



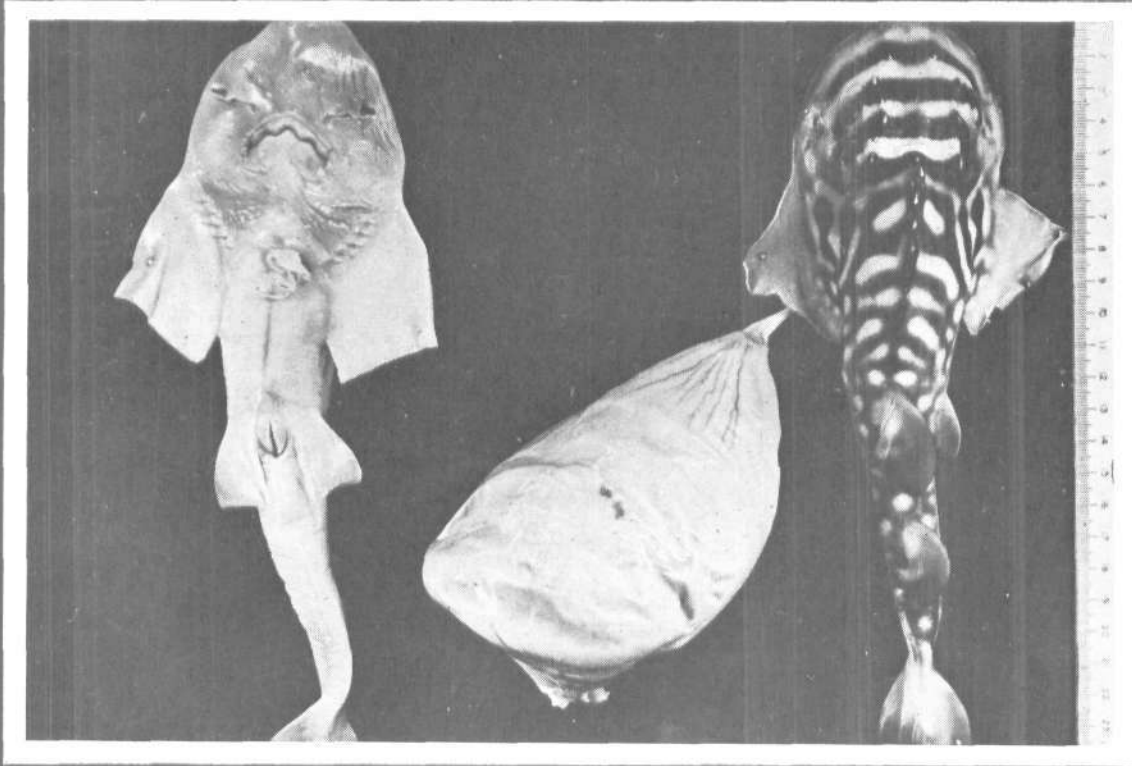
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Sex change in hound shark, along Madras coast*

The big eye hound shark, *Iago omanensis* has been recorded from the continental shelf off Bombay and Kutch region along the west coast and the Gulf of Mannar in the east coast. During regular observations at Madras fishery harbour on 28th July, 1994 about 150 kg of *Iago omanensis* was noticed in the trawl catches and thereafter six more trips were made to the centre and during each trip about 50 kg of this shark was noticed. More than sixty numbers in the size range of 295-745 mm were collected for detailed study.

This observation was of much interest, for many "male" hound sharks were found carrying developing embryos in their uteri. The number of such "males" was far more numerous that it cannot be dismissed as an abnormal case.

Description of reproductive organs

Based on the sexual behaviour of individual sharks three categories were recognised in the fishery as described below:

a. True males: Sexes are distinguishable externally in elasmobranchs as males are provided with claspers and the females with thelaca. In males, the claspers were well developed (Fig. 1). They grow proportionately to the total length of the shark till they attain maturity. So in a fully mature male the claspers measure 10-13% of the total length of the individual shark (Table 1). The smallest mature, true male measured 290 mm with a clasper length of 35 mm (12%). Internally a pair of testes develop one on either side of the vertebral column (Fig. 2). In all the true males observed, seminal fluid was found stored in the seminal vesicle and sperm oozed out on application of a mild pressure indicating the spawning season.

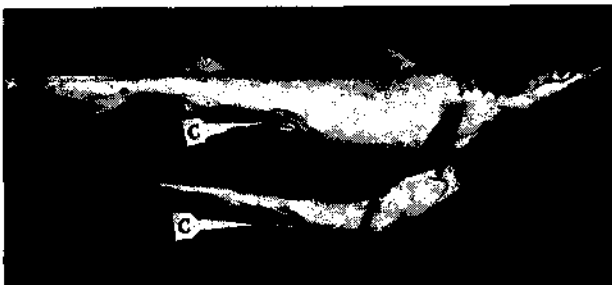


Fig. 1. A true male (smaller size) 310 mm TL having well developed fully calcified and rigid claspers (C) and a functional female (large size) with less developed and soft claspers (C) bearing embryos.

b. True females: In the adult female a single ovary and a pair of oviducts are present, the lower side of the oviduct being expanded to accommodate the developing embryos.

c. Functional females: These sharks appear externally as males with the presence of claspers, but are

TABLE 1. Values of clasper length percentages of the total length (true males)

Total length (mm)	Weight (g)	Clasper length (mm)	% in total length
290	65	35	12.1
300	80	40	13.3
300	90	40	13.3
315	95	40	12.5
315	100	38	12.1
322	104	38	11.8
335	128	40	11.9
350	140	45	12.9
355	152	40	11.3
355	158	48	13.5
360	160	48	13.3
365	150	46	12.6
365	145	48	13.2
408	200	41	10.0
450	350	45	10.0

fully functional females with ovary and embryos. The claspers are partially developed with imperfect grooves and are uncalcified. Presence of testes could not be traced internally. Other associated male reproductive organs like vasa differentia and seminal vesicles are also absent. So the claspers from these functional females appear to be functionless and may be just out growths of soft tissues. All the sharks examined were mature ones in the size range of 318-485 mm with the exception of one shark measuring 745 mm, the largest one in

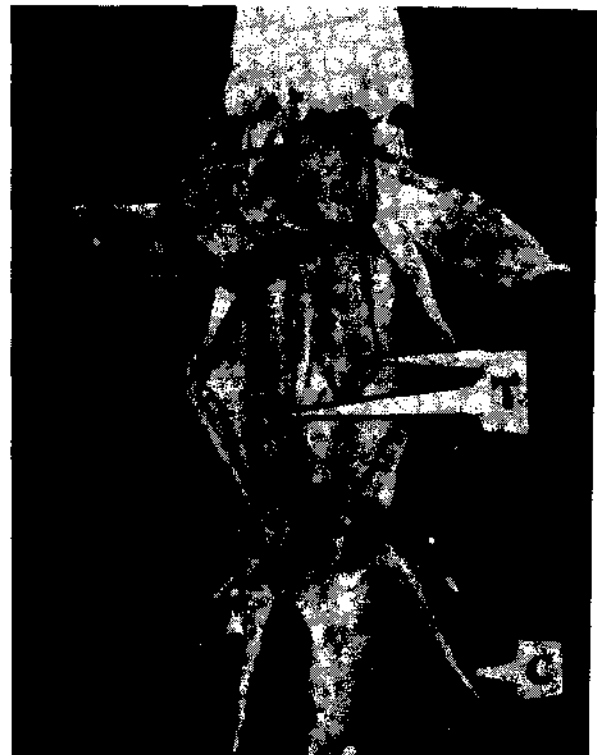


Fig. 2. A true male with a pair of testes (T) and claspers (C).

this observation. The 'claspers' observed in all these cases were measured and found to form 6-8% of the total body length (Table 2).

TABLE 2. Size of mother sharks and sex ratio of embryos in functional females and true females

Size range in total length (mm)	Weight range (g)	Length of claspers (mm)	% clasper in total length	No. of embryos	Sex ratio of F M
Functional females					
301-350	135-150	23-28	7-8	2-3	1 : 2
351-400	140-250	22-30	6-8	3-8	1 : 2
401-450	205-350	28-32	6-7	7-8	1 : 1.7
451-500	370-410	22-35	6-7	6-8	1 : 3.4
745	780	52	7	8	Not distinguishable
True females					
300	82	-	-	2	1 : 1
301-350	132-145	-	-	2-4	1 : 2
351-400	190-230	-	-	3-4	1 : 3
401-450	208-250	-	-	6-8	1 : 1.7
451-500	315-380	-	-	7-8	1 : 1.9
501-550	385-395	-	-	8	1 : 7
					1 : 2.4

Intra uterine and ovarian development

A maximum of eight embryos have been observed per litter (Fig. 3). The number of embryos per litter varied between 2 and 8 depending on the size of the mother shark (Table 2). Mature ovary with fully yolked ova (diameter 6-8 mm) ready to be spawned was also seen within the females of advanced pregnancy (Fig. 4). In other words, both ovarian and uterine cycles function simultaneously. These fully yolked ova are to be spawned immediately after parturition.

The number of developing embryos coincide with the number of mature ova present in the ovary at the same time. So the number of mature ova also indicates the fecundity of the species. In most of the cases upto 8 fully mature ova were traced. Only three specimens with 10 mature ova were seen without any embryos in the oviduct, which indicated that the



Fig. 3. Eight embryos measuring 135 to 140 mm TL removed from a 530 mm functional female; the embryos are with yolk sac placenta (YP).

shark was ready for ovulation and subsequent fertilization and development. The fully developed embryos which resembled miniature adults measured between 140 and 150 mm having connection with the mother shark through a well developed yolk sac placenta. The size at birth may be around 150 mm.



Fig. 4. Embryos (E) in the uterus; the developing ovary (O) is also seen.

Remarks

Functional hermaphroditism is common in a few species of marine fishes of the family Serranidae. But sexual abnormality, hermaphroditism and sex reversal are not common in elasmobranchs. Two instances of hermaphroditism in *Scylliorhinus caniculus* were reported by King (*J. Zool.*, 146: 312-314, 1966). Another case of hermaphroditism was reported in electric rays by Nair and Soundararajan (*Indian J. Fish.* 20(1): 260-264, 1973). Compagno (*Fish. Bull.*, 69(3): 615-626, 1971) observed partially developed and uncalcified claspers with eggs and early embryos in the oviducts of *I. omanensis* (Total length: 440 mm). In the present observation similar specimens with claspers, ovary with eggs and embryos in all stages of development formed more than 40% of the sharks examined. The size of each such shark was within the ranges of sexual maturity of each sex and no size below this maturity range was recorded. The sex ratio changed from young to adult. The embryonic sex ratio was 70 males to 30 females, but in the adult the ratio changed to 25 males, 33 females and 42 functional females having partially developed claspers. The presence of undeveloped claspers in these females is difficult to explain in the present context. Whether these sharks develop as males initially and reverse their sex as females later just before or at the onset of puberty retaining the external male symbol, or they are females from the earlier stage with claspers defunct could not be established. Histological studies on the reproductive tissues of the juveniles may help to know whether the sex reversal takes place as in the case of serranid fishes which change sex with age.

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