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Garig Gunak Barlu Cobourg Marine Park Green Sawfish Project: Scoping Trip Report

Christy L. Davies, Alan Withers & Peter M. Kyne

Project A12: Threatened and Migratory Marine Species in Australia's Northern Seascape

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Milestone 3 – Research Plan v5 (2019)



Enquiries should be addressed to:

Christy Davies
christy.davies@cdu.edu.au
Research Institute for the Environment and Livelihoods
Charles Darwin University
Darwin NT 0909
Australia

Project Leader's Distribution List

Department of the Environment and Energy – Biodiversity Conservation Division	
Department of the Environment and Energy – Parks Australia	
Australian Fisheries Management Authority	Steve Bolton
NT Department of Environment and Natural Resources	Tony Griffiths
NT Department of Primary Industry and Resources	Thor Saunders
NT Department of Tourism and Culture, Parks, Wildlife and Heritage	Executive Officer: Ricki Kelly
Garig Gunak Barlu Cobourg Marine Park Board	Secretariat: Ricki Kelly

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EXECUTIVE SUMMARY

Drone footage captured in late 2018 showing a Green Sawfish (*Pristis zijsron*) aggregation in the shallow waters of Garig Gunak Barlu Cobourg Marine Park footage was unprecedented anywhere in the wide Indo-West Pacific range of the species and suggested that this site may not only be nationally, but also internationally significant for this highly threatened species.

Drones and Baited Remote Underwater Videos (BRUVs) will be used to characterise recently-identified sawfish aggregation areas within the Garig Gunak Barlu Cobourg Marine Park. A scoping trip was undertaken during the period 15–22 March 2019 which aimed to assist in planning field surveys. From the scoping trip it is apparent that there are likely to be numerous locations throughout the Marine Park where Green Sawfish aggregate (several of which could be surveyed using the proposed methods), and the Marine Park is likely to be a hotspot for elasmobranch diversity generally.

This report outlines access and permits required to undertake research in the Park, environmental conditions as they relate to undertaking planned research, potential sampling sites, future sampling trips, and risk associated with the planned research.

1. INTRODUCTION

1.1 Cobourg Peninsula

The Cobourg Peninsula is located approximately 220 km northeast of Darwin, 570 km by road via Kakadu National Park. Garig Gunak Barlu National Park encompasses both land and sea country (*gunak* and *lala*, respectively in the local language Iwaidja), through the Cobourg Sanctuary and the Cobourg Marine Park. The Park includes the entire Peninsula, the surrounding waters of the Arafura Sea and Van Diemen Gulf, and some of the neighbouring islands. The Park is Aboriginal owned land that is jointly managed by the Cobourg Peninsula Sanctuary and Marine Park Board which includes representatives from local Traditional Owner groups and the Northern Territory Government.

Coastal waters in the northern section of the Park including Ports Essington and Bremer, and Popham, Trepang, and Raffles Bay, generally have very low turbidity as a result of a small tidal range (2–2.5 m) and low discharge from creeks and estuaries. In contrast, the waters of Van Diemen Gulf in the southern section of the Park are generally turbid, due to the discharge from large tidal rivers including the South and East Alligator Rivers, as well as a greater tidal range (~3 m) (CPSMPB & PWS 2011).

1.2 Shark & Ray Fauna of Northern Australia

Australian territorial waters are home to 328 species of chondrichthyan fishes (sharks, rays, and ghost sharks). This represents over a quarter of the global fauna and is the highest diversity of any country. The fauna differs considerably between southern temperate regions and the tropical north. The latter is characterised by the inshore, coastal, and continental shelf species found in the shallow waters of the north. Dominant families include the whaler sharks (family Carcharhinidae) and stingrays (Dasyatidae). In general, northern Australian species are more poorly-known than southern species, with considerable knowledge gaps on even some of the most common species. Northern Australia is a stronghold for several nationally and globally threatened species, in particular the sawfishes (Pristidae), wedgefishes (Rhinidae), giant guitarfishes (Glaucostegidae), and hammerhead sharks (Sphyrnidae).

1.3 Shark & Ray Fauna of Cobourg Marine Park

The high diversity of marine life is well renowned, and clearly visible to Traditional Owners, Parks and Wildlife Rangers, recreational fishers, and other visitors. A severe coral bleaching

event in 2018, brought to the worlds' attention through drone footage captured by one of the authors (AW), put the marine biodiversity values of the region in the spotlight:

- <https://www.abc.net.au/news/2018-03-14/coral-bleaching-sign-nt-marine-ecosystem-under-threat-scientists/9544956>
- <https://theconversation.com/new-coral-bleaching-outbreak-in-nt-a-worrying-sign-of-our-warming-oceans-93351>
- http://www.xinhuanet.com/english/2018-03/14/c_137037831.htm

A preliminary fauna list provided in Appendix 2 of the Cobourg Management Plan (CPSMPB & PWS 2011) was based on specimens held at the Museum and Art Gallery of the Northern Territory, and on all available published scientific literature as of 1988. Only 18 species of sharks and rays appear on this list, and no sawfishes were included. We are not aware of any formal surveys of elasmobranch fauna having been conducted in Cobourg Marine Park and adjacent waters. Drone footage captured by AW in early 2018 and shared with PMK and CD acted as the catalyst for this research. Figure 1 is a frame from part of that footage, showing numerous Green Sawfish (*Pristis zijsron*) in the shallows off Record Point. Such footage was unprecedented anywhere in the wide Indo-West Pacific range of Green Sawfish and suggested that this site may not only be nationally, but also internationally significant for this highly threatened species.

Drone footage collected by AW provided new information on the diversity of the local shark and ray fauna. Some still images are provided here to highlight some of this diversity: Figure 2 features a Green Sawfish alongside a Mangrove Whipray (*Urogymnus granulatus*); Figure 3, a likely nursery area for Giant Guitarfish (*Glaucostegus typus*); and, Figure 4, a Reef Manta Ray (*Mobula alfredi*).

Table 1 provides a list of elasmobranch species confirmed to be present in the Marine Park through recent (<5 yrs) photographs or drone footage captured by AW and reviewed by PMK and CD, or directly observed during the scoping trip. This list is by no means a comprehensive list of the local fauna, with many more species expected to be recorded on future sampling trips.

1.4 Aims

The NESP Marine Biodiversity Hub Project A12 'Threatened and Migratory Marine Species in Australia's Northern Seascape' includes the following research component:

Sawfish nursery area characterisation. Green and Dwarf Sawfishes (*EPBC Act* listed Vulnerable species) were identified as the most poorly known species in the species gap analysis undertaken in Phase 1 of project A12 (see Scoping Report Tables 4 and 13; Kyne *et al.* 2018). There are no documented breeding areas for these species in the North Marine Bioregion (and no designated Biologically Important Areas). The project will work with local collaborators to characterise a recently-identified nursery area for the Green Sawfish in the Northern Territory (in Garig Gunak Barlu Cobourg Marine Park). This will be achieved by firstly recording and counting juvenile animals, and characterising the physical environment (water depth, substrate type, fringing vegetation, turbidity, salinity etc). Using this information, we will attempt to model animal presence/counts with these variables, but if data are too limited for modelling, we will identify similar habitat across the North Marine Bioregion using Landsat imagery. By extrapolating habitat type from the fine-scale of the survey area to the broad-scale of the seascape, it will be possible to map "likely breeding" areas for the species (currently inaccurately mapped in SPRAT as entire coastal waters; see Scoping Report Figure 3; Kyne *et al.* 2018).

The aim of this report is to provide an overview of a scoping trip undertaken to Garig Gunak Barlu Cobourg Marine Park during the period 15–22 March 2019 which aimed to assist in planning field surveys under the above component of NESP Marine Biodiversity Hub Project A12. This report outlines access and permits required to undertake research in the Park, environmental conditions as they relate to undertaking planned research, potential sampling sites, future sampling trips, and risk associated with the planned research.



Figure 1. A still capture from drone footage showing at least 9 Green Sawfish aggregating in shallow water off *Lidarnardi* (Record Point), Cobourg in January 2018 (Credit: Alan Withers).



Figure 2. A still capture from drone footage showing a Green Sawfish and a Mangrove Whipray in shallow water off *Lidarnardi* (Record Point), Cobourg in January 2018 (Credit: Alan Withers).



Figure 3. A still capture from drone footage showing an aggregation of young Giant Guitarfish in shallow water off *Lidarnardi* (Record Point), Cobourg in February 2019 (Credit: Alan Withers).



Figure 4. A Reef Manta Ray off *Algarlalgari* (Black Point), Cobourg in March 2019 (Credit: Alan Withers).

Table 1. Elasmobranch species confirmed from Cobourg Marine Park by film, photographs or direct observation by the research team. This is not a comprehensive list of species occurring in the Marine Park but represents those that can be easily observed in shallow inshore waters of the Park.

Family	Common & species name	IUCN Red List Category ¹	Australian Shark Action Plan Category ²
Ginglymostomatidae	Tawny Nurse Shark <i>Nebrius ferrugineus</i>	Vulnerable	Least Concern
Carcharhinidae	Spottail Shark <i>Carcharhinus sorrah</i>	Near Threatened	Least Concern
Carcharhinidae	'Blacktip' Sharks ⁴ <i>Carcharhinus</i> sp.	Near Threatened – Least Concern	Least Concern
Carcharhinidae	Sharptooth Lemon Shark <i>Negaprion acutidens</i>	Vulnerable	Least Concern
Sphyrnidae	Hammerhead Sharks ⁵ <i>Sphyrna</i> sp.	Critically Endangered – Endangered	Endangered – Vulnerable
Pristidae	Dwarf Sawfish <i>Pristis clavata</i>	Endangered	Endangered
Pristidae	Green Sawfish <i>Pristis zijsron</i>	Critically Endangered	Critically Endangered
Rhinidae	Shark Ray <i>Rhina ancylostoma</i>	Critically Endangered ³	Near Threatened
Glaucostegidae	Giant Guitarfish <i>Glaucostegus typus</i>	Critically Endangered ³	Least Concern
Dasyatidae	Australian Whipray <i>Himantura australis</i>	Not Evaluated	Least Concern
Dasyatidae	Broad Cowtail Ray <i>Pastinachus ater</i>	Least Concern	Least Concern

Family	Common & species name	IUCN Red List Category ¹	Australian Shark Action Plan Category ²
Dasyatidae	Mangrove Whipray <i>Urogymnus granulatus</i>	Vulnerable	Least Concern
Gymnuridae	Australian Butterfly Ray <i>Gymnura australis</i>	Least Concern	Least Concern
Myliobatidae	Spotted Eagle Ray <i>Aetobatus ocellatus</i>	Vulnerable	Least Concern
Mobulidae	Reef Manta Ray <i>Mobula alfredi</i>	Vulnerable	Least Concern

¹Global extinction risk taken from <https://www.iucnredlist.org/>; ²Australian extinction risk taken from Kyne *et al.* (In prep.) ('SAP'); ³Revised global assessments submitted for publication on the IUCN Red List (Kyne *et al.* submitted); ⁴Includes Common Blacktip Shark *Carcharhinus limbatus* (IUCN RL, Near Threatened; SAP, Least Concern) and Australian Blacktip Shark *C. tilstoni* (IUCN RL, Least Concern; SAP, Least Concern); ⁵Includes Winghead Shark *Eusphyra blochii* (IUCN RL, Endangered; SAP, Vulnerable), Scalloped Hammerhead *Sphyrna lewini* (IUCN RL, Critically Endangered; SAP, Endangered), and Great Hammerhead *S. mokarran* (IUCN RL, Critically Endangered; SAP, Endangered) (the latter two revised global assessments submitted for publication on the IUCN Red List)

2. LOGISTICS

2.1 Access

Garig Gunak Barlu National Park is only open to the public during the dry season, with the Park generally opening on May 1st and closing around October (depending on the onset of build-up rains). The project team may be able to access the Park by road outside formal Park opening dates. Access by road requires negotiating Cahills Crossing on the East Alligator River. This notorious river crossing is officially closed throughout the wet season, and even once open it may still be impassable periodically, due to tidal influence. Roads throughout the Park are dirt, often extremely corrugated and frequently crisscrossed with washouts. Only well maintained four-wheel drives and ruggedized boat trailers are suitable for the journey.

When Cahills Crossing is closed, the Peninsula can be accessed from Darwin by air. The 'mail plane' is a single engine 4-seater plane operated by local charter company Hardy Aviation, which delivers supplies to the ranger station at Algarlalgarl (Black Point) weekly. Occasionally there may be space to transport people and/or gear on the mail plane, by arrangement with the rangers. The alternative is a private charter plane.

No fuel is available for purchase within (or near) the Park. With the volume required for both vehicles and vessels it may be necessary to ship some fuel to the ranger station prior to fieldwork. All other supplies (apart from drinking water) will also need to be taken on trips as there are no shops on (or near) the Peninsula.

2.2 Permits

Recreational visitors require a permit to camp within Garig Gunak Barlu National Park, however we've been advised that as researchers we will be exempt.

We have been liaising with the Permits section of the Parks, Wildlife and Heritage Division of the Department of Tourism, Sport and Culture regarding permits to undertake the scientific research. According to the Permits section manager we do not require any specific permits to undertake our work. This is primarily because the sampling methods (BRUVs and drones) being used are non-extractive and minimally disruptive.

Animal Ethics approval for the research has been provided by the Charles Darwin University Animal Ethics Committee.

3. ENVIRONMENTAL CONDITIONS

Water clarity across the region is very good throughout the dry season and build-up, when offshore winds prevail. Even with the onshore winds and enhanced swell occurring at the time of this trip (late wet season), the turbidity measured at one of the sites was only 4.2 NTU. Under such conditions BRUVs would likely still be effective. The low cloud cover that is typical of the dry season would also contribute to overall excellent visibility for drone work, though cloud cover can increase as the build-up progresses. The tidal range is much reduced when compared to much of the Top End coast, limited to around 2–2.5 m.

4. POTENTIAL SAMPLING SITES

Due to unfavourable conditions (strong winds and rough seas) during the scoping trip we were only able to visit two locations (Figure 5) that the rangers have already identified as potential sampling sites, based on their previous observations of high numbers of sawfish. Considering observations made whilst flying over the western half of the Peninsula, and during time spent on the water, it is evident that there may be numerous additional sampling sites across the Marine Park. A brief description of the two sites visited is included in the following section.



Figure 5. Cobourg Peninsula including two survey sites (green pins: Gul Gul and Lidarnardi) visited during the scoping trip, two other potential survey sites (white pins: Nudaway and Knocker Bay), and the field base at Algarlalgari (yellow pin).

4.1 Gul Gul

Approximately 30 minutes by boat from Algarlalgarl across the mouth of Bremer Bay is a shallow (1–2 m at high tide) wide-mouthed, northwest facing bay (Figure 6) at -11.1682° , 132.3185° . Due to weather conditions, this site was not accessible by water during the scoping trip. The ~80 km trip on unsealed road takes around 1.5 hours.

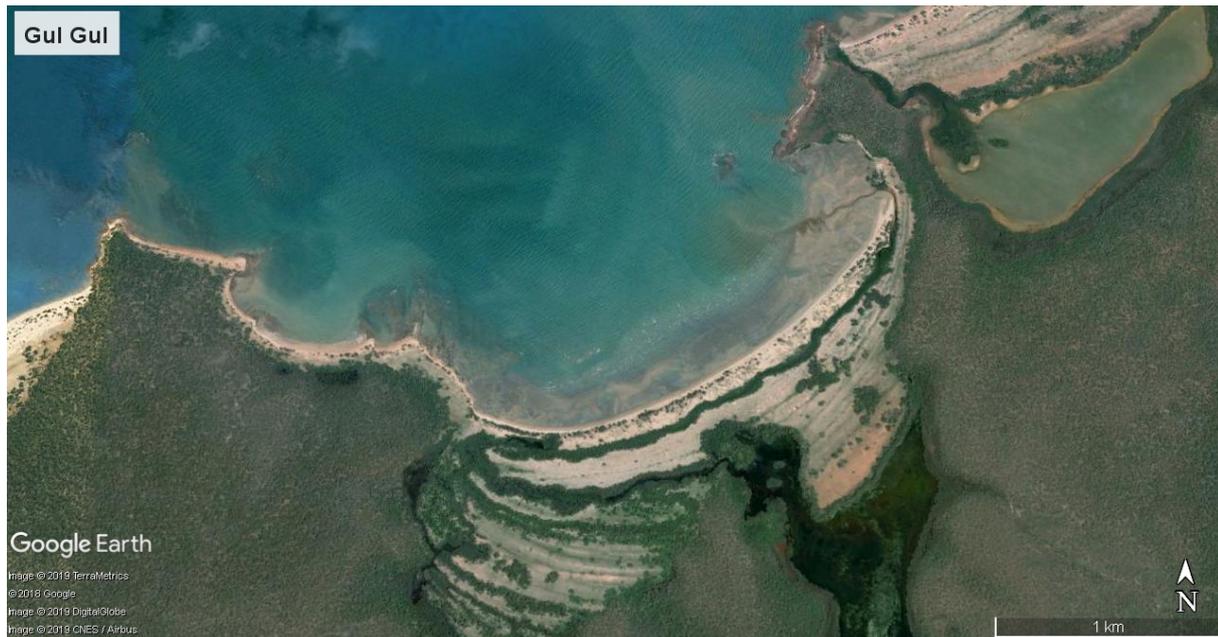


Figure 6. The Gul Gul site, including adjoining seasonally inundated wetland.

The bay is partially protected at the eastern end by a small rocky headland and there is minimal current. There is a creek running behind the beach (Figure 7) which makes access by vehicle under certain tidal conditions difficult and potentially hazardous due to the likely presence of Estuarine Crocodiles.

We were unable to cross onto the beach, so only observed the water from a distance. Water clarity in the main section of the bay was difficult to assess, mainly due to the surface chop.

There is a wetland area backing on to the beach (Figure 6). With the combination of sand flats, beach, and wetland in close proximity, this could provide good habitat for a range of shorebirds. There were small numbers of shorebirds present on the main beach.

In the northern-most section of the bay, in the lee of the small rocky headland, the water was calm, very shallow, and appeared extremely clear (Figure 8). There were also small numbers of

shorebirds present in this section, but there had likely been many more that were flushed by the three large raptors involved in an aerial skirmish when we arrived.



Figure 7. The tidal creek that runs between the land and beach at Gul Gul.



Figure 8. Northeast section of the bay at Gul Gul, with rocky headland in background.

4.2 Lidarnardi (Record Point)

Lidarnardi is a narrow south-southwest pointing spit in Port Essington (Figure 9), 15–20 minutes south of Algarlalgari by boat at -11.3242° , 132.1735° . This site is comprised of two distinct sections, located on either side of the tip of the spit. We accessed this site by boat during the scoping trip.

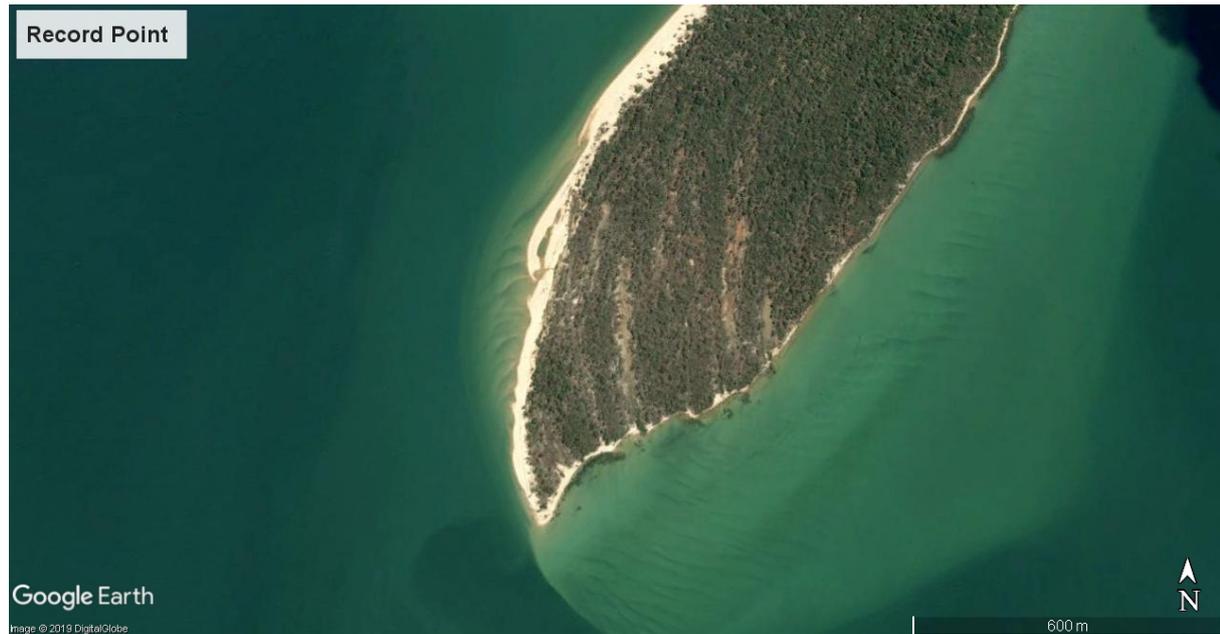


Figure 9. Lidarnardi site, showing the extensive area of shallow sandflats on the lee side.

There is a shallow southeast facing ‘bay’, in the lee of a small sandbar (Figure 10). We were unable to move all the way into the bay section as the tide was not yet high enough, however numerous small sharks could be seen actively feeding; many rays were also observed, and the substrate was pockmarked with indentations created by feeding rays. There were small numbers of shorebirds feeding on the shoreline. Many shorebirds and seabirds (terns) are reported to congregate at this location on higher tides.



Figure 10. Bay in lee of the sandbar at the tip of Lidarnardi.

The northwest facing beach (Figure 11) consists of a gentle sandy slope with a series of shallow 'gutters' which bony fish are chased into by predators as they become inundated by the tide. Sharks and rays were predominately observed moving from the spit end in a northeast direction up the beach.



Figure 11. Lidarnardi beach, with shallow 'gutters' partially inundated on an incoming tide.

Due to weather conditions we were forced to depart before high tide (when the highest diversity of marine life is usually present), nonetheless we observed 5–6 small (~1–1.5 m) sawfish, likely Green Sawfish (*Pristis zijsron*), as well as Broad Cowtail Rays (*Pastinachus ater*), Spotted Eagle Rays (*Aetobatus ocellatus*), Australian Butterfly Ray (*Gymura australis*), Giant Guitarfish (*Glaucostegus typus*), ‘Blacktip’ sharks (*Carcharhinus* sp.), Lemon Shark (*Negaprion acutidens*), and Spot-tail shark (*Carcharhinus sorrah*). The rangers also report regularly seeing whiprays (*Himantura* sp.) and hammerhead sharks (*Sphyrna* sp. ***bardbalminyun***) at this location, as well as the occasional Shark Ray (*Rhina ancylostoma*). Bony fish present included large Cobia (*Rachycentron canadum*), Milkfish (*Chanos chanos*) and Queenfish (*Scomberoides commersonianus* ***wanjalkarrij***); smaller fish included Whiting (*Sillago sihama*), mullet (*Mugil* sp. ***kumbukumbuk***), longtoms (*Hyporhamphus* sp. ***Arrkarl*** and/or ***urrulkurrukl***), and many more.

Water depth in the centre of Port Essington is around 15 m and is frequented by diverse marine life. Cetaceans including Australian Humpback Dolphins (*Sousa sahalensis*, one of the 16 Priority Species identified during the scoping phase of this research project; see Kyne *et al.* 2018), Indian Ocean Bottlenose Dolphins (*Tursiops aduncus*), and False Killer Whales (*Pseudorca crassidens*) are known to frequent Port Essington.

4.3 Other Potential Sampling Sites

A short drive north of the Gul Gul site is Nudaway (Danger Point). On the eastern side of Nudaway is another wide bay with large sections of shallow water with sandy substrate (Figure 12). Turtles were observed at the time of the visit. This may be another site worth assessing as a potential sampling site, given the habitat and high likelihood of sawfish occurrence.

Another possible site which was discussed but not visited during the scoping trip is Knocker Bay, south of Algarlalgarl on the western side of Port Essington. This area is covered by an active pearling lease and is excluded from the Park. However, the owner/operator may be willing to allow us to sample the area. It would be worthwhile arranging a preliminary visit during the first sampling trip.

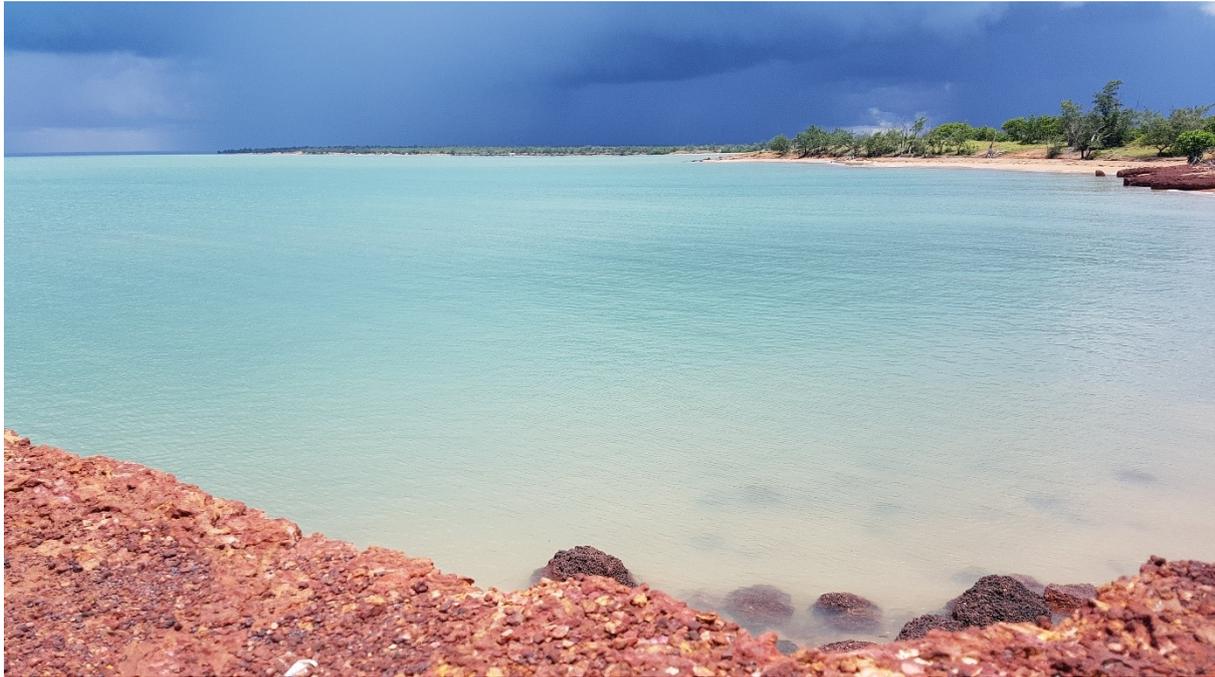


Figure 12. Bay on eastern side of Nudaway that may be another potential survey site.

5. SAMPLING TRIPS

Our current plan is to sample twice (using BRUVs and drones) in 2019, once in the early dry season (July–August) and again in the late dry (October–November). This will allow us to provide habitat parameters to Geoscience Australia by March 2020. There may also be potential to sample once more (possibly restricted to use of drones), in the early dry of 2020 if additional data (and/or replication) is needed. Trips are likely to be between 1 and 2 weeks duration.

6. RISKS

The NESP Marine Biodiversity Hub Project A12 project proposal outlined several risks. Table 2 shows the identified risks relevant to the research on Green Sawfish in Garig Gunak Barlu Cobourg Marine Park, as well as additional, recently identified risks.

Table 2: Risks (and their management) related to Green Sawfish research in Garig Gunak Barlu Cobourg Marine Park (a) identified in the Project A12 project proposal and (b) identified more recently.

Risk to project	Potential impact on project	Risk rating	How will risk be managed?
(a) Original identified risks			
1. Access to remote field sites for field components of project	Unable to undertake fieldwork at selected locations	Low	Time field work for appropriate access (i.e. avoid wet season, or consider air access for wet season); seek local advice and knowledge from ranger group; monitor weather; maintain appropriate research vessels and equipment at CDU
2. Possibility of low detection rates for sawfish nursery area characterisation	Inadequate data to characterise habitat	Low	Apply best-practice survey techniques for target species; engage with local rangers; project team has extensive experience surveying for rare species
3. Remote field work safety	Minor, moderate, and catastrophic injuries or death	Low	Annual field work risk assessment submitted to CDU; all CDU field OH&S protocols followed; adequate training for field participants; local weather and conditions assessed prior to any field activities
(b) Newly identified risks			
4. Drone piloting	Intended pilot unable to carry out aerial surveys	High	In April 2019 the NT Parks and Wildlife Drone Committee placed a (temporary) ban on staff flying drones for work purposes, and CDU is in the process of finalising their SOPs relating to drone use. We are exploring options with the CDU's Chief Remote Pilot Dr Hamish Campbell
5. Water clarity for effective deployment of BRUVs	Unable to accurately identify and measure species captured in footage	Low	Use local knowledge to confirm accurate tidal conditions for each site; allow enough days on each trip for a second attempt at sampling should conditions be suboptimal during first attempt

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www.nespmarine.edu.au

Contact:

Christy Davies
Charles Darwin University

Address | Research Institute for the Environment & Livelihoods | Charles Darwin University |
Darwin 0909 Northern Territory
email | christy.davies@cdu.edu.au
tel | +61 8 8946 7449

