

## OBSERVATIONS ON THE MATURITY AND SPAWNING OF *THRISSOCLES HAMILTONII* (GRAY) IN BOMBAY WATERS

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*Thrissocles* fishery in Bombay is mainly contributed by two species, namely, *T. purava* and *T. hamiltonii*, the occurrence of the other species of *Thrissocles* being rare and sporadic. Some work on the maturity and spawning of *T. purava* has been already carried out by Palekar and Karandikar (1952). An attempt is, therefore, made to study the maturity and spawning of *T. hamiltonii* which occurs in sizeable quantity along the coast of Bombay during the periods, late September to November and late March to May.

*Thrissocles hamiltonii* (Gray) locally known as 'Kateri' is a small fish attaining a maximum standard length of 20.0 cms., with a maximum weight of about 90 gms. The fish though tasty does not seem to suit the table delicacy of the rich as it contains numerous small bony spines in its skeleton. However, the middle and the lower class people consume this fish in large quantities.

The material for the study of maturity and spawning of *T. hamiltonii* was collected from the fish landing places along the coast of Bombay. The present work is based on the data collected during the period September 1953 to May 1954. The occurrence of this fish during the months of December and January and in June, July and August was practically negligible. The observations are based on the standard length of the fish measured from the tip of the snout to the origin of the caudal fin.

### *Spawning period :*

A gross examination of the gonads of all the fish collected, together with the detailed study of ova-diameter measurements of selected females were made use of in determining the spawning period of the fish. The ovaries of the collected fish were preserved in 5% formalin and later on 10 ovary samples were taken for measurement of ova diameters. The distribution of ova of various sizes, in the anterior, middle and posterior part of the ovary was found to be uniform. 300 ova from each ovary were measured for estimating the size frequency percentages of the ova. Method adopted by Clark (1934) and Prabhu (1956) was utilised for this purpose.

As a result of this study three stages in the development of the eggs in the ovary, are recognised (Fig. 1).

(1) The immature eggs upto 0.30 mm. in diameter constitute stage I. The fish with such an ovary is termed here as *immature* ;

(2) The maturing eggs ranging from above 0.30 mm. to 0.80 mm. in diameter constitute stage II. The fish with the predominance of such eggs in the ovary is called *maturing*, and finally,

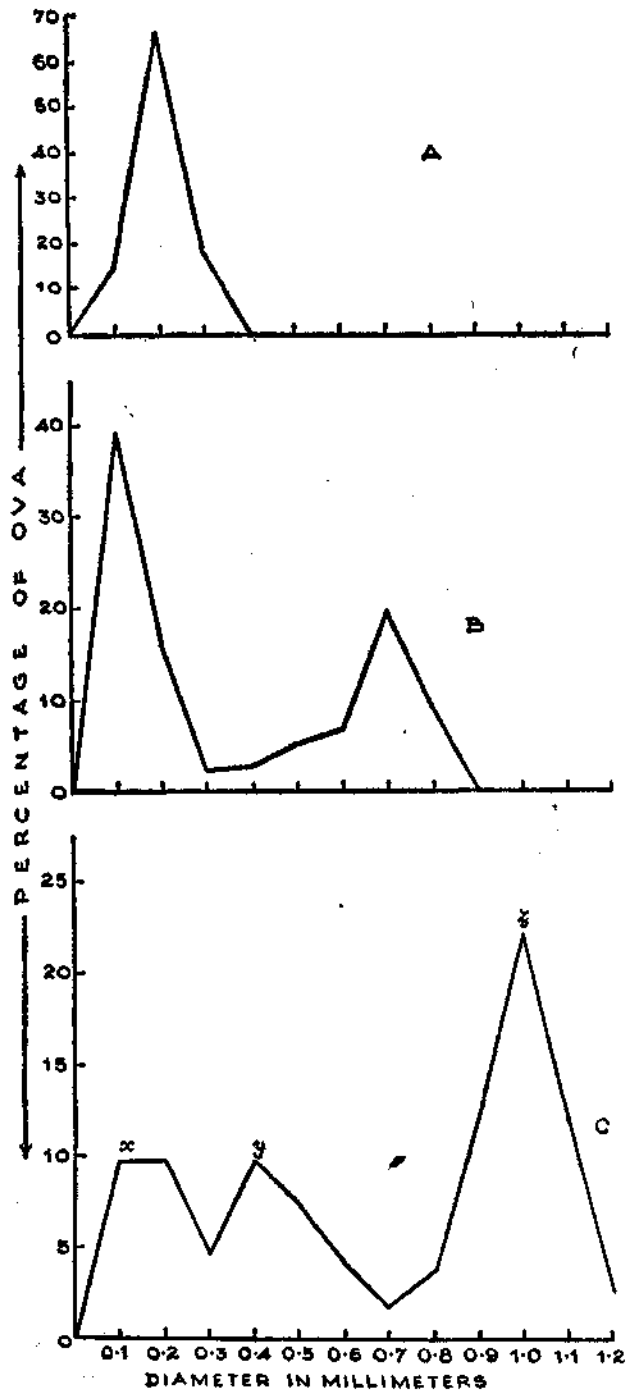


FIG. 1

OBSERVATIONS ON THE MATURITY & SPAWNING OF *THRISOCLES HAMILTONII* 19

(3) The matured eggs measuring more than 0.80 mm. in diameter represent stage III. Such a fish with ovary containing numerous mature eggs is termed as *mature*.

It has been mentioned at the outset that *T. hamiltonii* is found in sizeable quantities during the periods late September to November and late March to May. A study of the adult females during these periods shows that a large majority of the fish is either in mature or spent condition as shown in Table A giving the percentage of females in each stage of maturity. From this it can be inferred that the fish has two distinct spawning seasons one from October to November and the other from late March to May.

Incidentally it may be mentioned here that the plankton collections made in connection with the study of fish larvae and post-larvae of Bombay waters since 1952 to 1954, contained many post-larval forms of *T. hamiltonii*, ranging from 14 mm. to 22 mm. in size, during May and early June, and November.

A careful examination of the frequency polygon of the mature ovary (Fig. 1C) reveals that this ovary contains a distinct stock of mature ova (mode at z) and two other stocks of immature (mode at x) and early maturing (mode at y) eggs

TABLE A

*Percentage of females in each stage of maturity*

Stage of Maturity	Sept.	Oct.	Nov.	April	May
Immature	5	14	6	8	20
Maturing	60	22	14	32	15
Mature	35	27	41	40	25
Spent	—	37	39	20	40

TABLE B

*Number and percentage of mature and spent females in each centimeter length group*

Length in cms.	No. of fish observed	No. of mature and spent individuals	Percentage of mature and spent individuals
11.5—12.5	22	—	—
12.6—13.5	13	—	—
13.6—14.5	15	1	6.7
14.6—15.5	14	8	57.1
15.6—16.5	26	22	84.6
16.6—17.5	40	36	90.0
17.6—18.5	16	16	100.0
18.6—19.5	10	10	100.0

of equal magnitude. As the stock of mature ova is sharply differentiated from the general egg stock it can be inferred that the spawning of this species is restric-

ted to a short and definite period and that the individual fish spawns only once during each spawning season. It is therefore likely that the stock of early maturing eggs represented by the mode  $y$ , is the one that gets ready for spawning in the subsequent spawning season. The males examined during the spawning periods were also in mature or spent condition. This was roughly determined by microscopic examination and by size and colour of the fresh testes. The smallest male in a mature condition measured 13.2 cms. in standard length and the largest male in mature or spent state had a standard length of 15.8 cms. About 40% of the total fish examined happened to be males.

The occurrence of large number of fish along the coast only during the spawning periods, indicates that the fish invades inshore waters for the breeding purposes.

In Bombay waters *T. purava* and *T. hamiltonii* are the only predominant species of *Thrissocles*. The spawning habits of *T. hamiltonii* are similar to those of *T. purava* as can be judged with reference to the work of Palekar and Karandikar (1952). Both these species spawn twice in one year and further in both cases there is a short spawning duration, each individual spawning only once during the season. However, Mookerjee and Mookerji (1950) mention that the breeding season of *Engraulis* (*Thrissocles*) *hamiltonii* from Bengal, begins from January and prolongs upto the end of July. Similarly *Thrissocles mystax* from Calicut has a prolonged spawning season extending over a period of 8 months from September to May of the following year (Venkataraman 1956), whereas Dharmamba (1959) who has worked on the same species from Lowson's Bay, Waltair, mentions that the spawning of *T. mystax* is restricted to a short, definite period from June to August and again from December to February and that each individual spawns only once in a season. However, in *T. dussumieri*, she mentions that the spawning extends over a long period with individuals spawning twice in each season.

Thus it is evident that the *Thrissocles* species in general show periodicity in spawning but that the duration and frequency of spawning vary from species to species and in the same species even from place to place.

#### Condition Factor :

A study of the *Condition Factor* or *Ponderal Index* of the fish during the period of investigations shows that the values for the months of October-November and again April-May are considerably low, (Fig. 2), thereby further corroborating the observation on the spawning period of the fish.

#### Fecundity :

For the study of fecundity, five mature gonads were examined. Number of mature eggs in a gramme sample of the ovary was first counted and then by multiplying this number by the weight of the gonad, the total number of mature eggs in the ovaries was arrived at. These computations gave the following values:—

<i>Length of the fish</i>	<i>Number of eggs</i>
15.0 cms.	12495
16.0 cms.	13432
16.5 cms.	13552
17.0 cms.	21197
17.3 cms.	23060

Average 16747

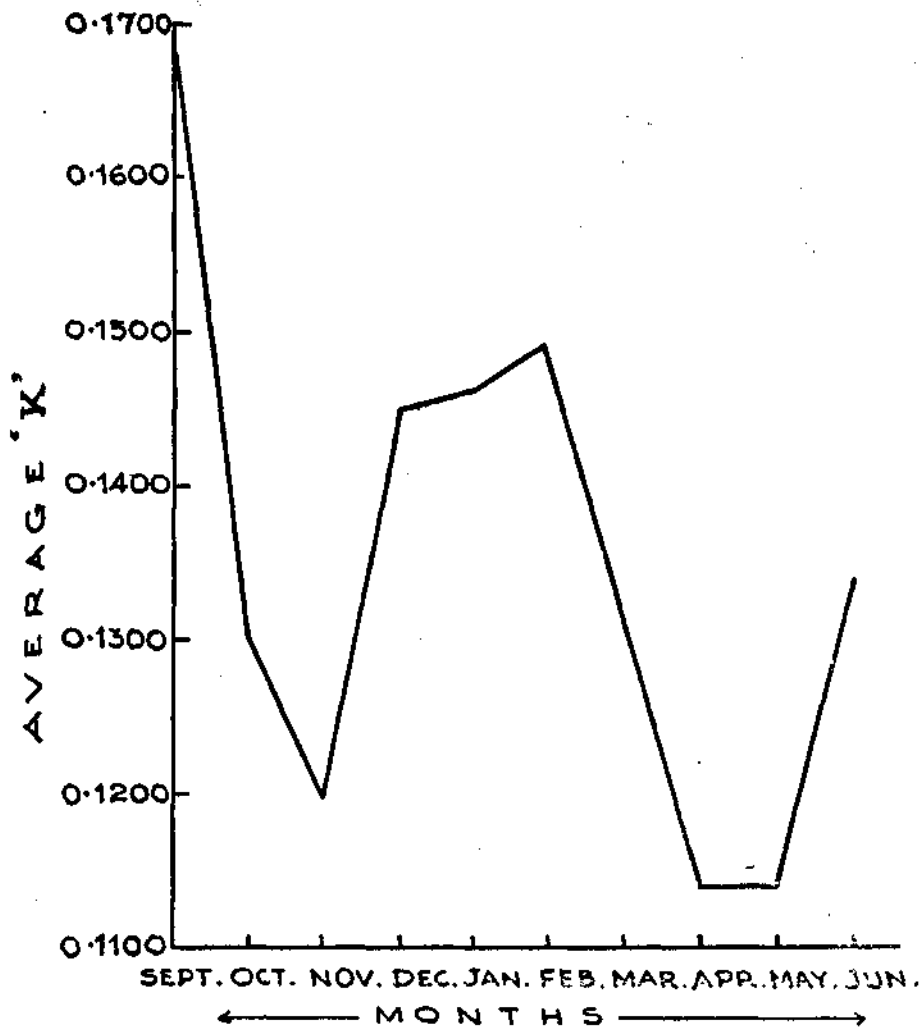


Fig. 2. Monthly Fluctuations in the 'K' values of *T. hamiltonii*

From this it can be concluded that *T. hamiltonii* contains an average of 16747 mature eggs and that the larger fish may contain as many as 23000 mature eggs.

*Size at First Maturity :*

For determining the minimum size at maturity females examined in the spawning seasons only, were made use of. The Table B gives the number and percentage of mature and spent fish in each cm. size group. It is seen from this table that the first mature female appears in the group 13.6 to 14.5 cms. where the percentage of mature and spent females is only 6.75. This percentage keeps on gradually increasing till it reaches 100 in the size groups above 17.6 cms. Though a single

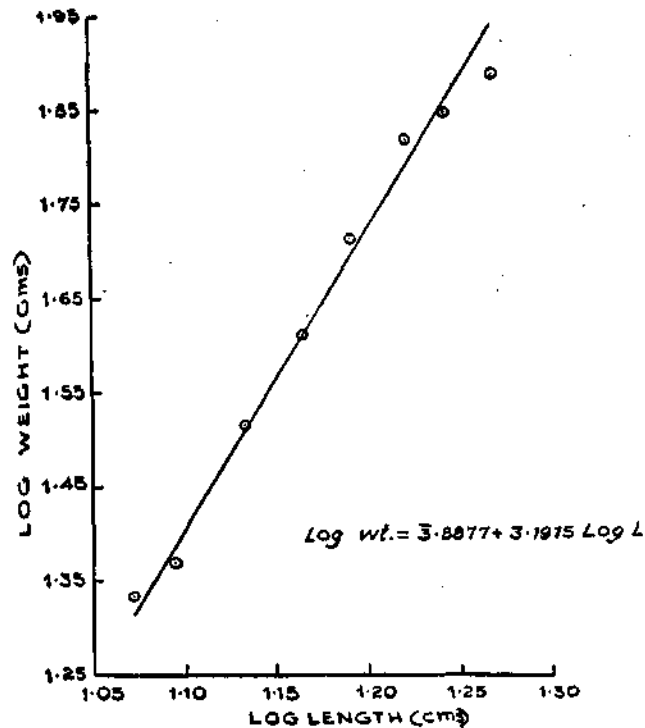
mature fish was recorded at the size of about 14.0 cms., the average size at first maturity can be fixed between 14.6 to 15.5 cms., i.e. at about 15.0 cms. as about 57% of the females in this group are found in either mature or spent condition.

*Weight Length Relationship : (Fig. 3 A. & B)*

The relationship was calculated from the lengths and weights of 333 specimens of *T. hamiltonii*.

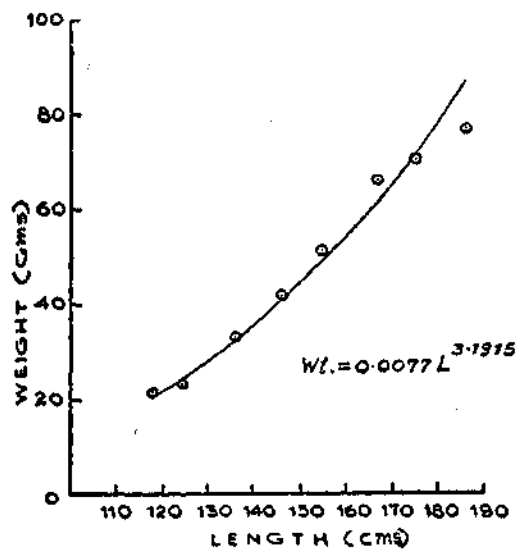
The formula  $W=K(L)^n$  or

$\text{Log } W = \text{Log } K + n \text{Log } L$ , where  $W$  is the weight,  $K$  is a constant,  $n$  is the relative growth constant and  $L$  is the length, was made use of in determining the relationship. Sexes were pooled when it was found that the relative growth constants for males and females were not significantly different. The equation of the fitted line for the pooled data worked out to be  $\text{Log } W = 3.8877 + 3.1915 \text{Log } L$ .



**A-THE REGRESSION OF WEIGHT ON LENGTH, SEXES COMBINED**

The curve presented in Fig. 3 B, is derived from the equation  $W=0.0077 L^{3.1915}$ . From this it can be concluded that the weight increases as about the cube of length for lengths between 11.0 and 19.0 cms. standard length.



B - THE LENGTH-WEIGHT RELATIONSHIP OF  
*T. hamiltonii*

FIG. 3

#### SUMMARY

In Bombay waters *T. hamiltonii* is found in sizeable quantities during late September to November and again from late March to May. During these periods mature and spent fishes are caught in inshore waters. Post-larval forms of the fish have also been recorded during these periods.

The spawning in this fish appears to be of a short duration though the fish spawns twice in a year. However, the individual fish spawns only once in a season. The minimum size at maturity appears to be about 15.0 cms. The weight length relationship of the fish has been determined and the weight appears to increase as about the cube of length for lengths between 11.0 and 19.0 cms.

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