

## Maturity and Spawning of the Marine Catfish, *Tachysurus dussumieri* (Valenciennes) along the South Kanara Coast

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Results of a study on the maturity and spawning of the marine cat-fish, *Tachysurus dussumieri* obtained from gill net catches at Malpe, Gangolli and from trawl catches at Mangalore during the period September 1975 to May 1976 are presented.

The species was found to spawn once a year from December to March with peak spawning in February. Females attain maturity at about 545 mm total length. The fecundity of the species was found to vary from 105 to 184 eggs, the average being 141 eggs per female. While a linear relationship was noticed between fecundity and the length of the fish, no relationship was observed between the fecundity and the weight of the fish. In fish above 300 mm, females dominated over males from October to February whereas, males dominated over females from March to May.

**Key Words:** Maturity and spawning, Marine catfish, *Tachysurus dussumieri*

### Introduction

Catfishes, along with the oil sardine, mackerel and prawns form the bulk of the marine fish catches of the South Kanara coast. Of the different species of catfishes captured along the South Kanara coast, *Tachysurus dussumieri* is one of the dominant species. Detailed studies on the biology maturity and spawning and fishery of *T. dussumieri* were made by us. Though the marine catfishes form an important group of food fishes of the country, available information on the group as a whole is meagre (Mojumder 1969, 1971, Sekharan 1973, 1973a, Sekharan & Mojumder 1974a,

Singh & Rege 1964, 1968, 1970 and Venkataraman 1960).

### Materials and Methods

Samples of *T. dussumieri* obtained from the gill net catches at Malpe (290 to 790 mm) and hook and line catches landed at Gangolli (290 to 770 mm) were examined for this purpose. The length, weight, sex and stage of maturity of all the fish were noted. The gonads were classified into different stages of maturity based on their macroscopic and microscopic structure. The frequency of spawning, spawning season and size at first

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maturity were studied by tabulation of the percentage occurrence of fish in various maturity stages monthwise and size-wise and also by the ova diameter frequency polygons. For determining size at first maturity fish in stages V and VI were considered mature. The data collected during the spawning season (December to March) were considered. Fecundity was estimated by counting the number of mature ova in stages IV to VI. The relationships between fecundity and length/weight of fish were studied. The sex-ratios of fish captured in different gears were studied separately. Standard methods adopted by various earlier authors (Clark 1934, Simpson 1951, Mac Gregor 1957) were used in the study.

### Observations

#### *Maturity Classification of Maturity stages*

Based on the macroscopic appearance and microscopic structure of the gonads (figure 1), fishes were classified into different stages of maturity as described below :

*Stage I—Immature:* The ovaries of this stage appear very small and brownish in colour. They occupy less than 1/3rd of the body cavity. Majority of the ova are opaque and round in shape. Small irregular and transparent ova firmly attached to the ovarian wall are also seen. All the ova are white in colour. The size range of the majority of ova of this stage is 3 to 8 ocular micrometer division (1 o.m.d. is equal to 0.14 mm) the maximum being 18 o.m.d.

In the case of males, the testes appear very thin, thread-like and brown in colour. The testes extend up to middle of the body cavity.

*Stage II—Maturing:* In this stage, ovaries appear slightly larger, white in colour and occupy more than 1/3rd of the body cavity. The ova are opaque, round in shape, and light yellow in colour. The yellowish tinge

indicates the commencement of yolk deposition. The ova range in size between 3 to 58 o.m.d. The largest group of ova which got separated from the immature egg stock forms a mode at 38 o.m.d.

The testes appear slightly thick and brownish-white in colour. They are cylindrical in shape.

*Stage III—Early mature:* Ovaries in this stage are big, swollen and occupy half the body cavity. They appear light yellow in colour. The ovarian wall is thick. Intraovarian eggs are big, round and light yellow in colour, indicating deposition of relatively large amounts of yolk. The ova are completely opaque, range in size between 3 and 68 o.m.d. with the mode of the largest group of ova at 53 o.m.d.

Testes in this stage appear long, thick and slightly flattened and dull white in colour.

*Stage IV—Late mature:* The ovaries of this stage occupy 3/4th of the body cavity. They appear yellowish in colour with a thick ovarian wall. The largest group of ova are deep yellow in colour, spherical in shape and completely opaque. The ova range in size between 3 and 73 o.m.d. The largest group of eggs form a mode at 63 o.m.d.

The testes are long, thick and flat and white in colour.

*Stage V—Ripe:* The ovaries are enlarged and occupy almost the entire body cavity. The ovarian wall becomes thinner. The ova can be seen through the ovarian wall. They are big, spherical in shape and deep yellow in colour. The ova vary in size from 3 to 98 o.m.d. The largest group of ova form a mode at 88 o.m.d.

Testes are much thicker, flat and creamy white in colour.

*Stage VI—Spawning:* The ovaries are very much enlarged, swollen, yellow in

colour and occupy the entire body cavity displacing the alimentary canal. The ovarian wall becomes very thin and almost transparent. The blood vessels are prominent. Fat accumulation is seen at the posterior end of the ovaries. Intraovarian eggs are spherical, deep yellow in colour, and range in size from 30 to 123 o.m.d. The largest common egg diameter is at 113 o.m.d.

The testes appear very thick, flat, long and creamy white in colour.

*Stage VII—Spent:* The ovaries become flabby after shedding the ripe eggs and appear dull brown in colour. They shrink and the ovarian wall becomes thick. The fatty tissue present at the posterior end of the ovary disappears. The intraovarian space is filled with “egg-stalk tissue” (the tissue around the eggs, which helps for the attachment of eggs to the ovarian wall) which is deep red in colour. The stalks measure about 1.5–2.0 cm in length. The smaller group of eggs are round and opaque. The ova of this stage range in size from 3 to 48 o.m.d.

In the case of males, the testes become very flat and appear bag-like and attain a pale brown colour.

*Stage VIIA—Spent recovering:* The ovaries shrink and appear white in colour. The ovarian wall becomes thicker. Internally, the egg-stalks are reduced in length. The ova range in size from 3 to 58 o.m.d. The mode of the largest group of ova is at 48 o.m.d.

This stage was not observed in males.

*Stage VIIB—Resting:* The ovaries are white in colour with thick ovarian wall, occupying less than 1/4th of the body cavity. Internally, the egg-stalks are reduced to very small size or absent. Only immature ova are found attached firmly to the ovarian wall. The developing ova which are present in the spent recovering stage are resorbed as indicated by the presence of

empty shells of eggs attached to the ovarian wall. Majority of the ova range in size from 3 to 13 o.m.d. The maximum size of the ova observed is 23 o.m.d.

*Development of ova to maturity:* Ovaries typical of the nine stages of maturity were selected and the ova diameter measurements of 300 ova were taken for each stage. They were grouped into 50 o.m.d. groups. The percentage frequency of ova in each group was calculated and the frequency of polygons drawn for all the stages (figure 1). In stage I, majority of ova are in the size range 3 to 8 o.m.d. few of them measuring 18 o.m.d. In stage II, a batch of ova get separated with a mode at 38 o.m.d. In stage III, this batch is clearly separated from the general egg stock with a mode at 53 o.m.d. In Stage IV, the mode shifts to 63 o.m.d. Thereafter it progressed rapidly to occupy a mode at 88 o.m.d. In Stage V, in addition to this, a second mode appears at 23 o.m.d.

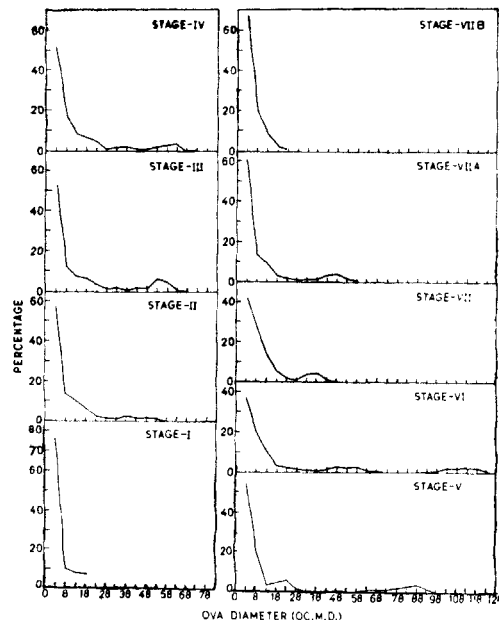


Figure 1 Ova diameter frequency polygons of ovaries of *T. dussumieri* in various stages of maturity

In Stage VI the second mode shifts to 48 o.m.d. In this stage, the first batch of ova measure 93 to 123 o.m.d. with a mode at 113 o.m.d. In the spent fish (Stage VII), there is a single mode at 38 o.m.d. as in Stage II. In the spent recovering stage (VIIA) a mode is found at 48 o.m.d. The ova diameter frequency polygon of a resting stage (VIIB) resembles that of Stage I in that only a stock of immature ova are present. This stage of the ovary is expected to result when all the mature ova are eliminated and the remaining maturing ova are resorbed as evidenced by the presence of empty egg shells. These ovaries probably remain for sometime in this state before the recommencement of the development of ova towards maturity.

*Frequency of spawning:* In Stage VI, the mature, maturing and immature stock are present. The mature group of ova are distinctly separate from the maturing group, indicating that the fish spawns for a short duration. The presence of maturing group of ova in the spent recovering stage (VIIA) indicates that the group does not mature in the same season. Hence, it could be concluded that the species spawns only once in a season. This view was supported by the occurrence of juveniles only during March, April and May.

*Spawning season:* The percentage occurrence of gonads in different stages of maturity in different months was calculated to determine the spawning season (tables 2 and 3).

The data on maturity of males and females captured in gill nets indicated that stage VI appeared first in December. Though spent males were not recorded in December, the occurrence of spent females in this month and the occurrence of males and females in spent condition in January and February and of males only in March is an evidence that this species spawns from

December to March. The occurrence of females in stage VI and that of males in stage VI and VII in March in the commercial catches indicates that spawning takes place in March also. The data from book and line catches also revealed that spawning commences prior to January and extends upto March. Intensive spawning was observed during February at both the places. This evidence was further supported by the occurrence of ripe and spent fish in large numbers during this month.

### Size at First Maturity

The size at first maturity was found to be 620 mm (table 1 & figure 2) in case of females as 50% of females collected during the spawning season (December-March) were found mature at this size (figure 2). Data for males were inadequate to draw any conclusion.

*Fecundity:* Since there is a clear demarcation of the mature ova from immature and maturing groups from stage IV, fishes of

Table 1 Percentage occurrence of mature fish during the spawning season (December-March) in various size groups

Size group (in mm)	Total No. of fish observed (From stage I to VI)	No. of mature fish (Stage V & VI)	Percentage of mature fish
470-503	14	1	7.14
503-500	16	2	12.05
530-560	6	1	16.67
560-590	19	3	15.78
590-620	17	5	29.41
620-650	24	17	70.83
650-689	10	8	80.00
680-710	15	12	80.00
710-740	5	5	100.00
740-770	1	1	100.00

stages IV to VI were utilized for this purpose. Since the species spawns only once the number of mature eggs in the ovary prior to spawning indicates fecundity. The mature eggs were found to vary from 105 to 184 eggs table (table 2) the average being 141 eggs per female. No relationship could be found between fecundity and length and fecundity and weight of the fish.



Figure 2 Percentage occurrence of mature fish in various size groups

Table 2 Number of mature ova in individuals of *T. dussumieri*

T.L. of fish (mm)	Wt. of fish (g)	Wt. of ovary (g)	Total no. of mature ova	Stage of maturity
633	2.65	422	152	VI
560	2.05	308	118	VI
535	1.85	272	116	V
560	1.90	204	184	IV
695	3.80	155	163	IV
680	3.30	405	130	VI
643	2.80	272	141	V
655	3.00	317	105	VI
710	4.50	195	152	IV
585	2.30	378	133	VI
610	2.65	392	131	VI
680	3.50	192	179	IV
730	4.35	420	148	VI
670	3.45	390	123	VI
605	2.85	371	127	VI
655	2.85	281	151	VI
645	2.75	266	136	V

Table 3 Sex-ratio of *T. dussumieri* captured by gill nets, hook and line and trawl nets at different places

Month	Gill net catch off Malpe		Hook & Line catches off Gangolli			Trawl catches off Mangalore			
	Total No. of fish	Percentage of Females Males		Total No. of fish	Percentage of Females Males		Total No. of fish (150 to 300 mm)	Females	Males
Oct.	22	63.64	36.36	—	—	—	—	—	—
Nov.	50	42.00	58.00	—	—	—	—	—	—
Dec.	49	53.66	46.94	—	—	—	14	57.14	42.86
Jan.	120	65.00	35.00	17	76.74	23.56	12	33.33	66.67
Feb.	128	51.72	38.28	148	62.84	37.16	48	47.92	52.08
Mar.	119	46.22	53.78	169	48.52	51.48	61	55.74	44.26
Apr.	153	25.49	74.51	79	43.04	56.96	63	49.21	50.79
May	—	—	—	10	30.00	70.00	73	46.58	53.42

**Sex ratio:** The sex-ratio of fish caught in different gears such as gill nets, hook and lines and trawl-nets were calculated separately (table 3). Gill net and hook and line catches consist of fish above 300 mm, whereas the trawl catches consists of fish below 300 mm. In fish above 300 mm, females dominated over males from October to February, except in November in gill net catches and in January and February in hook and line catches. Males dominated over females in March and April in gill net

catches and from March to May in hook and line catches. Fish below 300 mm, captured in trawl nets, showed almost a 1:1 ratio between males and females although males were slightly more than the females in majority of the months. The fish moving in schools in April and May were found to be exclusively males. The general size of fish varied between 510 to 715 mm majority being in the size range of 510 to 610 mm.

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