

## 'Megamama' is a virgin: dissection of the first female specimen of *Megachasma pelagios*\*

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On 29 November 1994 at 9:30 h a 21 year old student, Kazuhisa Ohue, birdwatching on the NE coast of Hakata Bay, Fukuoka, on the N coast of Kyushu, Japan found a strange, large (4.8 m TL, 800 kg), freshly-dead shark at the water's edge. He phoned the nearby public aquarium Marine World Umino-Nakamichi, and the staff members quickly identified it as the rare megamouth shark, *Megachasma pelagios*. It is the first female of this species examined by scientists and the 7th megamouth seen. By noon the find was announced on CNN worldwide satellite television and the next day the photograph of the shark was in every major newspaper in Japan.

Umino-Nakamichi, expanding its already famous aquarium and planning a grand opening of new facilities on 16 April 1995, seized the opportunity to rescue the fresh carcass of this impressive and unique shark to prepare it for display in the main lobby at the opening. (The first 2 megamouth specimens found in Japan were not saved.) Thanks to foresight and careful planning of the Director of the Aquarium, Seiichiro Wakisaka, Curator Kouji Tadaka, and their staff the carcass was quick-frozen and a 'megamouth office' was set up at the Aquarium. Japanese shark scientists and a few foreign scientists were invited to study the specimen before it was prepared for permanent display. Kazuhiro Nakaya of Hokkaido University, a leading shark biol-

ogist, was placed in charge of the dissection of megamouth # 7. He supervised the careful cutting of the specimen so the aquarium's veterinarian, Satoki Kudo, could sew it back together again for a life-like display in a giant acrylic tank especially fitted for it (at a cost of 7 000 000 Yen or over \$ 70 000 USD).

We consider ourselves most fortunate to be invited to join Kazuhiro Nakaya and Kazunari Yano of the Seikai National Fisheries Research Institute as the team to dissect the unique reproductive system of this megamouth.

The dissection took place on 9 February 1995 in a large warehouse in the National Marine Park, where megamouth had been thawing slowly, like a Thanksgiving turkey, in a huge acrylic tank of water kept at 2° C for several days. A large roll up doorway was sufficient to allow a crane to lift the 800 kg carcass in a sling out of the defrosting tank, through the doorway, and onto the floor of the warehouse where it lay on its right side.

After a reception and meeting the dissection began, on schedule at 9:30 h. Over 100 people were in attendance: 40 scientists and their assistants, reporters, photographers and TV cinematographers. A late break for lunch and a press conference took place at 15:00 h then the dissection continued until the end of the day and into the night. Nakaya arranged the dissection in 5 stages. External measurement and examinations were made and the mouth

\* Invited editorial

and gills probed and sampled. By examining the cloacal region we realized this female was a virgin and we gave up hope of seeing embryos or stored sperm. The pericardial and perivisceral cavities were opened by Nakaya making a midventral cut from the throat to near the cloaca. We had bid to make a lateral incision to lay back a flap of skin, a more convenient way to open a large shark on its side but for cosmetic reasons this was ruled out. The heart, digestive system and most of the visceral organs were removed in layers by other teams. We removed 2 large ovaries with many tiny oocytes (under 3 mm diameter), narrow oviducts with no definitive shell gland and small flat uteri that were completely separated. Twin vaginas each had a separate large opening covered with a hymen. The hymen on the right side was slightly split (perhaps by our external probing under the heavy prolapsed rectum) but intact on the left side. This reproductive tract had primitive features one would expect in a hexanchiform rather than a lamniform female shark. The kidney was the last organ to be removed by Dr. T. Tsuji. Samples of vertebrae were removed but the brain case was not opened.

All the organs removed were then examined more closely and dissected in more detail. Samples of the organs and parasites were preserved in at

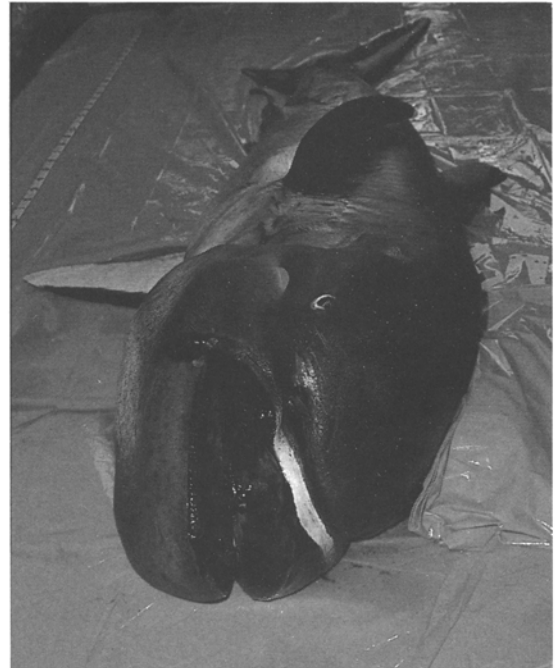


Fig. 1. The 'megamama' before dissection at the warehouse of the National Marine Park, Fukuoka, Japan (photograph by J. Castro).

least 4 ways: in formalin, alcohol, Bouin's solution and frozen. The histological work is now in progress. The participants have agreed to submit their

Table 1. Summary of the 7 known specimens of megamouth.

#	Date found	Place	Depth m	How found	Sex	Size TL	Present condition of shark	References
1	15 Nov 1976	Oahu, Hawaii 21°51'N, 157°46'W	165	dead on drift anchor	♂	4.46	preserved at Bishop Museum	Taylor et al. (1983)
2	29 Nov 1984	Santa Catalina Is. 33°25'N, 118°25'W	< 38	dead in gill net	♂	4.5	preserved at Los Angeles County Museum	Lavenberg & Seigel (1985)
3	18 Aug 1988	near Perth, W. Australia 32°31'S, 115°43'E	-	dead on beach	♂	5.15	preserved at Western Australian Museum	Berra & Hutchins (1990, 1991)
4	23 Jan 1989	Hammamatsu, Japan 34°40'N, 137°40'E	-	dead on beach	♂	~ 4	washed out to sea, photos only	Nakaya (1989)
5	12 June 1989	Suruga Bay, Yaizu, Japan 34°50'N, 138°20'E	< 40	alive in set net	?	~ 4.9	released by fishermen, photos only	Miya et al. (1992)
6	21 Oct 1990	Dana Point California 33°28'N, 117°42'W	40-145	alive in gill net	♂	~ 4	sonic tagged and released 24 Oct 90	Anon. (1991a, 1991b)
7	29 Nov 1994	Hakata Bay, Fukuoka, Japan	-	dead on beach	♀	4.8	preserved at Marine World Umi-no-Nakamichi	

scientific results to be published in a volume by Marine World Umino-Nakamichi, hopefully by the end of 1995 or early 1996.

When the gross dissection was finished, veterinarian Kudo's team hosed out the body cavity, stuffed it with 5 big gray blankets and stitched up all the incisions which took until almost daybreak. The shark was then taken to Marine World Umino-Nakamichi where its huge tank had been filled with water. The shark was positioned in the tank (with its pectoral fins spread) by scuba divers and then formalin was injected into the flabby muscles.

The next day Director Wakisaka had megamouth prepared, from a small piece of dorsal muscle, as a final treat for José and Genie: fried, poached with French sauce, and tempura style. Tempura was best.

### History of first 6 megamouths

The first megamouth, a male 4.46 m, was caught in a drift anchor at 165 m depth 15 November 1876 off Oahu. It was preserved whole at the Bishop Museum in Honolulu. Taylor et al. (1983) described the holotype and erected a new genus and family for it in the order Lamniformes. A strange new monster shark from the deep sea that feeds on plankton created a sensation. Over 370 species of sharks are known to be living today but only 3 of these are plankton feeders: the whale shark, the basking shark and megamouth. Each has a different type of feeding behavior and megamouth, probably the slowest swimmer of the 3, may make use of a reflective, luminescent mouth as a 'light trap' to attract and concentrate its prey (Compagno 1990, Diamond 1985). Compagno (1990) speculated that megamouth might then suddenly protrude its jaws, drop its tongue and pharynx and 'like a gigantic billows or underwater slurp gun' suck the prey inside.

The other megamouths have been caught in gill nets set at night or found dead on beaches (Table 1). Two previous sightings of megamouth in Japan (both in 1989 a few kilometers from each other) were lost. The first was found and photographed but washed away by waves before it could be saved (Nakaya 1989). The other was caught alive in a gill net, photographed by students, and released by

fishermen who believed it was an unusual basking shark (Miya et al. 1992). The sixth megamouth caught was tagged with a sonic transmitter by Don Nelson and Bob Lavenberg (personal communication) who discovered in 2 days of tracking, that it exhibited diel vertical migration, rising to 15 m depth at sunset and descending to 125–165 m at sunrise, probably following plankton in the deep scattering layer. The Hakata Bay 1994 megamouth may have entered the Bay at night. Hakata Bay is only 5 m deep in its deepest areas and the female probably was stranded in the bay and could not get out to deep water. A very large shark was actually reported swimming in Hakata Bay, 2 days before the female megamouth was found dead. Half the megamouths have been found stranded on beaches and half caught in gill nets or a pelagic anchor. Gill nets have been in use since the past century and people have been walking beaches long before that. Why megamouths have not been reported before the last 2 decades, even though gill nets have been deported long before, is a mystery.

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Fig. 2. Megamouth female, stuffed with blankets and ready to be sewn up for display at the Fukuoka's public aquarium, Marine World Umino-Nakamichi, after the dissection on 9 February 1995 (photograph by Yuki Ishizuka).