, the males being almost absent. The same has also been observed during the present investigation. He further states that *P. indicus* collected from the Satpati fishing village in April were almost entirely mature male specimens. Satpati fishermen stay away for fishing for three to five days. In order to keep the catch in fresh condition they remove the complete viscera from the fish. Due to this process of degutting, it is almost impossible to observe the gonadic condition of female specimens as the ovaries are removed along with the entrails.

The only one spawning specimen that was examined was from Sachana near Jamnagar. Shrivatsa (1953) mentions that Jew fishes and Indian salmons enter the Gulf of Cutch for spawning in March. Therefore, the breeding grounds of 'Dara' appear to be in the Gulf of Cutch. Satpati fishermen are understood to go northwards towards the Gulf of Cambay, as the summer advances for fishing. It may be because this fish is entering the upper reaches of Gulf of Cambay at that time.

For fecundity studies, two specimens measuring 93·8 and 95·0 cm. in the maturing condition were examined. They were estimated to contain 1,172,040 and 1,553,773 ova respectively.

Summary

1. Some aspects of the fishery and biology of *Polydactylus indicus* (locally known as 'Dara'), one of the main commercial species along the Bombay and Saurashtra coasts are presented and discussed.

2. Fully grown maturing 'Dara' are found in good numbers in the Bombay and Cambay regions. The fishery is well exploited by the fishermen of Satpati and Dahanu by the use of bottom-set gill-nets.

3. 'Chelna,' the immature 'Dara', are landed mainly from the Dwarka region by the trawlers. The areas K and M are extremely rich grounds for the 'Chelna' fishery. They form nearly 30·0% of the total catch during the season.

4. Study of growth in *P. indicus* was attempted by the method of length-frequency analysis. 3,376 specimens collected from the Dwarka region were measured. The Dwarka fishery seems to consist of the First, Second and Third year classes as well as the intermediary classes of one and a half and two and a half years.

5. *P. indicus* appears to spawn twice in a year once in April to June and again in October to December.

6. Fecundity studies indicate a high rate of recruitment.

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REFERENCES

Clark, F. N. 1934 .. Maturity of California sardine (*Sardina cærulæ*) determined by ova diameter measurements. *Calif. Fish Game*, No. 421–49.

De Jong, J. K. 1939 .. A preliminary investigation on the spawning habits of some fishes of Java Sea. *Treubia*, **17**, 307–27.

Gnanamuthu, C. P. 1958 .. Studies in the life-histories and feeding habits of fishes. *Proc. Indian Sci. Congr., 45th Session*, **4**, 127–28.

Hickling, C. F. and Ruttenberg, E. 1936 The ovary as an indicator of spawning period of fishes. *J. Mar. biol. Ass., U.K.*, **21**, 311–17.

Jayaraman, R., Seshappa, G., Mohamed, K. H. and Bapat, S. V. 1959 Observations on the Trawl-Fisheries of the Bombay and Saurashtra waters, 1949–50 to 1954–55. *Indian J. Fish.*, **6** (1), 58–144.

Karandikar, K. R. and Palekar, V. C. 1950 Studies on the ovaries of *Polynemus tetradactylus* Shaw in relation to its spawning habits. *J. Univ. Bombay*, **19** (3), 21–41.

Karekar, P. S. and Bal, D. V. 1958 The food and feeding habits of *Polynemus indicus* (Shaw). *Indian J. Fish.*, **5** (1), 77–94.

Mohamed, K. H. 1955 .. Preliminary observations on the biology and fisheries of the Thread-fin, *Polydactylus indicus* Shaw in the Bombay and Saurashtra waters. *Indian J. Fish.*, **2** (1), 164–79.

Panikkar, N. K. and Aiyar, R. G. 1939 Observation on breeding in brackish water animals of Madras. *Proc. Ind. Acad. Sci.*, **9 B**, 343–64.

Prabhu, M. S. 1956 .. Maturation of intraovarian eggs and spawning periodicities in some fishes. *Indian J. Fish.*, **3** (1), 59–90.

Shrivatsa, K. R. 1953 .. *List of Various Species of Fish and Crustaneas Caught by the Japanese Trawlers* Tayo Maru No. 17 *in Saurashtra Waters (with Notes) (from Operators from November* 1951 *to June* 1952). Department of Industries and Supplies, Government of Saurashtra.