

## Frilled Shark Research Project

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**ABSTRACT:** Marine Science Museum of Tokai University and Aquamarine Fukushima jointly started-up a new Frilled Shark research project in April 2016. This was a follow-up of a study conducted back in 1980s, through which we gained preliminary experience with the shark. In the current project, we gained further experience of culturing both embryos in egg shell and fetuses without egg shell. The previous record of culturing embryos was up to 134 days, but we managed to extend the record to 154 – 361 days in the culture experiments in 2016. In spring 2017, we obtained fetuses with external yolk sacs without egg shell. We conducted culture experiments on these fetuses (144 – 420 mmTL) and managed to culture a fetus as long as 116 days.

### INTRODUCTION

In the 1980s, Marine Science Museum of Tokai University (MSM) conducted tentative research on the Frilled Shark, *Chlamydoselachus anguineus* (Fig. 1), in Suruga Bay, thereby obtained preliminary knowledge on the captive breeding of the species. The study was suspended until the authors jointly started-up a new Filled Shark Research Project in April 2016. This project was motivated by the launch of the long-term exhibition of Frilled Shark in captive breeding by the two aquariums. In our previous study, a mature adult only survived about 1 week. However, we managed to rear shark embryos in egg capsules retrieved by laparotomy for a certain period of time. As a follow-up project, our objective this time was to demonstrate successful culturing of the shark embryos and fetuses for a more extended period.



Fig. 1. Frilled Shark, *Chlamydoselachus anguineus*.

All Frilled Sharks were captured as bycatch by the local shrimping and gill nets. They were collected most frequently in April and May during the height of the spring shrimping season.

### Culturing embryos in egg shell

A mature female shark was collected and brought in to MSM on 17th May 2016. The condition of the shark deteriorated after a few days, therefore, 4 fertilized eggs had been retrieved by laparotomy. Among them, small embryos were observed on the surface of yolk sac of 3 eggs (Fig. 2). Therefore, we conducted risk diversification and temperature matching experiments for culturing embryos in egg shell. The previous record of embryos survival in the 1980s was up to 134 days (Shiobara et al. 1997), but we managed to extend the record to 154 – 361 days.



Fig. 2. Fertilized egg of Filled Shark with embryo.

### ACTIVITIES OF THE PROJECT

#### Collection of Frilled Sharks

Since we started-up the project, we have been actively collecting specimens in collaboration with the local fishery. As a result, we were able to collect in total 20 adult Frilled Sharks (8 Male, 12 Female).

#### Culturing fetuses without egg shell

In spring 2017, we obtained fetuses with external yolk sacs of different sizes without egg shell for the first time in our project (Fig.3). Since there had been no previous report on the successful culturing of the shark fetuses with external yolk sac, we decided to make further culturing experiments on these fetuses ranging in size from 144 – 420 mm

in length. There were variations in the survival rates, but we managed to culture a fetus as long as 116 days.



Fig. 3. Fetuses of Filled Shark without egg shell. Fetuses with large external yolk sac (A). Fetuses with small external yolk sac (B).

#### Exhibition of fetuses

We made an exhibition open to public in MSM and Aquamarine Fukushima on 9th June 2017. This became the world's first captive exhibition of the

frilled shark fetuses without egg shell. We exhibited the fetus for about 2 months (Fig.4).



Fig. 4. The Filled Shark fetus in an exhibition tank.

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