

## A JUVENILE MEGAMOUTH SHARK *MEGACHASMA PELAGIOS* (LAMNIFORMES: MEGACHASMIDAE) FROM NORTHERN SUMATRA, INDONESIA

**William T. White**

Centre for Fish and Fisheries Research, Murdoch University, Murdoch 6150, Perth, Australia  
Email: wwwhite@murdoch.edu.au

**Fahmi, Muhammad Adrim and Kurnaen Sumadhiharga**

Research Centre for Oceanography, LIPI, Jl. Pasir Putih I, Ancol Timur, P.O. Box 4801/JKTF, Jakarta 11048, Indonesia

**ABSTRACT.** – A juvenile male megamouth shark (*Megachasma pelagios*) was found stranded on Gapang Beach, Sabang in northern Sumatra. This is the smallest megamouth specimen (1767 mm TL) reported and represents the 21<sup>st</sup> specimen of this extremely rare shark reported since its discovery in 1976 off Hawaii. The specimen was still relatively fresh when discovered and was frozen on the same day. This specimen will be stored at the Museum Zoologicum Bogoriense (MZB) in Bogor, Indonesia. Differences in the morphology of the dorsal and anal fins of this specimen compared to other previously examined specimens are discussed.

**KEY WORDS.** – juvenile male, megamouth shark, stranded, Sabang.

---

### INTRODUCTION

The first specimen of megamouth shark (*Megachasma pelagios*) was captured in 1976 approximately 42 km northeast of Kahuku Point, Oahu, Hawaii (Taylor et al., 1983). Since then, only 19 additional records have been reported, mainly from Japan and California, with seven of these specimens becoming part of museum or aquaria collections around the world. All examined specimens have been subadults or adults with the exception of a single juvenile specimen, the 1900 mm male caught off southern Brazil in 1995 (Amorim et al., 1995, 2000).

A juvenile male *Megachasma pelagios* was discovered stranded on Gapang Beach on Sabang off the northern tip of Sumatra in Indonesia (05° 51'N 103° 13.6' E, 9516'N 111.8' E) on 13 March 2004. Gapang Beach is roughly 1 km from the most westerly border of the Indonesian Region (Ujong Laut) and is also located adjacent to the Weh Island conservation zone (Weh Sabang Marine Park). This area is renowned for its diverse coral reef faunas and clear water and Sabang Bay is commonly frequented by schools of whale sharks and manta rays on an annual basis.

The specimen was 1767mm in total length and weighed 13.82 kg. It was recognised as unusual by Ton Egbers of the Lumba Lumba Dive Centre and was subsequently stored frozen until more information on what to do with this specimen was obtained. The specimen was eventually donated by Ton Egbers to the Indonesian Institute of Sciences (LIPI) in Jakarta

and is planned to be deposited into the fish collection at the Museum Zoologicum Bogoriense (MZB) in Cibinong, Bogor. This specimen represents the 21<sup>st</sup> record of this rare species and is the smallest megamouth reported to date and only the eighth to enter a museum collection. It is the second record of a megamouth shark from Indonesia with the first record being a sighting in 1998 when a large megamouth was observed being attacked or played with by three sperm whales off Nain Island, Bunaken Archipelago in North Sulawesi (Compagno, 2001).

The juvenile megamouth shark was thawed for examination on 21 April 2004 and was found to be in excellent condition. The specimen was subsequently measured, weighed and photographed and several genetic and tooth samples were taken. An internal examination of the specimen was not conducted.

### MATERIALS AND METHODS

The specimen was preserved in a large 2 m long purpose-built glass aquarium prior to examination and is temporarily stored at the Research Centre for Oceanography (RCO) LIPI laboratories in Ancol, Jakarta before being moved to the Museum Zoologicum Bogoriense (MZB) in Cibinong, Bogor. The morphometric measurements used follow the FAO system of Compagno (1984) and were taken before the specimen was preserved. A measuring tape was used for most large measurements and calipers were used to take all of the

smaller measurements. TL refers to total length. Tissue samples were taken on the ventral surface just posterior to the pelvic fins via a small incision through the skin. Photographs were taken on a Nikon Coolpix 5400 digital camera.

## RESULTS

Measurements of the Indonesian specimen and comparative measurements from four other specimens are given in Table 1. The specimen is an immature male 1767 mm in total length and weighing 13.82 kg (Figs. 1a-e). No external parasites were observed on the specimen. The body is very soft and flaccid and appears almost sunken in around the first dorsal region of the trunk. No fresh umbilical scar was evident. Several small grazes and abrasions on the specimen were presumably caused as the specimen was washed ashore over the rocky and reef areas adjacent to the beach. Body is tadpole-shaped and very slender behind head. The claspers are very small and slender, their inner margin length only 3.1% of TL, and non-calcified. The external morphology of this specimen is similar to other specimens described by Taylor et al. (1983), Nakaya et al. (1997) and Yano et al. (1999). One notable difference was the size and shape of the anal fin compared to the other described specimens (see Table 1, Fig. 1e). The anal fin from this specimen is substantially smaller with a short, rounded posterior margin compared to those described for the holotype and the Brazilian and Japanese specimens (Taylor et al., 1983; Nakaya et al., 1997; Yano et al., 1999; Amorim et al., 2000). Although the anal fin described for the specimen collected off Western Australia was also smaller than the other known specimens (Berra & Hutchins, 1990), it was similar in shape to these (Fig. 2). The dorsal fins are considerably more raked back in the Indonesian specimen than the other specimens with the apex posterior to level of insertion (see Fig. 1a), rather than well anterior to level of insertions in the other specimens (see Nakaya et al., 1997; Amorim et al., 2000). This is reflected in the length of the posterior margins of the two dorsal fins being substantially smaller in the Indonesian specimen than in the other specimens measured to date, i.e. 3.8% vs 5.7-6.6% for the first dorsal fin and 2.1% vs 3.0-3.7% for the second dorsal fin (Table 1).

The mouth is very large and terminal and the snout is very short and broadly rounded in dorsal view. Teeth are small (largest about 2 mm in height) and numerous. The teeth are similar in shape to those described from the 7<sup>th</sup> megamouth specimen (Yabumoto et al., 1997). There are approximately 79 rows in the upper jaw, i.e. 39 rows in the left upper jaw and 40 rows in the right upper jaw, and 104 rows in the lower jaw, i.e. 51 rows in the left lower jaw and 53 rows in the right lower jaw. There are between four and five functional series of teeth on each jaw. The cusps of the lower teeth are longer and more upright than those of the upper teeth, which is reflected in the height of the cusps, i.e. 2.12 vs 1.83mm, respectively. Both jaws have a toothless space at the symphysis but it is nearly four times larger in the upper jaw than in the lower one.

Dorsal surfaces of body, pectoral and pelvic, dorsal and caudal fins and outer margins of anal fin dark chocolate-brown. Lateral surface of body becomes gradually paler brown ventrally and then abruptly whitish below level of pectoral and pelvic fins. Ventral surface below lower jaw is dusky to grayish with a faint bluish metallic hue and numerous dark spots (Fig. 1c). Pectoral, pelvic and caudal fins have a conspicuous white tip. Ventral surface of pectoral fins mostly white with a thick dark chocolate-brown band on the anterior margin and a thin pale brown band on the posterior margin. Ventral surface of pelvic fins dark brown with strongly demarcated white tips. Claspers are brown with the distal portion white. Dorsal and anal fins and upper lobe of caudal fin lack white markings. The inside of the mouth and oral membrane is silvery, as originally described by Taylor et al. (1983). The tongue is very large and brownish with a silvery tint. A vivid narrow transverse white band is present above the upper jaw and between the left and right nostrils (Fig. 1d), which is a species-specific character of the megamouth shark and its possible functions have been investigated by Nakaya (2001).

## DISCUSSION

This specimen from northern Sumatra is the smallest megamouth shark to be examined. It is the second juvenile male to be examined (see Amorim et al., 2000) and is slightly smaller than the ~180 cm juvenile male that was anecdotally caught off Dakar in Senegal in 1995 (Seret, 1995), but with no definitive identifying data. Although it is the second record from Indonesia, this is the first specimen to be examined and preserved in this country.

*Megachasma pelagios* is one of the rarest shark species in the world with only 22 specimens recorded as of May 2004 since it was first discovered in 1976. This specimen represents the 21<sup>st</sup> specimen reported and since its discovery on 13 March 2004, another specimen, a 5.63 m adult female, was found washed ashore in Tokyo Bay, Ichihara City in Japan on 19 April 2004. The cause of the death of this specimen can only be speculated. It may have been caught in fishing gear and then washed ashore but there were no markings on the specimen to confirm this. Alternatively it may have died of natural causes. The juvenile male Brazilian specimen was captured on a longline which was unusual considering the filter feeding habit of this species.

Several of the values of the measurements made on this specimen differed from those for other specimens (see Table 1). Although the flesh of megamouth sharks can be easily deformed resulting in the measurements varying between specimens, measurements such as dimensions of fins are more fixed and should not vary in the same manner. The difference in size and shape of the anal fin cannot be attributed to allometric growth, i.e. juvenile vs adult, or sexual dimorphism since the Brazilian specimen, which has a more falcate and much larger anal fin (Amorim et al., 2000), was also a juvenile male and was of similar size to the Indonesian specimen. There is a chance that the anal fin on the Indonesian specimen

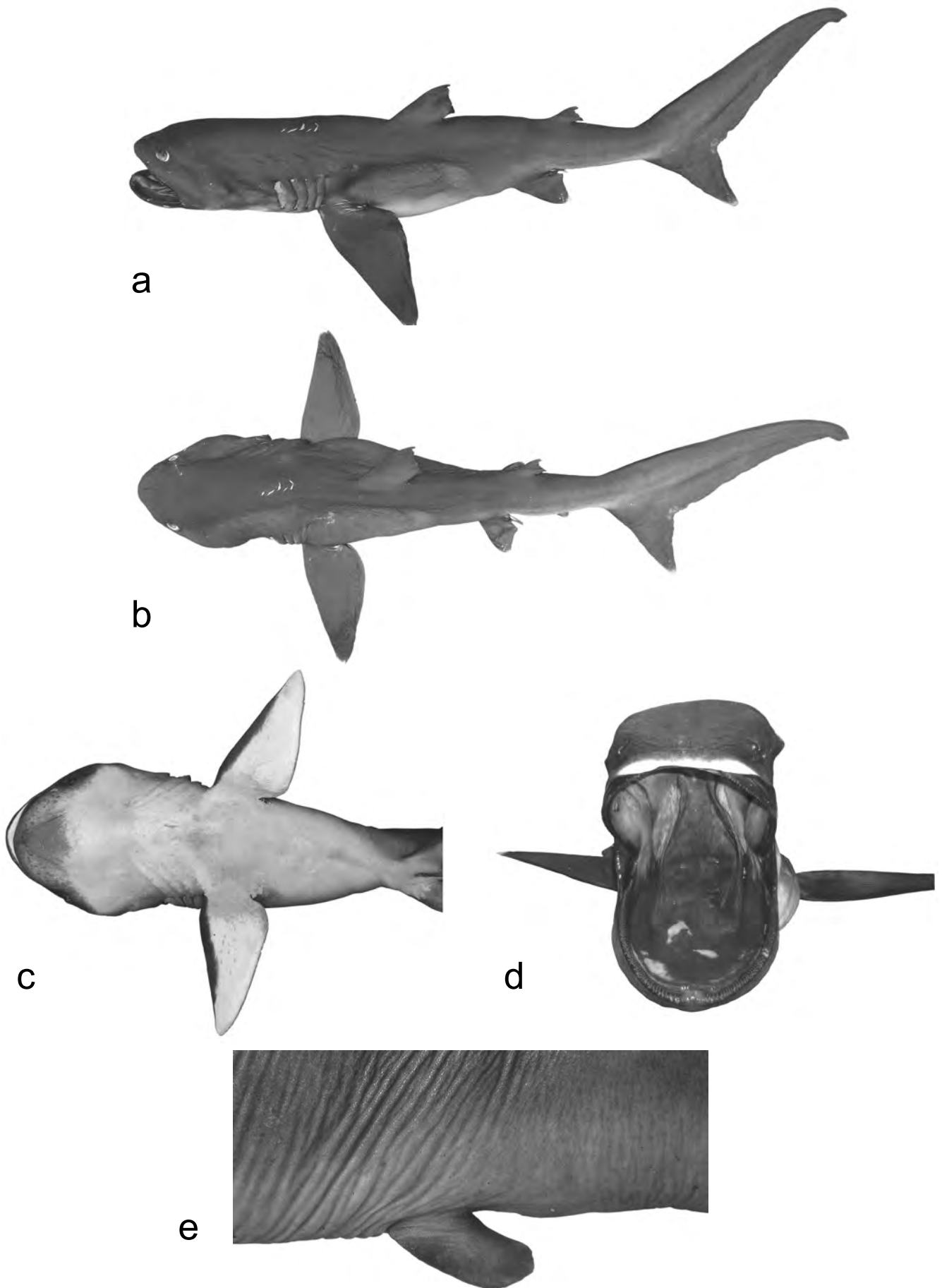


Fig. 1. The juvenile male *Megachasma pelagios* (1767mm TL) from northern Sumatra in Indonesia (MZB12906): a) lateral view, b) dorsal view, c) anterior ventral surface view, d) detail of mouth cavity, showing the numerous rows of small teeth, toothless symphyseal spaces on jaws and tongue on floor of mouth, e) detail of anal fin.

was deformed from birth, but it is not a result of damage as it was intact with no sign of recent damage or scarring when it was examined. The large difference in shape of the dorsal fins in this specimen compared to the other specimens would not be a result of a deformity. These differences between the Indonesian specimen and the other measured specimens (Taylor et al., 1983; Berra & Hutchins, 1990; Nakaya et al., 1997; Yano et al., 1999) should be further examined to ascertain whether there is in fact a second species belonging to the family Megachasmidae.

#### ACKNOWLEDGEMENTS

The authors would like to express our sincere thanks to Ton Egbers and Marjan van der Burg of the Lumba Lumba Dive Centre in Sabang for maintaining the specimen and for donating it to LIPI in Jakarta. We also sincerely thank Murdoch University for providing funding to cover the costs of maintaining the specimen and for its freight to Jakarta. We also thank the captains and crew of the LIPI research vessels BARUNA JAYA VII and VIII, Dharmadi from the Research Centre for Capture Fisheries (RCCF), Arie Muardy from Veterinary Unsyiah Aceh and Dr Rachel Cavanagh from the IUCN for their valuable cooperation and assistance during handling and dissection of the specimen.

#### LITERATURE CITED

- Amorim, A. F., L. Fagundes, C. A. Arfelli & F. E. S. Costa, 1995. Occurrence of megamouth shark, *Megachasma pelagios* Taylor, Compagno & Struhsaker, 1983, in the Atlantic. *VII Requiniao do Grupo de trabalho Sobre Pesca E Pesquina De Tubaroes e raias no Brasil* (Rio Grande do Sul, 20-24 November 1995).
- Amorim, A. F., C. A. Arfelli & J. I. Castro, 2000. Description of a juvenile megamouth shark, *Megachasma pelagios*, caught off Brazil. *Environmental Biology of Fishes*, **59**: 117-123.
- Berra, T. M. & J. B. Hutchins, 1990. A specimen of megamouth shark, *Megachasma pelagios* (Megachasmidae) from Western Australia. *Records of the Western Australian Museum*, **14**(4): 651-656.
- Compagno, L. J. V., 2001. Sharks of the world. An annotated and illustrated catalogue of shark species known to date. Volume 2. Bullhead, mackerel and carpet sharks (Heterodontiformes, Lamniformes and Orectolobiformes). *FAO Species Catalogue for Fishery Purposes*. No. 1, Vol.2., Rome. 269 pp.
- Nakaya, K., 2001. White band on upper jaw of megamouth shark, *Megachasma pelagios*, and its presumed function (Lamniformes: Megachasmidae). *Bulletin of the Faculty of Fisheries Hokkaido University*, **52**(3), 125-129.
- Nakaya, K., K. Yano, K. Takada & H. Hiruda, 1997. Morphology of the first female megamouth shark, *Megachasma pelagios* (Elasmobranchii: Megachasmidae), landed at Fukuoka, Japan. In: Yano, K., J. F. Morrissey, Y. Yabumoto & K. Nakaya (eds.), *Biology of the Megamouth Shark*. Tokai University Press, Tokyo, Japan. pp.51-62.
- Sžret, B., 1995. Premiřre capture dÕun requin grande guile (Chondrichthyes, Megachasmidae) dans lÕAtlantique, au large du Sžnřgal. *Cybiium*, **19**(4): 425-427.
- Taylor, L. R., L. J. V. Compagno & P. J. Struhsaker, 1983. Megamouth Ā a new species, genus, and family of lamnoid shark (*Megachasma pelagios*, family Megachasmidae) from the Hawaiian Islands. *Proceedings of the Californian Academy of Sciences*, **43**(8): 87-110.
- Yabumoto, Y., M. Goto, K. Yano & T. Uyeno, 1997. Dentition of a female megamouth, *Megachasma pelagios*, collected from Hakata Bay, Japan. In: Yano, K., J. F. Morrissey, Y. Yabumoto & K. Nakaya (eds.), *Biology of the Megamouth Shark*. Tokai University Press, Tokyo, Japan. pp.63-74.
- Yano, K., Y. Yabumoto, S. Tanaka, O. Tsukada & M. Furuta, 1999. Capture of a mature female megamouth shark, *Megachasma pelagios*, from Mie, Japan. In: Sžret, B. & J.-Y Sire (eds.), *Proceedings of the 5<sup>th</sup> Indo-Pacific Conference, NoumĀa, 1997*. Societe Fran•aise dÕIchtyologie, Paris, France. pp. 335-349.

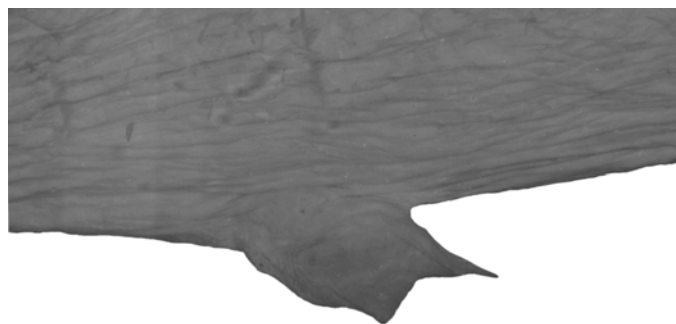


Fig. 2. The anal fin of the preserved adult male *Megachasma pelagios* (5150mm TL) from the Western Australian Museum in Perth (WAM P 29940-001).

Table 1. Morphometric measurements of the Indonesian *Megachasma pelagios* compared to previous specimens: no. 9 from Brazil (Amorim et al., 2000); the holotype (Taylor et al., 1983); no. 3 from Perth (Berra & Hutchins, 1990); and no. 7 from Fukuoka (Nakaya et al., 1997).

Location		Sumatra	Brazil	Holotype	Perth	Fukuoka
Total length		1767 mm	1900 mm	4460 mm	5150 mm	4710 mm
Sex		Male	Male	Male	Male	Female
Code		MZB12906				
	mm	% TL	% TL	% TL	% TL	% TL
Precaudal length	1144	64.7	64.7	69.3	66.6	66.6
Prenarial length	32.1	1.8	1.7	2.2	2.0	NA
Preoral length	16.9	1.0	0.8	1.5	1.2	NA
Preorbital length (horiz)	92.2	5.2	4.7	5.4	6.8	5.4
Prespiracular length	181	10.2	10.5	10.1	18.2	7.9
Prebranchial length	329	18.6	17.9	19.1	21.2	20.8
Head length	430	24.3	24.3	26.5	25.6	27.2
Prepectoral length	425	24.1	23.8	24.9	27.0	27.0
Prepelvic length	837	47.4	45.9	50.9	48.7	51.4
Vent-caudal length	852	48.2	50.5	48.5	47.6	NA
Pre-first dorsal length	536	30.3	29.5	34.5	32.4	33.0
Pre-second dorsal length	893	50.5	51.6	56.7	52.8	53.6
Interdorsal space	241	13.6	12.5	14.0	12.4	11.7
Second dorsal-caudal space	146	8.3	8.9	8.9	8.4	8.1
Pectoral-pelvic origins	425	24.1	21.8	26.0	21.7	24.3
Pectoral-pelvic space	348	19.7	16.4	NA	NA	19.3
Pelvic-anal space	121	6.8	6.7	7.4	7.2	4.6
Pelvic-caudal space	225	12.7	14.4	NA	13.9	12.1
Anal-caudal space	98	5.5	5.3	5.2	4.2	4.5
Eye length	32.2	1.8	1.7	1.3	1.2	1.1
Eye height	23.8	1.3	1.3	1.2	0.8	1.0
Interorbital space	153.9	8.7	8.2	8.3	10.7	10.8
Spiracle diameter	6.1	0.3	0.4	NA	NA	0.4
Nostril width	11	0.6	0.5	0.7	0.6	0.7
Internarial space	113.9	6.4	6.3	7.6	7.7	8.7
Anterior nasal flap length	2.5	0.1	0.2	NA	0.1	NA
Mouth length	118.6	6.7	7.5	6.1	8.7	11.3
Mouth width	231	13.1	11.6	18.5	11.3	9.6
1st gill slit height	66.1	3.7	4.7	5.9	4.3	5.1
2nd gill slit height	69.7	3.9	4.1	5.8	4.4	5.1
3rd gill slit height	92.9	5.3	4.2	5.9	4.4	5.0
4th gill slit height	73.3	4.1	4.6	5.7	4.1	4.2
5th gill slit height	77.1	4.4	4.8	5.2	3.9	3.3
Caudal peduncle height	103.4	5.9	4.7	5.3	5.4	5.6
Pectoral anterior margin	337	19.1	19.9	18.8	19.2	19.6
Pectoral base	93	5.3	5.7	5.9	6.4	5.9
Pectoral height	315	17.8	17.6	NA	16.9	17.5
Pelvic anterior margin	136	7.7	7.2	5.9	6.4	6.8
Pelvic base	77	4.4	4.7	4.6	6.2	5.5
Pelvic height	107	6.1	5.6	5.7	3.6	4.9
Pelvic inner margin	45	2.5	1.1	0.8	0.7	2.2
Pelvic posterior margin length	66	3.7	4.0	4.1	3.8	5.1
First dorsal anterior margin	118	6.7	10.0	9.3	5.4	9.4
First dorsal base	113.8	6.4	8.9	9.1	9.7	8.7
First dorsal height	87	4.9	6.7	5.1	4.9	6.2
First dorsal inner margin	37	2.1	2.2	1.8	1.6	1.9
First dorsal posterior margin	67	3.8	6.6	5.9	5.7	6.1
Second dorsal anterior margin	87	4.9	3.5	4.4	4.7	5.4
Second dorsal base	67	3.8	3.8	4.3	5.0	5.4
Second dorsal height	38	2.2	2.6	2.3	1.9	2.5
Second dorsal inner margin	28	1.6	2.2	1.8	1.5	1.7
Second dorsal posterior margin	37	2.1	3.7	3.5	3.0	3.7
Anal length	40	2.3	4.4	5.1	2.8	4.5
Anal anterior margin	35	2.0	2.8	4.4	3.0	2.9
Anal base	19	1.1	2.5	3.6	1.6	2.7
Anal height	22	1.2	2.1	1.7	1.6	1.8
Anal inner margin	19	1.1	1.9	1.5	1.3	1.8
Anal posterior margin	13	0.7	2.5	1.8	1.7	1.8
Dorsal caudal margin	623	35.3	32.3	32.3	33.6	34.6
Preventral caudal margin	268	15.2	16.4	14.0	14.0	16.0
Lower postventral caudal margin	145	8.2	10.5	8.5	8.4	7.0
Upper postventral caudal margin	421	23.8	21.6	27.4	23.5	22.5
Terminal caudal margin	33	1.9	2.6	2.2	2.0	NA
Subterminal caudla margin	25	1.4	1.8	NA	1.7	1.2
Clasper outer length	41	2.3	NA	NA	NA	-
Clasper base length	9	0.5	NA	NA	NA	-
Clasper inner length	54.1	3.1	NA	NA	NA	-