





Overview of Sabah's Sharks and Rays Based on Fish Market Surveys 1996-2018

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Outline of presentation



Relevance of the study for the future of shark and ray fisheries, conservation and tourism in Sabah







Elasmobranch studies in Sabah

1996-1997

 Sabah Elasmobranch Biodiversity Darwin Project



1999-2004

• similar study covering Malaysia (Sabah, Sarawak, and Peninsula Malaysia) and Brunei (Yano *et al.*, 2005)

2002-2004



2016-2019

 Sabah Elasmobranch Biodiversity Monitoring and Assessment SOSF Project

2014

• Malaysia NPOA-Shark Plan 2

2006

• Malaysia NPOA-Shark Plan 1









Elasmobranch Biodiversi and Management in Sab

A collaborative project between the Fisheries Sabah and the IUCN Shark liaison with WWF Malaysia and Univ funded by the UK government Darw Survival of Species. The IUCN Species Survival Commission

Elasmobranch Biodiversity, Conservation and Management

Proceedings of the International Seminar and Workshop, Sabah, Malaysia, July 1997

Edited by Sarah L. Fowler, Tim M. Reed and Frances A. Dipper



Occasional Paper of the IUCN Species Survival Commission No. 25



save our seas

foundation

Elasmobranch Biodiversi and Assessment in Sabal

A project of the Borneo Marine Rese Universiti Malaysia Sabah, funded b Foundation. <u>www.saveourseas.com</u>







Elasmobranch abundance in Sabah: 20 years on

1996-1997

Sabah Elasmobranch Biodiversity Darwin Project

2016-2019

• Sabah Elasmobranch Biodiversity Monitoring and Assessment SOSF Project







Data collection and Data analyses

- Fish market surveys by researchers and enumerators
- Vouchers (whole and/or tissue samples) in collection
- Photographs, video
- Identification of taxa to lowest level i.e. species; genus e.g. finned sharks
- Data storage: physical storage of the raw data material and digital format
- Rapid Fisheries Assessment by Market Survey (RFAMS) for assessing catch composition at fish landing sites and markets in the circumstances where no detailed data collection protocols exist (White et al. 2014).
- However, they stopped short of explaining how the log abundance estimate data is analysed.
- In this present study, the abundance data is analysed based on ecological approach.







Total: 95 species

Results: species biodiversity



Sizes not proportional







Additional species:

?New records – 3 species of coral catsharks



vagrants/ accidental species- stingrays







Results: rank abundance curves

- **Species abundances** based on # individuals per species
- Log abundance estimates



Log scale index of abundance
0 = 0
1 = 1
2 = 2 - 3
3 = 4 - 9
4 = 10 - 27
5 = 28 - 80

Notes: rank abundance plots provide a graphical summary of species evenness and richness

- 1. Market survey data are predominantly from trawl fisheries.
- 2. Data for selected species only; taxonomic groupings based on:
- a. family level (sharks), and
- b. ecomorphotype (rays)
- 2. Proportional abundance relative abundance of species

3. Trophic level (TRL) values extracted from FishBase (i.e. the values of trophic levels are set as one (1) in plants and detritus, two (2) in herbivores and detritivores (primary consumers), three (3) in secondary consumers, four (4) in tertiary consumers, and five (5) apex predators).







Sharks

- 1. Zebra shark
- 2. Bamboosharks
- 3. Catsharks
- 4. Weasel sharks
- 5. Whaler sharks
- 6. Hammerheads



Rays

- 1. demersal shark-like batoids (wedgefishes and guitarfishes)
- 2. demersal stingrays (flat-bodied stingrays small to medium-sized species)
- 3. demersal stingrays (flat-bodied stingrays- large-sized species)
- 4. inshore bentho-pelagic
- 5. offshore pelagic









Sandakan fish market (July 1996)





Pateobatis uarnacoides Pastinachus ater Abundance Class: 4 (10-27)

Hemigaleus microstoma

Carcharhinus spp.

Abundance Class: 3

Abundance Class: 4

Abundance Class: 3 (4-9)







Kota Kinabalu fish market (Sept 2016; Dec 2017)



Three full fish bins of Coral Catshark *Atelomycterus marmoratus*, Brownbanded Bambooshark *Chiloscyllium punctatum*, and Whitespotted Bambooshark *C. plagiosum*



A large cut-up devilray, and fitted into three fish bins







Comparison between sharks and rays: 1996-2018





Α

- Sharks are dominated by two of six taxa groups: hammerheads and whaler sharks
- Rays are dominated by three of the five taxa groups: all three are demersal species

В

- Sharks are dominated by two of six taxa groups: catsharks and bamboosharks
- Rays are dominated by one of the five taxa groups: demersal species (small to medium-sized and flat-bodied batoids)







Comparison between sharks: 1996-2018



- Sharks are presently dominated by catsharks and bamboosharks; 20 years ago, dominated by hammerheads and whalers
- TrL: 4.1 (Atelomycterus marmoratus); 4.0-4.1 (Chiloscyllium plagiosum, C. punctatum)
- TrL: 4.1 (Sphyrna lewini); 4.0-4.2 (medium-sized Look-alike sharks: Carcharhinus spp.)







Comparison between rays: 1996-2018



- Rays were (20 years ago) and are presently dominated by demersal species (small to medium-sized and flat-bodied batoids); however, their relative abundance has increased from 0.3 to 0.6 (log abundance estimate of 5 to 6), and presently dominated by "demersal stingrays (flat-bodied stingrays - small to medium-sized species)"
- Conversely, the relative abundance of all the other four taxa groups decreased between 0.04 and 0.19 rank 15







Musick (1995):

- in a **mixed-species fishery** where all species are subject to the same fishing effort and similar fishing mortality rates, less abundant species subjected to fishing activity throughout their range could be driven to extinction, while numerically dominant species continue to support the fishery.
- Species caught extensively as bycatch may be, indirectly, even more vulnerable than target species taken in a mixed fishery, because discards and landings are generally poorly monitored and signs of declining catches and collapsing stocks may thus be overlooked.

Hall (1999):

- 'unsustainable by-catches' are species that are not currently at risk but if they persist being by-catches, the population would decline.
- 'critical by-catches' are by-catches of species that are in danger of extinction which would refer to the Scalloped Hammerhead and Zebra Shark.







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