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THE FIRST RECORD OF A SHARK OF THE GENUS *GLYPHIS* IN INDONESIA

Fahmi and **Mohammad Adrim**
Research Centre for Oceanography, Indonesian Institute of Sciences (LIPI)
Jl. Pasir Putih I Ancol Timur Jakarta 14430, Indonesia
Email: fahmi@lipi.go.id

***ABSTRACT.* –** Sharks of the genus *Glyphis* are one of the elasmobranch fishes believed to inhabit tropical freshwater habitats. Presently, five species of *Glyphis* are known: *Glyphis gangeticus, G. glyphis, G. siamensis, G. garricki,* and *G.* sp. B. The latter has not been formally described and is known as Borneo River Shark**.** A shark species of the genus *Glyphis* was recorded at Sampit Bay, Central Kalimantan, Indonesia in September 2005. It was a mature male (1,660 mm total length) and was caught using hook–and-line by a local fisherman. The specimen was not kept due to the large size and lack of facilities in the field. However, this finding is the first record of the occurrence of this genus in Indonesia.

***KEY WORDS.* –** *Glyphis,* shark, freshwater, Kalimantan, Indonesia.

INTRODUCTION

The river shark of the genus *Glyphis* is known as one of the few elasmobranch species known to occur and live in tropical freshwater habitat. This genus is poorly known compared to other genera of the carcharhinid family (Compagno, 1988). The rarity, lack of information and difficulties in identifying the genus are the main factors contributing to the poor knowledge of *Glyphis* biology and taxonomy (Compagno et al., 2005). Species of this genus are often confused with the bull shark, *Carcharhinus leucas,* another member of the family Carcharhinidae, and which is also the more commonly encountered freshwater shark species inhabiting rivers and estuaries in the Indo-Pacific region (Compagno, 2002).

Based on Compagno's (1998; 1999; 2002; 2005) checklists of living elasmobranchs, there are at least six species of *Glyphis* known worldwide, i.e. *Glyphis glyphis* (Müller & Henle, 1839), *Glyphis gangeticus* (Müller & Henle, 1839), *Glyphis siamensis* (Steindachner, 1896), *Glyphis* sp. A [Last & Stevens, 1994], *Glyphis* sp. B and C [Compagno, 1998]. In a recent publication, Compagno et al. (2008), *G.* sp A was regrouped into *G. glyphis* and *G.* sp. C was described as *G. garricki* Compagno, White & Last, 2008. The nomenclature and classification of genus *Glyphis* were clearly explained in Compagno (1988). The description of the speartooth shark, *Glyphis glyphis,* apparently based on a stuffed specimen from the Zoologisches Museum, Humbolt Universitat, with no information on its locality, and the holotype no longer exists (Compagno, 1988). *Glyphis gangeticus* was described from two specimens collected in the Ganges River, India (Compagno, 1988; 1998; 2002). Another species of genus *Glyphis* is *G. siamensis* that was described from a specimen collected in the mouth of the Irrawaddy River near Rangoon (now Yangon), Myanmar, by Steindachner in 1896. While three other undescribed *Glyphis* were named as species A, B and C based on the specimens collected from Queensland (Australia), Borneo (Sabah, Malaysia), New Guinea and Northern Territory (Australia), respectively (Compagno, 1998). Later, Compagno et al. (2005) separated the specimens from Bay of Bengal and New Guinea as *Glyphis glyphis,* while the specimens from the Bizant River, Queensland and Adelaide River, Northern Territory were named as *Glyphis* sp. A, with a note that this may be the same species as *Glyphis glyphis*. Specimens from Borneo deposited in the Naturhistorisches Museum, Vienna and several juveniles collected from Kinabatangan River, Sabah, were named as *Glyphis* sp. B in Compagno (1998; 2002) and Compagno et al. (2005), while specimens from Bainuru and Fly River, Papua New Guinea, also those from Adelaide and South Alligator River in the Northern Territory were named as *Glyphis* sp. C (Compagno, 2002; Last, 2002). Lastly, the identities of *Glyphis* sp. A and C have been clarified by Compagno et al. (2008) as *G. glyphis* and *G. garricki,* respectively. The type species *Glyphis glyphis* was recently redescribed based on neotype specimen (ZMB 5265) and 15 other specimens from Northern Territory, Queensland and Papua New Guinea, while *G. garricki* was formally named and described based on nine specimens collected from Northern Territory, Western Australia and Papua New Guinea (Compagno et al., 2008).

Indonesia is considered to have the highest number of elasmobranch species in the world, due to its extensive

marine habitat diversity (see Compagno, 1998; Compagno et al., 2005; White et al., 2006). At least 135 elasmobranch species occur in eastern Indonesia of which 78 species of them are sharks (White et al., 2006). This number is expected to increase if other areas elsewhere in the country, such as western Indonesia is considered. Studies of elasmobranch diversity in Indonesia have been conducted since 2001 by a collaboration research team between Indonesian research institutions such as Fisheries and Marine Department (Department Perikanan dan Kelautan, DKP), the Indonesian Institute of Sciences (Lembaga Ilmu Pengetahuan Indonesia, LIPI) and CSIRO Australia under ACIAR project. The research is presently continued by staff of the Research Centre for Oceanography, Indonesian Institute of Sciences (RCO-LIPI) itself.

There is currently no information and publication on the occurrence of *Glyphis* in Indonesia. The extensive Indonesia-Australia elasmobranch project carried out between 2001 to early 2006, and which resulted in a guidebook on economically important sharks and rays of Indonesia (White et al., 2006) also did not list any *Glyphis* species. This paper provides the first information of this genus from the Indonesian Borneo (Central Kalimantan), and extending its distribution from other known location on Borneo Island (i.e. Sabah in Malaysian Borneo; see Compagno, 1998; Manjaji, 2002a & b; Compagno et al., 2005).

MATERIALS AND METHODS

A study on biodiversity and fisheries of elasmobranchs was conducted at various landing sites and coastal villages in Kalimantan, Indonesia from May 2005 to Oct.2006. A total of six fish landing sites in Kalimantan were surveyed (two sites in West and East Kalimantan and one site in Central and South Kalimantan; see Fahmi & Adrim, 2007). All elasmobranch species were identified, recorded, sexed and counted in each location. Measurements such as total length, disc width, weight and claspers length were measured if possible. Unidentified and unique specimens were photographed and some measurements and morphometric counts were taken following Compagno (1988; 1998). Some of them were kept and preserved if the size was reasonable for reference collections. Collected specimens are registered using National Collection of Indonesian Pisces (NCIP) numbers of Research Centre for Oceanography of the Indonesian Institute of Sciences (LIPI).

RESULTS

A total of 2,310 individuals of elasmobranchs were recorded from seven fish landing sites in Kalimantan representing 60 species of 13 families (for a list of species see Fahmi & Adrim, 2007). The batoids (Dasyatidae) was the most common chondrichthyan family recorded during the study in terms of the number of individuals but Carcharhinidae was one of the most speciose groups together with Dasyatidae (Fahmi & Adrim, 2007). The genus *Glyphis* was the rarest shark found during the study because it was only recorded from a single specimen. A mature male specimen of *Glyphis* sp. was recorded at a small landing site in Ujung Pandaran Village, Sampit District, Central Kalimantan Province, on the 3 Sep.2005. The village is located in the western part of Sampit Bay, which is connected to the Java Sea (Fig. 1). There is a small scale fishery operation in the waters off the village targeting shrimps and crabs. Most local fishers catch fishes only for local consumption using hand lines and gillnets. Fishes are also caught as bycatch in the trammel nets and lift nets targeting for shrimps. The *Glyphis* specimen was caught by a local fisherman using a hook and line at depth of less than 30 m in the waters off the village. Based on the diagnostic characteristics of the specimen, the fish clearly belongs to the genus *Glyphis* (Fig. 2).

The primary character distinguishing the genus *Glyphis* is the non-crescentic (longitudinal) shape of the upper precaudal pit (Fig. 3) as stated by Compagno (1998), and the large relative size of the second dorsal-fin (Last & Stevens, 1994). Those primary characters clearly distinguished between *Glyphis* and the bull shark, *Carcharhinus leucas.* Due to its large size, the *Glyphis* specimen from Sampit Bay was not collected but some measurements were taken and the specimen was photographed. The total length of the specimen was 1,660 mm and had fully calcified claspers (the outer length of the right clasper was 115 mm).

Morphological features of the *Glyphis* from Sampit Bay, Kalimantan, are as follows: long and broad pectoral-fins with straight posterior margins; snout short and bluntly rounded; mouth long and parabolic, its length is about a half of its width (Fig 4). Absence of an interdorsal ridge; first dorsal-fin large and broadly triangular in shape with posterior margin almost straight, origin posterior to insertion of pectoral fin; second dorsal-fin high with almost straight edge at posterior margin and has long posterior lobe; teeth in upper jaw broad and triangular with the outer margins serrated; lower teeth erect with narrow cusps and without prominent cusplets (Fig 5); pectoral-fin length 0.58 of its anterior margin length; anterior margin of the pelvic-fin 0.30 of pectoral anterior margin; height of the second dorsal-fin 0.40 of first dorsal fin, its base 0.42 of first dorsal-fin base (Fig 6); anal-fin height 0.77 of second dorsal-fin height and its base 0.85 of second dorsal-fin base; snout length shorter than mouth width (0.5 times), and head 0.2 of its total length. The measurement ratios comparing to the total length are presented in Table 1.

Unfortunately, due to the lack of preservation facility during the study, neither tissue sample nor the body part was collected. Instead, the specimen was processed by villagers as both smoked and salted meat for local consumption. The fins were dried, but the head and guts were discarded.

DISCUSSION

Glyphis sp. from Sampit Bay, Kalimantan is the largest specimen of the genus *Glyphis* so far recorded in Borneo

Table 1. Measurement ratio (in %) of total length (TL) for *Glyphis* sp. from Sampit Bay compared to *Glyphis glyphis* and *G. garricki* specimens (Compagno et al., 2008).

	Glyphis sp. (1,660 mm TL)	*Glyphis glyphis*	*Glyphis garricki*
Head length	21.4	24.0–26.0	24.0–25.5
Snout length	6.1	2.8–7.9	7.0–7.7
Mouth width	12.2	9.8–10.8	10.4–11.2
Pectoral-fin length	14.9	11.3–14.0	12.9–13.8
Pectoral anterior margin	25.7	17.5–22.2	19.9–22.4
First dorsal-fin length	17.1	16.2–19.6	16.7–18.7
First dorsal-fin base	13.6	12.1–13.9	11.9–13.3
Second dorsal-fin length	8.6	9.8–13.0	10.2–12.5
Second dorsal-fin base	5.7	6.5–8.9	6.6–8.4
Interdorsal length	22.1	14.5–20.8	16.1–21.2
Pelvic-fin length	8.9	7.1–10.3	9.2–10.6
Pelvic-fin anterior margin	7.7	7.0–9.0	7.6–9.1
Pelvic-fin height	4.3	4.7–8.0	6.9–8.1
Pelvic-fin base	5.3	4.6–6.6	5.4–6.8
Anal-fin height	3.7	3.0–5.4	4.6–5.3
Anal-fin base	4.8	5.5–7.3	6.0–7.0

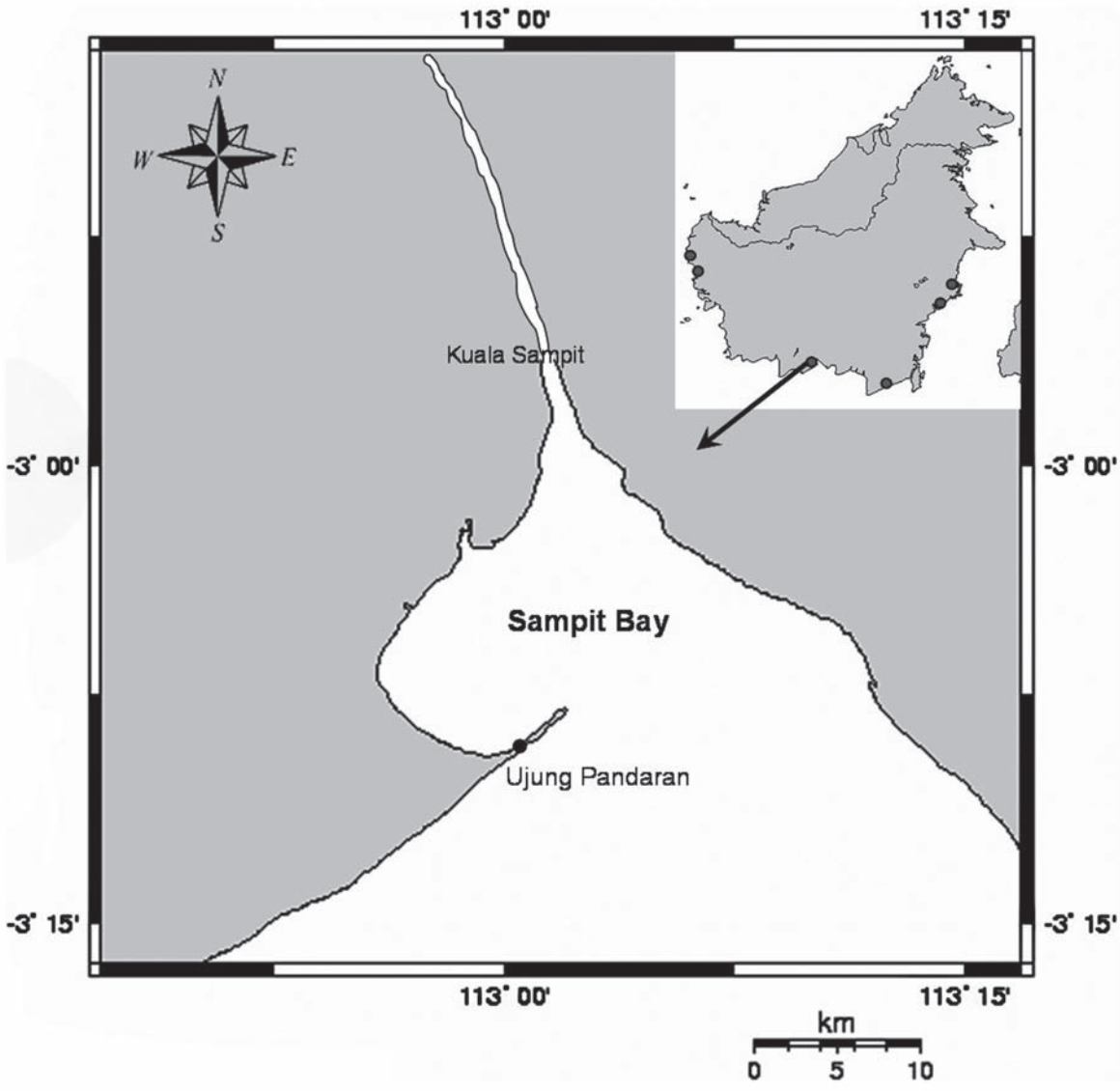

Fig. 1. Sampling locality of the reported *Glyphis* from Ujung Pandaran Village, Sampit District, Central Kalimantan Province.

Island (including Kalimantan, Sarawak and Sabah). This is also the first and the only record of this genus found in coastal waters of this region. The salinity of Sampit Bay varied between 5 ppt in the river mouth and around 20 ppt in the bay area (Nursyarifuddin, pers. com.). The previous specimens found from Borneo were known from riverine habitats but also suggests its occurrence in brackish water. The first finding of the genus *Glyphis* in Borneo was collected from an unknown location about a century ago and it is deposited in the Naturhistorisches Museum, Austria (Compagno, 1988; 2002; Manjaji, 2002a). Other specimens of this genus were from the Kinabatangan River in East Sabah in 1997 and followed by several findings thereafter (Manjaji, 2002a). Later, Compagno et al. (2005) referred to all specimens from Borneo as Borneo River Shark, *Glyphis* sp. B (Fig. 7).

The characteristics of *Glyphis* sp. B, according to Compagno et al. (2005), are having broadly rounded short snout,

Fig. 2. Lateral view of *Glyphis* sp. (mature male, 1,660 mm total length) from Sampit bay.

Fig. 3. Dorsal view of *Glyphis* sp. (mature male, 1,660 mm total length), indicating absence of the interdorsal ridge, and longitudinally-shaped precaudal pit (arrow).

Fig. 4. Ventral view of the mouth of *Glyphis* sp. (mature male, 1,660 mm total length).

Fig. 5. Upper and lower jaws of *Glyphis* sp. (mature male, 1,660 mm total length).

Fig. 6. Dried first and second dorsal fins of *Glyphis* sp. (mature male, 1,660 mm total length).

Fig. 7. Lateral view of *Glyphis* sp. B (young female, 595 mm total length) from Kinabatangan River, Sabah. An unregistered collection of Universiti Malaysia Sabah, collected on 30 Apr.2003 (Photo: K. Jensen and J.N. Caira)

absence of an interdorsal ridge, first dorsal origin over rear third of pectoral-fin bases, second dorsal slightly more than half or two-thirds of first dorsal in height, and anal-fin with deeply notched posterior margin. In general, the primary characteristics of *Glyphis* sp. B are similar to *Glyphis* from Sampit. However, the first dorsal fin shape of *Glyphis* sp. B seemed to be lower and broader than the Sampit specimen (see Figs. 6 & 7), and the size of second dorsal-fin of specimen from Sampit was smaller (0.40 of first dorsal-fin) comparing to *Glyphis* sp. B (0.50–0.67 of first dorsal-fin). Moreover, teeth from the lower jaw of Sampit specimen were more erect with unserrated cutting edges comparing to *Glyphis* sp. B. The shape of its lower teeth was more similar to the lower teeth of *G. glyphis*, but this species differs from *G. glyphis* in the height of second dorsal-fin (see Compagno et al. 2005; 2008). The above-mentioned morphological characters have shown that the specimen from Sampit is probably not conspecific with either *Glyphis* sp. B or *G. glyphis*. Hence, the species from Kalimantan, Indonesia could be a different species. Unfortunately, due to its large size and lack of preservation facilities, the Sampit specimen was not collected and therefore there is presently no way to confirm the distinctiveness of this species.

Nevertheless, the finding of this species near the coast in Sampit Bay, Ujung Pandaran Village, Central Kalimantan, extends the distribution of *Glyphis* in Borneo and this is the first record of its presence within Indonesian territory. Moreover, this finding is also evidence that *Glyphis* from Borneo can inhabit coastal and marine habitats. The presence of this presumed rare species in Sampit Bay is probably due to the low fishing pressure at coastal waters in Central Kalimantan, especially in Sampit Bay. The relatively long distance from the nearby city, lack of transportation facilities and lack of electricity in the villages along the Sampit Bay are some factors which have led to low pressure of fishing and may constrain fisheries development in this area.

CONCLUSION

The finding of a *Glyphis* species at Ujung Pandaran Village, Central Kalimantan, is the first record of the genus in Indonesian territory. This record also revealed that members of the genus from Borneo inhabit marine as well as freshwater habitats. Moreover, the specimen could belong to a new species. This finding also revealed that some unexploited areas in Indonesia, i.e. Sampit Bay, should be maintained or further protected, as areas such as these are under low fishing pressures. The authors realized that due to the lack of information on the Indonesian biodiversity, some rare fauna could become either extinct or overexploited before they are documented by scientists. An example is the Indonesian Coelacanth, in which the local community had already known about an "oily grouper" for several decades, but it was only scientifically described in 1998 (Erdmann et al., 1998). Therefore, all information on biodiversity covering marine and freshwater habitats, including the freshwater shark, will contribute to the basic knowledge on their biology and habitat to support conservation activities.

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LITERATURE CITED

Compagno, L. J. V., 1997. Threatened fishes of the world: *Glyphis gangeticus* (Müller & Henle, 1839) (Carcharhinidae). *Environmental Biology of Fishes* **49**: 400.

Compagno, L. J. V., 1988. *Sharks of the Order Carcharhiniformes*. The Blackburn Press, New Jersey. 486 pp.

Compagno, L. J. V., 1998. Sharks. In; K. E. Carpenter & V. H. Niem (eds.), *FAO Species identification guide for fishery purposes. The living marine resources of the western central Pacific. Cephalopods, crustaceans, holothurians and sharks. Vol. 2.* FAO, Rome. Pp. 1193–1366.

Compagno, L. J. V., 1999. Checklist of living elasmobranchs. In: W. C. Hamlett (ed.), *Sharks, skates, and rays: the biology of elasmobranch fishes*. The Johns Hopkins University Press, Baltimore. Pp. 471–498.

Compagno, L. J. V., 2002. Freshwater and estuarine elasmobranch surveys in the Indo-Pacific region: threats, distribution and speciation. In: S.L. Fowler, T.M. Reed & F.A. Dipper, (eds.), *Elasmobranch biodiversity, conservation and management: Proceeding of the International Seminar and Workshop in Sabah, July 1997*. IUCN SSC Shark Specialist Group: Gland, Switzerland and Cambridge, UK. Pp. 168–180.

Compagno, L. J. V., M. Dando & S. L. Fowler, 2005. *Sharks of the world*. Princeton University Press, New Jersey. 368 pp.

Compagno, L. J. V., W. T. White & P. R. Last, 2008. *Glyphis garricki* sp. nov., a new species of river shark (Carcharhiniformes: Carcharhinidae) from northern Australia and Papua New Guinea, with description of *Glyphis glyphis* (Müller & Henle, 1839). In: P. R. Last, W. T. White & J. J. Pogonoski (eds.), *Descriptions of new Australian chondrichthyans. CSIRO Marine and Atmospheric Research Paper No. **022***. CSIRO, Australia. Pp. 203–225.

Erdmann, M. V., R. L. Caldwell & M. K. Moosa, 1998. Indonesian 'king of the sea' discovered. *Nature*, **385**(6700): 335.

Fahmi & M. Adrim, 2007. Elasmobranch diversity of Kalimantan waters. *Marine Research in Indonesia*, **32**(2): 97–105.

Last, P. R., 2002. Freshwater and estuarine elasmobranchs of Australia. In: S. L. Fowler, T. M. Reed & F. A. Dipper, (eds.), *Elasmobranch biodiversity, conservation and management: Proceeding of the International Seminar and Workshop in Sabah, July 1997*. IUCN SSC Shark Specialist Group: Gland, Switzerland and Cambridge, UK. Pp. 185–193.

Last, P. R. & J. D. Stevens, 1994. *Sharks and Rays of Australia*. CSIRO, Australia. 513 pp.

Manjaji, B. M, 2002a. Elasmobranchs recorded from rivers and estuaries in Sabah. In: S. L. Fowler, T. M. Reed & F. A. Dipper, (eds.), *Elasmobranch biodiversity, conservation and management: Proceeding of the International Seminar and Workshop in Sabah, July 1997*. IUCN SSC Shark Specialist Group: Gland, Switzerland and Cambridge, UK. Pp. 194–198.

Manjaji, B. M, 2002b. New records of elasmobranch species from Sabah. In: S. L. Fowler, T. M. Reed & F. A. Dipper (eds.), *Elasmobranch biodiversity, conservation and management: Proceeding of the International Seminar and Workshop in Sabah, July 1997*. IUCN SSC Shark Specialist Group: Gland, Switzerland and Cambridge, UK. Pp. 70–76.

White, W. T., P. R. Last, J. D. Stevens, G. K. Yearsley, Fahmi & Dharmadi, 2006. *Economically important sharks and rays of Indonesia*. ACIAR, Canberra. 329 pp.