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Project A6 -
Prioritisation of research and management needs for Australian elasmobranch species

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1.   BACKGROUND

Conservation of elasmobranch species (sharks and rays) is an increasing priority globally, including for the Australian Government, as evidence of overexploitation of some species becomes increasingly apparent (e.g., Stevens et al. 2000, Graham et al. 2001, Clarke et al. 2006, Dulvy et al. 2008, Dulvy et al. 2014). Increased use of and reliance upon marine populations and products as a food source has seen elasmobranchs captured as target, byproduct and bycatch in fisheries around the globe (Dulvy et al. 2014). Based on scientific status assessments through the International Union for Conservation of Nature (IUCN) Red List process, current global estimates indicate one quarter of elasmobranch populations are threatened with extinction with five of the seven most threatened families comprising ray species (Dulvy et al. 2014). Recognition of the declining status of shark and ray populations is leading to increased protections for their populations in national and international waters. Australia has approximately 323 shark and rays species, with about half of these species being endemic. In Australia 13 elasmobranch species are currently listed in a threat category under the Environment Protection and Biodiversity Conservation (EPBC) Act (Table 1).

IUCN assessments are completed by scientists considered to be experts in the field and peer-reviewed for accuracy prior to acceptance on the Red List. These listings are a scientific assessment and as such do not have any regulative or statutory authority. They are, however, often used to guide management and conservation policy in many parts of the world and form a basis for international protections where required. Assessment of 175 Australasian species in 2003 revealed that 34 species were threatened (Critically Endangered, Endangered and Vulnerable), while 52 were Near Threatened, 71 of Least Concern and 59 species were considered Data Deficient (Cavanagh et al. 2003). In 2015 members of the IUCN Shark Specialist Group, Oceania Region convened a workshop to re-assess elasmobranch species within the region and include species not assessed previously. These assessments have been completed and reviewed for publication on the IUCN Red List in 2016. It is anticipated that the assessments conducted for Australian species will form the basis of ongoing and future consideration of increased national protection for species of concern.

Management and conservation of elasmobranch species is complicated by several factors. First, these species can be the target of directed fishing effort. Exploitation of these populations produces different levels of decline, some of which may be directed to reach maximum sustainable yield from fisheries. This situation differs dramatically from non-exploited and/or terrestrial species. Second, studying species in marine environments is complex due to the difficulty in locating and observing individuals. This often limits the amount of data available on which to make management and conservation decisions. Finally, many of these species undertake cross-jurisdictional movements and/or are considered migratory. This extended movement can lead to protection via international agreements such as the Convention on the Conservation of Migratory Species (CMS). Stronger international regulation can also be applied via the Convention on International Trade in Endangered Species (CITES). These international conventions have direct implications for management and policy within member states, including Australia.

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Table 1. EPBC listed elasmobranch species and their 2015 IUCN Red List Assessment for the Oceania region

Species	Common name	EPBC	IUCN	Other listings*
Carcharias taurus (East coast of Australia subpopulation)	Grey Nurse Shark	CR	CR	
Glyphis glyphis	Speartooth Shark	CR	EN	
Glyphis garricki	Northern River Shark	EN	CR	
Zearaja maugeana	Maugean Skate	EN	EN	
Pristis pristis	Largetooth Sawfish	VU	CR	CITES App I, CMS App I & II
Pristis zijsron	Green Sawfish	VU	CR	CITES App I, CMS App I & II
Pristis clavata	Dwarf Sawfish	VU	EN	CITES App I, CMS App I & II
Carcharias taurus (Western Australia subpopulation)	Grey Nurse Shark	VU	NT	
Carcharodon carcharias	White Shark	VU	VU	CITES App II, CMS App I & II
Rhincodon typus	Whale Shark	VU	VU	CITES App II, CMS App II
Galeorhinus galeus	School Shark	CD	VU	
Centrophorus harrissoni	Harrisson's Dogfish	CD	EN	
Centrophorus zeehaani	Southern Dogfish	CD	NE	

CR: Critically Endangered, EN: Endangered, VU: Vulnerable, NT: Near Threatened, CD: Conservation Dependent, NE: Not Evaluated

*CITES: Convention on International Trade in Endangered Species of Wild Fauna and Flora, Appendices I & II; CMS: Convention on the Conservation of Migratory Species of Wild Animals Appendices I & II

Australia is a signatory to both CITES and CMS and as such has an obligation to manage, conserve and protect (where necessary) species listed on these international conventions. Although member countries are obligated to protect listed species, the form of protection employed (i.e., type of policy applied) is at the discretion of the country and not dictated by the international agreement. In Australia administration of the requirements of CMS and CITES are implemented through the EPBC Act. However, both CITES and CMS have different standards and are handled differently in the Australian legislation. CITES works through regulating and controlling international trade. All import, export and re-export of product must be authorised through a licensing system. For species on Appendix I (species threatened with extinction), trade is prohibited aside from exceptional circumstances. For species on Appendix II (species not threatened, but trade must be controlled to prevent them becoming threatened), trade is permitted but regulated. Countries must produce a Non-Detriment Finding (NDF) for species on Appendix II to indicate that current trade levels are sustainable. CMS is designed to facilitate conservation and sustainable use of migratory

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animals and their habitats. Similar to CITES it contains two appendices. Appendix I includes migratory species that are endangered and signatories must endeavour to conserve species and their habitats, prevent adverse effects and prevent or reduce factors causing the species to be threatened. Take of species listed on Appendix I is prohibited aside from exceptional circumstances. Appendix II includes species which have "*an unfavourable conservation status and which require international agreements for their conservation and management*" and requests parties form agreements to benefit the status of these species. It should also be noted that the EPBC Act does not differentiate between the two CMS appendices and treat all CMS listed species as listed under Appendix I. As such, both CITES and CMS impose policy and legislative requirements for the management of populations within Australian waters and any consideration of the status of Australian elasmobranchs must consider the listings and implications of both CITES and CMS. The information needed to help inform Australia's response to these international-treaty listed species must also be considered and addressed. Species currently listed on CITES and CMS are reported in Tables 1 and 2. At the level of State and Territory Governments, species that are listed in the EPBC Act need to be considered in fisheries legislation and policy. Thus, EPBC, CITES and CMS listings have ramifications for the State and Territory agencies that are responsible for managing fisheries that interact with these species.

In addition to the above considerations related to management and policy, there are significant data gaps for many elasmobranch species. The 2003 IUCN assessment of Australasian elasmobranchs revealed 34% of species were Data Deficient (Cavanagh et al. 2003). Global statistics indicate as many as 47% of elasmobranchs cannot be assessed for IUCN due to limited data (Dulvy et al. 2014). To ensure effective management and conservation of elasmobranch species improved data collection and prioritisation should be conducted.

Table 2. Australian shark and ray species not currently listed on EPBC, but listed on CITES or CMS. IUCN status indicates Oceania regional assessment

Species	Common name	IUCN	Other	Comments*
Anoxypristis cuspidata	Narrow Sawfish	EN	CITES App I CMS App I & II	
Carcharhinus longimanus	Oceanic Whitetip Shark	CR	CITES App II CMS App II	Previously considered by TSSC
Cetorhinus maximus	Basking Shark	LC	CITES App II, CMS App I & II	
Lamna nasus	Porbeagle Shark	NT	CITES App II CMS App II	
Manta alfredi	Reef Manta	VU	CITES App II CMS App I & II	Previously considered by TSSC
Manta birostris	Giant Manta Ray	VU	CITES App II	Previously considered by TSSC

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Species	Common name	IUCN	Other	Comments*
			CMS App I & II	
Sphyrna lewini	Scalloped Hammerhead	EN	CITES App II CMS App II	Under assessment for EPBC
Sphyrna mokarran	Great Hammerhead	VU	CITES App II CMS App II	Under assessment for EPBC
Sphyrna zygaena	Smooth Hammerhead	LC	CITES App II CMS App II	Under assessment for EPBC
Isurus oxyrinchus	Shortfin Mako	VU	CMS App II	Previously considered by TSSC
Isurus paucus	Longfin Mako	VU	CMS App II	Previously considered by TSSC
Squalus acanthias	Spiny Dogfish	VU	CMS App II	
Carcharhinus falciformis	Silky Shark	NT	CMS App II	
Mobula eregoodootenkee	Pygmy Devil Ray	NT	CMS App II	
Mobula japonica	Spinetail Devil Ray	NT	CMS App II	
Mobula thurstoni	Bentfin Devil Ray	NT	CMS App II	
Alopias pelagicus	Pelagic Thresher	NE	CMS App II	
Alopias superciliosus	Bigeye Thresher	NE	CMS App II	
Alopias vulpinus	Common Thresher	NE	CMS App II	

CR: Critically Endangered, EN: Endangered, VU: Vulnerable, NT: Near Threatened, LC: Least Concern, NE: Not Evaluated

*TSSC: Threatened Species Scientific Committee (Australia)

2.   PROJECT AIMS

Based on increasing concern over the status of elasmobranch species the Department of the Environment has a need to understand the priorities and status of these species in Australian waters. Specifically, information is required on what species are of near and mid-term importance for conservation action and what research approaches can and should be applied to define the status of potentially at-risk species. The objectives of this workshop were to:

- integrate existing data to explore species status and knowledge gaps
- explore research and monitoring methods for defining the status of elasmobranchs
- produce a list of priority species and conservation and/or research priorities to help guide funding and policy development as appropriate

3.   APPROACH

This project was completed through use of existing information and eliciting expert opinion and consensus via a workshop. The workshop was held in Brisbane 17-18 November including representatives of research and management agencies and organisations from around the country, including staff from the Department of the Environment (Appendix 1). The 2015 IUCN species assessments for the Oceania region formed the basis of expert elicitation and subsequent discussion.

Species were considered in groups based on their recent IUCN regional assessment. The criteria used to assess whether species were priorities for conservation action included:
- evidence of decline
  - fishery data (catch/CPUE)
  - fishery-independent data
  - observer data
- distribution of fishing effort (inferred threat)
- biology (fecundity, life history)
- distribution, habitat selection
- existing protection (e.g., MPA, CMR)
- connectivity to high threat regions (i.e., high fishing pressure)
- tractability (i.e., the ability to mitigate any current threats)

Due to high overlap between IUCN and EPBC listing of Critically Endangered and Endangered species the workshop focussed primarily on species in the IUCN Vulnerable, Near Threatened and Data Deficient categories. Species assessed as Least Concern by the IUCN Oceania assessment (182 species) were not considered (Appendix 2).

It should be noted that current fishery data are limited in their application and that other methods of monitoring and projecting population decline should be considered. The approach applied here was based on currently available data. To allow a more proactive approach (i.e. intervention before significant declines are realised), better data and modelling approaches need to be developed and applied.

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4. RESULTS

4.1.1 Species prioritisation

Comparisons between recent IUCN assessments and current EPBC listing status were considered as a starting point.

Critically Endangered and Endangered species (IUCN)

All but one species assessed as Critically Endangered under IUCN are currently listed on the EPBC Act or have previously been considered (*Carcharhinus longimanus*) for listing (Table 3). The only exception, *Cephaloscyllium albipinnum*, has shown evidence of significant decline based on fisheries observer data and should be prioritised for EPBC assessment and conservation action. Comparison of IUCN Endangered species revealed that approximately half of the species are protected under EPBC, under assessment for EPBC listing (*Sphyrna lewini*), or previously considered for listing (*Urolophus orarius*). Of the IUCN Endangered species not included or considered for EPBC listing, only one species, *Dipturus canutus,* has shown evidence of significant declines and should be considered a high priority for EPBC assessment and conservation action (Table 4). The consensus perspective of the workshop was that current data for the remaining three species may not be adequate to meet the evidentiary standards for EPBC listing and/or the reasons for the Endangered status are tied to exploitation outside Australian waters. For species where threats exist outside Australia's EEZ, protection within Australia's EEZ would not be effective in mitigating the threats to these species or improve their population status. Of the remaining three species, additional data collection and assessment should be considered for *Anoxypristis cuspidata* since it is the only species of sawfish not protected in Australian waters (but is protected by WA, NT and Qld legislation) and is a member of a family under high global threat of extinction. *Aetomylaeus vespertilio* is at risk due to impacts outside of Australia that cannot be altered via EPBC listing and *Myliobatis hamlyni* is at risk due to restricted range, but does not interact with fisheries and as such EPBC listing will have limited impact and therefore these species were not considered a high priority for assessment. Finally differences in status should be considered and a data audit conducted to determine if the listed sawfish species should re-assessed considering they are all listed as Critically Endangered under IUCN but only as Vulnerable under the EPBC Act, a difference of two categories.

Table 3. Species assessed as Critically Endangered or Endangered by IUCN and EPBC listing

Species	Common name	EPBC	IUCN
Carcharias taurus (East coast of Australia subpopulation)	Grey Nurse Shark	CR	CR
Glyphis garricki	Northern River Shark	EN	CR
Pristis pristis	Largetooth Sawfish	VU	CR
Pristis zijsron	Green Sawfish	VU	CR
Carcharhinus longimanus	Oceanic Whitetip Shark	‡	CR
Cephaloscyllium albipinnum	Whitefin Swellshark		CR

Species	Common name	EPBC	IUCN
Glyphis glyphis	Speartooth Shark	CR	EN
Zearaja maugeana	Maugean Skate	EN	EN
Pristis clavata	Dwarf Sawfish	VU	EN
Centrophorus harrissoni	Harrisson's Dogfish	CD	EN
Sphyrna lewini	Scalloped Hammerhead	*	EN
Urolophus orarius	Coastal Stingaree	‡	EN
Anoxypristis cuspidata	Narrow Sawfish		EN
Aetomylaeus vespertilio	Ornate Eagle Ray		EN
Dipturus canutus	Grey Skate		EN
Myliobatis hamlyni	Purple Eagle Ray		EN

‡ previously considered for EPBC listing and not prioritised
*currently under assessment for EPBC listing

Vulnerable and Near Threatened Species (IUCN)

Analysis of species assessed as Vulnerable and Near Threatened by IUCN resulted in ranking species by their level or priority for listing based on the criteria described above. A total of 21 Vulnerable and 37 Near Threatened species were considered and ranked as High, Moderate or Low priority. Two High Priority species were identified from the Vulnerable and Near Threatened categories (Table 4) and are both considered to have undergone significant population declines. In total, 6 of the 21 Vulnerable species (29%) and 8 of 37 Near Threatened species (22%) were rated as Moderate Priority (Table 4). The remaining 43 species were considered Low Priority for conservation action or EPBC listing assessment (Appendix 2). Reasons for Low rakings included: (a) previously considered for EPBC assessment, (b) inability to mitigate threats via EPBC listing (i.e., main threats exist outside Australian waters), or (c) data limitations. It is recommended that action take place within 1-5 years for High Priority species and 6-10 years for Moderate priority species. Note that the majority of the priority species (67%) are skates or rays.

Table 4. Species considered High (1-5 year time frame) and Moderate (6-10 year time frame) priorities for conservation action and potential EPBC listing

Species	x	IUCN	Priority
Cephaloscyllium albipinnum	Whitefin Swellshark	CR	High
Dipturus canutus	Grey Skate	EN	High
Squatina albipunctata	Eastern Angelshark	VU	High
Squalus chloroculus	Greeneye Spurdog	NT	High
Dipturus australis	Sydney Skate	VU	Moderate
Dipturus confusus	Longnose Skate	VU	Moderate
Dasyatis fluviorum	Estuary Stingray	VU	Moderate
Urolophus bucculentus	Sandyback Stingaree	VU	Moderate
Squalus montalbani	Philippine Spurdog	VU	Moderate
Urolophus sufflavus	Yellowback Stingaree	VU	Moderate
Dipturus endeavouri	Endeavour Skate	NT	Moderate
Squalus grahami	Eastern Longnose Spurdog	NT	Moderate

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Galeocerdo cuvier	Tiger Shark	NT	Moderate
Rhynchobatus australiae	Whitespotted Wedgefish	NT	Moderate
Rhynchobatus palpebratus	Eyebrow Wedgefish	NT	Moderate
Dipturus cerva	Whitespotted Skate	NT	Moderate
Trygonoptera imitata	Eastern Shovelnose Stingaree	NT	Moderate
Urolophus kapalensis	Kapala Stingaree	NT	Moderate

VU: Vulnerable, NT: Near Threatened

Data Deficient species (IUCN)

The final consideration for prioritisation of species included those assessed as Data Deficient. The definition of Data Deficient applied here is that used by IUCN. In the context of conducting quantitative stock assessments and/or EPBC listing assessments many more species may be considered Data Deficient than those listed here (Appendix 2).

Five of the 56 Data Deficient species (9%) were considered to be a Moderate priority for data collection and potential conservation action (Table 5). These species were considered priorities for data collection due to their common interaction with fisheries and restrictive life history parameters. Remaining Data Deficient species were considered Low Priority. No species were considered to be of high priority for data collection. It is worth noting, however, that the majority of the Data Deficient species are deep water inhabitants. Should fishing pressure change within Australian waters (e.g., fishing to below 700m [the current max depth of most Australian fishing]) these species will have increased exposure to risk. Thus any expansion of deep water fisheries should take these little known species into account and may alter species prioritisation for data collection and research.

Table 5. Species considered Moderate (6-10 year time frame) priorities for data collection, conservation action and potential EPBC listing

Species	Common name	IUCN	Priority
Dentiraja flindersi	Pygmy Thornback Skate	DD	Moderate
Dipturus melanospilus	Blacktip Skate	DD	Moderate
Cirrhigaleus australis	Mandarin Shark	DD	Moderate
Mustelus walkeri	Eastern Spotted Gummy Shark	DD	Moderate
Sqaulus albifrons	Eastern Highfin Spurdog	DD	Moderate

In addition to prioritising species for listing or conservation action, workshop participants also considered what the main data gaps were for species in the Vulnerable, Near Threatened and Data Deficient categories (Table 6). This assessment revealed the considerable differences in knowledge of the various species. Vulnerable and Near Threatened species require additional data on population trends, life history characteristics and pressures. In contrast, for many of the Data Deficient species the taxonomy was the only solid information with over 80% of species requiring data on nearly every category needed to assess status. This result highlights the need for better species-specific data on abundance and fishery interactions as well as basic biology of elasmobranchs in Australian waters.

Table 6. Knowledge gaps for elasmobranch species not currently listed under EPBC

Gap	VU and NT species	DD species
Taxonomy	7 (13%)	5 (9%)
Life history	16 (29%)	47 (84%)
Abundance	13 (24%)	53 (95%)
Population trend	24 (44%)	52 (93%)
Pressures	16 (29%)	52 (93%)
Distribution	6 (11%)	50 (89%)
Population connectivity	10 (18%)	Not considered

VU: Vulnerable, NT: Near Threatened, DD: Data Deficient

A brief examination of the currently known distribution patterns of species was also conducted to determine if any patterns were apparent in where species in each category occur in Australia (Table 7). The majority of Vulnerable and Near Threatened species were located on the east coast of Australia and may be linked to the longstanding fisheries and high population density in this part of the country. The majority of Data Deficient species were from deep water regions in Western Australia and Queensland. In contrast, this result is likely based on limited fishing pressure in these regions.

Table 7. Geographic distribution of elasmobranch species not currently listed under EPBC

Location	VU and NT species	DD species
Western Australia	19 (35%)	22 (39%)
Northern Territory	12 (22%)	7 (13%)
Queensland	31 (56%)	15 (27%)
New South Wales	32 (58%)	12 (21%)
Victoria	21 (38%)	10 (18%)
South Australia	12 (22%)	6 (11%)
Tasmania	15 (27%)	6 (11%)
Commonwealth waters	15 (27%)	5 (9%)

The final species-specific exercise involved identification of the main threats to species in Vulnerable and Near Threatened categories. The predominant threat to these species is fisheries, but this assessment was designed to provide an indication of which fishing gear species in these categories were interacting with most. Results indicated the majority of Vulnerable and Near Threatened species interacted with trawl (39) and longline (19) fisheries with fewer species interacting with gillnet (7) and recreational (4) fisheries. Habitat loss was also considered as a possible threat for at least one species.

4.2   Research, data collection and priority activities

A number of additional activities were identified as being relevant and useful to better defining the status of Australian elasmobranchs and implications of current fishing pressure and management regimes. These were beyond the scope and time allocation of the current

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project, but should be noted for subsequent work. Future project priorities should include:

- Update Ecological Risk Assessments of fishery species relative to the capacity to collect data and assess the status of these species (tractability). This would identify species of high concern and high ability to improve the status of the population. Flow on analyses could consider the tractability and efficacy of mitigation and management processes.
- Conduct regional risk assessments: overview of regions where greatest or fewest numbers of species are at risk (or data deficient). This assessment will allow targeted observer programs, targeted surveys or sample collection, or consideration of whether a single management action can be used to benefit multiple species.
- Conduct susceptibility analysis: quantitative analysis of species-specific distributions relative to high resolution data detailing the location and amount of fishing effort. Analysis of key fisheries threats that are affecting multiple species.
- Conduct qualitative risk assessments for deep water species (which comprise the majority of Data Deficient species) and identify any future threats for these populations. For example, if fisheries are developed to exploit depths below 700m.
- Explore and develop methods for assessing the status of species and their population trajectories independent of fishery catch data which may be unreliable and retrospective in nature.
- Complete a meta-analyses of current protections (e.g. dogfish closures, GBRMP, CMR, etc) to act as default protection for other at-risk but not listed species.
- Develop a National Shark Research Strategy to help define research needs, enhance data collection and collaborative efforts to improve the national perspective.
- Actively work to accumulate data to define population trends and their associated pressures. This should include collection of tissue samples for genetic analyses (close-kin, effective population size, genetic connectivity and gene flow estimates) and life history studies.
- Examine the potential for species to act as sentinels for various ecotypes.
- Consider the potential implications of cumulative threats, primarily in relation to coastal species, where habitat loss, pollution, exposure to multiple fisheries, etc. can play a compounding role in species status and population viability.

Research and data needs for Data Deficient species are extensive. A list of needs and potential opportunities to collect data were identified and include:
- Direct surveys and sampling to:
  - Define distribution, habitat preference, ecotype
  - Collect tissue samples for genetic and life history analyses
  - Apply non-extractive methods such as baited underwater video or towed video systems
- Examine fisheries catch composition for rare or little known species
- Improve identification of deep water or difficult to discern species
- Support, utilise and/or revitalise fishery observer programs and data
- Prioritise deep water sampling
- Prioritise regional sampling (e.g., WA, QLD)

4.3 Future international priorities

In addition to priorities established here for Australian species, international nominations to CITES and CMS are already in progress. If successful these listings will have implications for the protection, regulation and monitoring of species in Australian waters. Several species currently listed on CMS (*Alopias pelagicus, A. superciliosus, A. vulpinus*; *Mobula eregoodootenkee, M. japanica, M. thurstoni; Carcharhinus falciformis*) are likely to be nominated for CITES listing in 2016. These species occur in Australian waters and interact with Australian fisheries (including shark control programs) to varying degrees. Monitoring and management may be required to satisfy Non-Detriment Finding requirements. Given the high value of their fins and growing global concern for their status it is likely that the wedgefishes (*Rhina, Rhynchobatus*) will be nominated for listing under both CMS and CITES in the next 3-6 years. To improve our ability to meet and support international listings as well as develop adequate national policy around of the species above they should be an immediate priority for data collection.

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5.   CONCLUSIONS

Overall conclusions of the workshop were that the majority of Australian elasmobranch species are Low Priority for conservation action due to existing management of fisheries. Four species (*C. albipinnum*, *D. canutus*, *S. albipunctata*, *S. chloroculus*) are considered to be immediate priorities for assessment and potential EPBC listing. EPBC listing nominations should be prepared for these species. An additional 14 species should be a priority for increased monitoring and data collection to support management changes or listing nominations relative to these species in the near future. Better data and altered management may alleviate the need to list these species under EPBC if appropriate actions can be taken in time. Species that are, or will be, subject to international conventions should also be prioritised for monitoring and data collection to meet international obligations.

There are significant data needs for a large number of Australian elasmobranch species and mechanisms for collecting these data and co-ordinating research efforts should be supported where possible. There is a strong need for accurate abundance as well as fishery catch and effort data and workshop participants strongly recommend implementing and/or expanding observer programs to aid in accurate identification of catch and collection of tissue samples for genetic and life history studies. Development of observer programs has the added benefit of collecting data and samples for a suite of species rather than adopting a species-specific sampling approach.

6.   RECOMMENDATIONS

- Nominate and assess High Priority species in Table 4
- Establish monitoring and data collection protocols for Moderate Priority species (Tables 4 and 5) and CITES and CMS nominated species
- Support and fund observer programs to improve and enhance data and sample collection of priority species
- Prioritise and fund relevant risk assessment analyses
- Develop a National Shark Research Strategy in conjunction with the research community (e.g., in partnership with the Oceania Chondrichthyan Society)

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APPENDIX 1

List of workshop participants

Name	Institution
John Gunn (facilitator)	AIMS
Michelle Heupel (convener)	AIMS
Sharon Appleyard	CSIRO
Phil Bouchet	UWA
Mark Bravington	CSIRO
Barry Bruce	CSIRO
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Ian Jacobsen	Qld Fisheries
Grant Johnson	NT Fisheries
Ivan Lawler	DoE
Ashley Leedman	DoE
Rory McAuley	WA Fisheries
Jenny Ovendon	UQ
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Paul Rogers	SARDI
Colin Simpfendorfer	JCU
Conrad Speed	AIMS
Will White	CSIRO

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APPENDIX 2

Species assessed as Vulnerable and Near Threatened considered Low priority for conservation action and potential EPBC listing.

Species	IUCN	Priority
Brachaelurus colcloughi	VU	Low
Pastinachus atrus	VU	Low
Hemiscyllium hallstromi	VU	Low
Odontaspis ferox	VU	Low
Aptychotrema timorensis	VU	Low
Centrophorus granulosus	VU	Low
Centrophorus squamosus	VU	Low
Urolophus viridis	VU	Low
Carcharhinus albimarginatus	NT	Low
Carcharhinus amblyrhynchos	NT	Low
Carcharhinus limbatus	NT	Low
Carcharhinus obscurus	NT	Low
Carcharhinus plumbeus	NT	Low
Triaenodon obesus	NT	Low
Pseudocarcharias kamoharai	NT	Low
Rhina ancylostoma	NT	Low
Hydrolagus ogilbyi	NT	Low
Chlamydoselachus anguineus	NT	Low
Neotrygon annotata	NT	Low
Dipturus gudgeri	NT	Low
Cephaloscyllium variegatum	NT	Low
Prionace glauca	NT	Low
Deania quadrispinosa	NT	Low
Dalatias licha	NT	Low
Echinorhinus cookei	NT	Low
Heptranchias perlo	NT	Low
Hexanchus griseus	NT	Low
Centroscymnus coelolepis	NT	Low
Proscymnodon plunketi	NT	Low
Squalus edmundsi	NT	Low

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Species assessed as Data Deficient considered Low priority for conservation action and potential EPBC listing.

Species	IUCN	Priority
Sinobatis caerulea	DD	Low
Sinobatis filicauda	DD	Low
Bathyraja ishiharai	DD	Low
Insentiraja laxipella	DD	Low
Irolita westraliensis	DD	Low
Notoraja hirticauda	DD	Low
Notoraja ochroderma	DD	Low
Pavoraja arenaria	DD	Low
Centrophorus westraliensis	DD	Low
Chimaera obscura	DD	Low
Dasyatis microps	DD	Low
Dasyatis parvonigra	DD	Low
Neotrygon kuhlii	DD	Low
Neotrygon ningalooensis	DD	Low
Etmopterus brachyurus	DD	Low
Etmopterus molleri	DD	Low
Orectolobus reticulatus	DD	Low
Parascyllium elongatum	DD	Low
Parascyllium sparsimaculatum	DD	Low
Dipturus falloargus	DD	Low
Dipturus queenslandicus	DD	Low
Rhinochimaera africana	DD	Low
Rhinoptera neglecta	DD	Low
Apristurus bucephalus	DD	Low
Apristurus sinensis	DD	Low
Asymbolus funebris	DD	Low
Atelomycterus marnkalha	DD	Low
Bythaelurus incanus	DD	Low
Cephaloscyllium cooki	DD	Low
Cephaloscyllium signourum	DD	Low
Cephaloscyllium speccum	DD	Low
Cephaloscyllium zebrum	DD	Low
Figaro striatus	DD	Low
Galeus gracilis	DD	Low
Parmaturus bigus	DD	Low
Tetronarce macneilli	DD	Low
Echinorhinus brucus	DD	Low
Centroscyllium kamoharai	DD	Low
Etmopterus unicolor	DD	Low
Hexanchus nakamurai	DD	Low
Megachasma pelagios	DD	Low
Oxynotus bruniensis	DD	Low
Scymnodalatias albicauda	DD	Low
Scymnodalatias sherwoodi	DD	Low

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Species	IUCN	Priority
Somniosus antarcticus	DD	Low
Zameus squamulosus	DD	Low
Squalus altipinnis	DD	Low
Squalus crassispinus	DD	Low
Squalus nasutus	DD	Low
Squalus notocaudatus	DD	Low
Trygonoptera galba	DD	Low

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Species assessed as Least Concern by IUCN and not prioritised for conservation action or potential EPBC listing.

Species	IUCN
Carcharhinus altimus	LC
Carcharhinus amblyrhynchoides	LC
Carcharhinus amboinensis	LC
Carcharhinus brachyurus	LC
Carcharhinus brevipinna	LC
Carcharhinus galapagensis	LC
Carcharhinus macloti	LC
Carcharhinus melanopterus	LC
Negaprion acutidens	LC
Rhizoprionodon acutus	LC
Cetorhinus maximus	LC
Himantura fai	LC
Himantura granulata	LC
Himantura jenkinsii	LC
Himantura leoparda	LC
Himantura uarnak	LC
Pteroplatytrygon violacea	LC
Taeniura lymma	LC
Taeniurops meyeni	LC
Urogymnus asperrimus	LC
Nebrius ferrugineus	LC
Hemipristis elongata	LC
Chiloscyllium punctatum	LC
Mitsukurina owstoni	LC
Aetobatus ocellatus	LC
Glaucostegus typus	LC
Eusphyra blochii	LC
Sphyrna zygaena	LC
Squalus megalops	LC
Stegostoma fasciatum	LC
Sinobatis bulbicauda	LC
Bathyraja richardsoni	LC
Insentiraja subtilispinosa	LC
Irolita waitii	LC
Notoraja azurea	LC
Notoraja sticta	LC
Pavoraja alleni	LC
Pavoraja mosaica	LC
Pavoraja nitida	LC

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Species	IUCN
Pavoraja pseudonitida	LC
Pavoraja umbrosa	LC
Brachaelurus waddi	LC
Callorhinchus milii	LC
Carcharhinus cautus	LC
Carcharhinus coatesi	LC
Carcharhinus fitzroyensis	LC
Carcharhinus sorrah	LC
Carcharhinus tilstoni	LC
Loxodon macrorhinus	LC
Rhizoprionodon taylori	LC
Chimaera argiloba	LC
Chimaera fulva	LC
Chimaera lignaria	LC
Chimaera macrospina	LC
Hydrolagus homonycteris	LC
Hydrolagus lemures	LC
Hydrolagus marmoratus	LC
Hydrolagus trolli	LC
Euprotomicrus bispinatus	LC
Isistius brasiliensis	LC
Isistius plutodus	LC
Dasyatis brevicaudata	LC
Dasyatis thetidis	LC
Himantura astra	LC
Himantura dalyensis	LC
Himantura toshi	LC
Neotrygon leylandi	LC
Neotrygon picta	LC
Etmopterus baxteri	LC
Etmopterus dianthus	LC
Etmopterus dislineatus	LC
Etmopterus evansi	LC
Etmopterus fusus	LC
Gymnura australis	LC
Hemigaleus australiensis	LC
Hemiscyllium ocellatum	LC
Hemiscyllium trispeculare	LC
Heterodontus galeatus	LC
Heterodontus portusjacksoni	LC
Hexatrygon bickelli	LC
Hypnos monopterygius	LC

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Species	IUCN
Narcine lasti	LC
Narcine nelsoni	LC
Narcine ornata	LC
Narcine tasmaniensis	LC
Narcine westraliensis	LC
Eucrossorhinus dasypogon	LC
Orectolobus floridus	LC
Orectolobus halei	LC
Orectolobus hutchinsi	LC
Orectolobus maculatus	LC
Orectolobus ornatus	LC
Orectolobus parvimaculatus	LC
Orectolobus wardi	LC
Sutorectus tentaculatus	LC
Plesiobatis daviesi	LC
Pristiophorus cirratus	LC
Pristiophorus delicatus	LC
Pristiophorus nudipinnis	LC
Pseudotriakis microdon	LC
Amblyraja hyperborea	LC
Dentiraja lemprieri	LC
Dipturus acrobelus	LC
Dipturus apricus	LC
Dipturus grahami	LC
Dipturus healdi	LC
Dipturus oculus	LC
Dipturus polyommata	LC
Dipturus wengi	LC
Leucoraja pristispina	LC
Okamejei arafurensis	LC
Okamejei leptoura	LC
Rajella challengeri	LC
Spiniraja whitleyi	LC
Aptychotrema rostrata	LC
Aptychotrema vincentiana	LC
Rhinobatos sainsburyi	LC
Trygonorrhina dumerilli	LC
Trygonorrhina fasciata	LC
Harriotta haeckeli	LC
Harriotta raleighana	LC
Rhinochimaera pacifica	LC
Apristurus albisoma	LC

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Species	IUCN
Apristurus ampliceps	LC
Apristurus australis	LC
Apristurus longicephalus	LC
Apristurus melanoasper	LC
Apristurus pinguis	LC
Apristurus platyrhynchus	LC
Asymbolus analis	LC
Asymbolus occiduus	LC
Asymbolus pallidus	LC
Asymbolus parvus	LC
Asymbolus rubiginosus	LC
Asymbolus submaculatus	LC
Asymbolus vincenti	LC
Atelomycterus fasciatus	LC
Atelomycterus macleayi	LC
Aulohalaelurus labiosus	LC
Cephaloscyllium hiscosellum	LC
Cephaloscyllium laticeps	LC
Figaro boardmani	LC
Halaelurus sellus	LC
Squatina australis	LC
Squatina pseudocellata	LC
Squatina tergocellata	LC
Furgaleus macki	LC
Hemitriakis abdita	LC
Hemitriakis falcata	LC
Hypogaleus hyugaensis	LC
Iago garricki	LC
Mustelus antarcticus	LC
Mustelus ravidus	LC
Mustelus stevensi	LC
Centrophorus moluccensis	LC
Deania calcea	LC
Squaliolus aliae	LC
Etmopterus bigelowi	LC
Etmopterus lucifer	LC
Etmopterus pusillus	LC
Heterodontus zebra	LC
Parascyllium collare	LC
Parascyllium ferrugineum	LC
Parascyllium variolatum	LC
Centroscymnus owstonii	LC

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Species	IUCN
Centroselachus crepidater	LC
Squalus acanthias	LC
Trygonoptera mucosa	LC
Trygonoptera ovalis	LC
Trygonoptera personata	LC
Trygonoptera testacea	LC
Urolophus circularis	LC
Urolophus cruciatus	LC
Urolophus expansus	LC
Urolophus flavomosaicus	LC
Urolophus gigas	LC
Urolophus lobatus	LC
Urolophus mitosis	LC
Urolophus paucimaculatus	LC
Urolophus piperatus	LC
Urolophus westraliensis	LC

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