

SHARKS AND RAYS IN INDONESIA

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ABSTRACT

Indonesia is considered to have a high diversity of sharks and rays due in part to its position in the equatorial line, between two continents and two oceans. According to recent studies and various publications, the number of chondrichthyan species known to date is 207 species of 44 families, comprised of 109 species of sharks, 96 species of batoids, and two species of ghost sharks (chimaera). The Dasyatidae (stingrays) is the most speciose family of chondrichthyans occurring in Indonesia, followed by the Carcharhinidae (whaler sharks). Most species of elasmobranchs commonly occur on the continental or insular shelves and rays are more commonly found than sharks. This type of habitat can be found mostly in the western part of Indonesia (the Java Sea, Karimata Strait, South China Sea, Malacca Strait, and Macassar Strait). Due to the separation by the Wallace Line, there are some differences in species diversity between western and eastern region. The shark and ray fauna of the eastern region is more similar to the Australian fauna, while the fauna in the western region is more similar to the Asian fauna. There are also some endemic species known to occur in Indonesian waters. The endemism of some species can be restricted in a certain area or in a regional area such as the Indo-West Pacific.

Keywords: Shark, Ray, Diversity, Indonesia

INTRODUCTION

Studies on fish biodiversity, including sharks and rays, in Indonesia have been conducted since the early 19th Century. The first fish collections in Indonesia were conducted in Waigeo Island by the European explorers and naturalists using several French vessels from 1818 to 1826. One of those first collections was a black-tip reef shark, *Carcharhinus melanopterus* that was originally described from Waigeo by the French researchers. Other following studies were conducted by Dutch researchers until 1945 and some international expeditions during the 20th century (Allen and Adrim, 2003). Then, several international surveys of fishes in Indonesia were conducted in the late of the 20th Century such as Joint Eastern Tropical Indian Ocean Fishery Survey (JETINDOFISH) project in the early 1980's and the KARUBAR expedition in 1991 (White *et al.*, 2006). Those surveys also recorded and collected sharks and rays as a part of the collections.

The first study focusing on sharks and rays in Indonesia was carried out by Indo-Australian researchers from 2001 to 2006. The study was a

collaboration research between Indonesia and Australia in a project titled "Artisanal shark and ray fisheries in eastern Indonesia" funded by Australian Centre for International Agricultural Research (ACIAR). Other studies on elasmobranch fishes were conducted by researchers of Indonesian Institute of Sciences (LIPI) from 2003 to 2007 through Census of Marine Life Projects in Sumatra, Java, and Kalimantan, followed by a collaboration research between LIPI and NSF (National Science Foundation) in Kalimantan from 2006 to 2008.

A total of 137 species of chondrichthyans, consisting of 78 sharks, 56 rays, and 3 chimaeras were formally recorded to occur in Indonesian waters (White *et al.*, 2006). This number of species was based on the Indo-Australian surveys in eastern Indonesia including Java, Bali, Nusa Tenggara and Papua (Merauke). Fahmi and Adrim (2007) stated that 60 species of elasmobranchs consisting of 26 species of sharks and 34 species of rays (including stingrays, eagle rays, devil rays, shovelnose rays and guitarfishes) occurred in Kalimantan waters. Other publications also

Table 1. Type of habitats of sharks and rays in Indonesian waters based on Compagno (2002) and Last and Compagno (2002)

Type of Habitats	Code
Obligate Freshwater	FWO
Oceanic	OCE
Euryhaline freshwater/shelves	SHF
Continental/insular shelves	SHL
Shelf to oceanic	SHO
Shelf to slope	SHS
Continental/insular slopes	SLO
Slope to oceanic	SOC
Shelf to semi oceanic	SSO
Wide range of habitats	WRH

semi oceanic (SSO). Some carcharhinids, sphyrnids and all devil rays (Mobulidae) are categorized to this type of habitats. In Indonesia, those species can be found mostly in eastern Indonesia including the Indian Ocean, West Pacific Ocean, Banda Sea, Timor Sea, and sometimes in South China Sea, Sulawesi Sea, Flores Sea, Arafura Sea, Bali Sea, Molucca Sea, Seram Sea, and the Makassar Strait.

Some endemic species are also known to occur in Indonesian waters. The endemism of some species can be restricted in a certain area or in a regional area such as the Indo-West Pacific region. Most of the endemic fishes are demersal or deep water species with limited distribution. For

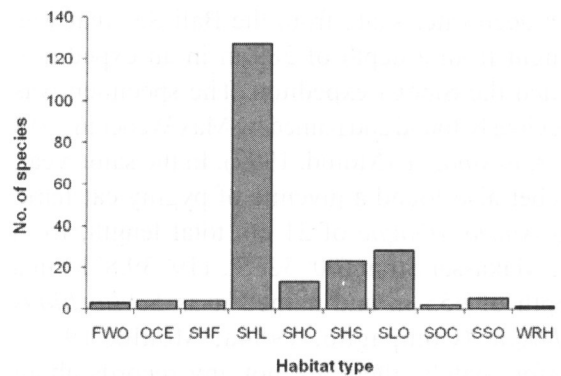


Figure 2. Total numbers of shark and ray species according to their type of habitat in Indonesia.

instance, two new species of bamboo sharks, *Hemiscyllium galei*, and *H. henryi* are apparently restricted to Cendrawasih Bay, Papua (Allen & Erdmann, 2008). Another endemic species, *Squalus hemipinnis*, presumably occurs in deep waters of eastern Indonesia only, from south of Java to south of Nusa Tenggara (White *et al.*, 2007). List of some endemic species in Indonesia is presented in Table 2.

Presently, some species on the list occurred in Indonesia (Appendix 1) might not exist anymore or are extinct due to the exploitation pressure. Several species were recorded based on old specimens in museums or from only a single specimen found. For example, *Fenestraja sibogae*

Table 2. List of endemic species and their distributions in Indonesia

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>Narcine</i> sp. D	south of Java and Bali	(White <i>et al.</i> , 2006)
<i>Fenestraja sibogae</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 lobistoma</i>	Borneo and Sumatra	(Manjaji and Last, 2006)
<i>Himantura pastinacoides</i>	Borneo (Kalimantan) and Sumatra	(White <i>et al.</i> , 2006)
<i>Pastinachus solocirostris</i>	Borneo (Kalimantan) and Sumatra	(Last <i>et al.</i> , 2005)
<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 and White, 2008)
<i>Hemiscyllium galei</i>	western New Guinea	(Allen and Erdmann, 2008)
<i>Hemiscyllium henryi</i>	western New Guinea	(Allen and 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>Mustelus widodoi</i>	south of Bali and Java	(White and Last, 2006)

is a deepwater skate from the Bali Sea that was caught from a depth of 289 m in an expedition called the Siboga expedition. The specimen was previously found and named by Max Weber in 1913 as *Raja sibogae* (Mould, 1997). In the same year, Weber also found a juvenile of pygmy catshark, *Apristurus sibogae* of 21 cm total length, from the Makassar Strait (00° 32' S., 119° 39.8' E) in a depth of 655 m and named it as *Scyliorhinus sibogae* (Compagno, 1984a; Mould, 1997). Unfortunately, there are not any records about those two species at the present time according to some recent studies in Indonesia.

A carcharhinid species, *Carcharhinus hemiodon* is a very rare shark and it was recorded from Java, Kalimantan and Sulawesi based on old specimens in the museums. This species has not been found or recorded for almost 30 years (Cavanagh *et al.*, 2003) and it is not recorded during the elasmobranch study from 2001 to 2008. This species is sometimes difficult to distinguish with other carcharhinids such as *Carcharhinus amblyrhynchoides*, *C. sorrah*, *C. limbatus* and *C. brevipinna*. Therefore, some people often found difficulty in identifying species and misidentifications have been made for species such as *C. hemiodon* due to their similar general characteristics such as black edge on fins and a present of dermal ridge between dorsal fins (Compagno, 1984b; Cavanagh *et al.*, 2003; Compagno *et al.*, 2005). Due to its rarity, *C. hemiodon* is categorized as Critically Endangered in the IUCN Red List of threatened species (Cavanagh *et al.*, 2003; Compagno *et al.*, 2005). Another carcharhinid shark, *Glyphis* sp. is a recent species that was recorded from only single specimen from Sampit Bay, Kalimantan in 2005 (Fahmi and Adrim, 2007; 2009). This species was assured to be a different species from another species, *Glyphis* sp.B which is recorded only occurs in Malaysian Borneo. Unfortunately, the *Glyphis* sp. from Sampit was not collected so that the status of this species remains uncertain.

DISCUSSION

According to Compagno (2002) and Last & Compagno (2002), some families of Elasmobranchs are only known to occur in the continental or insular shelves, most of them are batoids, such as Pristidae, Rhynchobatidae, Rhinobatidae, Narcidae, Torpedinidae, Urolophidae, Gymnuridae,

Myliobatidae and Rhinopteridae, while shark families occurring in this type of habitat are Hemiscyllidae and Hemigaleidae. Most dasyatids and carcharhinids are also occurring in this habitat, but some of them can live in other habitats such as freshwater, oceanic, and slopes. Therefore, rays are more common to be found in the continental shelves rather than sharks. In Indonesia, this type of habitat can be found mostly in the western part area such as the Java Sea, South China Sea, Karimata Strait, Malacca Strait, Sunda Strait, Bali Strait, and a part of Makassar Strait. While in the eastern Indonesia, the continental shelves habitat can be found in the Arafura Sea. However, there are some differences in species diversity between western and eastern region due to the separation by the Wallace Line. Most species from the Arafura Sea (eastern region) are similar to Australian species, while species in western region are characterized by Asian species. For instance, *Himantura pastinacoides*, *Pastinachus solocirostris* (Dasyatidae), and *Carcharhinus borneensis* (Carcharhinidae) only occur in the western region. On the other hand, *Dasyatis fluviatorum*, *Neotrygon picta* (Dasyatidae) and *Rhizoprionodon taylori* (Carcharhinidae) are only found in the eastern region. *N. picta* was previously known as Australian endemic species, but actually it was also caught from the Arafura Sea, eastern Indonesia (Figure 3). The finding of this species in Indonesian region is also a new record for its distribution.

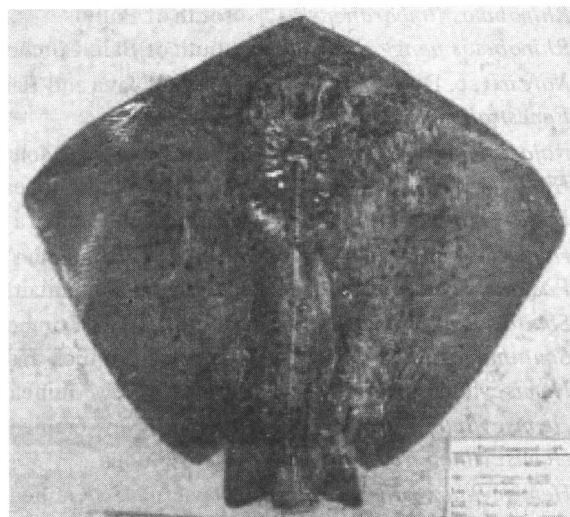


Figure 3. *Neotrygon picta*, a specimen collection of Research Centre for Oceanography, LIPI Jakarta (NCIP 6340).

A valid name of species is sometimes changed from time to time following the knowledge development. A latter description of particular species at the present time by using accurate measurements, new findings, comparisons and genetic analyses, sometimes lead to the decision to change or move the extant species name to another validated name. According to ICZN (1999), 'if a name in use for a taxon is found to be unavailable or invalid, it must be replaced by the next oldest available name from among its synonyms'. For instance, *Himantura bleekeri* was a scientific name for Bleeker's whipray. This species name has been used in many publications (Mould, 1997; Froese and Pauly, 2008; Widodo and Mahiswara, 2008). However, Manjaji (2004) indicated that the species was a synonym of *H. uarnacoides*, therefore the valid name for this species is *H. uarnacoides*. This change can be seen in Last & Compagno (1999, 2002) and White *et al.* (2006), where the English name for *H. uarnacoides* is Bleeker's whipray or whitenose whipray. Another dasyatid, *H. pareh* (Bleeker, 1852), is a species known to occur in Indonesia based on old specimen from Batavia (Mould, 1997). Manjaji (2004) considering that this species was a synonymy of *H. pastinacoides*. However, in the Fish Base list of species, both *H. bleekeri* and *H. pareh* were still listed together with their valid names, *H. uarnacoides* and *H. pastinacoides*, as different species (Froese & Pauly, 2008).

In conclusion, Indonesia is considered to have the highest shark and ray diversity in the world. The findings of new species and new records in many surveys indicated that the chondrichthyan diversity in Indonesia has not fully discovered yet. Therefore, studies on shark and ray diversity in Indonesia are still essential, especially in the eastern region such as Sulawesi, Maluku Islands, Papua, and island in Banda Sea and Flores Sea.

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Appendix 1. List of species of sharks and rays known to occur in Indonesian waters
(Type of habitats refers to Table 1.)

Family	Species	Type of Habitat
Pristidae	<i>Anoxypristis cuspidata</i>	SHL
Pristidae	<i>Pristis microdon</i>	SHL
Pristidae	<i>Pristis pectinata</i>	SHL
Pristidae	<i>Pristis zijsron</i>	SHL
Rhinidae	<i>Rhina ancylostoma</i>	SHL
Rhynchobatidae	<i>Platyrhina sinensis</i>	SHL
Rhynchobatidae	<i>Rhynchobatus australiae</i>	SHL
Rhynchobatidae	<i>Rhynchobatus springeri</i>	SHL
Rhynchobatidae	<i>Rhynchobatus</i> sp.1	SHL
Rhinobatidae	<i>Glaucostegus thouin</i>	SHL
Rhinobatidae	<i>Glaucostegus typus</i>	SHL
Rhinobatidae	<i>Rhinobatos jimbaranensis</i>	SHL
Rhinobatidae	<i>Rhinobatos penggali</i>	SHL
Rhinobatidae	<i>Rhinobatos schlegeli</i>	SHL
Rhinobatidae	<i>Aptychothrema</i> sp.	SHL
Hypnidae	<i>Hypnos monopterygium</i>	SHL
Narcinidae	<i>Narcine brunnea</i>	SHL
Narcinidae	<i>Narcine indica</i>	SHL
Narcinidae	<i>Narcine maculata</i>	SHL
Narcinidae	<i>Narcine prodorsalis</i>	SHL
Narcinidae	<i>Narcine timlei</i>	SHL
Narcinidae	<i>Narke dipterygia</i>	SHL
Narcinidae	<i>Narcine</i> sp.D	SHL
Torpedinidae	<i>Torpedo nobiliana</i>	SHL
Hexatrygonidae	<i>Hexatrygon bickelii</i>	SLO
Plesiobatidae	<i>Plesiobatis daviesi</i>	SLO
Plesiobatidae	<i>Plesiobatis</i> sp.	SLO
Rajidae	<i>Bathyraja andriashevi</i>	SLO
Rajidae	<i>Bathyraja tzinovskii</i>	SLO
Rajidae	<i>Fenestraja sibogae</i>	SHS
Rajidae	<i>Raja annandalei</i>	SLO
Rajidae	<i>Dipturus</i> sp.	SHS
Rajidae	<i>Dipturus johannisdavisi</i>	SHS
Rajidae	<i>Okamejei boesemani</i>	SHL
Rajidae	<i>Okamejei cf powelli</i>	SHS
Rajidae	<i>Okamejei cairae</i>	SHS
Anacanthobatidae	<i>Anacanthobatis borneensis</i>	SLO
Anacanthobatidae	<i>Anacanthobatis (Sinobatis) bulbicauda</i>	SLO
Urolophidae	<i>Urolophus javanicus</i>	SHL
Urolophidae	<i>Urolophus kaiaemus</i>	SHL
Urolophidae	<i>Urotrygon</i> sp.1	SHL
Urolophidae	<i>Trygonoptera</i> sp.1	SHL
Dasyatidae	<i>Taeniura lymma</i>	SHL
Dasyatidae	<i>Taeniurops meyeri</i>	SHL
Dasyatidae	<i>Dasyatis akajei</i>	SHL
Dasyatidae	<i>Dasyatis fluviorum</i>	SHL
Dasyatidae	<i>Dasyatis parvonigra</i>	SHL
Dasyatidae	<i>Dasyatis microps</i>	SHL
Dasyatidae	<i>Dasyatis zugei</i>	SHL

Appendix 1. *continued*

Family	Species	Type of Habitat
Dasyatidae	<i>Dasyatis</i> sp.1	SHL
Dasyatidae	<i>Himantura alcockii</i>	SHL
Dasyatidae	<i>Himantura astra</i>	SHL
Dasyatidae	<i>Himantura fai</i>	SHL
Dasyatidae	<i>Himantura gerrardi</i>	SHL
Dasyatidae	<i>Himantura granulata</i>	SHL
Dasyatidae	<i>Himantura hortlei</i>	SHL
Dasyatidae	<i>Himantura imbricata</i>	SHL
Dasyatidae	<i>Himantura jenkinsi</i>	SHL
Dasyatidae	<i>Himantura leoparda</i>	SHL
Dasyatidae	<i>Himantura lobistoma</i>	SHL
Dasyatidae	<i>Himantura oxyrhyncha</i>	FWO
Dasyatidae	<i>Himantura pastinacoides</i>	SHL
Dasyatidae	<i>Himantura polylepis</i>	SHF
Dasyatidae	<i>Himantura signifer</i>	FWO
Dasyatidae	<i>Himantura uarnak</i>	SHL
Dasyatidae	<i>Himantura uarnacoides</i>	SHL
Dasyatidae	<i>Himantura undulata</i>	SHL
Dasyatidae	<i>Himantura walga</i>	SHL
Dasyatidae	<i>Himantura cf walga</i>	SHL
Dasyatidae	<i>Himantura</i> sp. (fresh water stingray)	FWO
Dasyatidae	<i>Neotrygon cf annotata</i>	SHL
Dasyatidae	<i>Neotrygon kuhlii</i>	SHL
Dasyatidae	<i>Neotrygon leylandi</i>	SHL
Dasyatidae	<i>Neotrygon picta</i>	SHL
Dasyatidae	<i>Pastinachus atrus</i>	SHL
Dasyatidae	<i>Pastinachus gracilicaudus</i>	SHL
Dasyatidae	<i>Pastinachus solocirostris</i>	SHL
Dasyatidae	<i>Pastinachus stellurostris</i>	SHL
Dasyatidae	<i>Pteroplatytrygon violacea</i>	OCE
Dasyatidae	<i>Urogymnus asperrimus</i>	SHL
Gymnuridae	<i>Gymnura zonura</i>	SHL
Gymnuridae	<i>Gymnura poecilura</i>	SHL
Myliobatidae	<i>Aetobatus flagellum</i>	SHL
Myliobatidae	<i>Aetobatus ocellatus</i>	SHL
Myliobatidae	<i>Aetomylaeus maculatus</i>	SHL
Myliobatidae	<i>Aetomylaeus nichofii</i>	SHL
Myliobatidae	<i>Aetomylaeus vespertilio</i>	SHL
Myliobatidae	<i>Myliobatis tobijei</i>	SHL
Rhinopteridae	<i>Rhinoptera javanica</i>	SHL
Rhinopteridae	<i>Rhinoptera cf. neglecta</i>	SHL
Mobulidae	<i>Mobula eregoodootenkee</i>	SHO
Mobulidae	<i>Mobula japanica</i>	SHO
Mobulidae	<i>Mobula kuhlii</i>	SHO
Mobulidae	<i>Mobula tarapacana</i>	SHO
Mobulidae	<i>Mobula thurstoni</i>	SHO
Mobulidae	<i>Manta birostris</i>	SHO
Hexanchidae	<i>Heptranchias perlo</i>	SHS
Hexanchidae	<i>Hexanchus griseus</i>	SHS
Hexanchidae	<i>Hexanchus nakamurai</i>	SLO

Appendix 1. *continued*

Family	Species
Centrophoridae	<i>Centrophorus atromarginatus</i>
Centrophoridae	<i>Centrophorus cf. lusitanicus</i>
Centrophoridae	<i>Centrophorus isodon</i>
Centrophoridae	<i>Centrophorus moluccensis</i>
Centrophoridae	<i>Centrophorus niaukang</i>
Centrophoridae	<i>Centrophorus squamosus</i>
Centrophoridae	<i>Deania calcea</i>
Centrophoridae	<i>Deania quadrispinosum</i>
Dalatiidae	<i>Dalatias licha</i>
Dalatiidae	<i>Isistius brasiliensis</i>
Etmopteridae	<i>Etmopterus evansi</i>
Etmopteridae	<i>Etmopterus lucifer</i>
Etmopteridae	<i>Etmopterus pusillus</i>
Etmopteridae	<i>Etmopterus splendidus</i>
Somniosidae	<i>Zameus squamulosus</i>
Somniosidae	<i>Centroselachus crepidater</i>
Somniosidae	<i>Centroscymnus owstoni*</i>
Squalidae	<i>Cirrhigaleus barbifer</i>
Squalidae	<i>Squalus edmundsi</i>
Squalidae	<i>Squalus hemipinnis</i>
Squalidae	<i>Squalus montalbani</i>
Squalidae	<i>Squalus nasutus</i>
Mitsukurinidae	<i>Mitsukurina owstoni</i>
Squatinae	<i>Squatina legnota</i>
Squatinae	<i>Squatina sp.</i>
Ginglymostomatidae	<i>Nebrius ferrugineus</i>
Hemiscyllidae	<i>Chiloscyllium griseum</i>
Hemiscyllidae	<i>Chiloscyllium hasselti</i>
Hemiscyllidae	<i>Chiloscyllium plagiosum</i>
Hemiscyllidae	<i>Chiloscyllium indicum</i>
Hemiscyllidae	<i>Chiloscyllium punctatum</i>
Hemiscyllidae	<i>Hemiscyllium galei</i>
Hemiscyllidae	<i>Hemiscyllium henryi</i>
Hemiscyllidae	<i>Hemiscyllium ocellatum</i>
Hemiscyllidae	<i>Hemiscyllium freycineti</i>
Hemiscyllidae	<i>Hemiscyllium hallstromii</i>
Hemiscyllidae	<i>Hemiscyllium strahani</i>
Hemiscyllidae	<i>Hemiscyllium trispeculare</i>
Orectolobidae	<i>Orectolobus leptolineatus</i>
Orectolobidae	<i>Eucrossorhinus dasyapogon</i>
Rhincodontidae	<i>Rhincodon typus</i>
Stegostomatidae	<i>Stegostoma fasciatum</i>
Megachasmidae	<i>Megachasma pelagios</i>
Pseudotriakidae	<i>Pseudotriakis microdon</i>
Alopiidae	<i>Alopias pelagicus</i>
Alopiidae	<i>Alopias superciliosus</i>
Lamnidae	<i>Isurus oxyrinchus</i>
Lamnidae	<i>Isurus paucus</i>
Odontaspidae	<i>Carcharias taurus</i>
Odontaspidae	<i>Odontaspis ferox</i>

*W. White (pers. comm.)

Appendix 1. *continued*

Family	Species	Type of Habitat
Pseudocarchariidae	<i>Pseudocarcharias kamoharai</i>	OCE
Scyliorhinidae	<i>Apristurus platyrhynchus</i>	SLO
Scyliorhinidae	<i>Apristurus sibogae</i>	SLO
Scyliorhinidae	<i>Apristurus spongiceps</i>	SLO
Scyliorhinidae	<i>Atelomycterus baliensis</i>	SHL
Scyliorhinidae	<i>Atelomycterus marmoratus</i>	SHL
Scyliorhinidae	<i>Cephaloscyllium cooki</i>	SHS
Scyliorhinidae	<i>Cephaloscyllium pictum</i>	SHS
Scyliorhinidae	<i>Halaelurus maculosus</i>	SHL
Scyliorhinidae	<i>Parmaturus lanatus</i>	SLO
Scyliorhinidae	<i>Scyliorhinus garmani</i>	SHL
Proscylliidae	<i>Proscyllium habereri</i>	SHL
Triakidae	<i>Hemitriakis indroyonoi</i>	SHS
Triakidae	<i>Iago garricki</i>	SHS
Triakidae	<i>Mustelus cf. manazo</i>	SHL
Triakidae	<i>Mustelus widodoi</i>	SHL
Triakidae	<i>Mustelus sp.</i>	SHL
Hemigaleidae	<i>Chaenogaleus macrostoma</i>	SHL
Hemigaleidae	<i>Hemigaleus microstoma</i>	SHL
Hemigaleidae	<i>Hemipristis elongata</i>	SHL
Hemigaleidae	<i>Paragaleus tengi</i>	SHL
Carcharhinidae	<i>Carcharhinus albimarginatus</i>	SSO
Carcharhinidae	<i>Carcharhinus altimus</i>	SHS
Carcharhinidae	<i>Carcharhinus amblyrhynchoides</i>	SHL
Carcharhinidae	<i>Carcharhinus amblyrhynchos</i>	SHL
Carcharhinidae	<i>Carcharhinus amboinensis</i>	SHL
Carcharhinidae	<i>Carcharhinus borneensis</i>	SHL
Carcharhinidae	<i>Carcharhinus brevipinna</i>	SHL
Carcharhinidae	<i>Carcharhinus dussumieri</i>	SHL
Carcharhinidae	<i>Carcharhinus falciformis</i>	SHO
Carcharhinidae	<i>Carcharhinus hemiodon</i>	SHL
Carcharhinidae	<i>Carcharhinus leucas</i>	SHF
Carcharhinidae	<i>Carcharhinus limbatus</i>	SHL
Carcharhinidae	<i>Carcharhinus longimanus</i>	SHO
Carcharhinidae	<i>Carcharhinus maccloti</i>	SHL
Carcharhinidae	<i>Carcharhinus melanopterus</i>	SHL
Carcharhinidae	<i>Carcharhinus obscurus</i>	SHS
Carcharhinidae	<i>Carcharhinus plumbeus</i>	SHS
Carcharhinidae	<i>Carcharhinus sealei</i>	SHL
Carcharhinidae	<i>Carcharhinus sorrah</i>	SHL
Carcharhinidae	<i>Galeocerdo cuvier</i>	SSO
Carcharhinidae	<i>Glyphis glyphis</i>	SHF
Carcharhinidae	<i>Glyphis sp.</i>	SHF
Carcharhinidae	<i>Lamiopsis tephrodes</i>	SHL
Carcharhinidae	<i>Loxodon macrorhinus</i>	SHL
Carcharhinidae	<i>Negaprion acutidens</i>	SHL
Carcharhinidae	<i>Prionace glauca</i>	SHO
Carcharhinidae	<i>Rhizoprionodon acutus</i>	SHL
Carcharhinidae	<i>Rhizoprionodon oligolinx</i>	SHL
Carcharhinidae	<i>Rhizoprionodon taylori</i>	SHL

Appendix 1. continued

Family	Species	Type of Habitat
Carcharhinidae	<i>Scoliodon macrorhynchus</i>	SHL
Carcharhinidae	<i>Triaenodon obesus</i>	SHL
Sphyrnidae	<i>Eusphyrna blochii</i>	SHL
Sphyrnidae	<i>Sphyrna lewini</i>	SSO
Sphyrnidae	<i>Sphyrna mokarran</i>	SSO
Sphyrnidae	<i>Sphyrna zygaena</i>	SSO
Chimaeridae	<i>Chimaera argiloba</i>	SHS
Chimaeridae	<i>Hydrolagus cf lemures</i>	SLO