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Short Paper

Sexual Maturation in the Attached Juvenile Stage of the Ursine Ark shell, *Scapharca globosa ursus*, in the Innermost Area of Ariake Sound, Japan

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The ursine ark shell, *Scapharca globosa ursus*, is one of the commercially important shellfish in the Ariake Sound, western kyushu, Japan. A remarkable fall of its population needed effective measures for recovery as soon as possible on a biological basis. Nevertheless, the population ecology of the shell has remained mostly unresolved, especially on maturation and spawning behavior.

The shell spawns usually during the period from July to August every year in the region mentioned above. In its early life history, larval shells spend planktonic life for several weeks after hatching, and turn to benthic life divided into two phases. The first phase is adhesive life, when full grown larvae settle down by bysus on such substratum as their adults or the pen shell, *Atrina pectinata* (Fig. 1), probably for 13-14 months[1,2]. The second one is independent life after cutting off the bysus. Evidence has not necessarily provided well further details of later life history, especially on the age and size at first sexual maturity.

In the course of our local surveys on reproduction ecology of the shell, it was found to mature in both sexes at its juvenile stage one year after hatching. Samples settled down on the pen shell. We observed this reproductive fact by the naked eye as

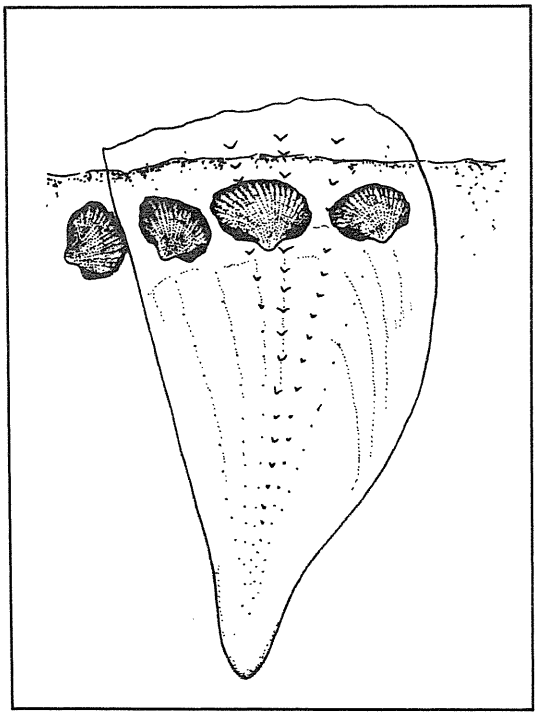

Fig. 1. Lateral view of living juveniles of the ursine ark shell attached to the pen shell on the sea bottom, usually on a level of 5 -6 cm below the exposed tip of the host shell.

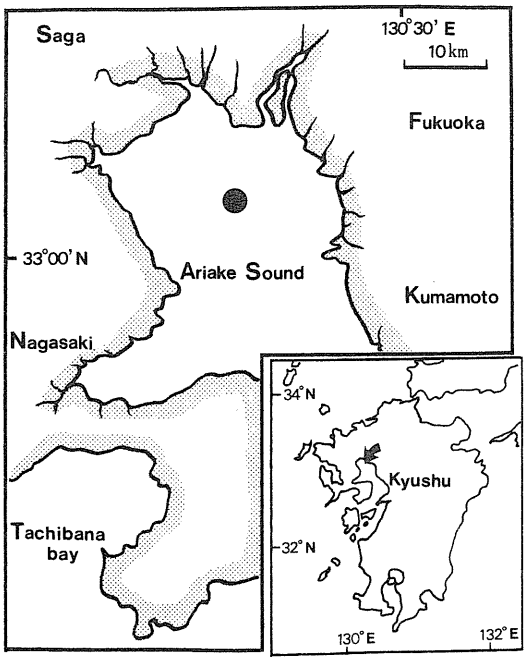

Fig. 2. Innermost area of Ariake Sound. Closed circle indicates the sampling area for the present study.

well as under histological procedures.

For our investigation, juveniles were sampled by diving fishery from a 12m depth of the surveyed area (Fig. 2) on July 15 (113 shells) and August 11 (77 shells), 1997. Of environmental factors, bottom mud quality is subject to the grain size composition based on the medium grain diameter and the mud content (soil particle of less than 63μm size) in weight composition. Material sampled on July 15, 1997, shows the diameter is 1.90 in medium diameter phi units and the mud content 17.2%. Water quality in temperature and salinity (Fig. 3) was observed at 11 stations in the area monthly during the period from June 1996 to September 1997. These measurements are given as the average of figures available from the stations mentioned above at high tide during the days of the spring tide at every new moon.

In laboratory just after sampling material, we measured samples in shell length and total weight, and dissected to pick up a patch of muscle layer including gonad. After macro- and microscopic determination of sexuality on the muscle layer, concerned sample layers were fixed in 10% buffered formalin solution, and observed on their structure by light optics through paraffin sections of 5-6μm thick, stained by hematoxylin-eosin.

As easily understandable from the shell length composition by sex (Fig. 4), the macro- and microscopic observation of the gonad forming tissue resulted a successful sex discrimination in all of our samples (190 shells). The gonad took on a bright orange color in ovary, and on a milk white one in testis. Genital tubules (Fig. 5) were microscopically recognized to contain matured oocytes and spermatozoids in respective sex. Through all of these samples, male were dominant, and the sex ratio is 1 : 62.3 in this case.

As far as our investigation goes, the age at first maturity is one year in both sexes; the biological minimum size in shell length is 24.7mm in female and 17.7mm in male. It is comparable with a related species, the red ark shell, *Scapharca broughtonii*. In the case of this shell, Numaguchi[3] estimated as the former factor is one year and the latter one around 44mm through sexes. Considering a similar level in the maximum size (120-130mm in shell length) between them, it is very probable the ursine ark shell matures earlier than the other shell.

The acquired data on the sex ratio, as referred above, correspond to adhesive stage of the shell. It

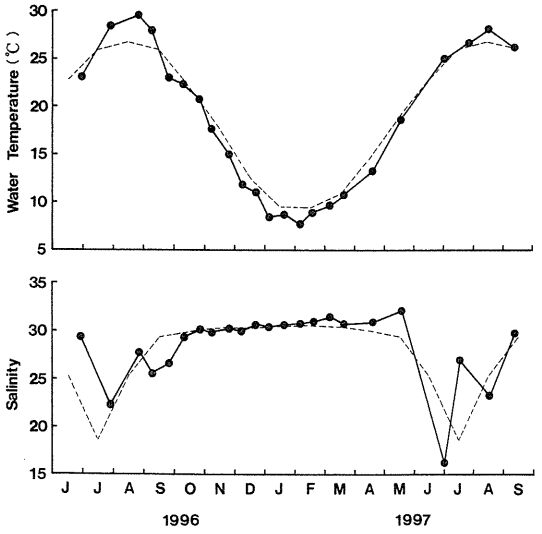

Fig. 3. Monthly fluctuation of surface temperature (top) and salinity (bottom) in the innermost area of Ariake Sound during the period from June 1996 to September 1997 (solid line). Broken line, equivalent values given during the term from April 1971 to March 1997. For further details, see text.

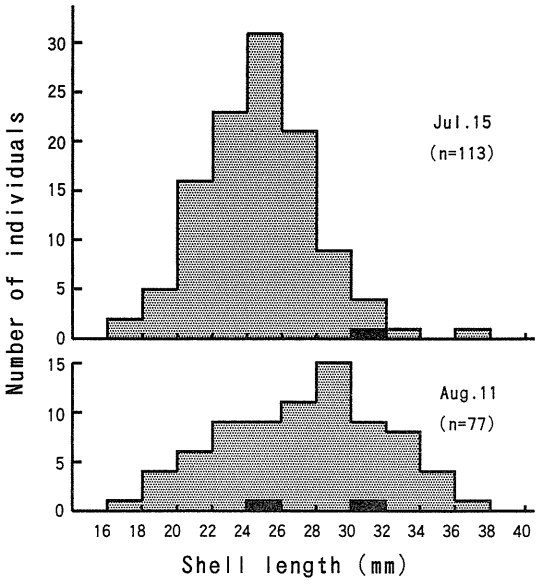

Fig. 4. Shell length composition by sex of sample juveniles attached to the pen shell. ■, Female ; ▨, Male.

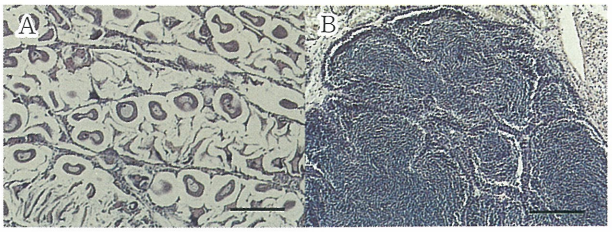

Fig. 5. Histological structure of the gonad (A, B) of the ursine ark shell in attached juvenile stage. A, female of 24.7mm in shell length; B, male of 17.7mm in shell length. Scale bar indicates 100 μm.

means the given figures are not necessarily cover the total phase of the factor in the concerned population including independently living shells. This question will be resolved by succeeding studies on the 1996 year class stock. Besides equivalent surveys of the same year class should be required in other areas. In this connection, comparison among several year classes must be another inevitable topic. These studies may give the reason why a strong bias of sex ratio occurred in our samples. All of such problems remain for further scrutinies.

References

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3) K. Numaguchi 1996: Gonad development of the ark shell *Scapharca broughtonii* brood stock in farming grounds of Japan. *Nippon Suisan Gakkaishi*, 62 (3), 384-392 (In Japanese with English summary).