

Some Rare and Endemic Elasmobranchs of Indonesia and Their Conservation Status

FAHMI¹ and DHARMADI²

¹ Research Center for Oceanography-Indonesian Institute of Sciences

Jl. Pasir Putih I, Ancol Timur Jakarta 14430 Indonesia

Email: fahmi_lipi@yahoo.com

² Research Center for Fisheries Management and Conservation, Ministry of Marine Affairs and Fisheries.

ABSTRACT

Indonesia has a very high diversity of sharks and rays that can be found in freshwater and all the way into the deep sea. Some elasmobranchs are considered as endemic species which occur in restricted areas. Comprehensive studies and reviews on the diversity of elasmobranchs in Indonesia have been conducted since 2001 and have resulted in many findings, both of new species and new records. At least 25 species of sharks and rays are known to exist in restricted areas throughout Indonesia. The majority of them are coastal species, the rest are made up of freshwater and deepwater species. Information on the occurrence, distribution and conservation status of some rare and endemic elasmobranchs is provided in this paper. The Bali catshark (*Atelomycterus baliensis*), spear tooth shark (*Glyphis* sp.), the giant freshwater ray (*Himantura polylepis*) and the freshwater ray (*Himantura signifer*) are just some examples of coastal and freshwater elasmobranchs that are vulnerable to extinction in nature due to anthropogenic and uncontrolled fishing activities. However, there is as yet no management action from the government seeking to protect and conserve these endemic species, mainly due to limited existing data on their biology, ecology and populations.

Keywords: Elasmobranch, endemic, conservation status

INTRODUCTION

Indonesia is a country with mega biodiversity of both flora and fauna. Due to its strategic position along the equator between two oceans and two continental locations, an abundance of animals live in the area both on the land and in the waters. According to the fish data base (Froese and Pauly, 2008), there are at least 4,512 species of fish are found existing in Indonesian waters, from freshwater to the deep sea. This number is comprised of 1,083 species of freshwater fish, 3,345 species of marine fish and 84 species living in both fresh and saltwater. Among them, about 705 species are commercially fished and c.a. 120 species are endemic.

Cartilaginous fish (elasmobranchs), are a group that contributes minimally to the total number of fish in Indonesia but is significant in terms of their biomass, due to their commonly large size. The latest recorded number of cartilaginous species occurring in Indonesia was 208, consisting of 109 species of shark, 97 rays and two chimaeras from 43 families (Fahmi, 2010). More than 80% of elasmobranch fish in Indonesia are found along the insular shelf (SHL), from the coastal area to the continental shelf, while others are found from freshwater to the deep ocean. Some of the elasmobranch fish are endemic to a specific area or type of habitat.

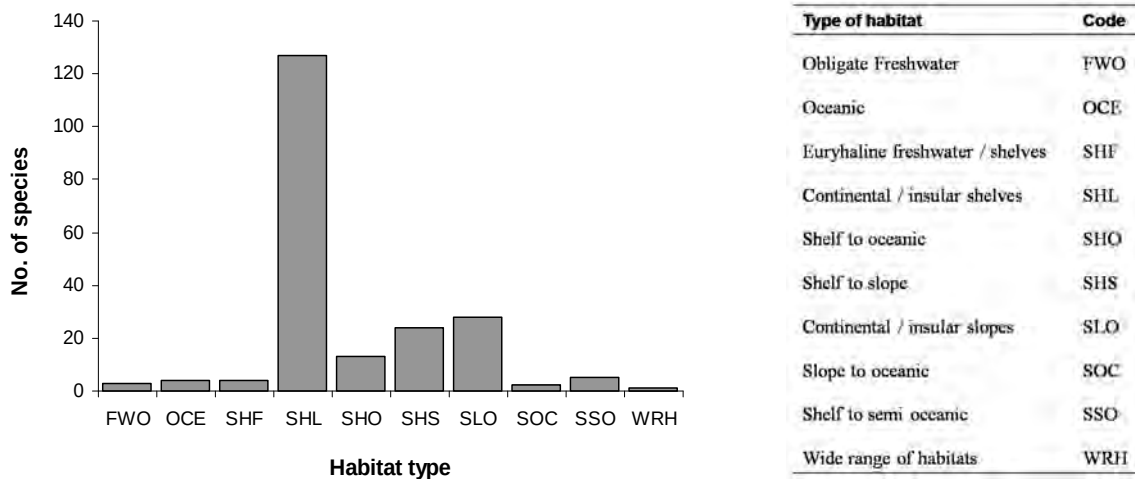


Fig.1. The composition of Indonesian elasmobranchs, according to the habitat (Fahmi, 2010).

Due to their restricted distribution and habitat, most of the endemic elasmobranchs are vulnerable to extinction. Once their habitats are destroyed or their populations overexploited, they could vanish easily from the earth. This paper describes some endemic elasmobranchs existing in Indonesian waters including their distribution, habitat and their conservation status.

MATERIALS AND METHODS

Elasmobranch study in Indonesia has been conducted through several projects since 2001. Data were gathered through frequent visits to fish landings and fish markets in Indonesia. Each elasmobranch fish landing was identified and categorized into species level, photographed and measured by its length, weight and the stage of maturity. Some specimens were collected and preserved in 10% formalin for about a month, then placed into 90% alcohol for permanent storage as a reference collection. Some identified specimens were measured and photographed in more detail. Tissue samples were also collected for future genetic analysis. Species identifications were based on the latest identification keys used by a number of authors (Compagno, 1998; Compagno *et al.*, 1999; Last & Compagno, 1999; Compagno *et al.*, 2005; Last *et al.*, 2005; White *et al.*, 2006; Last *et al.*, 2010a; Last *et al.*, 2010b).

Some new endemic species were found during the surveys. Holotypes were stored at The Museum of Zoologicum Bogoriense in Cibinong, Indonesia, while paratypes were distributed to a few locations in both Australia and Indonesia.

RESULTS AND DISCUSSION

At least 25 elasmobranch species were categorized as endemic, occurring in Indonesian and adjacent waters. Most of the endemic fish are coastal species, deep water and freshwater species and have limited distributions. Table 1 shows some endemic species occurring in Indonesian waters, consisting of either freshwater species or coastal and deep water species. Most of the endemic species are rare, but not all rare species are endemic. Some rare species with clumped distribution also occur in Indonesian waters and they are listed in Table 2.

Table 1. List of some endemic species of elasmobranchs occurred in Indonesian waters.

Species	Region	Source
<i>Rhinobatos jimbaranensis</i>	South of Bali	(Last <i>et al.</i> , 2006b)
<i>Rhinobatos penggali</i>	South of Bali, Lombok and Java	(Last <i>et al.</i> , 2006b)
<i>Fenestrasibogae</i>	Bali Sea	(Mould, 1997; Compagno, 1999)
<i>Raja annandalei</i>	Halmahera Sea Molucca	(Mould, 1997)
<i>Himantura hortlei</i>	Southern New Guinea	(Last <i>et al.</i> , 2006a)
<i>Himantura cf. kittipongi</i>	Indo-Malay Archipelago	(Last <i>et al.</i> , 2010b)
<i>Himantura lobistoma</i>	Borneo and Sumatra	(Manjaji & Last, 2006)
<i>Himantura pastinacoides</i>	Borneo (Kalimantan) and Sumatra	(White <i>et al.</i> , 2006)
<i>Himantura signifer</i>	Kalimantan	(Compagno & Roberts, 1982)
<i>Neotrygon picta</i>	Arafura Sea	(Last & White, 2008a)
<i>Pastinachus gracilicaudus</i>	Borneo	(Last & Manjaji-Matsumoto, 2010)
<i>Pastinachus solocirostris</i>	Borneo (Kalimantan) and Sumatra	(Last <i>et al.</i> , 2005)
<i>Pastinachus stellurostris</i>	West Kalimantan	(Last <i>et al.</i> , 2010a)
<i>Squalus hemipinnis</i>	South of Bali, Lombok, Java	(White <i>et al.</i> , 2007)
<i>Squatina legnota</i>	South of Lombok and Java	(Last & White, 2008b)
<i>Cephaloscyllium pictum</i>	South of Lombok and Java	(Last <i>et al.</i> , 2008)
<i>Hemiscyllium galei</i>	Western New Guinea	(Allen & Erdmann, 2008)

<i>Hemiscyllium henryi</i>	Western New Guinea	(Allen & Erdmann, 2008)
<i>Hemiscyllium freycineti</i>	New Guinea	(Cavanagh <i>et al.</i> , 2003)
<i>Hemiscyllium hallstromii</i>	Western New Guinea	(Cavanagh <i>et al.</i> , 2003)
<i>Hemiscyllium strahani</i>	New Guinea	(Cavanagh <i>et al.</i> , 2003)
<i>Apristurus sibogae</i>	Makassar Strait	(Mould, 1997)
<i>Atelomycterus baliensis</i>	South of Bali and Java	(White <i>et al.</i> , 2005)
<i>Hemitriakis indroyonoi</i>	South of Bali and Java	(White <i>et al.</i> , 2009)
<i>Mustelus widodoi</i>	South of Bali and Java	(White & Last, 2006)

Table 2. List of some rare elasmobranchs of Indonesian waters

Species	Region	Source
<i>Himantura oxyrincha</i>	Borneo, Cambodia and Thailand	(Last <i>et al.</i> , 2010b)
<i>Himantura polylepis</i>	Indo-West Pacific	(Last <i>et al.</i> , 2010b)
<i>Himantura signifer</i>	Kalimantan, Sumatra, Thailand, Malaysia	(Last <i>et al.</i> , 2010b)

Some endemic sharks and rays found in Indonesian waters have been described recently by elasmobranch experts (Last *et al.*, 2005; White *et al.*, 2005; White *et al.*, 2007; Last & White, 2008b; Last *et al.*, 2010a; Last *et al.*, 2010b). The facts indicate that information about elasmobranch diversity in Indonesian waters remains minimal. An extensive survey on elasmobranch fish in Indonesian waters from 2001 to 2006 recorded 78 species of sharks, 56 rays and three species of chimaera (White *et al.*, 2006). The number of elasmobranch species occurring in Indonesian waters is still increasing right up to the present day. The later publication stated that the diversity of elasmobranchs in Indonesia consisted of 109 species of sharks, 96 rays and three ghost sharks (Fahmi, 2010). The enormous marine areas and lack of experts from Indonesia are the main reasons why limited information exists on Indonesian elasmobranchs. Most described new species were from the Indian Ocean region with a few others from Kalimantan waters (Last *et al.*, 2010b).

Most endemic and rare species are vulnerable to extinction. This is due to their limited distribution and restricted habitat options. Once the habitat is damaged by anthropogenic activities or the species population is over-exploited, they will easily become extinct. Below are some rare and endemic species that were recorded during the last decade of studies.

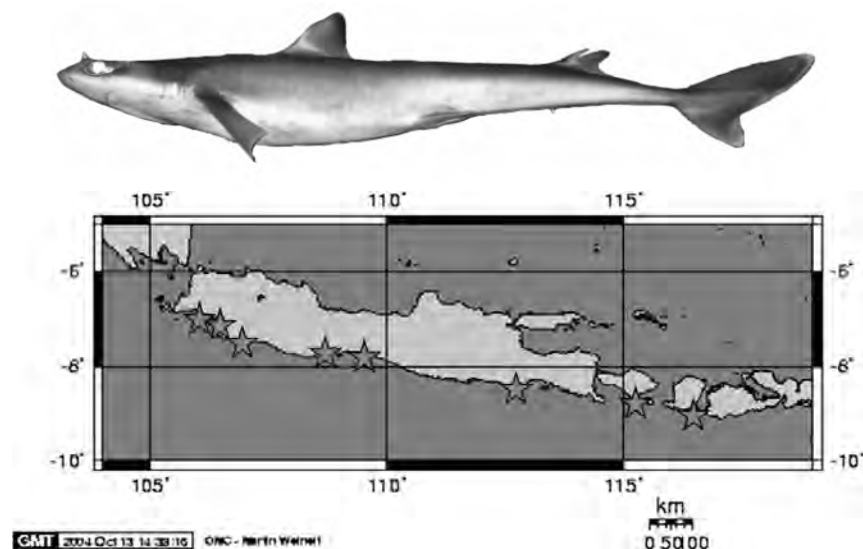


Fig. 2. Distribution of *Squalus hemipinnis* in Indonesia

***Squalushemipinnis* White, Last & Yearsley, 2007**

The Indonesian Short snout Shark, *Squalushemipinnis* was described in 2007 as a new species from eastern Indonesia. It's only known distribution is from Central Java to eastern Lombok seen at depths of 100m (White *et al.*, 2007), but later it was also found in West Java (pers. obs.). Therefore, it is suggested that the distribution occurs from the south of Java to the south of Nusa Tenggara (Fig. 2). This species is one of the most common catches of the demersal longline fishery, operating in the deep waters of eastern Indonesia. Due to intensive catching of elasmobranchs in the area through deep water, demersal, longline fisheries and the associated high potential to rapidly deplete population numbers in the future, the conservation status of this species on the IUCN red list is categorized as 'Near Threatened' (White and Couzens, 2009).

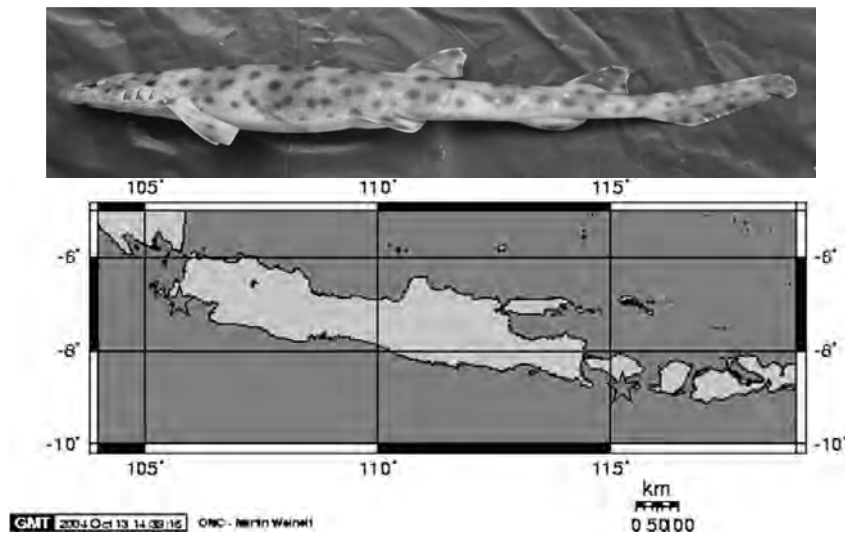


Fig. 3. Distribution of *Atelomycterus baliensis* in Indonesia

***Atelomycterus baliensis* White. Last, Dharmadi, 2005**

The Bali cat shark, *Atelomycterus baliensis*, is a reef-dwelling cat shark that has been previously described as an endemic species from Bali waters (White *et al.*, 2005). Later, Fahmi (2010) added the distribution of this species to the western part of Java, based on a single specimen found at the Binuangeun landing site in Banten (Fig. 3). This species is thought to inhabit holes and crevices in reefs like other related cat sharks, but with a restricted range. The IUCN red list categorized the Bali cat shark as a vulnerable species because of its rarity, the degradation of its habitat quality and destructive fishing in the area (White *et al.*, 2009).

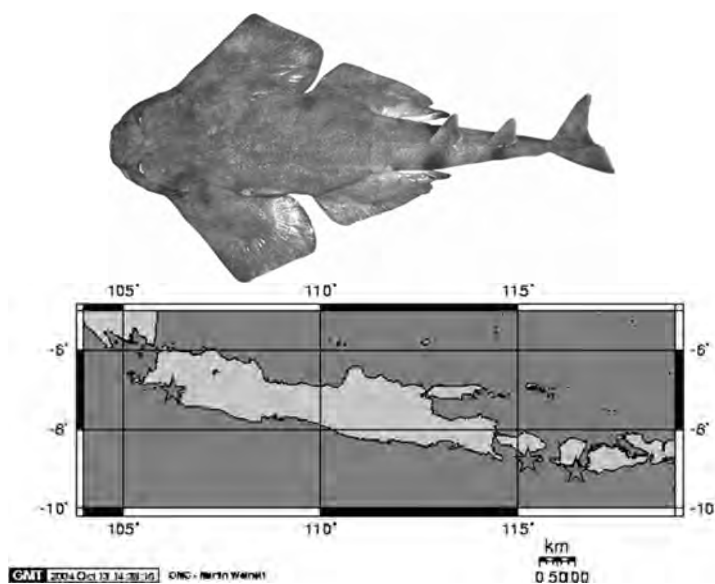


Fig. 4. Distribution of *Squatina legnota* in Indonesia

***Squatina legnota* Last & White, 2008**

The Indonesian angel shark has been known to be endemic in the south of Java, Bali and Lombok (Fig. 4). As a demersal fish, this species was rarely caught by demersal longline fisheries operating in continental shelf and upper slope waters. This species can attain a length of at least 134cm in total, based on a specimen found at Tanjung Luar landing site on Lombok Island (Last & White, 2008b). Due to scarce existing data about the animal, including its biology, population and catch data, this species has not yet been assessed for conservation status. Therefore, the IUCN red list still categorizes this species as Data Deficient (DD).

***Glyphis* sp.**

The genus of *Glyphis* was recorded existing in Indonesian waters by Fahmi and Adrim (2009) based on a single specimen found at Sampit Bay, Central Kalimantan (Fig. 5). This species was assumed to be new, but due to the fact that there was no specimen retained, the status remains questionable. Last *et al.* (2010b) suggested that *Glyphis* sp., from Kalimantan may be conspecific to specimens found from Mukah, Sarawak. This species is possibly also endemic in Borneo waters, inhabiting turbid rivers, brackish backwaters and marine areas adjacent to major river outflows. Due to its rarity, there is no information about its biology and conservation status available. Therefore, this species has not yet been evaluated for inclusion on the IUCN red list of threatened species however, due to its restricted distribution and close proximity to fisheries and anthropogenic activities, this species is assumed to be highly threatened. Further investigation on the species in the Kalimantan area is needed to ensure its ongoing existence in Indonesian waters.

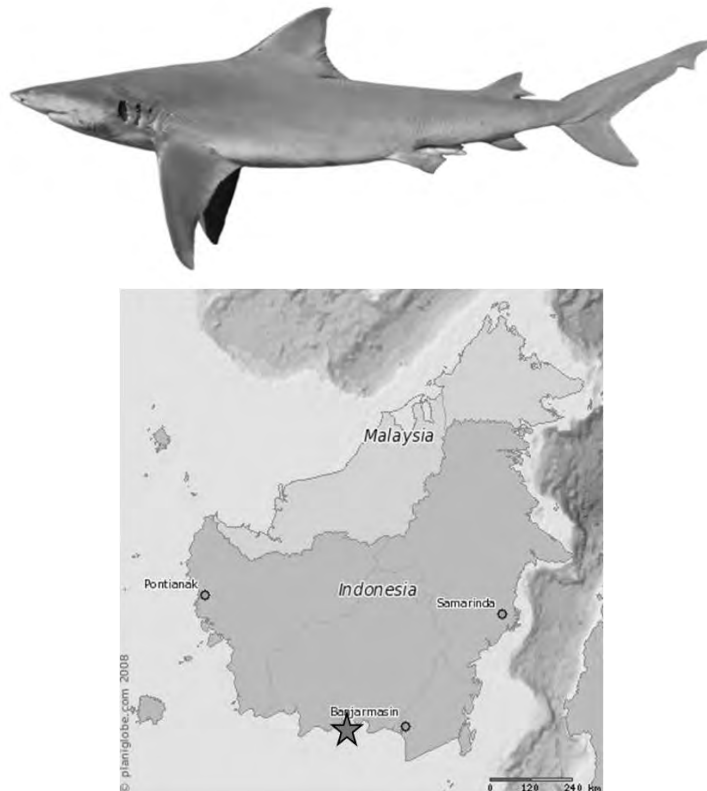


Fig.5. The occurrence of *Glyphis* sp. in Indonesia

***Pastinachus solocirostris* Last, Manjaji & Yearsley, 2005**

The rough nose stingray, *Pastinachus solocirostris*, is a demersal stingray found on insular and continental shelves, but mostly near large estuaries. This species is known to be found in Borneo (Kalimantan) and Sumatra alone (Last *et al.*, 2005). It is caught occasionally by bottom trawl and demersal gillnet fisheries, operating off Sumatra and Kalimantan. The known distribution of this species occurs along the coast lines of Kalimantan Island and around the coast of Riau Province (Bagan Siapiapi) (Fig.6). This species is categorized as endangered due to its restricted distribution and the degradation of its habitat caused by anthropogenic and fishing activities, examples of which include loss of mangrove habitat through conversion of land to shrimp farms, logging and coastal development (Fahmi *et al.*, 2009).

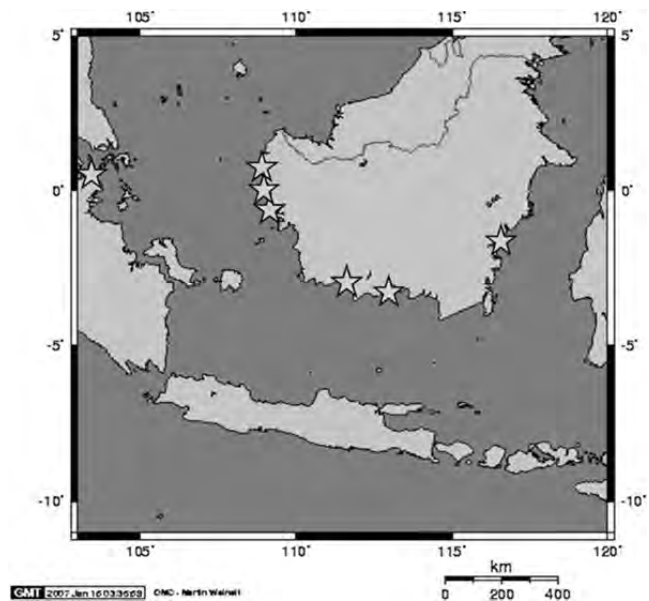


Fig.6.Distribution of *Pastinachus solocirostris* in Indonesia

***Pastinachus stellurostris* Last, Fahmi & Naylor, 2010**

Another rough nose ray species is *Pastinachus stellurostris*. This species is currently described based solely on a few specimens found in West Kalimantan. Its habitat is confined to the brackishwater and coastal areas of western Kalimantan. It is also possibly associated with the large river estuaries of the region (Last *et al.*, 2010a; Last *et al.*, 2010b). The exact distribution of this species is still unclear due to the rarity of specimens becoming available, but at present, this species is believed to be endemic to west Kalimantan (Fig. 7). According to its conservation status, this species has not yet been evaluated for the IUCN red list. However, its status is suggested to be similar to that of *P. solocirostris* on account of their similarities in habitat position and their restricted distributions.



Fig.7.Distribution of *Pastinachus stellurostris* in Indonesia

***Himantura pastinacoides* (Bleeker, 1852)**

The round whipray, *Himantura pastinacoides* is a demersal species inhabiting coastal embayments, estuaries and is also found near large river mouths (Last *et al.*, 2010b). The distribution of *H. pastinacoides* is restricted to the Indo-Malay Archipelago, including Borneo Island and eastern Sumatra. The specimen description of this species was previously recorded based on specimens from the Java Sea. This species is also thought to exist in Jakarta Bay (Fig. 8). The round whipray is commonly caught by bottom trawl, line and beach seines operating around Borneo Island. Sometimes it is confused with other coastal rays, *Himantura gerrardi* and *H. uarnacoides*, due to it being often found caught among these two species. The intensive fishing efforts around the coastal area in the Indo-Malay region and habitat degradation, makes the species vulnerable to extinction in the future. The stingray catches in the area have also been reportedly in decline in inshore waters. Therefore, the conservation status of *H. pastinacoides* on the IUCN red list is categorized as 'Vulnerable' (Manjajiet *al.*, 2009).

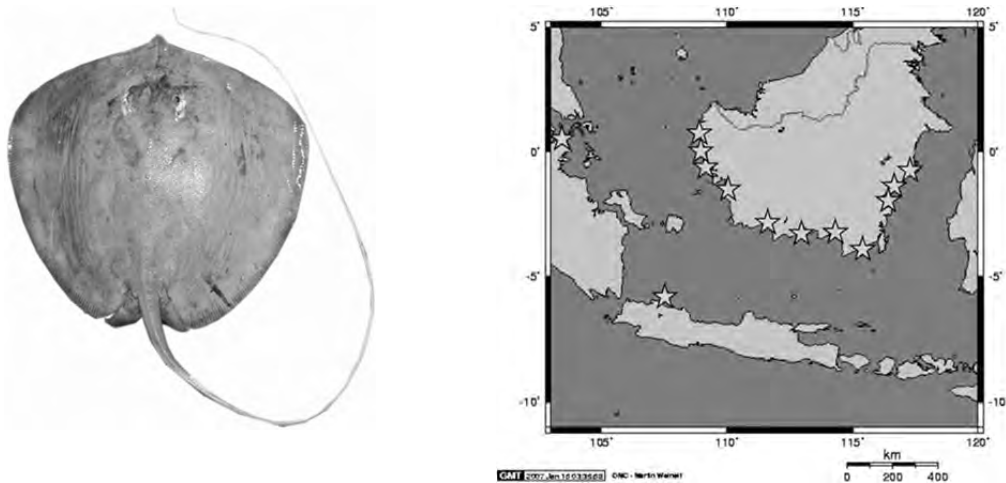


Fig.8. Distribution of *Himantura pastinacoides* in Indonesia

***Himantura lobistoma* Manjaji-Matsumoto & Last, 2006**

The tubemouth whipray, *H. lobistoma*, is a demersal species inhabiting the soft substrates of coastal areas (Manjaji & Last, 2006; Last *et al.*, 2010b). This species is endemic to Borneo and eastern Sumatra and is mainly distributed in western Borneo (Fig. 9). *H. lobistoma* is commonly caught by bottom trawl and demersal longline fisheries, operating off mangroves in western Kalimantan. Similar to *H. pastinacoides*, the conservation status of this species is also 'vulnerable' due to fishing activities and habitat destruction, particularly the removal of the mangrove habitat.

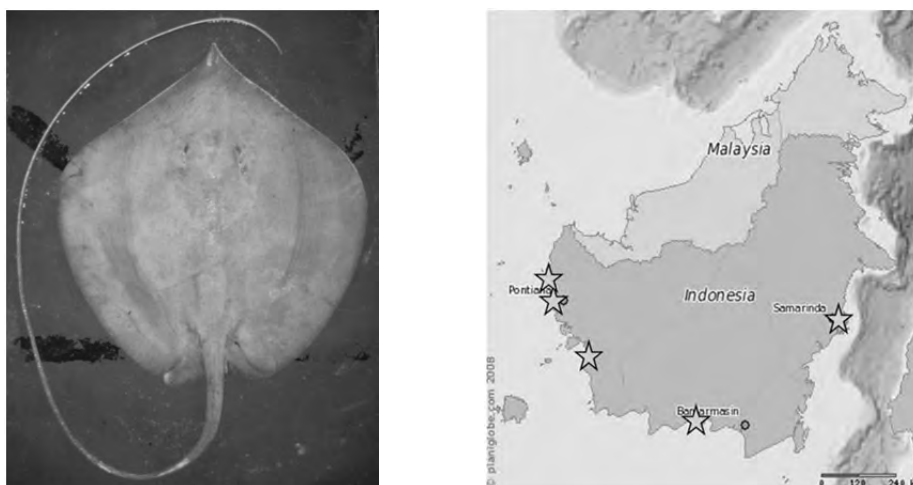


Fig.9. Distribution of *Himantura lobistoma* in Indonesia

***Himantura polylepis* (Bleeker, 1852)**

The giant freshwater whipray, *Himanturapolylepis* was previously known as *Himantura chaophraya* - a local synonym. This species, once famous as the largest freshwater fish in the world, mainly exists in the Chaophraya River. *H. polylepis* is known inhabiting rivers, estuaries, brackish waters and sometimes coastal areas. The distribution is widespread but patchy in the Indo–West Pacific, from India to eastern Indonesia (Last *et al.*, 2010b). A similar member of this species is also found off Australia and is described as *H. dalyensis* (Last & Manjaji-Matsumoto, 2008). In Indonesia, *H. polylepis* is known to exist in eastern Kalimantan (including Tarakan and the Mahakam River), eastern Sumatra (Indragiri and Musi Rivers) and in southern Java (Palabuhanratu) (Fig. 10). This species is occasionally caught in gill nets, traps and caught accidentally by demersal longline fisheries. Due to the large body and the biology of this species, *H. polylepis* is categorized as ‘vulnerable’ in general, but is a critically endangered species of the Chaophraya River because of its population depletion (Vidthayanon *et al.*, 2011). Species from Indonesia are also thought to be critically endangered due to the vast habitat degradation along the rivers on account of anthropogenic activities such as transportation, commercial fishing and urban pollution.

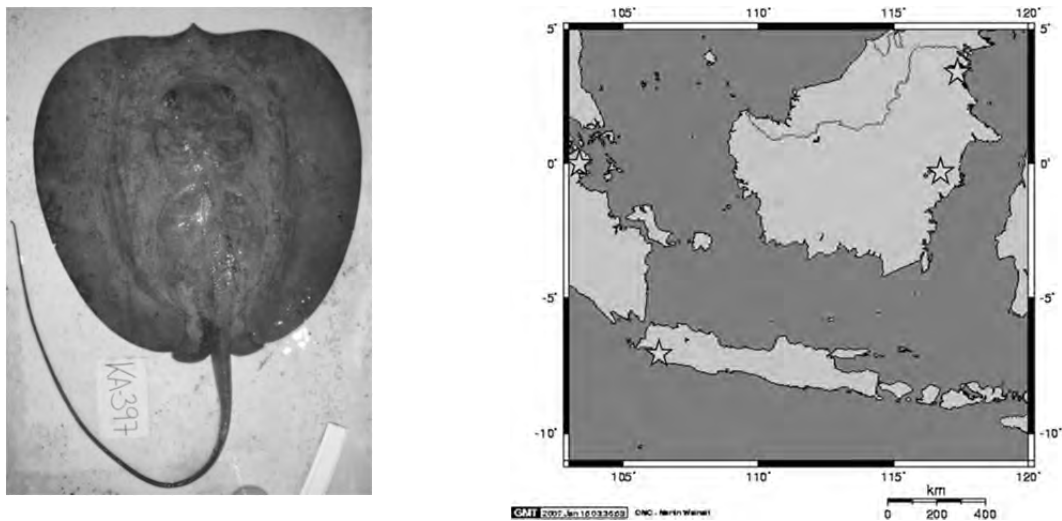


Fig. 10. Distribution of *Himantura polylepis* in Indonesia

***Himantura signifer* Compagno & Roberts, 1982**

Himantura signifer is a whipray found exclusively in freshwater. It is a small animal with a maximum disc width of 37cm DW. It is found inhabiting soft substrates in rivers, streams and occasionally estuaries, but mostly they are seen in upstream rivers. This species has been previously described, based on specimens found at Kapuas River. The distribution of this species is from the riverine area in western Kalimantan to eastern Sumatra, Thailand and Malaysia (Fig. 11). It is mainly caught by traps and bottom lines operating along the rivers. Due to its restricted distribution, habitat loss and water pollution, this species is categorized as ‘endangered’ in the IUCN red list table (Compagno, 2005).

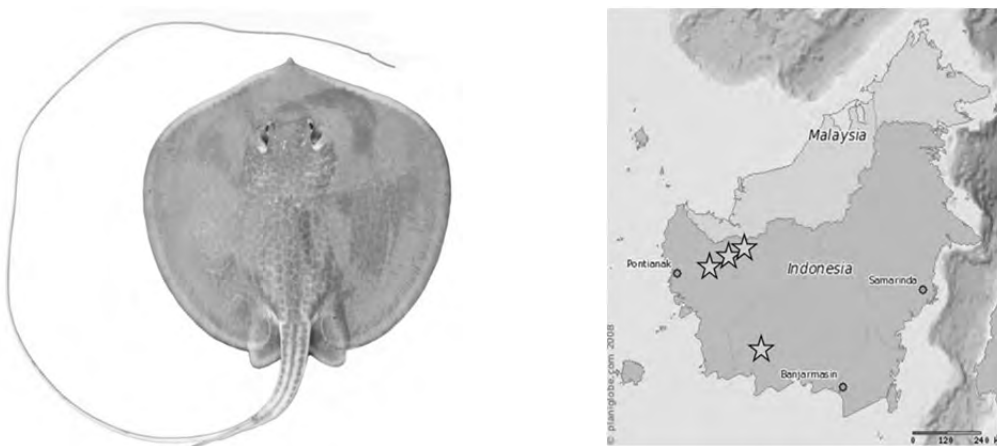


Fig.11. Distribution of *Himantura signifer* in Indonesia

Conservation status

Concerns regarding elasmobranch conservation have grown in the last decade, as the global catch trend has decreased. Indonesia itself is known as the country with the highest annual total catch of elasmobranchs in the world, which is of great concern due to the global alarm about the status of shark and ray resources. Many countries including Indonesia, have responded to the issue by implementing fisheries management to control elasmobranch exploitation. Indonesia produced the National Plan of Action (NPOA) for sharks in 2010. However, as of the present day, the NPOA is yet to be well implemented.

Previously, Indonesia has had many regulations related to the protection of marine biotas. In 1990, the government introduced a regulation related to the protection of marine biota, including sea turtles, marine mammals, black coral, coconut crabs and fossil fish Coelacanth. This regulation however, did not mention the protection of elasmobranchs. The only regulations related to the protection of elasmobranch species was one from the ministry of agriculture, No. 716/KPTS/Um/10/1980 and the 1999 government regulation No.7, which protects the sawfish (Pristidae), especially *Pristis microdon*, from Sentani Lake. Unfortunately, due to the lack of controls and effective communication in the field, these regulations were not well implemented. On the other hand, there is still a lack of species specific, catch data of elasmobranchs in Indonesia. This problem is the result of a lack of knowledge on species identification had by fisheries officers and also amongst the fishing community. Therefore, the NPOA for sharks was designed to enable better management through the gathering of accurate information and identifying the best methods by which to control the illegal and unregulated elasmobranch fishing that has occurred in this country. For the first five years, the NPOA aimed to produce better statistical catch data by species, raise the competency of fisheries officers enabling them to correctly identify species and to identify the most vulnerable species as targets for further conservation action. Moreover, the wise fishing practices seen in Indonesia must be effectively communicated to all stakeholders, especially to elasmobranch fishing practitioners, in order to implement sustainable fisheries in the future.

REFERENCES

- Allen, G. R., & Erdmann, M. V. (2008). Two new species of bamboo sharks (Orectolobiformes: Hemiscylliidae) from Western New Guinea. *aqua Special Publication*, 13(3-4), 93-108.
- Cavanagh, R. D., Kyne, P. M., Fowler, S. L., Musick, J. A., & Bennett, M. B. (Eds.). (2003). *The conservation status of Australasian chondrichthyans: Report of the IUCN Shark Specialist Group Australia and Oceania regional Red List workshop, Queensland, Australia*. Brisbane: The University of Queensland, School of Biomedical Sciences.
- Compagno, L. J. V. (1998). Sharks. In K. E. Carpenter & V. H. Niem (Eds), *Species identification guide for fishery purposes. The living marine resources of the western central Pacific. Cephalopods, crustaceans, holothurians and sharks* (Vol. 2, pp. 1193-1366). Rome: FAO.
- Compagno, L. J. V. (1999). Checklist of living elasmobranchs. In W. C. Hamlett (Ed), *Sharks, skates, and rays: the biology of elasmobranch fishes* (pp. 471-498). Baltimore: The Johns Hopkins University Press.
- Compagno, L.J.V. (2005). *Himantura signifer*. In: IUCN 2011. IUCN Red List of Threatened Species. Version 2011.2. <www.iucnredlist.org>. Downloaded on 2 April 2012.
- Compagno, L. J. V., Dando, M. & Fowler, S. L. (2005). *Sharks of the world*. New Jersey: Princeton University Press.
- Compagno, L. J. V., Last, P. R., Seret, B., & de Carvalho, M. R. (1999). Batoid fishes. In K. E. Carpenter & V. H. Niem (Eds), *Species identification guide for fishery purposes. The living marine resources of the western central Pacific. Batoid fishes, chimaeras and bony fishes part 1 (Elopidae to Loniphrinidae)* (Vol. 3, pp. 1398 - 1530). Rome: FAO.
- Compagno, L. J. V., & Roberts, T. R. (1982). Freshwater stingrays (Dasyatidae) of Southeast Asia and New Guinea, with description of a new species of *Himantura* and reports of unidentified species. *Env. Biol. Fish.*, 7(4), 321-339.
- Fahmi. (2010). Sharks and rays in Indonesia. *Marine Research in Indonesia*, 35(1), 43-54.
- Fahmi, & Adrim, M. (2009). The first record of a shark of the Genus *Glyphis* in Indonesia. *The Raffles Bulletin of Zoology*, 57(1), 113-118.

Fahmi, White, W., Manjaji, B.M., Vidthayanon, C., Badi, S. & Capuli, E. (2009). *Pastinachus solocirostris*. In: IUCN 2011. IUCN Red List of Threatened Species. Version 2011.2. <www.iucnredlist.org>. Downloaded on 2 April 2012.

Froese, R., & Pauly, D. (2008, Oct 2008). FishBase. *World Wide Electronic Publication* Retrieved 12 Dec 2008, from <http://www.fishbase.org>

Last, P. R., & Compagno, L. J. V. (1999). Dasyatidae: Stingrays. In K. E. Carpenter & V. H. Niem (Eds), *FAO Species Identification Guide for Fishery Purposes. The Living Marine Resources of the Western Central Pacific. Batoid Fishes, Chimaeras and Bony Fishes Part 1 (Elopidae to Linophrynidae)* (Vol. 3, pp. 1479-1505). Rome: FAO.

Last, P. R., Fahmi, & Naylor, G. J. P. (2010a). *Pastinachus stellurostris* sp. nov., a new stingray (Elasmobranchii: Myliobatiformes) from Indonesian Borneo. In P. R. Last, W. T. White & J. J. Pogonoski (Eds), *Descriptions of new sharks and rays from Borneo* (Vol. 032, pp. 129-140). Hobart: CSIRO Marine and Atmospheric Research Paper.

Last, P. R., & Manjaji-Matsumoto, B. M. (2008). *Himantura dalyensis* sp. nov., a new estuarine whiplay (Myliobatoidei: Dasyatidae) from northern Australia. In P. R. Last, W. T. White & J. J. Pogonoski (Eds), *Descriptions of new Australian chondrichthyans* (Vol. 022, pp. 283-291). Hobart: CSIRO Marine and Atmospheric Research.

Last, P. R., & Manjaji-Matsumoto, B. M. (2010). Description of new stingray, *Pastinachus gracilicaudus* sp. nov. (Elasmobranchii: Myliobatiformes), based on material from the Indo-Malay Archipelago. In P. R. Last, W. T. White & J. J. Pogonoski (Eds), *Descriptions of new sharks and rays from Borneo* (Vol. 032, pp. 115-128). Hobart: CSIRO Marine and Atmospheric Research Paper.

Last, P. R., Manjaji-Matsumoto, B. M., & Kailola, P. J. (2006a). *Himantura hortlei* n. sp., a new species of whiplay (Myliobatiformes: Dasyatidae) from Irian Jaya, Indonesia *Zootaxa*, 1239, 19-34.

Last, P. R., Manjaji, B. M., & Yearsley, G. K. (2005). *Pastinachus solocirostris* sp. nov., a new species of stingray (Elasmobranchii: Myliobatiformes) from the Indo-Malay Archipelago. *Zootaxa*, 1040, 1-16.

Last, P. R., Seret, B., & White, W. T. (2008). New swellsharks (*Cephaloscyllium*: Scyliorhinidae) from the Indo-Australian region. In P. R. Last, W. T. White & J. J. Pogonoski (Eds), *Descriptions of new Australian Chondrichthyans* (Vol. 022, pp. 129-146). Hobart: CSIRO Marine and Atmospheric Research Paper.

Last, P. R., & White, W. T. (2008a). Resurrection of the genus *Neotrygon* *Castelnau* (Myliobatoidei: Dasyatidae) with the description of *Neotrygon picta* sp. nov., a new species from northern Australia. In P. R.

Last, W. T. White & J. J. Pogonoski (Eds), *Descriptions of new Australian chondrichthyans* (Vol. 022, pp. 315-326). Hobart: CSIRO Marine and Atmospheric Research Paper.

Last, P. R., & White, W. T. (2008b). Three new angel sharks (Chondrichthyes: Squatinidae) from the Indo-Australian region. *Zootaxa*, 1734, 1-26.

Last, P. R., White, W. T., Caira, J. N., Dharmadi, Fahmi, Jensen, K., *et al.* (2010b). *Sharks and rays of Borneo*. Australia: CSIRO Publishing.

Last, P. R., White, W. T., & Fahmi. (2006b). *Rhinobatos jimbaranensis* and *R. penggali*, two new shovel-nose rays (Batoidea: Rhinobatidae) from eastern Indonesia. *Cybium*, 30(3), 261-271.

Manjaji, B. M., & Last, P. R. (2006). *Himantura lobistoma*, a new whiplay (Rajiformes: Dasyatidae) from Borneo, with comments on the status of *Dasyatis micropthalmus*. *Ichthyological Research*, 53, 290-297.

Manjaji, B.M., Last, P.R., Fahmi, White, W.T. (2009). *Himantura pastinacoides*. In: IUCN 2011. IUCN Red List of Threatened Species. Version 2011.2. <www.iucnredlist.org>. Downloaded on 2 April 2012.

Mould, B. (1997). Classification of the recent Elasmobranchii; A Classification of the Living Sharks and Rays of

- the World [Electronic Version], 178. Retrieved March 2007 from <http://ibis.nott.ac.uk/elasmobranch.html>.
- Vidthayanon, C., Baird, I. & Hogan, Z. (2011). *Himantura polylepis*. In: IUCN 2011. IUCN Red List of Threatened Species. Version 2011.2. <www.iucnredlist.org>. Downloaded on 2 April 2012.
- White, W. T., Compagno, L. J. V., & Dharmadi. (2009). *Hemitriakis indroyonoi* sp. nov., a new species of houndshark from Indonesia (Carcharhiniformes: Triakidae). *Zootaxa*, 2110, 41-57.
- White, W.T. & Couzens, G. 2009. *Squalus hemipinnis*. In: IUCN 2011. IUCN Red List of Threatened Species. Version 2011.2. <www.iucnredlist.org>. Downloaded on 2 April 2012.
- White, W.T., Fahmi & Dharmadi (2009). *Atelomycterus baliensis*. In: IUCN 2011. IUCN Red List of Threatened Species. Version 2011.2. <www.iucnredlist.org>. Downloaded on 2 April 2012.
- White, W. T., & Last, P. R. (2006). Description of two new species of smooth-hounds, *Mustelus widodoi* and *M. ravidus* (Carcharhiniformes: Triakidae) from the western central Pacific. *Cybium*, 30(3), 235-246.
- White, W. T., Last, P. R., & Dharmadi. (2005). Description of a new species of catshark, *Atelomycterus baliensis* (Carcharhiniformes: scyliorhinidae) from eastern Indonesia. *Cybium*, 29(1), 33-40.
- White, W. T., Last, P. R., Stevens, J. D., Yearsley, G. K., Fahmi, & Dharmadi. (2006). *Economically important sharks and rays of Indonesia*. Canberra: ACIAR.
- White, W. T., Last, P. R., & Yearsley, G. K. (2007). *Squalus hemipinnis* sp. nov, a new short-snout spurdog from eastern Indonesia. In P. R. Last, W. T. White & J. J. Pogonoski (Eds), *CSIRO Marine and Atmospheric Research Paper* (Vol. 014, pp. 101-108). Hobart: CSIRO Australia.