



Australian Government

Australian Centre for
International Agricultural Research

Final report

Project full title

Extension activities for PNG's shark fishery

project ID

FIS/2018/150

date published

3/10/2019

prepared by

William White (CSIRO)

*co-authors/
contributors/
collaborators*

Colin Simpfendorfer (JCU)
Simon Vieira (doMar)
Sharon Appleyard (CSIRO)
Benthly Sabub (NFA)
Leontine Baje (NFA)
Andrew Chin (JCU)

approved by

Ann Fleming

final report number

N/A

ISBN

N/A

published by

ACIAR
GPO Box 1571
Canberra ACT 2601
Australia

This publication is published by ACIAR ABN 34 864 955 427. Care is taken to ensure the accuracy of the information contained in this publication. However ACIAR cannot accept responsibility for the accuracy or completeness of the information or opinions contained in the publication. You should make your own enquiries before making decisions concerning your interests.

© Australian Centre for International Agricultural Research (ACIAR) 2019 - This work is copyright. Apart from any use as permitted under the *Copyright Act 1968*, no part may be reproduced by any process without prior written permission from ACIAR, GPO Box 1571, Canberra ACT 2601, Australia, aciarc@aciarc.gov.au.

Contents

1	Acknowledgments	3
2	Executive summary	4
3	Background.....	5
4	Objectives	6
5	Methodology	7
6	Achievements against activities and outputs/milestones	8
7	Key results and discussion	9
8	Impacts	10
8.1	Scientific impacts – now and in 5 years	10
8.2	Capacity impacts – now and in 5 years	10
8.3	Community impacts – now and in 5 years	10
8.4	Communication and dissemination activities	10
9	Conclusions and recommendations	12
9.1	Conclusions.....	12
9.2	Recommendations	12
10	References	13
10.1	References cited in report.....	13
10.2	List of publications produced by project.....	13
11	Appendixes	14
11.1	Appendix 1:	14

1 Acknowledgments

We wish to thank Ian Macleod and the team at Cinematic Experiences for producing the fantastic project video as well as Ella Kennedy and Frederique Olivier for filming interview sequences in Hobart. We also thank Ms Helen O'Neill (CSIRO) and Michael Grant (JCU) for providing comments on poster drafts, and to Melissa Joyce (JCU) for developing the website template.

We are grateful to Dr Ann Fleming (manager of ACIAR's Fisheries Program) and to CSIRO senior managers Drs Alistair Hobday, Andrew Young and Leo Joseph for their support of this project.

2 Executive summary

A previous ACIAR project which investigated the shark and ray resources of PNG (FIS/2012/102) generated a large number of scientific outputs ranging from biodiversity lists, to ecological studies and demographic models, to socio-economic analyses and a policy brief. However, only limited outreach to the broader general audience and the communities was achieved in that project. The current project focused on generating outreach and communication material to convey the scientific results of the previous project to a more general audience and to support the PhD candidature of a key PNG team member.

This project provided support for the completion of Leontine Baje's PhD study on the shark resources of the Gulf of Papua. Commencing as a Masters student in Australia in 2015 through a John Allwright Fellowship, Leontine successfully upgraded to a PhD in 2017. This project supports the remaining 12 months of Leontine's PhD which will provide a significant capability boost to NFA upon her return.

The project generated 3 pamphlets and 6 posters to convey the major findings of FIS/2012/102 to a wider audience. The pamphlets were: shark fisheries in PNG and need for management; sawfish and river sharks in PNG; and shark fishing in the Louisiade Archipelago. The posters were: overall shark biodiversity; overall ray biodiversity; sharks caught in longline fisheries; sharks and rays caught in trawl fisheries; sharks and rays caught in Milne Bay coastal fisheries; and new species of sharks and rays described during the project. Printed copies and soft copies of each pamphlet and poster were provided to NFA for dissemination.

A project video was produced to communicate the aims and main findings of the shark and ray research conducted in PNG by ACIAR. The 4:35 min video has been made available to NFA and ACIAR for dissemination to a wider audience. Such videos are beneficial for NFA and ACIAR to highlight to the general audience the importance of collaborative research being undertaken on capture fisheries in PNG.

A draft website was developed to capture the information provided in the Sharks and Rays of PNG book which was one of the major outputs of FIS/2012/102 being published in 2018. The website provides a more accessible medium for users to identify and learn about the shark and ray biodiversity in PNG as well as read information on the ecology, utilisation and conservation status of the species. It also importantly provides a mechanism to keep the biodiversity information for sharks and rays up to date with any taxonomic changes being updated and any additional species being added as found. The website combined with the printed book will help improve identification of shark and ray resources which will lead to improved fisheries assessments in the future, as well as aid training of data collectors.

3 Background

This SRA follows on from a 4-year fisheries project in PNG entitled “Sustainable management of the shark resources of Papua New Guinea: socioeconomic and biological characteristics of the fishery” (FIS/2012/102). This project generated significant scientific outputs including more than 20 international journal articles and one book, as well as supporting 4 students. However, the project did not generate outreach and communication materials to showcase the research that has been done for a more general audience. Much of the research undertaken was made possible by the willingness of communities to assist with our surveys etc, so having educational material such as posters and pamphlets is highly beneficial. Also, the National Fisheries Authority-PNG are keen to obtain materials such as posters that they can hand out to visitors and interested parties, particularly during publicity events. Providing education material for school aged children has flow on community education effects.

One of the successes of the FIS/2012/102 project was obtaining a John Allwright Fellowship for an NFA staff member, Leontine Baje in 2014 to undertake a Masters study at James Cook University in Townsville. In 2017 Leontine successfully upgraded her Masters to a PhD, a significant outcome as she will be the first NFA staff member to obtain a PhD. Her extension was made possible by a 12-month Schlumberger Foundation grant, but she required additional funds to allow for her completion year in the 2018/2019 FY. This project provided the additional funds necessary to cover the extra costs associate with this extension to ensure Leontine can complete her PhD.

4 Objectives

1. Support the PhD candidature of Leontine Baje to provide a significant boost to NFA's scientific expertise in a range of fisheries related research area.
2. Generate outreach and communication material for dissemination to fisheries agencies and to a general audience
3. Extend the longevity and widen the audience of the shark and ray biodiversity research presented in the recently published Sharks and Rays of Papua New Guinea

5 Methodology

Six posters and three pamphlets were generated using key findings and media from the previous project. Adobe InDesign was used to produce these outreach materials. Printed copies (100 of each poster, 400 of each pamphlet) were provided to NFA for dissemination as well as high quality pdfs for additional printing to be undertaken if needed.

A project video, relating to FIS/2012/102 was produced by Cinematic Experiences using high definition video collected during the previous project and stock footage from that company to highlight the collaborative work between NFA and Australian partner agencies through ACIAR funded work on the shark and ray resources of PNG. Interviews with key project staff, Simon Vieira, Colin Simpfendorfer, Leontine Baje and William White, were included in the video. The video was supplied to ACIAR and NFA for dissemination.

A website template was produced using a Wix platform through JCU. The website focused on making the keys to family and genera easily available (as pdfs) and creating templates for all of the orders of sharks and rays. Species pages were also developed for the Myliobatiformes (36 species).

Funds were transferred to JCU for Leontine Baje to cover her expenses for the final period of her PhD studies to ensure she completes a high-quality PhD. Project staff (Colin, Andrew, Will) worked with Leontine to assist with ensuring all data chapters are of the quality to be published in high quality international journals.

6 Achievements against activities and outputs/milestones

Objective 1: Support the PhD candidature of Leontine Baje to provide a significant boost to NFA's scientific expertise in a range of fisheries related research area

no.	activity	outputs/ milestones	completion date	comments
1.1	Provide financial support for the final 8 months of Leontine Baje's PhD thesis at James Cook University in Townsville	Resources provided to JCU	August 2018	complete
1.2	Provide mentoring and guidance for Leontine's thesis chapters to facilitate publication in high quality international journals	1 paper published in PLoS One and 1 in Pacific Conservation Biology; 2 more near completion	Thesis due August 2019	

PC = partner country, A = Australia

Objective 2: Generate outreach and communication material for dissemination to fisheries agencies and to a general audience

no.	activity	outputs/ milestones	completion date	comments
2.1	Generate pamphlets for A) livelihoods - Louisiade case study; B) sawfishes and river sharks; and C) shark utilisation and the need for proper management.	Three pamphlets completed (A4, tri-fold type) and hard and soft copies provided to NFA	May 2019	400 printed copies of each and high resolution pdf provided to NFA
2.2	Posters – Generate posters for A) overall shark composition; B) A) overall ray composition; C) prawn trawl species; D) longline species; E) Milne Bay key species; F) new species discovered in PNG	Six posters produced (A2) and hard and soft copies provided to NFA	May 2019	100 printed copies of each and high resolution pdf provided to NFA
2.3	Project video – Generate a short project video to highlight the projects aims and outputs	A project video (duration 4:35) generated to showcase FIS/2012/102 project aims and findings https://youtu.be/qQOFB74yH_E	June 2019	Video provided to ACIAR and NFA

PC = partner country, A = Australia

Objective 3: Extend the longevity and widen the audience of the shark and ray biodiversity research presented in the recently published Sharks and Rays of Papua New Guinea

no.	Activity	outputs/ milestones	completion date	comments
2.1	Design a sharks and rays of PNG website using information from the recently published book	Website template produced https://www.sharksraysPNG.org	July 2019	Template website produced with aim to continue to expand content over time. Expansion of the content for the website will be continued by CSIRO beyond this project

7 Key results and discussion

The key results in terms of outputs are detailed in Section 6 above. The following summarises additional key information.

Leontine's PhD journey has been a key outcome in both this SRA and in the original project FIS/2012/102. Leontine was instrumental in activating the training workshops and subsequent rapid deployment of observers on the longline vessels in early 2014. This was critical because it turned out to be the final fishing trip in the shark longline fishery before it ceased in July 2014 which would have severely reduced our project data. Her success led her application for the John Allwright Fellowship so early in the project which she was successful in obtaining. She then made the tough choice of moving to Townsville away from her 4 young children in the hope of making a better future for her family. She progressed through her Masters so efficiently that she successfully upgraded to a PhD which is due for completion in September 2019. Leontine will be the first NFA staff member to have attained a PhD level qualification. This is a significant capability boost for both NFA and PNG in general. She is a strong role model for early career researchers in PNG, particularly women.

The recent restructure of NFA has reduced capacity for their staff to contribute to fisheries projects with focus placed on core agency issues. In this SRA project, we were careful not to add to the burden of NFA staff but to focus on producing outreach material that NFA can use into the future and to showcase a highly successful project. The posters and pamphlets were delivered to NFA in hard and soft copy forms so they can control their dissemination. The project video (https://youtu.be/qQOFB74yH_E) was also generated to highlight the successful collaborative project FIS/2012/102 and to provide information about NFA and ACIAR's work to a more general audience.

The website template has provided a user friendly platform to host the biodiversity information provided in the Sharks and Rays of PNG book produced in FIS/2012/102. The website will allow for additional shark and ray species to be added in as found as well as providing up-to-date names for all the species found in PNG if any changes occur. This is one of the downfalls of hard copy books, although they in themselves are important for use in the field and where internet access is not reliable. Examples of pages on the website (<https://www.sharksraysPNG.org>) are provided in Appendix 11.3.

8 Impacts

8.1 Scientific impacts – now and in 5 years

Improved identification of sharks and rays in PNG - facilitated primarily by the website and to a lesser extent the posters. This will lead to improved fisheries assessments in the future and likely reduce inaccurate identifications which were documented in the observer data during the previous project.

8.2 Capacity impacts – now and in 5 years

Providing the resources for Leontine to complete her PhD will have the most significant capacity impact. Being the first NFA staff member to attain PhD qualification is a substantial boost to PNG's scientific capability and the mentoring that can come from her learnings. The inspirational story of her journey will also have a long-lasting impact and will provide motivation for junior staff and future staff entering this workforce.

The shark and ray website will provide an additional capacity tool for improving species identification of sharks and rays in PNG which will reach a wider audience than the book.

8.3 Community impacts – now and in 5 years

Providing accessible outreach materials to a general audience, including in communities where the data was obtained (like Milne Bay Province), informs more people of the reason for good fisheries management and the need for sustainable management options. This is important as one of the key socio-economic findings of the previous project is that community-level fisheries management is likely the only, or at least major, option for managing shark and ray fisheries in the more remote areas.

8.3.1 Economic impacts

Improving sustainable management of fisheries ensures those resources are available for future generations. That form of economic stability is essential for communities who rely on fisheries resources.

8.3.2 Social impacts

The outreach materials (pamphlets, posters, video and website) will hopefully reach the younger generations inspiring more interest in the amazing marine biodiversity of PNG and potentially generate more interest in the fisheries space by students.

Leontine's PhD journey is likely to empower younger generations, particularly females, and provide them with a vision of what successes can be achieved through hard work. This could lead to a more invigorated workforce in the future.

8.3.3 Environmental impacts

Improving species identifications will improve data quality in PNG fisheries which in turn, over the longer term, will result in improved fisheries management. This will have positive influences on biodiversity conservation through improved management of fisheries.

8.4 Communication and dissemination activities

The main outputs of this project were the communication materials produced. NFA is in full control of dissemination of the pamphlets and posters, with copies also sent to colleagues at UPNG. The project video was supplied to NFA and ACIAR for dissemination

as required. The website is available for anyone to access freely and will continue to be updated to include all species in the Sharks and Rays of PNG book.

9 Conclusions and recommendations

9.1 Conclusions

Outreach and communication materials are an important addition to the scientific output produced from research projects. They reach a far wider audience and can assist engagement with local communities who we rely on so heavily for the data we collect. Funding projects such as these to produce outreach materials are important as local capacity to produce this material is not always available. NFA like distributing posters and pamphlets to the wider audience as it is far more accessible than scientific papers.

9.2 Recommendations

Project videos are a great source of outreach. Cinematic Sciences are a trusted video production company who have done several now for ACIAR. Given that each project generates stock footage and extra interview material, it is worth considering all fisheries projects using this company early on in a project since a lot of media is already available and they are a trusted source.

10References

10.1 References cited in report

nil

10.2 List of publications produced by project

There have been no publications from this SRA, however, the following publications relating to the previous project FIS/2012/102 have been published since July 2018:

- Baje, L., Smart, J.J., Chin, A., Simpfendorfer, C.A. & White, W.T. (2018) Age, growth and maturity of the Australian Sharpnose Shark *Rhizoprionodon taylori* from the Gulf of Papua. *PLoS One* 13(10): 1-17
- Baje, L., Smart, J.J., Grant, M.I., Chin, A., White, W.T. & Simpfendorfer, C.A. (2019) Age, growth and maturity of the Australian blackspot shark *Carcharhinus coatesi* in the Gulf of Papua. *Pacific Conservation Biology* <https://doi.org/10.1071/PC18069>
- Green, M.E., Appleyard, S.A., White, W.T., Tracey, S., Devloo-Delva, F. & Ovenden, J.R. (2019) Novel multimarker comparisons address the genetic population structure of silvertip sharks (*Carcharhinus albimarginatus*). *Marine and Freshwater Research* 70: 1007-1019
- Smart, J.J., Punt, A.E., Espinoza, M., White, W.T. & Simpfendorfer, C.A. (2018) Refining mortality estimates in shark demographic analyses: a Bayesian inverse matrix approach. *Ecological Applications* 28(6): 1520-1533.
- White, W.T., Baje, L., Appleyard, S.A., Chin, A., Smart, J.J. & Simpfendorfer, C.A. (in press) The shark longline fishery of Papua New Guinea: size and species composition and spatial variation of the catches. *Marine & Freshwater Research*
- White, W.T., Baje, L., Simpfendorfer, C.A., Appleyard, S.A., Chin, A., Sabub, B., Rochel, E. & Naylor, G.J.P. (2019) Elasmobranch bycatch in the demersal prawn trawl fishery in the Gulf of Papua, Papua New Guinea. *Scientific Reports* 9:9254

11 Appendixes

11.1 Appendix 1: Pamphlets produced for NFA

11.1.1 Shark fisheries in PNG

Coastal fisheries

Although small scale compared to the commercial fisheries, the combined catches from coastal fisheries can be substantial. In PNG, the shark catches in coastal fisheries is poorly understood.

The coastal fisheries vary by region and location. In the Western Province, the main coastal fishery which catches sharks is the gillnet fishery for barramundi and jewfish. In the Milne Bay Province, drop (drum) lines are used by some fishers to target sharks for their fins. In northern New Ireland, sharks are typically not targeted nor considered a desirable catch.

The combined shark catch in coastal fisheries is not known but is likely far more substantial than currently considered. Given that the dynamics of the coastal fisheries vary by region, detailed information from each of the provinces is required.



Bull Shark landed at the mouth of the Sepik River

Shark utilisation

Sharks are utilised for their meat and fins, and to a lesser extent their skins, jaws, and rostrum (in sawfish). The most lucrative product from sharks is their fins. The fins are dried and exported to places like Taiwan, Singapore and China for their use in shark-fin soup.

Shark meat can be an important protein source in some areas. In some locations however, shark meat is not considered good quality and only fins are retained.



Dried shark fins at a fin dealer in Buka, Bougainville

The information in this pamphlet was collected during a project led by PNG's National Fisheries Authority entitled "Sustainable management of the shark resources of Papua New Guinea: socioeconomic and biological characteristics of the fishery" between 2014 and 2018.



Shark Fisheries in Papua New Guinea



Shark fisheries

Sharks are caught in a variety of fisheries in PNG, e.g. longline, purse seine, demersal trawl and coastal fisheries. Although mostly taken as bycatch, several fisheries do target sharks.

Shark longline fishery

In the 1990s, some longline vessels, which traditionally target tuna, began targeting sharks. As a result, NFA developed a Shark Management Plan in 2002 to regulate the catches of sharks in PNG. This plan allowed for 9 licensed vessels to operate with a Total Allowable Catch for the fishery of 2,000 tonne (carcass weight) per year.

The most abundant species caught in this fishery was the Silky Shark. This species contributed to more than 80% of the catches.

This fishery ceased in July 2014 following a ruling by the Western Central Pacific Fisheries Commission that Silky Sharks were to become a no-take species. This was based on recent stock assessments for Pacific populations.



Silky Shark caught in the target shark longline fishery

Tuna longline fishery

Vessels operating as tuna longliners operate under the Tuna Management Plan. This plan prevents retention of sharks or their fins. Catches of sharks in this fishery are far less than the number caught in the target shark fishery. The main species caught are Blue Sharks and Silky Sharks.



Blue Shark bycatch in the tuna longline fishery

Purse seine fishery

The PNG purse seine fishery has an intensive observer program providing detailed data on the target and non-target species caught.

The most common sharks in the bycatch are juvenile Silky Sharks and Oceanic Whitetip Sharks. Whale Sharks are also occasionally caught and released alive. Manta and devilrays are also commonly caught in purse seine nets.

Non-target species are caught far less than the target species - tunas.

Prawn trawl fishery

The Gulf of Papua prawn fishery is the only trawl fishery in PNG. Sharks and rays are commonly present in the bycatch. A total of 42 species of sharks and rays are known to be caught in this fishery.

The most common sharks caught in this fishery are Australian Sharpnose, Australian Blackspot, Scalloped Hammerhead and Australian Weasel sharks. The most common rays caught are the Australian Butterfly Ray and Blackspotted Whipray.



Typical catch from a trawl set in the Gulf of Papua



Bycatch of Australian Sharpnose Sharks from a trawl set

11.1.2 Sawfish and river sharks in PNG

Threats to river sharks

River sharks are among the poorest known and yet most threatened whaler sharks. As with most shark species, they have low productivity due to their slow growth and small number of offspring.

They occupy similar habitats to sawfish (rivers, estuaries and adjacent coastal areas), and face similar threats, e.g. habitat destruction, pollution and fishing.

River sharks are caught in gill nets, particularly those targeting barramundi and jewfish.

Conservation status

The Speartooth Shark is listed (as of April 2019) as Critically Endangered and the Northern River Shark as Endangered on the IUCN's *Red List of Threatened Species*.



Speartooth Shark caught in a gillnet at the Katatai village

Ensuring their survival

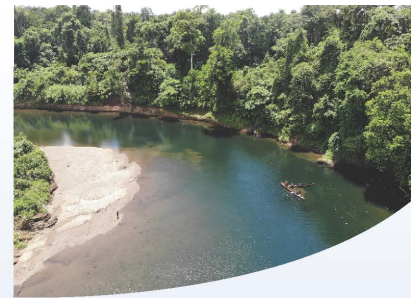
Sawfish and river sharks are two groups of unique sharks and rays that face a very high risk of extinction. It is possible that PNG holds some of the healthiest populations of these species in the world.

More information is needed to assist fisheries managers to develop strategies to ensure their survival into the future.



Largetooth Sawfish (~3.5 m length) caught by a prawn trawler in the Gulf of Papua

The information in this pamphlet was collected during a project led by PNG's National Fisheries Authority entitled "Sustainable management of the shark resources of Papua New Guinea: socioeconomic and biological characteristics of the fishery" between 2014 and 2018.



Sawfish & River Sharks in Papua New Guinea



What are sawfish (family Pristidae)

Sawfish are a group of distinctive rays with a highly specialised, saw-like snout. They use their saw to club and slash prey and also in defence against sharks or crocodiles.

Four species are found in PNG where they are found in rivers (including in freshwater reaches for at least one species), estuaries and coastal waters.



Narrow Sawfish – *Anoxypristis cuspidata* (max. 4.7 m)



Dwarf Sawfish – *Pristis clavata* (max. 3.1 m)



Largetooth Sawfish – *Pristis pristis* (max. 6.6 m)



Green Sawfish – *Pristis zijsron* (max. 7.3 m)

Threats to sawfish

Sawfish are one of the most threatened groups of elasmobranchs (sharks and rays). This is partly due to their very low productivity (slow growth, low numbers of offspring).

The areas inhabited by sawfish are also prone to degradation (e.g. pollution) and habitat destruction (e.g. mangrove removal).

Fishing is a major threat to sawfish populations. Sawfish populations have undergone dramatic declines and in many areas have been completely lost.

Sawfish are commonly caught as bycatch in gillnets and trawls in PNG, particularly in the Western, Gulf and East Sepik provinces.

Conservation status

The Dwarf and Narrow Sawfish are both listed as Endangered and the Largetooth and Green Sawfish as Critically Endangered on the IUCN's *Red List of Threatened Species*.



Narrow Sawfish caught in gillnets in the Sepik River

What are river sharks (genus *Glyphis*)

River sharks are a type of whaler shark (family Carcharhinidae). They have small eyes and large pectoral fins; both adaptations for living in murky areas with high tidal regimes.

Two species are found in PNG where they are found in rivers, estuaries and coastal marine waters. They were first discovered in PNG in the 1960's and 1970's. Their occurrence in PNG was not confirmed until their rediscovery in 2015.



Northern River Shark – *Glyphis garricki* (max. 2.5 m)



Speartooth Shark – *Glyphis glyphis* (max. 2.6 m)

The river sharks are commonly confused with other whaler sharks (especially the Bull Shark) but they differ in having a second dorsal fin more than half the height of the first dorsal fin.

They also have a shallow, longitudinal pit just before the caudal fin on the upper surface (vs. a deep, semicircular pit).

11.1.3 Shark fishing in the Louisiade Archipelago

Therefore, shark fin is one of the most important sources of income for island communities in the Archipelago.

The other key source of income is *bêche-de-mer* (sea cucumber), which was previously a focus of local communities. However, at the time of this project, sea cucumber fishing had been banned after heavy overfishing across PNG. This significantly reduced income levels in the region, not only because of the inability to sell sea cucumber but the lack of sea cucumber trade also disrupted access to the shark-fin buyers.

Other income sources including trochus shell, copra (used to produce coconut oil) and fresh fish are far less reliable and profitable for island communities.



Shark fisher and his stockpile of dried shark fin

Fishing for shark is also an important family activity. Family groups go out to nearby islands on dinghies or traditional sailing canoes called 'sailaus' (see image on front page) and camp on the islands typically for four to five weeks.

While the men set and haul lines on a daily basis, the women and children maintain the camp and cook meals. When sea cucumber fishing is allowed, sea cucumber harvesting and shark fishing will often occur on the same fishing trip.

Summary

The importance of shark fishing in the Louisiade Archipelago is significant. Shark fishing is important as both a family and community activity, but also an alternative source of income while sea cucumber stocks recover. The closure of the sea cucumber fishery due to overfishing had dramatic impacts on local income levels. Therefore, preventing shark from becoming overfished is an urgent fisheries management issue.

The information in this pamphlet was collected during a project led by PNG's National Fisheries Authority entitled "Sustainable management of the shark resources of Papua New Guinea: socioeconomic and biological characteristics of the fishery" between 2014 and 2018.



Shark fishing in the Louisiade Archipelago



The Louisiade Archipelago is located in the Milne Bay Province at the southeastern tip of Papua New Guinea (PNG).



Local livelihoods

Livelihoods within the archipelago are typically communal that is, they focus on contributing to the family or community, and involve traditional subsistence farming and fishing and trading of goods (e.g. food, clay pots, woven baskets, mats and bags). More recently, it also includes farming and fishing for monetary income.



Brooker Island family making clay pots for trade

Livelihoods in the region face a number of pressures. Population growth has put pressure on limited land and ocean resources, while distance to markets and poor infrastructure (e.g. no running water or electricity) also limit income sources. Local climate factors including drought and cyclones can also have devastating affects. For example, Cyclone Ita hit Brooker Island in early 2014, destroying its school, library and coconut supply.

Importance of marine resources

The Archipelago's abundance of marine resources, including large areas of coral reef and significant fishery resources, means that communities are heavily reliant on marine resources. However, with this reliance comes a need to properly manage and sustain these marine resources to ensure they continue to provide food and income into the future.

Shark is an example of one marine resource in the region that requires improved management. Shark catches have risen rapidly in recent years due to the high price paid for shark fin for the Asian shark-fin market. A major problem is that sharks are highly susceptible to overfishing because of their very low productivity. Also, shark meat is of limited value, so the fins are often sliced off and the remaining carcass is wasted.

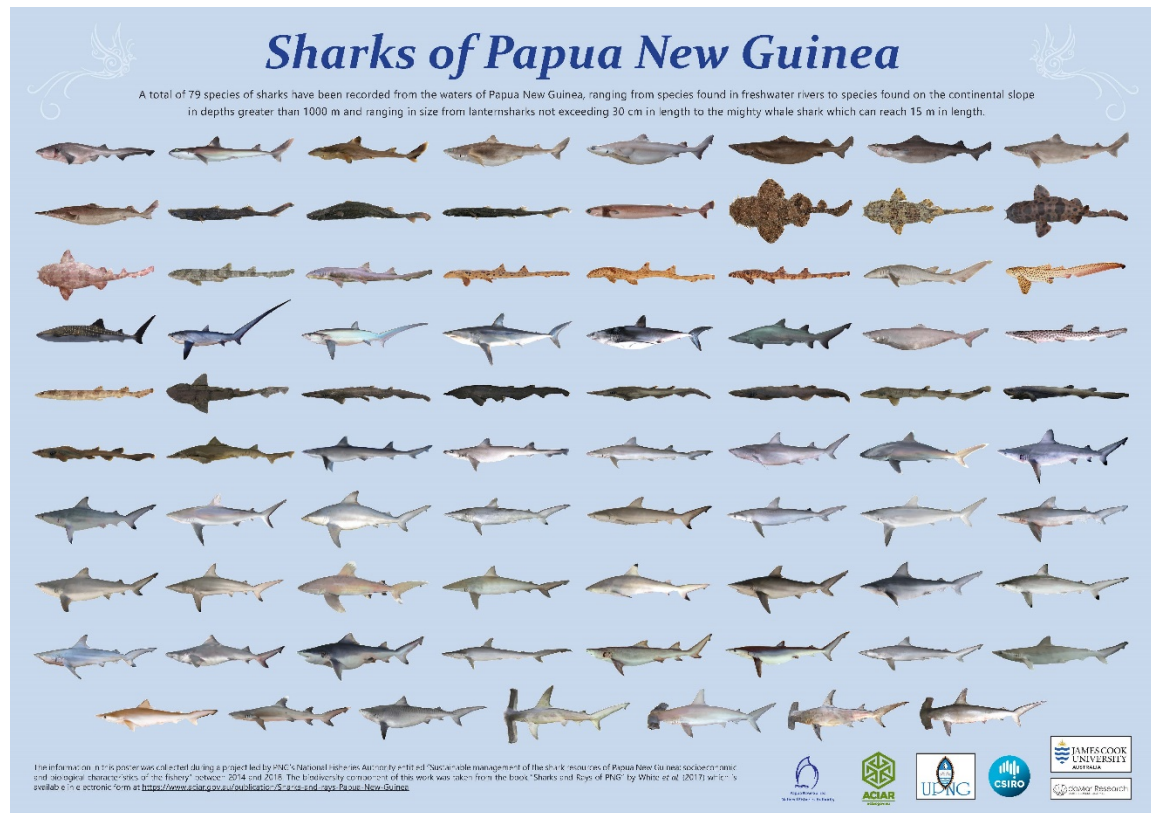


Group of shark fishers being interviewed

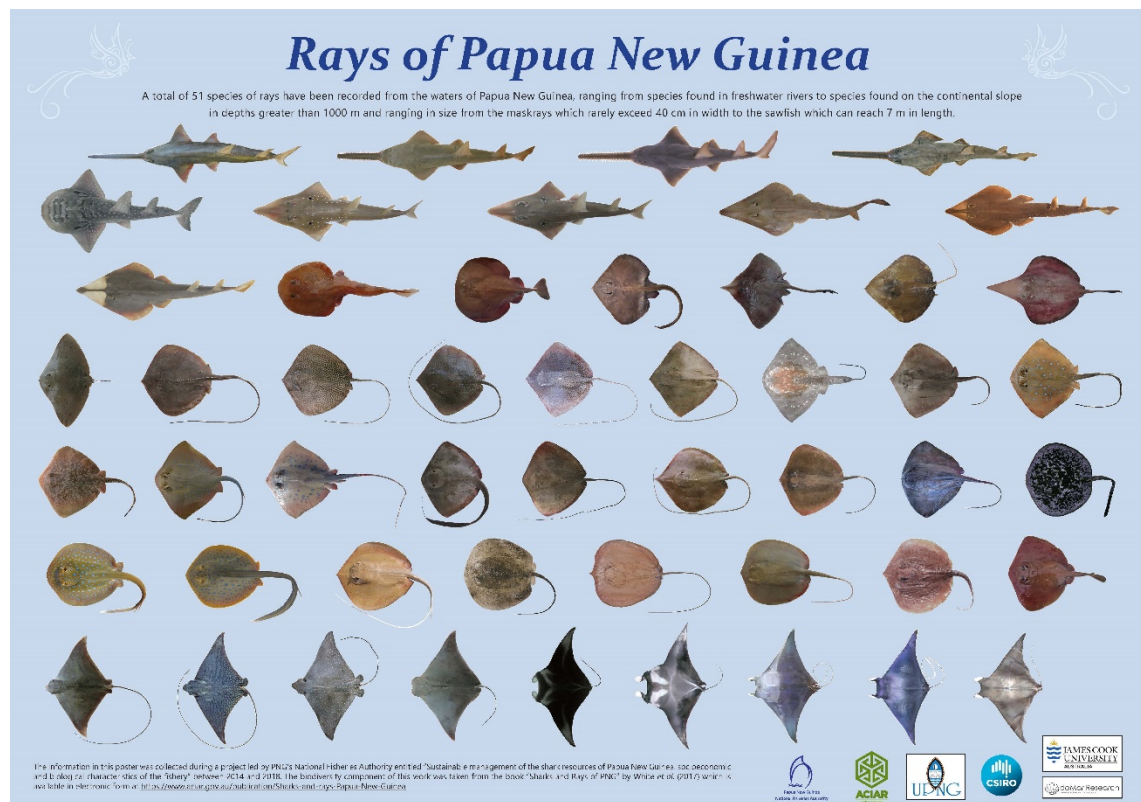
Despite these issues, shark fin provides a perfect opportunity for villagers in cash poor communities in the Archipelago to access much needed income. Sharks are abundant in local waters, shark fin can be dried, and the small size of shark fin means that fins can be easily transported to market.

11.2 Appendix 2: Posters produced for NFA

11.2.1 Overall shark biodiversity



11.2.2 Overall ray biodiversity



11.2.3 New species in PNG

New sharks and rays in PNG

A total of 12 new species of sharks and rays were discovered by the project team, ranging in size from the Papuan Lanternshark reaching only 28 cm in length to the Mumburarr Whipray reaching at least 1.6 m in width



Longfin Gulper Shark
Centrophorus longipinnis
Found in the Huon Gulf at depths of 530-460 m
- described in 2017



Papuan Velvet Skate
Notoraja sereti
Found off Madang Province at depths of 500-800 m
- described in 2017



Papuan Guitarfish
Rhinobatos manoi
Found off New Ireland at depths of 191-250 m
- described in 2016



Mumburarr Whipray
Urogygmus ocnobothrium
Found off northern Australia and in the Gulf of Papua in PNG
- described in 2015



Papuan Lanternshark
Etmopterus samadai
Found off Tac, Sepik, Morobe and Madang at depths of 140-170 m
- described in 2017



Luanah's Skate
Dipturus 'new species'
Found off Madang and Sandaun at depths of 440-620 m
to be described in 2018



Australian Bluespotted Maskray
Neotrygon australis
Found off western Australia, eastern Indonesia and Western Province of PNG
- described in 2016



Bluebanded Eagle Ray
Aetomylus caeruleofasciatus
Found off northern Australia and PNG
- described in 2015



Yang's Longnose Catshark
Apristurus yangi
Found in the Vitian Strait and off New Ireland at depths of 610-745 m
- described in 2017



Australian Whipray
Himantura australis
Found off northern Australia and New Guinea
- described in 2016



Oceania Fantail Ray
Toernia lessona
Found off Fiji, Solomon Islands, and New Britain and New Ireland in PNG
- described in 2016



Corrigan's Catshark
Gollus corriganae
Found off Madang and New Britain at depths of 500-742 m
- described in 2016

The information in this poster was collected during a project led by PNG's National Fisheries Authority entitled "Sustainable management of the shark resources of Papua New Guinea: socio-economic and biological characteristics of the fishery" between 2014 and 2015. The biodiversity component of this work was taken from the book "Sharks and Rays of PNG" by White et al. (2017) which is available in electronic form at <https://www.dca.gov.au/papua-guinea/sharks-and-rays/papua-new-guinea>








11.2.4 Trawl biodiversity in PNG

Shark and ray species in trawl bycatch


Common species




Australian Sharpnose Shark
Rhizoprionodon taylori




Australian Blackspot Shark
Carcharias cookei




Milk Shark
Rhizoprionodon terraenovae




Scalloped Hammerhead
Sphyrna lewini




Blackspotted Whipray
Megastoma ashi




Australian Butterfly Ray
Gymnura altavela




Australian Weasel Shark
Hemigymnus australis




Brownbanded Bamboo Shark
Chiloscyllium punctatum



Winghead Shark
Etmopterus blacodes



Eyebrow Wedgefish
Rhynchobatis pacificus




Narrow Sawfin
Anoxypterus caespitosus




Australian Cowhose Ray
Vulpirostris nasutus


Less abundant species




Zebra Shark
Megastoma fasciatum




Tawny Shark
Natalus ferrugineus




Graceful Shark
Carcharias astyris




Pigeon Shark
Etmopterus unicolor



Spinner Shark
Carcharias kamoharui




Creek Whaler
Carcharias ferrugineus




Bull Shark
Carcharias leucas




Common Blacktip Shark
Carcharias limbatus




Hardnose Shark
Carcharias maui




Spot-tail Shark
Carcharias signatus




Australian Sharpnose Shark
Carcharias tasma




Great Hammerhead
Sphyrna mokohaeui




Largetooth Sawfish
Pristis pristis




Shark Ray
Rhina ancylostoma




Giant Guitarfish
Georacina typus




Merauke Stingray
Himantura longicauda




Australian Whipray
Himantura australis




Leopard Whipray
Himantura leopardus



Smalleye Stingray
Megastoma microdon




Plain Maskray
Neotrygon pacifica




Speckled Maskray
Neotrygon pacifica



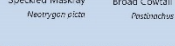
Broad Cowtail Ray
Pseudocarcharias kamoharui



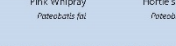
Pink Whipray
Pseudobatis fiji



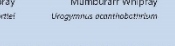
Hortle's Whipray
Pseudobatis hortle



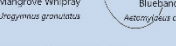
Mumburarr Whipray
Urogygmus ocnobothrium




Mangrove Whipray
Urogygmus gronovius



Bluebanded Eagle Ray
Aetomylus caeruleofasciatus








Spotted Eagle Ray
Aetomylus oculatus

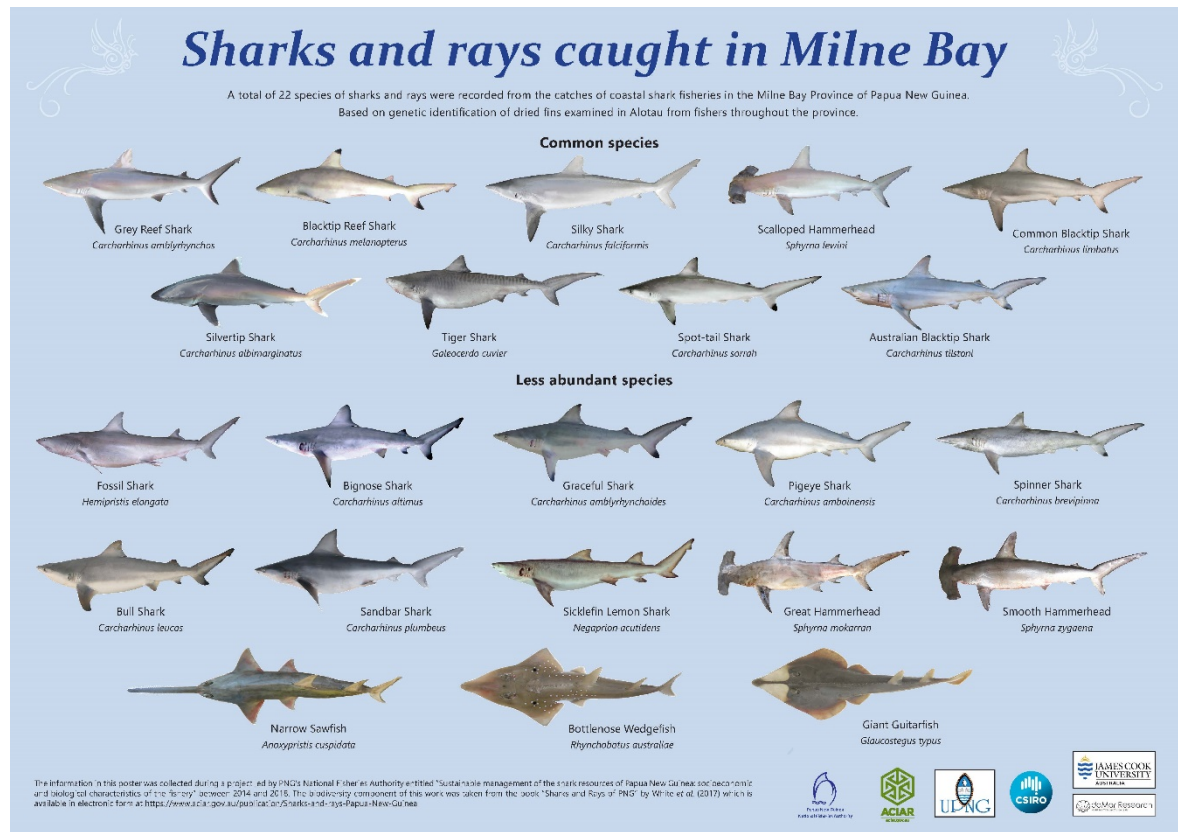


Reef Mantle Ray
Megastoma ashi

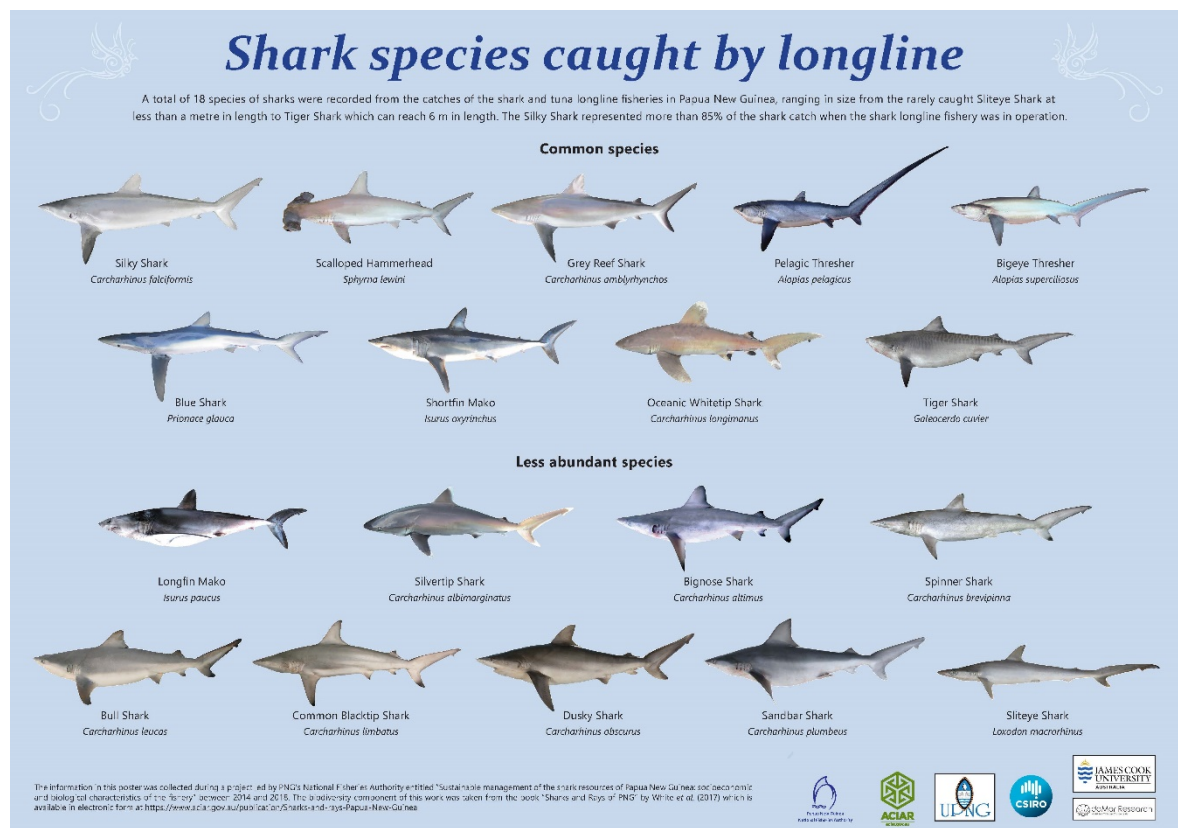
The information in this poster was collected during a project led by PNG's National Fisheries Authority entitled "Sustainable management of the shark resources of Papua New Guinea: socio-economic and biological characteristics of the fishery" between 2014 and 2015. The biodiversity component of this work was taken from the book "Sharks and Rays of PNG" by White et al. (2017) which is available in electronic form at <https://www.dca.gov.au/papua-guinea/sharks-and-rays/papua-new-guinea>

11.2.5 Milne Bay biodiversity

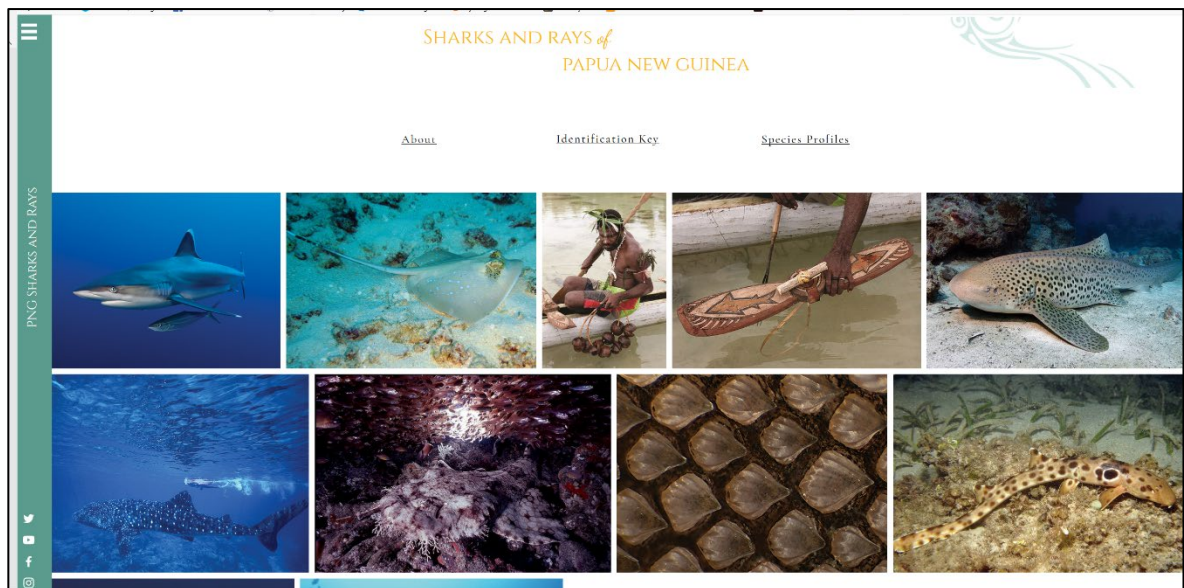


11.2.6 Longline biodiversity

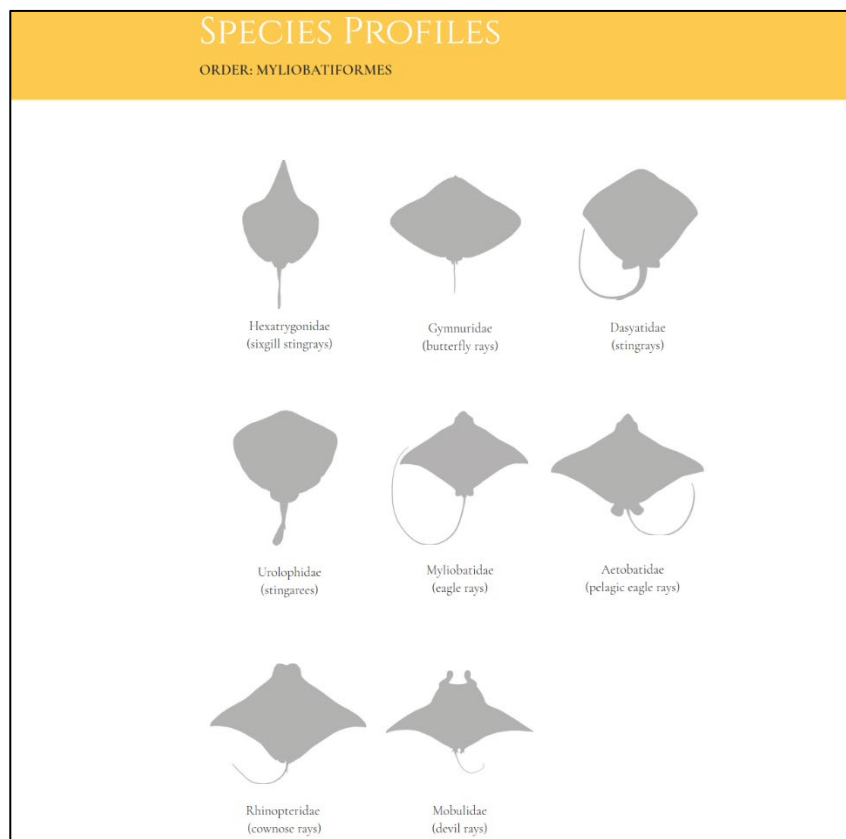


11.3 Appendix 3: Screen 'grabs' from various pages of the Sharks and rays of PNG website

11.3.1 Home page



11.3.2 Example Order page – Order Myliobatiformes, with clickable family icons to go to the species accounts for each family.

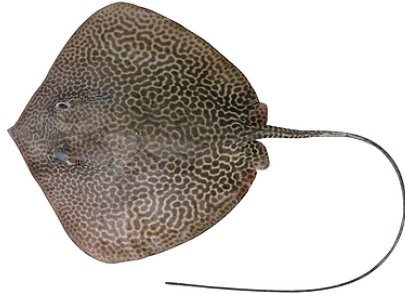


11.3.3 Example species pages for the Dasyatidae (stingrays)

AUSTRALIAN WHIPRAY

Himantura australis (Last, White & Naylor, 2016)

IUCN Status NE



[Click for more info](#)

BIOLOGY

Maximum size: 183 cm DW (350 cm TL)
Maturity size: Males at ~112 cm DW
Birth size: ~29–30 cm DW
Litter size: 2–4 pups
Reproductive mode: Viviparous, with histotrophy

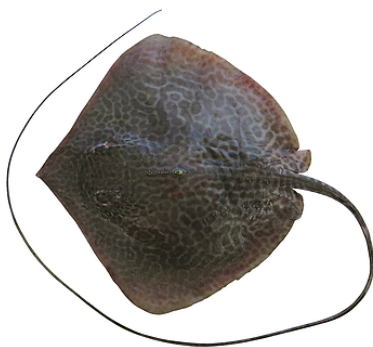
KEY FEATURES

- Tail long, whip-like and variably banded, without skin folds
- Base of tail not depressed, circular in cross-section
- Disc broad and weakly rhombic
- Snout relatively short and broadly triangular
- Denticle band on disc well developed in adults
- Strong colour pattern of dark reticulations or small spots

LEOPARD WHIPRAY

Himantura leoparda (Manjaji-Matsumoto & Last, 2008)

IUCN Status VU



[Click for more info](#)

BIOLOGY

Maximum size: At least 140 cm DW (410 cm TL)
Maturity size: Males at 70–85 cm DW
Birth size: ~20 cm DW
Litter size: Unknown
Reproductive mode: Viviparous, with histotrophy

KEY FEATURES

- Tail long, whip-like and variably banded, without skin folds
- Base of tail not depressed, circular in cross-section
- Disc broad and weakly rhombic
- Snout relatively short and broadly triangular, with pointed tip
- Denticle band on disc well developed in adults
- Strong colour pattern of leopard-like ocelli in adults (large blackish spots in juveniles)

11.3.4 Example additional information section for a species

PAPUA NEW GUINEA

ORDER: MYLIOBATIFORMES

Family: Mobulidae (devilrays)

Species: 5

REEF MANTA RAY

Mobula alfredi (Krefft, 1868)

Colour: Dorsal surface black with two distinct pale or white shoulder patches; anterior margins of shoulder patches curving inwards (not parallel with front of head). Ventral surface mostly white (black in melanistic forms, but rare) with variable dark markings. A small black, semicircular spot extending out of fifth gill slits.

Distribution: Found in the tropical eastern Atlantic and Indo-west and central Pacific. In PNG, confirmed from the Gulf of Papua and Milne Bay Province, but probably widespread.

Habitat and biology: Pelagic, mainly occurring inshore around coral and rocky reefs, usually where there are upwellings. Feeds on planktonic organisms and probably also small bony fishes. Gestation period 12–13 months.

Utilisation: One specimen observed in the catch of a prawn trawler in the Gulf of Papua, but probably a rare encounter; possibly in the bycatch of the purse seine fishery.

Remarks: Previously thought to be a single manta ray species, *Mobula birostris*, but found to be a distinct species, which is mostly found around inshore reef habitats near upwellings (vs. more offshore and oceanic). The most commonly observed manta ray by divers. Previously placed in the genus *Manta*. Similar species: Very similar to *M. birostris* but differs in having the anterior margins of the white shoulder patches not running parallel with front of head (vs. running parallel with front of head) and no calcified mass behind dorsal fin (vs. a calcified mass with embedded sting behind dorsal fin).

Maturity size: Females at 410–470 cm DW
males at 375–400 cm DW


Birth size: Unknown

Litter size: Unconfirmed, but probably only a single pup

Reproductive mode: Viviparous, with histotrophy

KEY FEATURES

- Mouth at front of head (terminal)
- A calcified mass containing an embedded spine behind dorsal fin



VU

pup

(not

s

VU

a DW