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# STUDIES ON THE CATSHARK *CHILOSCYLLIUM GRISEUM* FROM INDIAN WATERS

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ABSTRACT

The catshark *Chiloscyllium griseum* belonging to the family Hemiscyllidae is described in detail from samples collected from both east and west coast of India. Various patterns of growth of individual organs are described. Analysis of data on length-weight relationship showed no significant difference between sexes. Hence a common value of Log W= —4.8378 + 2.7314 log L is obtained. The shark feeds on bottom fishes and crustaceans. Males mature at 520 mm and females at 530 mm total length. The paired oviduct contains 4 egg-cases, 2 on either side at a time without any embryonic development taking place while inside the oviduct. The egg-cases are laid outside for embryonic development and hatching in the sea water.

## INTRODUCTION

CATSHARK *Chiloscyllium griseum* Muller and Henle 1841, is a sluggish, slow moving shark which inhabits the inshore regions of the coastal waters. It is fished by the mechanised trawlers during December to May period and is able to live out of water longer. No complete account on the taxonomy and biology of this species is available. Literature on the biology of this shark has been short and patchy. Sundara Raj (1914) described briefly the egg-case, while Setna and Sarangdhar (1948) gave a short account of the structure of the reproductive organs and egg-cases. In the present work covering over a period of 4 years, some attempts were made to fill the lacuna in our knowledge on the biology of this shark.

Day (1878) recorded the genus *Chiloscyllium* from Indian waters under the family Scyllidae. Later Jordan (1917) assigned *Chiloscyllium* under the family Hemiscyllidae. But Fowler (1941) and Berg (1947) classified this under the family Orectolobidae. Compagno (1984) dealt *Chiloscyllium* with the family Hemiscyllidae.

Misra (1959) and Devadoss (1977) treated *C. indicum* of Day as a junior synonym of *C. griseum*.

## MATERIAL AND METHODS

Samples for the present work were collected as and when available at Vellayil fish landing centre and also from the fish market, Calicut. Specimens collected from Porto Novo were analysed for the taxonomic study. For proportional dimensions, measurements from 23 sharks were analysed and the results are presented here in a format which indicate the variations and changes, if any of the dimensions with the growth of the animal (Fig. 1). Colour pattern, sex and reproductive status were noted. The methods as adopted by Bass *et al.* (1975) for recording stomach contents and Devadoss (1978) for determining maturity condition were followed.

## DESCRIPTION

Super-Order: Galeomorphii

Order: Orectolobiformes

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*Family*: *Hemiscyllidae* Gill, 1862

Genus: *Chiloscyllium* Muller and Henle, 1837

**Chiloscyllium griseum** Muller and Henle, 1841

"Korangan" in Malayalam and "Korangu sora" in Tamil.

*Chiloscyllium griseum* Muller and Henle, 1841. *Syst. Beschr. Plagiostomen*, 19 (type locality, India, Japan); Sundar Raj, 1914, *Rec. Indian Mus.*, 10: 818-819 (egg-case); Misra, 1959, *Rec. Indian Mus.*, 57: 81; Devadoss, 1977. *Ph.D. Thesis, Annamalai Univ.*

*Chiloscyllium indicum* (not Gmelin) Day, 1878. *Fishes of India* pt. 6, 726 fig. 3.

*Hemiscyllium punctatum* (Muller and Henle) Fowler, 1941. *Bull. U.S. natn. Mus.*, 100 : 85.

The proportional morphometric dimensions from 23 specimen are given in Table 1.

Head length (snout to first gillslit) 12.49-15.76, snout to anterior margin of eye 5.36-7.60, snout to pectoral 15.37-18.31, snout to pelvic 31.69, 35.60, snout to mouth 4.26-6.34, internarial distance 3.67-5.63, diameter of eye 1.15-1.97, interorbital distance 4.30-6.43, first dorsal base 7.04-9.36, between dorsal bases 8.09-12.16-pectoral length 11.03 - 13.60, distance from pectoral to pelvic 10.98 - 19.97 and length of upper caudal lobe 24.10-27.60 in percentage of total length.

Spiracles and eye equal, the former rather upper than behind the latter, short labial folds at angle of mouth and broad lower lip grooves continuous across chin; teeth in 28 - 30 in each jaw; nostril cirri almost equal orbit; origin of first dorsal behind the base of pelvic origin; one to three dermal ridges on the back, in some 13 transverse dark brown bands along the length of the body.

*Distribution:* India, Southeast Asia, China and Japan.

*Pattern of growth*

Analysis on the proportional dimensions revealed various patterns of growth of individual organs as the fish grows in total length (Fig. 1). These can be summarised as follows:

1. Reduction in the characters of head region both length and breadth; in the size of the eyes, distances from snout to first gill slit, mouth, anterior margin of eye, nostrils, pectoral and pelvic fins and in the internarial and interorbital distances.

TABLE 1. *Summary of the proportional dimensions of* C. griseum 136-580 mm

| Characters | Juveniles | Adults |
|---|---|---|
| Distance from snout to pelvic | 34.19 ± 0.68 | 32.64 ± 1.13 |
| pectoral | 17.34 ± 0.39 | 15.82 ± 0.53 |
| I gillslit | 15.22 ± 0.53 | 13.22 ± 0.51 |
| eye | 7.23 ± 0.30 | 6.14 ± 0.37 |
| nostrils | 2.80 ± 0.98 | 2.60 ± 0.31 |
| mouth | 5.56 ± 0.38 | 4.49 ± 0.20 |
| Length of nostril | 1.34 ± 0.13 | 1.09 ± 0.06 |
| Between nostrils | 4.88 ± 0.42 | 3.92 ± 0.15 |
| Eye diameter | 1.80 ± 0.21 | 1.38 ± 0.12 |
| Interorbital distance | 5.98 ± 0.42 | 4.72 ± 0.30 |
| Mouth width | 5.61 ± 0.34 | 5.22 ± 0.22 |
| Orbit to spiracle | 1.13 ± 0.25 | 0.80 ± 0.07 |
| Length of spiracle | 1.59 ± 0.28 | 1.50 ± 0.15 |
| Between dorsal bases | 9.18 ± 0.72 | 11.15 ± 0.69 |
| Second dorsal to origin of caudal | 10.13 ± 0.95 | 15.05 ± 0.81 |
| Pectoral to pelvic | 11.73 ± 1.06 | 17.74 ± 1.36 |
| I dorsal base | 8.54 ± 0.83 | 8.23 ± 0.50 |
| height | 6.66 ± 0.93 | 6.13 ± 0.48 |
| II dorsal base | 8.55 ± 0.59 | 8.84 ± 0.70 |
| height | 5.75 ± 0.80 | 5.48 ± 0.44 |
| Anal base | 12.06 ± 1.07 | 11.81 ± 1.04 |
| Pectoral base | 6.41 ± 0.53 | 6.41 ± 0.31 |
| length | 12.19 ± 0.86 | 12.49 ± 0.34 |
| Pelvic origin to lateral corner | 10.70 ± 0.97 | 11.50 ± 0.59 |
| Caudal upper lobe | 25.67 ± 1.28 | 25.00 ± 0.77 |
| lower lobe | 19.45 ± 1.07 | 17.33 ± 0.65 |
| Length of I gillslit | 2.18 ± 0.42 | 1.85 ± 0.46 |
| III gillslit | 2.46 ± 0.51 | 2.23 ± 0.37 |

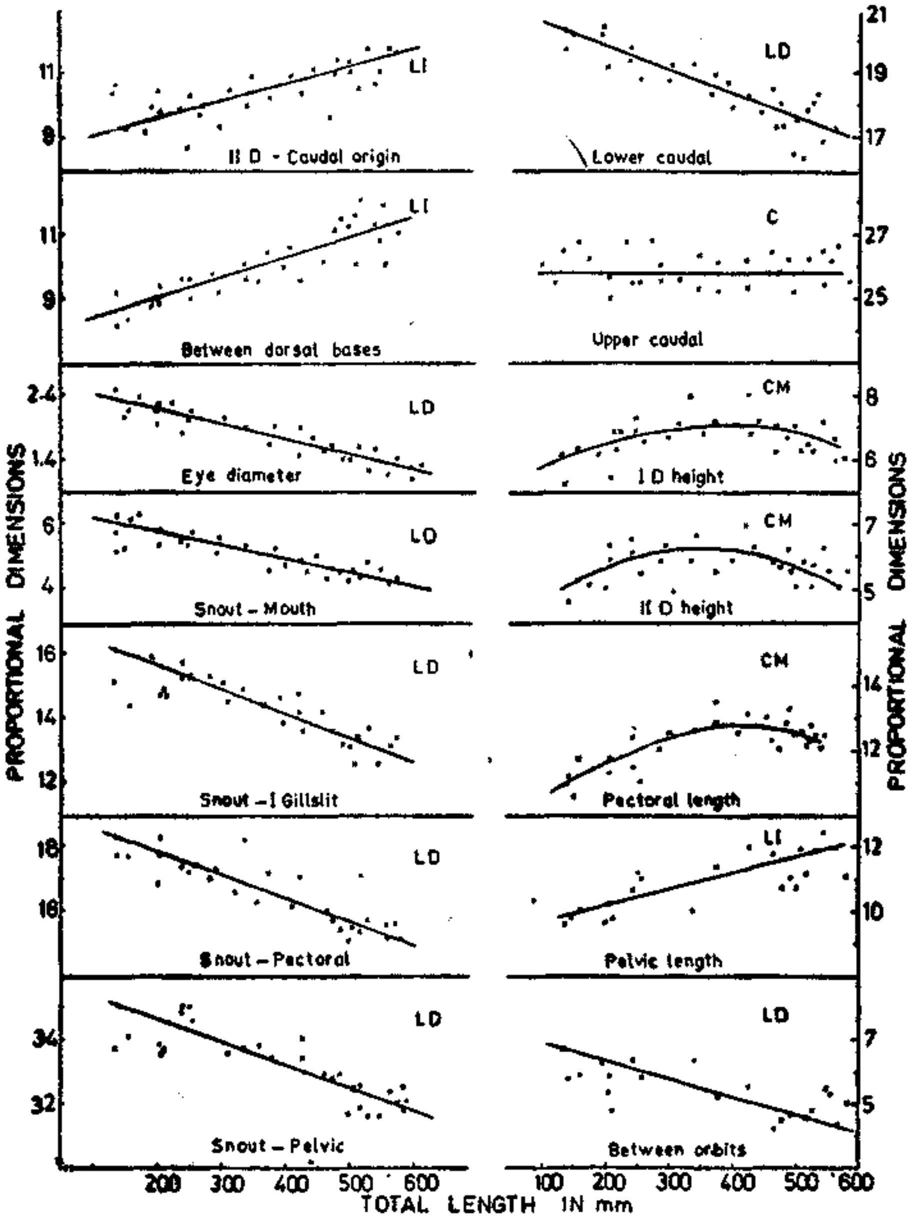


Fig. 1. Different types of growth patterns in the proportional dimensions of *C. griseum* (C- Constant; CM-Curvilinear, rising to a maximum followed by decrease as the shark grows in total length, LI-linear, increasing and LD - linear, decreasing.

2. Accelerated growth in the trunk and caudal region and lengthening of pectoral and pelvic fins.

3. Slackening in the growth of dorsal fins and lower caudal lobe.

It is a fact that fast swimming pelagic sharks have much larger first dorsal fin placed over the pectoral region and a distinct lower caudal, whereas the very slow swimming ones which live at the bottom possess small first dorsal fin placed over the pelvic region and a very much reduced or non-existent lower caudal (Bass *et al.*, 1975). So the slackening in the growth of dorsal fins and lower caudal found in the present observation contribute to the characters of lower grade of this shark.

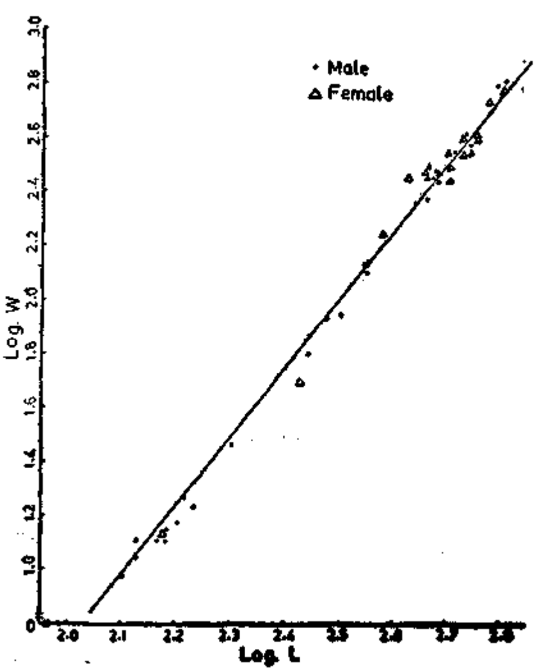


Fig. 2. Length-weight relationship of *C. griseum*.

*Length-weight relationship*

The length-weight relationship was calculated by the least square method by using the LeCren formula $W = aL^{b}$ or its logarithmic form $\log W = \log a + b \log L$, where W is weight, L length, and a and b constants.

The logarithmic regression equations obtained are as follows:

Males $\log W = -4.8674 + 2.7390 \log L$

Females $\log W = -4.7941 + 2.7205 \log L$

The corresponding parabolic equations are:

Males $W = 0.00001357 \times L^{2.7390}$

Females $W = 0.00001607 \times L^{2.7205}$

Fig. 3. Female reproductive organs with 4 egg - cases (O - Ovary with yolked ova; ODF - Oviducal funnel; NG - Nidamental gland and OD - Oviduct - enclosing egg - cases).

The significance between the regression coefficients for males and females was tested by the methods of analysis of covariance (Snedecor, 1956) and it was found that difference between male and female regression coefficients was not significant at 5% level. Hence sexes were combined and a length-weight relationship obtained as follows.

$$\log W = - 4.8378 \quad 2.7314 \log L$$

and its parabolic equation is:

$$W = 0.00001453 \times L^{2.7314}$$

The logarithmic values of observed weights and length are plotted in Fig. 2. With the regression line fitted based on the above equation.

Analysis of covariance is given in Table 2.

on the bottom fishes and crustaceans. Fishes like soles, juvenile *Psettodes erumei* small sciaenids and leiognathids formed the main item. Prawns and crabs constituted the crustacean diet. Molluscs mainly *Sepia* spp. formed a smaller portion of the feed.

TABLE 2. *Analysis of covariance*

| | DF | $\sum x^2$ | $\sum xy$ | $\sum y^2$ | B | Deviation from regression DF | SS | MS |
|---|---|---|---|---|---|---|---|---|
| With in males | 36 | 2.270066 | 6.217865 | 17.182675 | 2.739068 | 35 | 0.151520 | 0.004329 |
| With in females | 21 | 1.612253 | 4.386329 | 12.220130 | 2.720621 | 20 | 0.076691 | 0.003834 |
| | | | | | | 55 | 0.228211 | 0.004149 |
| pooled with in | 57 | 3.882319 | 10.604194 | 29.192904 | 2.731407 | 56 | 0.428532 | 0.004081 |
| | | | Differences between slopes | | | 1 | 0.000321 | 0.000321 |

$$F = \frac{0.000321}{0.004149} = 0.077369 \text{ NS}$$

TABLE 3. *Summary of the stomach contents of 43 sharks*

| Type of food | No of items present | % | Remarks |
|---|---|---|---|
| Teleost fish | 24 | 55.8 | includes mostly soles, juvenile *Psettodes erumei*, sciaenids and leiognathids. |
| Crustaceans | 19 | 44.2 | prawns and crabs. |
| Molluscs | 7 | 16.3 | mainly *Sepia* spp. |

*Food and feeding*

The stomachs were classified based on the degree of their distension due to food content. of the 43 stomachs analysed 2.33% of them were gorged (1+), 20.93% in full condition (1), 62.79% in half full (0.5) and 13.95% of them were empty (0). The food items were in various stages of digestion. Summary of the stomach contents is given in Table 3. This shark has got a definite feeding habit. It feeds

*Breeding*

Sex is differentiated by the appearance of the claspers at the relatively early stage of embryonic development. In the case of *Scoliodon laticaudus* the appearance of claspers was noticed at the early stage when the embryo attains the size of 30 mm (Devadoss, 1979). The sex differentiation by the development of gonads occurs later when the individual reach puberty. Gonads appears at the anterior end of the epigonal organs.

Fig. 3. shows the female reproductive organs of *C. griseum*. As in most sharks the overy on the right side was functional. The structure of uterus is same as that of *S. laticaudus* described by Devadoss (1979) earlier. As the shark is oviparous, the nidamental glands are relatively bigger in size than those of the viviparous species where the function of the nidamental gland *i.e.* secretion of the egg-case is the minimum. As the fertilized ova pass through nidamental glands, they are enclosed in albumen with thick brownish yellow egg-case. At a time 4 egg-cases two on either side are present. This observation corroborates with the findings of Stena and sarangdhar (1948). The development of embryos inside the egg-case does not commence during its journey down along the uterus, in closely related Japanese catshark *Cephaloscyllium, Scyliorhinus, Apristurus* and Japanese *Galeus* as Nakaya (1975) observed. As the embryo in the egg-case starts developing, the next capsule comes down into the oviduct above the earlier one. Like wise a number of capsules are contained in the oviduct arranged one above the other and in various stages of embryonic development before they are laid out side. But in the present case even though there are more than one capsule present in the oviduct at a given time, no development of embryos inside the capsule was observed which implies that the period of stay in the oviduct may be only for a short time. As the first one is laid out side the third one may descend down in quick succession to take the place of the second one which in turn move down to number one place. So much so there are two capsules present at a time inside an oviduct.

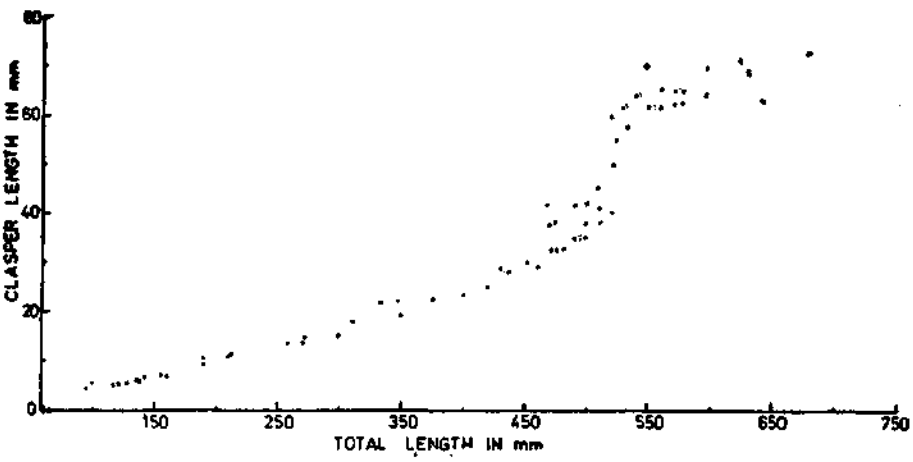


Fig. 4. Relationship between the length of claspers and the total length of shark.

In addition to four egg-cases on their way to be laid out, currently present inside the oviduct, there are 18 fully yolked, mature eggs measuring 20-25 mm in diameter present in the ovary along with numerous smaller ones in various degree of maturity. So breeding in this species appears to be a continuous process.

*Sexsual maturity*

Maturity in males is determined based on the enlarged testes and the collection of milt in the seminal sac. This fluid flows out if the sac is pressed gently. With out dissecting the fish sexual maturity can be determined by measurement of clasper length. Claspers are measured from the cloaca to the tip of clasper (Devadoss, 1978). Young claspers are short and flexible reaching barely the tip of pelvic fin. But during the onset of maturity the growth of claspers accelerated and become very stiff. The relationship between the length of claspers and the total length of males is shown in Fig. 4. After reaching sexual maturity the growth rate of claspers slackens. At this stage the males measure 520 mm which may be taken as the length at which males attain sexual maturity.

The determination of maturity of females is based on the development of internal organs like the development of ovary, enlargement of lower part of oviduct to function as uterus and the presence of egg-case in the oviduct. Females of *C. griseum* from 530 mm onwards were observed to possess these characters. So it is possible that females reach maturity when they attain a size of 530 mm.

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