

OBSERVATIONS ON THE INTRAOVARIAN OVA OF A FEW TACHYSURIDS FROM INDIAN WATERS

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ABSTRACT

Three different groups of intraovarian ova, 'a', 'b' and 'c', are noticed in the ovary of mouthbrooding tachysurid catfishes; the former two groups are small nonyolked and reproductively nonfunctional and the last group is yolked, opaque and functional. The group 'a' and 'b' ova are sequentially arranged, respectively in the oviducal and posterior region while the group 'c' ova occupies the anterior three-fourth of the ovarian cavity. There is a certain ratio in the number of ova of the three groups, probably characteristic of each species. All the nonfunctional ova of the groups 'a' and 'b' and ripe functional group 'c' are spawned in a bunch and taken into the mouth of male, where only the group 'c' ripe eggs develop into young ones.

INTRODUCTION

During the course of a series of investigations on the fishery and biology of the mouthbrooding tachysurid catfishes a deviation from the normal pattern of distribution, structure and function of intraovarian ova was observed in species such as *Tachysurus thalassinus*, *T. serratus*, *T. caelatus*, *T. dussumieri*, *T. platystomus*, *T. sona* and *Osteogeneiosus militaris*. Attempts were, therefore, made to study in detail the nature of intraovarian ova, the sequential arrangement of different groups of ova, the ratio between different groups of ova, and the diameter frequency of the eggs collected from the mouth of gestating males. The earlier accounts which have relevance to the present context are those of Gunter (1947) and Sekharan and Mojumder (1973).

MATERIAL AND METHODS

The material for study was collected from trawl and drift-net catches of Mandapam, Pamban and Rameswaram during the period 1969-1976. The ovaries at all stages of maturity were collected and preserved in 5% formalin. The ovaries of stages IV to VII were cut open before being preserved in order that the ova might not get disorted. All ova below 1 mm diameter were measured with an ocular micrometer, each division corresponding to 0.013 mm. Ova above 1 mm were measured with vernier calipers. While the number of group 'c' ova is the total

count, the number of ova of groups 'b' and 'a' were estimated from subsamples taken from appropriate portions of the ovary. The eggs collected from the mouth of gestating males were also considered for egg-diameter frequency.

RESULTS

Structure of the ovary of a tachysurid catfish, Tachysurus platystomus (Day)

The systovarian ovaries are paired, tubular organs, lying dorsal to the alimentary canal. The two asymmetrical lobes of the ovary (the right one being larger) are separated from each other except posteriorly, where the oviducts unite just before entering the urogenital opening. The ovary wall is made up of a thick connective tissue (tunica albuginea) with many blood vessels, elastic tissue and smooth muscles. The ovary is attached to the dorsal body wall by a mesovarium. Ovigerous folds of the tunica albuginea project into the oviducal region of the ovarian cavity. Developing oocytes lie along the inner wall of the ovary as well as along the ovigerous folds.

In a mature ovary of *T. platystomus* there are three different groups of ova, termed for convenience as 'a', 'b' and 'c'. While 'a' and 'b' ova are small, nonyolked, white in colour, and frothy in nature, group 'c' ova are yolked, depending on the degree of maturation, and opaque. Eventhough the 'a' and 'b' ova are different groups, functionally and structurally they are same. In a ripe ovary all the ripe group 'c' ova and groups 'a' and 'b' ova are liberated from the follicles; and usually groups 'a' and 'b' ova are found attached in bunches to a few posteriorly placed ripe group 'c' ova (Fig. 1). At the time of spawning groups 'a' and 'b' and ripe group 'c' ova are extruded in a bunch. And after spawning the maturing group 'c' ova and a few liberated group 'a' ova remain

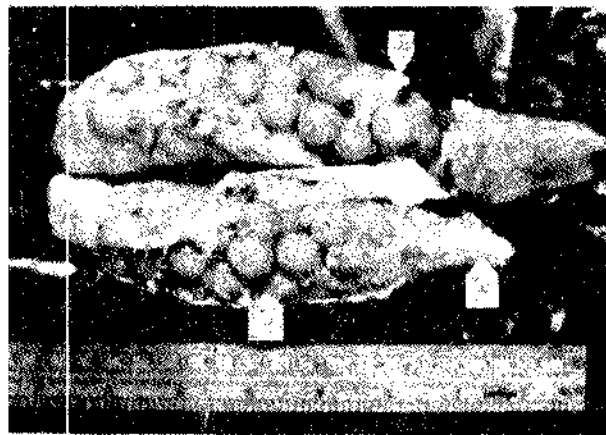


FIG. 1. Ripe ovary of *T. platystomus* (370 mm in total length) showing liberated group 'c' ripe ova with bunches of groups 'b' and 'a' ova attached to them.

TABLE 1. Modal sizes (mm) of ova of groups 'a', 'b' and 'c' at different stages of maturity for various species of tachysurids.

Stage of maturity	I			II			III			IV			V			VI			VII							
	'a'	'b'	'c'	'a'	'b'	'c'	'a'	'b'	'c'	'a'	'b'	'c'	'a'	'b'	'c'	'a'	'b'	'c'	'a'	'b'	'c'					
<i>T. platystomus</i>	0.09	—	0.07	0.16	—	0.10	0.22	0.36	0.59	0.59	1.11	2.5	0.85	1.63	2.5	0.85	2.5	2.5	0.16	—	2.5					
									1.37			6.5			8.5			11.5								
<i>T. thalassinus</i>	0.03	—	0.22	0.09	—	0.46	0.15	0.32	0.46	0.22	0.84	1.7	0.35	1.22	1.7	0.45	2.5	2.2	0.22	—	1.5					
									1.37			7.2			11.0			3.7			2.8					
<i>T. caelatus</i>	0.02	—	0.17	0.07	—	0.38	0.10	0.26	0.42	0.20	0.46	2.2	0.32	1.10	2.5	0.39	2.5	4.0	0.15	—	4.0					
									1.22			5.7			9.5			11.0								
<i>T. serratus</i>	No data															1.20	3.0	1.0	—							
																		5.0								
																		16.0								
<i>T. sona</i>	No data															1.80	4.0	5.0	2.00	5.0	5.0	1.80	—	5.0		
															14.1			15.0								
<i>T. dussumieri</i>	0.08	—	0.22	0.13	—	0.50	0.27	0.92	0.72	0.47	1.17	2.7	0.97	2.90	4.5	1.20	3.7	4.5	0.9	—	4.5					
									1.67			4.5			11.7			13.5								
<i>O. militaris</i>	0.09	—	0.12	0.11	—	0.30	0.17	0.31	0.41	0.20	0.59	1.80	0.29	1.32	2.18	0.31	2.0	3.0	0.59	—	3.0					
									1.37			4.92			8.16			10.3								

in the ovary; probably the latter may get absorbed in due course. Ova similar in nature were noticed in the ovary of several species of mouthbrooding tachysurids such as, *T. thalassinus*, *T. serratus*, *T. caelatus*, *T. dussumieri*, *T. sona* and *Osteogeneiosus militaris*. The modal sizes of ova of groups 'a', 'b' and 'c' at different stages of maturity for the above mentioned species are given in Table 1.

All the three groups of ova are arranged in sequential order in the ovary, where the group 'a' ova occupies the ovigerous folds of the oviducal region; the group 'b' ova in the posterior region of the two lobes of the ovary in bunches; and the group 'c' ova in the anterior three-fourth of the ovary (Fig. 2). In a

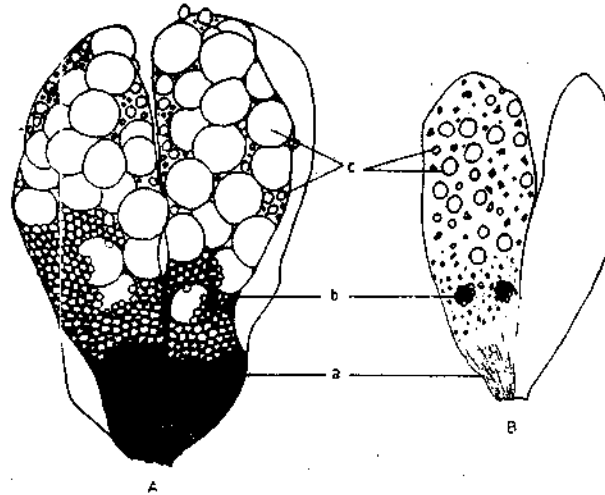


FIG. 2. Camera lucida sketch of a ripe (A) and spent (B) ovary of *T. thalassinus* showing the sequential arrangement of ova of groups 'c', 'b' and 'a'.

ripe ovary all the ova of the various groups are visible through the thin, transparent wall of the ovary; the group 'c' ova are yellowish green in colour and the groups 'b' and 'a' ova are translucent-white. This sequential arrangement of all the three groups of ova first becomes discernible at stage three of gonadal maturity. In all the mouthbrooding tachysurids studied the arrangement of the three groups of ova is similar.

The fate of ova of groups 'a' and 'b', after taken in the mouth of the male parent is not clearly known. Since these two groups of ova are small and non-yolked, they are perhaps reproductively nonfunctional and may form incidental food for the parent, while the larger yolked eggs remain in the oral cavity for development.

The number of ova among the three groups shows a certain ratio probably characteristic of each species. The number of group 'c' ova is much smaller than the group 'b' and 'a' ova (Table 2).

TABLE 2. Ratio of the intraovarian ova of groups 'a' : 'b' : 'c' in various species of tachysurids (Number in parenthesis)

Species	'a'	:	'b'	:	'c'
<i>T. thalassinus</i>	1 (27200)	:	0.04 (1105)	:	0.02 (550)
<i>T. caelatus</i>	1 (110000)	:	0.09 (953)	:	0.04 (424)
<i>T. platystomus</i>	1 (13600)	:	0.07 (956)	:	0.03 (410)
<i>T. sona</i>	1 (19650)	:	0.33 (5910)	:	0.12 (2088)
<i>T. serratus</i>	1 (19800)	:	0.35 (6500)	:	0.11 (2100)
<i>T. dussumieri</i>	1 (15000)	:	0.31 (4500)	:	0.12 (1800)

Diameter-frequency polygon of eggs from the mouth of gestating male parents of some species of tachysurids

A study on the diameter-frequency polygon of eggs collected from the mouth of gestating males of some species of tachysurids shows that all the three groups of eggs are met with in the mouth (Fig. 3), though in several instances only the ripe group 'c' are present, which are not found in bunches and have undergone development. In several other instances it is observed that all the three groups of eggs are in a bunch, fastened by mucus.

DISCUSSION

Gunter (1947) noticed large functional and smaller nonfunctional ova in the ovary of *Galeichthys felis*, a tachysurid catfish, and suggested that all the nonfunctional ova (around 3 mm in diameter) and the ripe yellow eggs (12 to 14 mm in diameter) might be spawned and taken in the mouth of male. Furthermore, he showed in his Fig. 1 three modes, which correspondingly represent the groups 'c', 'b' and 'a' ova referred to in this account.

Sekharan and Mojumder (1973) in a study on the diameter frequency of the eggs collected from the mouth of a male catfish, *T. caelatus*, found three different groups of eggs, with distinct modes at 11-13 mm, at less than 6 mm and at 0.04-0.16 mm respectively. They termed the latter two groups immature

and former ripe. The present study on the intraovarian ova as well as eggs collected from the mouth of gestating males of *T. caelatus* and from several other species clearly indicates that: (i) 'a' and 'b' ova also grow in size as maturity progresses and (ii) the difference between these two groups and the group 'c' ova are only in the relative size and the presence or absence of yolk. The absence of yolk in the ova of groups 'a' and 'b' clearly indicates that they are unable to undergo development and hence nonfunctional reproductively. Since the nonfunctional ova also undergo normal growth as maturity progresses and get spawned along with ripe 'c' ova, it may be incorrect to categorize them as immature ova. Hence, the eggs of the groups less than 6 mm and 0.04-0.16 mm sizes explained by Sekharan and Mojumder (1973) seem to be nonfunctional ova of groups 'b' and 'a' respectively.

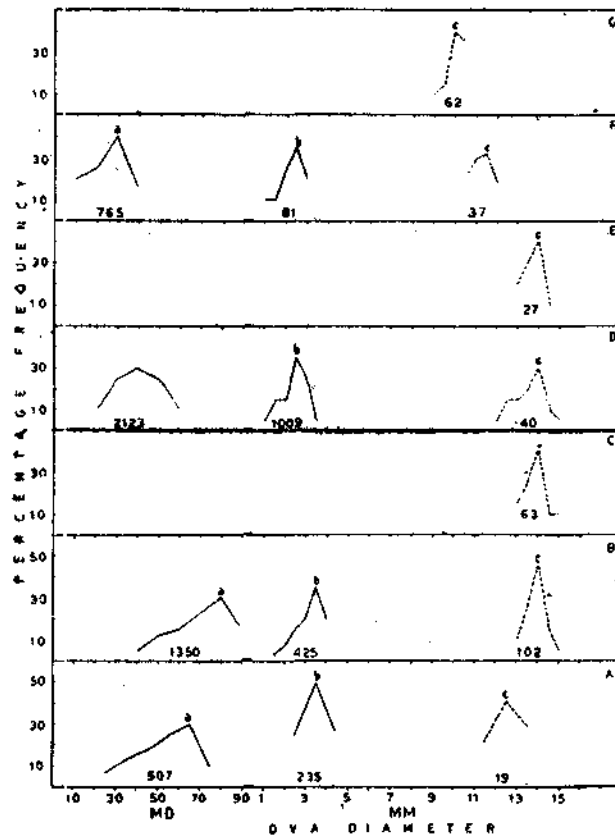


FIG. 3. Diameter frequency polygon of 'a', 'b' and 'c' eggs collected from the mouths of gestating males of (A) *T. platystomus* (318 mm), (B) *T. dussumieri* (725 mm), (C) *T. dussumieri* (673 mm), (D) *T. thalassinus* (420 mm), (E) *T. thalassinus* (375 mm), (F) *T. caelatus* (345 mm), (G) *O. militaris* (310 mm). The number of eggs in each group is given at the base.

Gunter's (1945) earlier observation led him to believe that the females of *G. felis* 'possibly spawned more than once a season'. However, his subsequent study (Gunter 1947) on the same species showed that, instead of developing further, those small ova became 'merely sacs of clear material' and got spawned along with the larger ova. The size-frequency distribution of both reproductively nonfunctional and functional ova, if represented in a frequency polygon, would result in a polymodal frequency distribution, similar to the one presented for *T. thalassinus* in fig. 1c of Sekharan and Mojumder (1973). Furthermore, Sekharan and Mojumder (1973) believed that 'all categories of ova both mature and immature may be released at the same time, although only ova of the largest size category may be fertilized'. But, a detailed study indicates that ripe functional group 'c' and nonfunctional 'a' and 'b' alone are spawned, while the maturing group 'c' ova remain in the ovary for the subsequent years' crop (Menon 1979). Therefore, the 'translucent immature ova' and the 'small immature ova' (apparently of groups 'b' and 'a' ova respectively referred to above) described by Sekharan and Mojumder (1973) seem to be reproductively non-functional, but not immature; and therefore they reflect neither the reproductive potential nor the frequency of spawning of the species of catfishes. Hence, the observation that polymodal frequency distribution of ova diameter in fishes may indicate fractional spawning (Clark 1934 and Hickling and Rutenburg 1936) may not hold good for the species of mouthbrooding tachysurid catfishes, if nonfunctional ova are considered, as they are also spawned in the same spawning act involving the spawning of group 'c' ripe ova.

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