

Scymnodalatias albicauda (Elasmobranchii, Squalidae) Is a Prolific Shark

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The genus *Scymnodalatias* Garrick, 1956, contains four nominal species mainly from the southern Hemisphere. *Scymnodalatias sherwoodi* (Archev, 1921), reported from New Zealand, is known only from the holotype. *S. albicauda* was described by Taniuchi and Garrick (1986), based on two specimens from the South Indian and South Pacific Oceans. Kukuyev and Konovalenko (1988) described *S. garricki* and *S. oligodon*, both on the basis of single small specimen from north of the Azores in the North Atlantic Ocean and off Chile in the south Pacific Ocean, respectively. Only a few additional specimens have been reported (Last and Stevens, 1994), and almost nothing is known about the biology of the genus.

Two female specimens of *S. albicauda*, from southern Atlantic Ocean, were recently caught by tuna longlines. One of the females had an unusually high number of embryos, by far the most numerous reported for any shark in the order Squaliformes. This paper describes some reproductive aspects, including prolific reproduction in *S. albicauda*.

Materials and Methods

HUMZ (fish catalogue of Laboratory of Marine Zoology, Faculty of Fisheries, Hokkaido University) 129360, female, 1110 mm in total length (TL), 43°54'S, 07°45'E, tuna longlines, *Taiwa Maru* no. 78, May 8, 1993; 59 embryos from HUMZ 129360, 157.0-192.0 mm TL. Embryos were removed from the mother after capture, and frozen separately. Mr. Horacio Romero (CSIRO, Australia), a temporary observer on *Taiwa Maru* no. 78, collected the specimens and prepared notes regarding the number of embryos, sexes, specimen sizes, and capture conditions.

Results

The present embryo-bearing specimen (Fig. 1) was dissected after preservation in formalin and the following reproductive features were observed. The ovary had disintegrated, but some 20 small ova, 6.5 mm or less in diameter, were found in the anterodorsal part of the abdominal cavity. The ostium abdominale was located at the anterior-most part of the abdominal cavity, below the liver, its largest diameter being 14 mm. The oviduct between the ostium abdominale and the shell gland was thin and narrow, being 7.0 mm in width. The shell gland was small and elongated, and only a little thicker than the oviduct, 12.5 mm and about 40 mm in width and length, respectively. The oviduct between the shell gland and uterus was thin and narrow, similar to that between the ostium abdominale and shell gland. The uterus was large and wide, 85 mm and 460 mm in width and length, respectively. Many uterine villi of about 50-70 mm in length were present.

The sizes and sexes of the embryos are shown in Table 1. Although the total number of embryos obtained was 59 (Fig. 2), the number contained in each uterus is unknown. Embryo sizes ranged from 157.0 to 192.0 mm TL, and the sex ratio being 1 (male): 0.79 (female).

Each embryo possessed a large, external yolk sac, connected by a thick vitelline duct to the midventral part between the pectoral fin origins (Fig. 3). The internal yolk sac (Fig. 3, dotted area of schematic drawing) was large, situated on the right ventral side of the digestive tract below the right liver, and occupied a little over half or two thirds of the abdominal cavity from its anterior end to, or exceeding, the 1st dorsal fin origin. Internal yolk sac was connected to the duodenum just before the spiral intestine, some amount of yolk being present in the spiral intestine. The liver was thin, but almost as long as the abdominal cavity. The cardiac and pyloric stomachs were thin and weak, lying between the left liver and internal yolk sac. Cardiac and pyloric stomachs were empty.

Average weights of the external and internal yolk sacs in 10 specimens (170-181 mm TL, 33.6-39.6 g with external yolk sac) were 10.1 g (26.7% of body weight including external yolk) and 6.5 g (17.2%), respectively. Lengths of internal yolk sacs were between 42.9 mm and 55.2 mm.

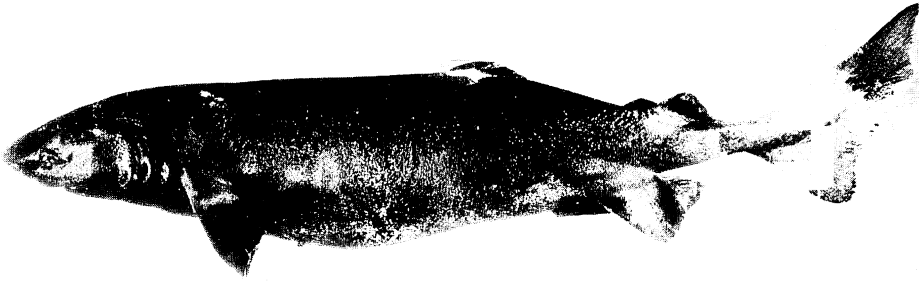


Fig. 1. Female specimen (HUMZ 129360, 1110mm TL) of *Scymnodalatias albicauda*, which contained 59 embryos.

Table 1. Length frequency of the embryos in *Scymnodalatias albicauda*

Total length (mm)	Male	Female
157	1	—
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170	—	1
171	1	—
172	—	1
173	—	—
174	1	1
175	1	1
176	—	—
177	1	4
178	—	—
179	2	2
180	4	—
181	3	4
182	5	5
183	4	1
184	2	—
185	1	3
186	2	1
187	1	1
188	—	—
189	3	1
190	—	—
191	—	—
192	1	—
Total	33	26

Discussion

The above facts indicate that the mode of reproduction in *Scymnodalatias albicauda* is ovoviparous, or aplacental viviparous, depending solely on yolk reserves, as in other squalid sharks. Among aplacental viviparous sharks, oophagous species tend to have smaller numbers of embryos, maximum litter sizes of two having been reported in *Alopias superciliosus*, *Eugomphodus taurus* and *Pseudotriakis microdon* (Pratt and Casey, 1990; Yano, 1992). However, a specimen of *Isurus oxyrinchus* had 16 embryos (Stevens, 1983), which is the largest litter size reported for oophagous species. Among other viviparous sharks, the number of embryos in a litter also varies, both according to species and size of the mother. The largest litter size for such sharks, also being the largest for any shark, is 135 embryos in *Prionace glauca*, followed by 108 embryos in *Hexanchus griseus*, 55 embryos in *Galeocerdo cuvier*, and 52 embryos in *Galeorhinus zyopterus* (Pratt and Casey, 1990). The largest litter size previously reported in a squalid shark was 36 for *Centroscymnus plunketi* (Compagno, 1984). Other species of this genus have also been reported as having larger litter sizes, i.e., 29 for *C. coelolepis* and 28 for *C. owstoni* (Yano and Tanaka, 1988). The highest recorded litter sizes for other squalid genera are 25 in *Squalus* (*S. acanthias*: Sato, 1935), 20 in *Etmopterus* (*E. spinax*), 16 in *Dalatias* (*D. licha*), 12 in *Deania* (*D. calcea*), 10 in

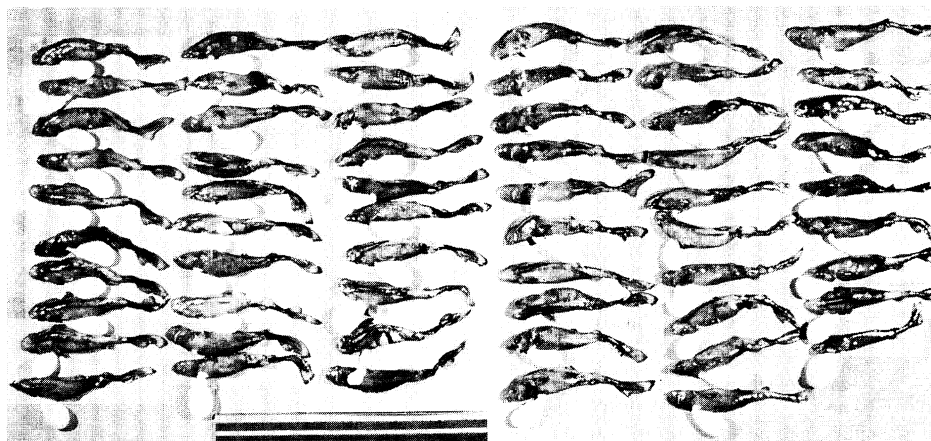


Fig. 2. Embryos removed from *Scymnodalatias albicauda* (HUMZ 129360). Ruler is 30 cm in length.

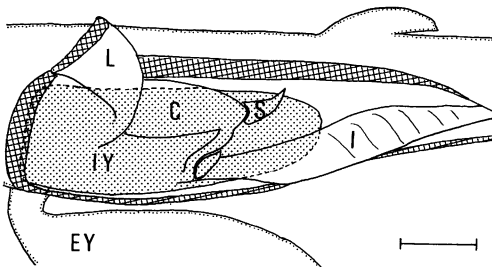
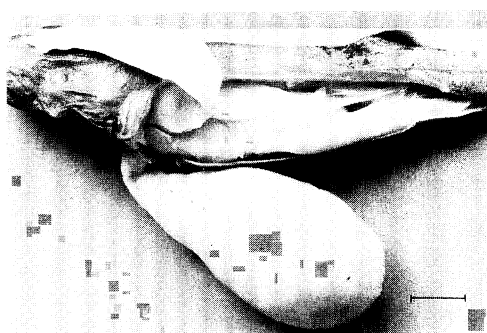


Fig. 3. Lateral view of abdominal viscera (above) in an embryo of *Scymnodalatias albicauda*, and its schematic drawing (below). Dotted area indicates internal yolk sac. C—cardiac stomach; EY—external yolk sac; I—intestine; IY—internal yolk sac; L—liver; S—spleen. Scales are 10 mm.

Somniosus (*S. microcephalus*) (Compagno, 1984) and 10 in *Centroscyllium* (*C. excelsum*: Shirai and Nakaya, 1990). Although the 59 embryos taken from *Scymnodalatias albicauda* far exceeded the next largest litter size reported from a squalid shark, the

total litter size of this species was evidently greater, because the mother apparently lost at least some pups, which were not collected during capture (H. Romero, field notes). Present record is also the third largest litter size among the sharks, following *Prionace glauca* and *Hexanchus griseus*.

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オジロザメ (ツノザメ目ツノザメ科) は多産

仲谷一宏・中野秀樹

南大西洋で漁獲されたツノザメ目ツノザメ科のオジロザメ *Scymnodalatis albicauda* の1尾の妊娠個体から発生中の59個体の胎子を見いだした。胎子の性別はオス33個体、メス26個体で、オス：メスの性比は1:0.79、大きさは全長157 mmから192 mmであった。本個体はマグロ延縄で漁獲されたが、捕獲時の記録によると、いくつかの胎子が総排出腔より海中に落ちたという。したがって、60個体以上の胎子をもっていたと推測される。サメ類の1腹の胎子数は種類や個体の大きさにより様々であるが、ツノザメ類で知られている1腹の胎子数は36個体までで、大部分は20個体以下である。本研究ではオジロザメから1腹59個体の胎子を見いだしたが、これは今までのツノザメ類の記録をはるかに上回る数で、ツノザメ類では最多、サメ類全体からみてもヨシキリザメ(135個体)、カグラザメ(108個体)に次ぐ3番目の胎子数である。

なお、各胎子は大きな外卵黄嚢をもち、腹腔内の3分の2の長さにおよぶ内卵黄嚢が形成されていた。内卵黄嚢は腸の始部(十二指腸部)に直接開口し、腸内にも卵黄物質が見られた。生殖方法は卵胎生(卵黄物質にのみ依存する非胎盤性の胎生)であると考えられる。

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