

## **Port Hedland Spoilbank Marina:**

# **Sawfish Risk Assessment**

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## Contents

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<b>1.</b>	<b>Context and Scope .....</b>	<b>3</b>
	1.1 <b>Context.....</b>	<b>3</b>
	1.2 <b>Background .....</b>	<b>3</b>
	1.3 <b>Conservation Status .....</b>	<b>3</b>
	1.4 <b>Distribution .....</b>	<b>3</b>
	1.5 <b>Key Threats.....</b>	<b>4</b>
<b>2.</b>	<b>The Proposal.....</b>	<b>4</b>
	2.1 <b>Overview .....</b>	<b>4</b>
<b>3.</b>	<b>Benthic Habitats .....</b>	<b>7</b>
<b>4.</b>	<b>Sawfish Expert Technical Advice .....</b>	<b>8</b>
	4.1 <b>Sawfish Survey Records/Catch Data .....</b>	<b>8</b>
<b>5.</b>	<b>Impact Pathways.....</b>	<b>8</b>
	5.1 <b>Turbidity.....</b>	<b>8</b>
	5.2 <b>Injury or Mortality .....</b>	<b>9</b>
	5.3 <b>Underwater Noise.....</b>	<b>9</b>
	5.4 <b>Direct Habitat Loss.....</b>	<b>9</b>
	5.5 <b>Indirect Habitat Loss.....</b>	<b>9</b>
	5.6 <b>Pollution and Contamination.....</b>	<b>9</b>
<b>6.</b>	<b>Management Measures .....</b>	<b>10</b>
<b>7.</b>	<b>Risk Assessment.....</b>	<b>10</b>
<b>8.</b>	<b>Conclusions .....</b>	<b>18</b>
<b>9.</b>	<b>References .....</b>	<b>19</b>

## Appendices

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Appendix A Technical Review – Spoilbank Marina Proposal: Review of Potential Impacts to Green Sawfish

## 1. Context and Scope

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### 1.1 Context

On 5 February 2020 a workshop was held at the Department of Transport (DoT, Marine House, Fremantle) to assess the risk of impacts to sawfish from the proposed development of the Spoilbank Marina (the Proposal). This workshop was attended by Mat Hourston (Department of Primary Industries and Regional Development), Dr Bruce Hegge (Teal Solutions), Chris Lane (O2 Marine) and Matt Spence (DoT). Dr David Morgan (Harry Butler Institute, Murdoch University) was an apology at the workshop.

### 1.2 Background

Pre-referral advice (provided on 1 August 2019) from the Department of Water and Environmental Regulation (EPA Services) indicated that impacts to Green Sawfish (*Pristis zijsron*) could be a key issue for the Proposal's impact assessment on the Marine Fauna Environmental Factor. The Proposal was also referred to the Commonwealth Department of Environment and Energy (DoEE) under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) on 22 August 2019. The Proposal was determined to be a 'Controlled Action' by a Delegate of the Commonwealth Minister for the EPBC Act on 21 January 2020 as it will, or is likely to have, a significant impact on the following Matters of National Environmental Significance (MNES):

- Listed threatened species and communities (Section 18 and 18A) – Green Sawfish (*Pristis zijsron*), Dwarf Sawfish (*Pristis clavata*), Flatback Turtles (*Natator Depressus*) and Green Turtles (*Chelonia mydas*)
- Listed migratory species (Sections 20 & 20A) – Narrow Sawfish (*Anoxypristis cuspidata*)

### 1.3 Conservation Status

These sawfish species are protected under the following State and Commonwealth legislation:

- Green Sawfish (*P. zijsron*) – listed as threatened (Vulnerable) under the WA *Biodiversity Conservation Act 2016* (BC Act) and as migratory/threatened (Vulnerable) under EPBC Act,
- Dwarf Sawfish (*P. clavata*) – listed as threatened (Vulnerable) under the WA BC Act and as migratory/threatened (Vulnerable) under EPBC Act
- Narrow Sawfish (*A. cuspidata*) – Listed as migratory under the EPBC Act.

### 1.4 Distribution

Green Sawfish are currently distributed from about the Whitsundays (Harry et al., 2011) in Queensland across northern Australian waters to Shark Bay in Western Australia. Individuals have been recorded in inshore coastal environments and estuaries, but the species does not penetrate into freshwater. There are also records of Green Sawfish hundreds of kilometres offshore in relatively deep water (Stevens et al., 2005).

The distribution of Dwarf Sawfish in Australia is likely to extend from the Pilbara coast in Western Australia across northern Australia and into the Gulf of Carpentaria (Last & Stevens, 1994; Stevens et al., 2008). Distribution on the east coast of the Cape York Peninsula is contested (Kyne et al., 2013a).

Narrow sawfish are a benthic-pelagic species found throughout the Indo-West Pacific, and across northern Australia from the Pilbara Coast in Western Australia to Broad Sound in Queensland (Last and Stevens 2009). Adults mainly occur offshore while juveniles and pupping females require inshore and estuarine habitats (Peverell 2005).

## 1.5 Key Threats

The Commonwealth’s *Sawfish and River Sharks Multispecies Recovery Plan* (DoEE, 2015) identified the principal threats to sawfish species as:

- fishing activities including: being caught as by-catch in the commercial and recreational sectors; through Indigenous fishing; and illegal, unreported and unregulated fishing
- habitat degradation and modification.

In the context of the Commonwealth’s recovery plan, habitat degradation and modification are considered the likely key threats relating to the Spoilbank Marina Proposal that require assessment. A priority action identified in the recovery plan is to ensure all future developments do not significantly impact upon sawfish habitats critical to the survival of the species or impede upon the migration of individual sawfish (DoEE, 2015). Furthermore, the recovery plan directs a proponent to seek advice on likely impacts and potential mitigation measures from sawfish experts for all developments proposed to occur in habitat critical to survival of the species.

## 2. The Proposal

The DoT propose to develop a marina complex on the western side of the Spoilbank in the town of Port Hedland Western Australia. The Spoilbank is an artificial coastal landform created in the late 1960s and early 1970s as a result of the disposal of dredge material associated with the Port Hedland Inner Harbour and Goldsworthy shipping channel dredging works.

### 2.1 Overview

The Proposal includes ~25 ha of clearing and ground disturbance within a Development Envelope of approximately 80 ha and will include the following physical and operational elements (Table 1):

- Marina basin, berth facilities (up to 80 pens), boat launching area and entrance channel.
- Capital dredging to a maximum depth of -2 m chart datum. This will result in ~900,000m<sup>3</sup> of dredge material which will be used onsite as fill material to raise the finished ground level prior to landscaping. No ocean disposal of dredge material will occur as part of this proposed action.
- Construction of the marina’s breakwaters, revetments and sand trap. Materials for the construction of these structures will be sourced from local commercial quarry operations.
- Parking facility, amenities (public and pen holders), public open space and upgrading of road infrastructure.

**Table 1 Key proposal characteristics**

<b>Action Title</b>	Port Hedland Spoilbank Marina Proposal
<b>Proponent name</b>	Department of Transport
<b>Short description</b>	<p>The Proposal is for the construction of the Port Hedland Spoilbank Marina, located within the Town of Port Hedland, Pilbara. The Proposal includes the development of up to 80 boat pens and includes:</p> <ul style="list-style-type: none"> <li>• Dry-land excavation of the marina basin (maximum depth to -2m chart datum (-5.9 m AHD))</li> <li>• Capital dredging works resulting in up to 900,000m<sup>3</sup> of dredge material</li> <li>• Sand trap</li> <li>• Construction of breakwaters and revetment walls</li> <li>• Disposal of capital dredge spoil on land as fill material to raise the finished ground level prior to landscaping.</li> </ul>

	The Proposal also includes the ongoing management and maintenance of the marina water body and infrastructure.
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Element	Location	Proposed Extent
<b><i>Physical Marine Element</i></b>		
Marina basin and entrance channel	Figure 1	Approximately 10 ha
Breakwater and revetment wall	Figure 1	Approximately 5 ha
Sand trap	Figure 1	Approximately 7 ha
<b><i>Physical Terrestrial Element</i></b>		
Parking and trailer bays	Figure 1	Approximately 3.5 ha
Public open space	Figure 1	Approximately 3.5 ha
Road infrastructure	Figure 1	Design is being finalised

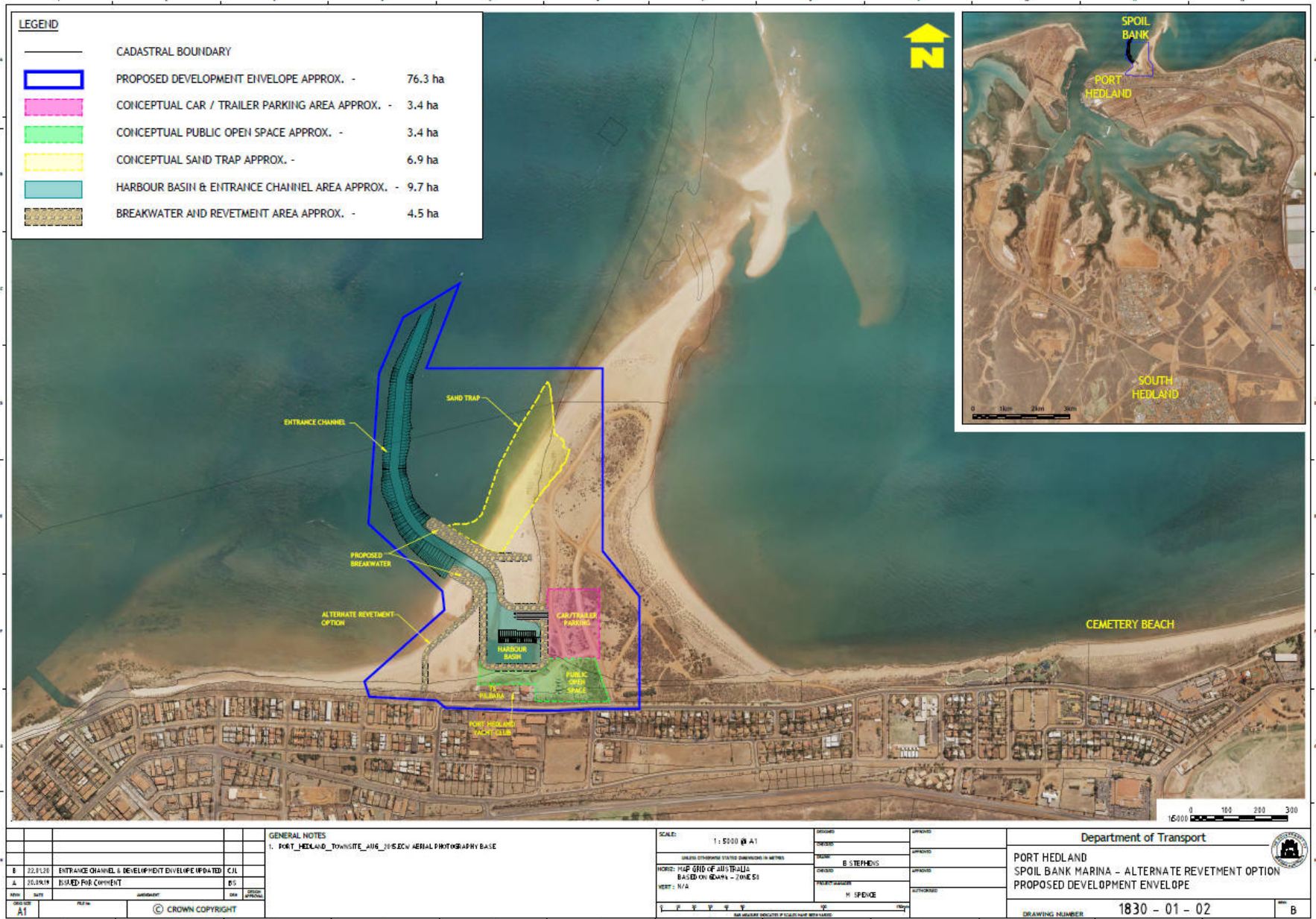


Figure 1 Proposed Spoilbank marina and development envelope

### 3. Benthic Habitats

The subtidal benthic communities and habitat (BCH) in the vicinity of the Proposal has been mapped into three broad classes:

- Bare Sand
- Mixed assemblage (Corals, Sponges, Macroalgae, and Hydrozoan) and
- Mixed assemblage with seagrass (sparse Seagrass, Sponges, Macroalgae, and Hydrozoan)

The benthic cover was found to be generally sparse to low across more than 95% of the study area. Small areas of low- to medium-density mixed assemblage habitat were typically found on consolidated or semi-consolidated substrate generally in shallow water and/or in the intertidal zone and mostly along the shoreline. In the vicinity of the development envelope mixed assemblage habitat were present on low profile reefs and patches of very sparse ephemeral seagrass on sand were also observed. Sparse seagrass communities were observed in the vicinity of the Project area (Figure 2).



Figure 2 Benthic habitat adjacent to the proposed Marina

## 4. Sawfish Expert Technical Advice

To assess the risk to sawfish populations the DoT engaged Dr David Morgan (Harry Butler Institute), as well as research scientists from the Sawfish Conservation Society and Sharks and Rays Australia, to provide an impact assessment and expert commentary as part of the impact assessment for the Proposal (Appendix A). The expert commentary addresses the following elements:

1. Whether habitat critical to the survival of the Green Sawfish occur in the project area.
2. Critical times/seasons that the species may be in the project area.
3. Known sightings or recordings of the species in the vicinity of the project area.
4. Potential impact on these species from the proposal.
5. Targeted survey work, monitoring and management actions that could be implemented to help mitigate potential impacts to the species.

### 4.1 Sawfish Survey Records/Catch Data

In the absence of targeted sawfish surveys in the immediate vicinity of the proposed Port Hedland Marina or on the Spoilbank, Morgan *et al* (2019) collated recent (since 2010) records of sawfish from the Pilbara region between 80 Mile Beach and south to Karratha (a range of approximately 400 km). A total of 66 sightings of sawfish fell within this area around Port Hedland. A total of 16 of these sawfish sightings were located at Port Hedland, 11 of which were positively identified as *P. zijsron*, the remaining 5 individuals only identifiable to genus. Locations in Port Hedland included two records off the Spoilbank and one caught at the Port Hedland jetty at the entrance of the inner harbour. These fish ranged in length from ~0.6 m to 3 m and were likely to be pups, juveniles or sub-adults, suggesting the area may be a key nursery habitat for the species. Small green sawfish generally have a very small home range and occupy very shallow waters (see Morgan *et al*. 2017).

Morgan *et al* concluded that some fragmentation of juvenile habitat may occur as a result of the Proposal, although the Port of Port Hedland is likely to be a greater cause of any fragmentation should it be occurring. It is possible that disturbance of the Spoilbank through construction of the marina may disturb sawfish in the immediate vicinity of the impact site, however it was considered unlikely to reduce the area of occupancy of an important population.

## 5. Impact Pathways

A review of a similar project in the Pilbara region (the Onslow Marine Supply Base, O2 Marine 2016), technical comments provided from Morgan *et al* (2019), the State and Commonwealth management and recovery plans have identified the following potential risks to sawfish:

- Turbidity generated from dredging activities during construction;
- Injury or mortality of sawfish during dredging;
- Underwater noise generated during dredging or piling;
- Direct loss of critical habitat;
- Indirect loss of critical habitat' and
- Pollution and contamination.

### 5.1 Turbidity

Sawfish live in naturally turbid (i.e. creek/rivers) or low light (i.e. below the photic zone) environments and have sensory adaptations for detecting and capturing prey (O2 Marine, 2016). Port Hedland marine environment is highly dynamic and experiences large tidal ranges, high natural turbidity and large natural variations in sediment resuspension and transport.



Morgan *et al* (2019) noted that sawfish are nocturnal, and dredging should be undertaken during daylight hours to reduce the likelihood of turbidity impacting on with these species. DoT's dredging schedule does not involve any night-time dredging and will be limited to 12-hour shifts allowing time for any dredge plumes to dissipate overnight back to background levels. Dredge plume modelling indicates a localised and temporary plume may be generated and is likely to dissipate rapidly to ambient turbidity levels (Baird, 2020).

Noting the high background levels of turbidity, previous large-scale dredging projects that have occurred in the region and small and short-term nature of DoT's dredge works, turbidity impacts to sawfish are considered negligible. Furthermore, it is anticipated that sawfish can actively avoid plumes generated from dredging activity, which was confirmed by Morgan *et al* (2019) noting that sawfish are likely to move away from the site during dredging.

## 5.2 Injury or Mortality

It is anticipated that sawfish will actively avoid a noisy slow-moving dredge. Nonetheless, a Dredge Environmental Management Plan (DEMP) has been developed which includes soft start-up procedures for each new or re-start operation which will involve running the dredge for a few minutes to encourage sawfish to leave the immediate area prior to the commencement of dredging. Furthermore, Morgan *et al* (2019) noted that sawfish are nocturnal, and dredging shall not be undertaken during daylight hours which should reduce the likelihood of interacting with these species.

## 5.3 Underwater Noise

Casper (2006) identified that while elasmobranchs can detect sounds, they do not have sensitive hearing compared to other marine animals or the ability to detect most natural sounds they encounter in the far field. As behavioural impacts from underwater noise would be temporary and localised, and only occur at close range to piling and dredge operations the potential unmitigated impacts on sawfish are therefore likely to be negligible. As described above, a soft start-up procedure would assist to encourage sawfish away from the area prior to the commencement of dredging.

## 5.4 Direct Habitat Loss

The Proposal involves the direct removal of approximately 10 ha of substrate due to the proposed dredging works. Morgan *et al* (2019) noted that some fragmentation of juvenile habitat may occur as a result of the development and there is some likelihood that disturbance of the Spoilbank through construction of the marina may disturb sawfish in the immediate vicinity of the impact site. However, it is unlikely to reduce the area of occupancy of an important population (Morgan *et al*, 2019).

## 5.5 Indirect Habitat Loss

The modifications to the bathymetry may have the potential to change hydrodynamic regimes and sediment transport and fate pathways but are not considered significant and highly unlikely to impact sawfish at a population level.

## 5.6 Pollution and Contamination

Release of waste material can adversely impact on the sawfish through toxic effects, entanglement, suffocation and ingestion of wastes. These wastes may include solid wastes, hazardous wastes and sewage and grey water. There is a risk of hydrocarbon spill to the marine environment during the operation of the marina. All hazardous substances on site must be appropriately stored such that they do not pose a threat to the health and safety of personnel and the environment. All necessary material for mitigation of accidental spillage of hydrocarbons should be kept onsite at all times. All Contractors will work to the required

refuelling management plans reviewed and approved by DoT, and in accordance with the refuelling policy for DoT maritime facilities. In the event of accidental spillage, the Contractor should cease work immediately and ensure contamination is cleaned up prior to recommencing. A comprehensive environmental incident report will then be completed and provided to the DoT. During operation, monitoring and management of marine water quality in and adjacent to the Marina will be undertaken consistent with the Proposal's Marine Environmental Quality Plan (MEQP) which has been developed to ensure the ecosystem health and integrity is maintained.

## 6. Management Measures

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A Construction Environmental Management Plan (which includes the DEMP and Marine Fauna Monitoring Program) includes the following management measures:

- No dredging at night and/or during the months of December to March.
- Engagement of Marine Fauna Observers (MFOs) to monitor exclusion zones
- Use of small-to moderate-size dredge to reduce turbidity generation and limit the potential for impact on sawfish
- Implement best management dredging practices including utilising turtle exclusion devices and disturbance chains
- Underwater noise from piling activities managed through a soft start-up approach with progressively increasing hammer energy to alert sawfish.

## 7. Risk Assessment

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A sawfish risk assessment workshop was undertaken to supplement to assess a range of potential impact pathways (see Section 5) and determine the likelihood of impact on the sawfish population of the Pilbara. The risk assessment includes identification and description of the project specific stressors, description of the potential impact on sawfish, review of what is known and identification of proposed management and mitigation and follows a similar approach to that used to assess the Onslow Marine Supply Base (O2 Marine, 2016). The likelihood and consequence ratings (Figure 1) was adapted from Pilbara Ports Authority Hazard Management Procedure (PPA 2016). The outcome of the risk assessment workshop is presented in Table 2.

In addition, the risk workshop included consideration of the significance criteria identified in the Matters of National Environmental Significance *Significant Impact Guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999* (the MNES Guidelines; DoEE, 2013). DoT understands that the MNES Guidelines state that an action is likely to have a significant impact on a threatened species if there is a real chance or possibility that it will meet the specific criteria detailed in the MNES Guidelines. An assessment against each criterion is provided in Table 3.

Environmental Impacts		CONSEQUENCE				
		Insignificant	Minor	Moderate	Major	Catastrophic
		Negligible impact to biota and ecosystems (less than 1 year). Negligible impact to cultural features	Minor impact (up to 1 year) to biota and ecosystems. Minor / repairable impacts to cultural features. Regulatory notice	Moderate impact (up to 2 years) to biota & ecosystems. Moderate impact to cultural features of low significance. Regulatory notice and investigation.	Major impacts (up to 10 years) to biota, ecosystems or environmental harm. Extensive impacts to cultural features of significance. Regulatory fine/prosecution and/or warning.	Significant impacts to biota, ecosystems or environmental harm - Impact Persistence >10 years. Impacts resulting in significant or total loss of cultural features of high significance and/or items of National Heritage Value. Loss of licence/prosecution and/or fine
LIKELIHOOD	<b>Almost Certain</b> Has occurred frequently at the location and in the Company. Almost certain to occur during the next year	MOD	HIGH	HIGH	EXT	EXT
	<b>Likely</b> Has occurred frequently in the Company. Likely to occur in the next 2 years	MOD	MOD	HIGH	HIGH	EXT
	<b>Possible</b> Has occurred once or twice in the Company. May occur within 5 years	LOW	MOD	HIGH	HIGH	HIGH
	<b>Unlikely</b> Has occurred in Industry but not in the Company. May occur within the next 10 to 20 years.	LOW	LOW	MOD	MOD	HIGH
	<b>Rare</b> Almost unheard of in the Industry. May occur within the next 20 to 50 years	LOW	LOW	MOD	MOD	HIGH

Figure 3 Likelihood and consequence ratings

Table 2 Sawfish risk assessment

Stressor	Activity	Sawfish Impact	What is known	Risk Rating			Management	Monitoring	Residual Risk Rating		
				Likelihood	Consequence	Risk Rating			Likelihood	Consequence	Risk Rating
Turbidity	Dredging	Altered distribution of Sawfish due to temporary avoidance of area	Sawfish are nocturnal and adapted to sensory feeding. Live in naturally turbid or dark waters. Port Hedland experiences high natural variations in turbidity.	Possible	Insignificant	Low	DMMP. Day time dredging only between 6am-6pm.	DMMP - Monitoring aimed at reducing the extent of dredge plumes.	Possible	Insignificant	Low
Mechanical Impact	Dredging	Cutter head injury or mortality to individuals	Juvenile green sawfish (2 records) have been caught off the Spoilbank (Morgan <i>et al</i> , 2019). Juveniles tend to use inshore (water depth 0-1 m) habitat.	Rare	Minor	Low	DMMP. Soft start-up procedures.	Reporting protocols.	Rare	Minor	Low
Noise	Dredging/ Pile Driving	Altered distribution of Sawfish due to temporary	While elasmobranchs can detect sounds, they do not have sensitive hearing	Likely	Insignificant	Moderate	Small- to medium-sized dredge. Consider soft Start-up procedures.	Reporting protocols.	Possible	Insignificant	Low

Stressor	Activity	Sawfish Impact	What is known	Risk Rating			Management	Monitoring	Residual Risk Rating		
				Likelihood	Consequence	Risk Rating			Likelihood	Consequence	Risk Rating
		avoidance of area)	compared to other marine animals or the ability to detect most natural sounds they encounter in the far field								
Habitat loss (Direct)	Dredging	Permanent reduction in critical habitat/ shift in Sawfish presence in Port waters and tidal creeks	Construction involves approx. 10 ha of direct loss in local area of Spoilbank.	Possible	Insignificant	Low	Dredging footprint minimised to limit habitat loss in the marine environment.	DMMP provides monitoring to limit the zones of impact's spatial areas.	Possible	Insignificant	Low
Habitat loss (Indirect)	Dredging	Sandy substrate will not be impacted beyond approx. 10 ha that will be directly removed from dredging.	Migratory routes for adults occur offshore. Known primary nurse sites occur in King Sound and Fitzroy River.	Unlikely	Insignificant	Low	Dredging footprint minimised to limit habitat loss in the marine environment.	DMMP provides monitoring to limit the zones of impact's spatial areas.	Unlikely	Insignificant	Low

Stressor	Activity	Sawfish Impact	What is known	Risk Rating			Management	Monitoring	Residual Risk Rating		
				Likelihood	Consequence	Risk Rating			Likelihood	Consequence	Risk Rating
Pollution	Refuelling/solid waste disposal	Injury or mortality from chemicals and waste	Toxic effects of pollution, migration of habitat, possible entanglement, suffocation, and ingestion of wastes	Possible	Insignificant	Low	MEQP – manages marina including monitoring for pollution events and hydrocarbon spills.	DMMP and MEQP include monitoring of pollutants during construction and operation phases	Unlikely	Insignificant	Low

**Table 3 Commonwealth EPBC Act Significance Criteria**

Consideration	Impact prediction and risk assessment
<p>Long-term decrease in the size of an important population of a species</p>	<p><b><i>Morgan et al, (2019) Comments (Appendix A)</i></b>            Without fine-scale population genetic studies for all species within the Pilbara region, the information to suggest that the proposal will lead to a long-term decrease in the populations is lacking. Broadly, there are population differences between Western Australian sawfishes and those elsewhere, and there are also known morphological differences. Some studies suggest that each population requires individual management and that there is fine-scale differences (e.g. Feutry et al. 2015), and Phillips et al. (2017) recommend the preservation of the remaining genetic diversity as a high conservation priority for the three <i>Pristis</i> spp.</p> <p><b><i>Risk Assessment Workshop Commentary</i></b>            Potential impacts are considered limited to juvenile green sawfish that may be transiting the inshore waters adjacent to the project area. Offshore migratory pathways and primary nursery sites occurring at King Sound and Fitzroy River are highly unlikely to be affected by the nearshore and sub-tidal construction activities. Of the 66 individual records of sawfish over the past 10 years that have been reported over a range of 400 km (between Karratha and 80 Mile Beach), only 16 (mostly juveniles) have been recorded in the Port Hedland area, with 2 records at the Spoilbank land formation. Habitat within, and adjacent, to the Proposal's development envelope may support juveniles of these species, but when considered at a population level, as well as in a regional context, it is considered highly unlikely that a long-term decrease in the size of an important population of sawfish will occur. Furthermore, the intensity, duration, magnitude and geographic extent of potential impacts associated with undertaking the proposed action can be managed (avoided and reduced) to acceptable levels and therefore, it is considered highly unlikely that the Proposal will lead to a long-term decrease in the size of an important population of a sawfish species.</p> <p><u>Risk rating: Low</u></p>
<p>Reduce the area of occupancy of an important population</p>	<p><b><i>Morgan et al, (2019) Comments (Appendix A)</i></b>            The proposal is unlikely to noticeably reduce the area of occupancy for any sawfish species.</p> <p><b><i>Risk Assessment Workshop Commentary</i></b>            Agreed. The overall disturbance footprint of approximately 10 ha will not significantly reduce the available habitats for sawfish at a species or population level.</p> <p><u>Risk rating: Low</u></p>
<p>Fragment an existing important population into two or more populations</p>	<p><b><i>Morgan et al, (2019) Comments (Appendix A)</i></b>            Some fragmentation of juvenile habitat may occur as a result of the development, although the main port is potentially a greater cause of any fragmentation should it be occurring.</p> <p>There is some likelihood that disturbance of the Spoilbank through construction of the marina may disturb sawfish in the immediate vicinity of</p>

	<p>the impact site. The loss of shallow habitats, construction of breakwaters and subsequent redistribution of sediment and the dredge channel may disrupt the ability of small juvenile green sawfish, which typically inhabit water depths of &lt;1 m (Morgan et al. 2017), to migrate around the site. It is less likely to impact larger individuals (of all species) which typically utilise deeper waters (Whitty et al. 2009, 2017; Morgan et al. 2017).</p> <p><b>Risk Assessment Workshop Commentary</b></p> <p>The presence of the Marina, breakwaters and navigational channel not likely to create a barrier to the movement of sawfish within the area. Sandy substrate occurs throughout the area and wider region and the channel is unlikely to present a barrier between these environments or fragment any populations of sawfish.</p> <p><u>Risk rating: Low</u></p>
<p>Adversely affect habitat critical to the survival of a species</p>	<p><b>Morgan et al, (2019) Comments (Appendix A)</b></p> <p>It is unknown as to the importance of the Spoilbank as juvenile sawfish habitat; although records of small individuals appear to frequent the area. The shallow, sandy substrate appears suitable as feeding grounds during high and low tides. There are similar suitable habitats along the Pilbara coast. Home range of green sawfish increases with growth, and therefore impact to resident sawfish is most likely for small juveniles of <i>P. zijsron</i> only (&lt;1.2 m Total Length).</p> <p><b>Risk Assessment Workshop Commentary</b></p> <p>Considering the negligible area of habitat that will be removed (~10 ha) when compared to the wider Pilbara region that supports sawfish populations, including offshore migratory pathways for adults, the Proposal is highly unlikely to affect habitat critical to the survival of any sawfish species.</p> <p><u>Risk rating: Low</u></p>
<p>Disrupt the breeding cycle of an important population</p>	<p><b>Morgan et al, (2019) Comments (Appendix A)</b></p> <p>Very little is known in relation to the breeding biology of sawfishes in Western Australia. It is known that maturity occurs at sizes &gt;3 m in Green Sawfish and freshwater sawfish. New-born pups of freshwater sawfish, in Western Australia, are generally known only from the Kimberley, but sub-adults and adults are found along the Pilbara coast, where they are thought to breed, with females returning to their natal river to breed. In contrast, while Green Sawfish also are believed to be philopatric, pups have been recorded along the Pilbara coast. Breeding is likely to occur offshore in both species, and should not be impacted during or post construction.</p> <p><b>Risk Assessment Workshop Commentary</b></p> <p>Agreed. Furthermore, the limited duration, magnitude and geographic extent of construction activities associated with implementing the Proposal are considered highly unlikely to disrupt the breeding cycle of an important population of sawfish.</p> <p><u>Risk rating: Low</u></p>



<p>Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline</p>	<p><b>Risk Assessment Workshop Commentary</b> The limited duration, magnitude and geographic extent of the Proposal's disturbance area, when compared to regional habitat available to each species, including primary nurse sites occurring at King Sound and Fitzroy River, it is considered highly unlikely that this criterion would be impacted. <u>Risk rating: Low</u></p>
<p>Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat</p>	<p><b>Morgan et al, (2019) Comments (Appendix A)</b> Unlikely to occur as a result of the proposed development; most likely to occur as a result of transportation to the area via international shipping routes into the Port Hedland harbour. <b>Risk Assessment Workshop Commentary</b> Agreed. Furthermore, biosecurity monitoring and reporting protocols are proposed for the Proposal. <u>Risk rating: Low</u></p>
<p>Introduce disease that may cause the species to decline</p>	<p><b>Morgan et al, (2019) Comments (Appendix A)</b> Unlikely (see above). <b>Risk Assessment Workshop Commentary</b> Agreed. The Proposal is unlikely to support vectors for disease, or transmission of disease causing species decline. <u>Risk rating: Low</u></p>
<p>Interfere substantially with the recovery of the species.</p>	<p><b>Morgan et al, (2019) Comments (Appendix A)</b> All sawfishes have declined substantially over the last few decades (Dulvy et al. 2016); Western Australia remains a stronghold for the species. Although the current project will have an unknown localised impact, it is likely to be minor compared to the cumulative impacts of other larger proposals occurring along the Pilbara coastline. <b>Risk Assessment Workshop Commentary</b> Agreed. The overall extent of the Proposal's disturbance footprint is unlikely to result in habitat degradation and modification to the extent that sawfish species will experience a significant decline and therefore, substantially interfere with the recovery of the species. Furthermore, the Proposal is unlikely to support fishing activities that negatively impact on sawfish species through by-catch in the commercial and recreational sectors, Indigenous fishing, and illegal, unreported and unregulated fishing activities. <u>Risk rating: Low</u></p>

## 8. Conclusions

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All residual risks to sawfish evaluated from Spoilbank Marina construction and operational activities, are considered 'Low'. It is considered that the proposed monitoring and management measures will ensure that the Spoilbank Marina does not have a significant impact on sawfish specie or significantly impact habitats critical to the survival of these species or impede upon the migration of individual sawfish.

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## **Appendix A Technical memo in relation to the presence of sawfish species and the construction of a marina in Port Hedland**

# Technical Memo in relation to the presence of sawfish species and the construction of a marina in Port Hedland

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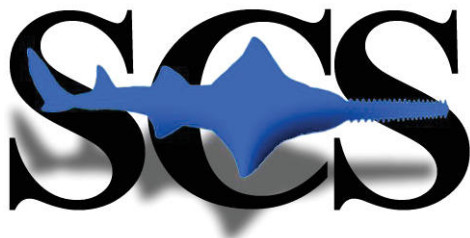
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Sawfish Conservation Society



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## Summary

The Technical Memo provides information on sawfish species in relation to the construction of a marina at the Port Hedland Spoil Bank and whether the proposal is likely to impact these Federally listed species.

Details of the proposed marine can be found at the following web address:

<https://www.transport.wa.gov.au/projects/port-hedland-spoilbank-marina.asp>.

There have been no targeted sawfish surveys in the immediate vicinity of the proposed Port Hedland Marina or on the Spoil Bank, nor have there been targeted sawfish surveys near Port Hedland; the closest being north at Cape Keraudren and south at Onslow. As such, contemporary and historical records of sawfish were collated from a variety of published and unpublished sources. These included the published records in Morgan et al. (2011, 2015) (and references therein), and unpublished records from the Sawfish Conservation Society and Sharks and Rays Australia. These latter records were previously uploaded to either their social media sites or through submissions to the Sharks and Rays Australia sawfish database which began soliciting for public records in 2016.



The absence of targeted sawfish surveys at Port Hedland, and the absence of knowledge as to the degree to which species of sawfish and which life history stages utilise or inhabit the Spoil Bank hinders the ability to provide detailed assumptions as to the potential significant impact of the proposed construction.

It is clear from the literature, database and social media review however, that at least three of Western Australia's four species of sawfish pass through the area, with the Green Sawfish (*Pristis zijsron*) having been captured on the Spoil Bank and at a number of other locations close to the town as recently as 2019. The size ranges of these fish (<1-3 m in total length), suggest that the area is occupied by juvenile fish and sub-adults (see Morgan et al. 2011, 2017). The Spoil Bank is likely to act as a foraging ground as well as post-parturition nursery area for these

individuals. There are possible impacts during construction (e.g. dredging), and dredging should occur during daylight hours so as to not impact with these generally nocturnal fishes. Other mitigation strategies could be to use small to moderate size dredge to reduce the broad dispersion of very high turbidity and limit the potential for maceration of sawfish. However, sawfish are likely to move away from the site during dredging, and the use of a 'sawfish spotter' is recommended. Underwater noise from piling activities should be managed through a soft start-up approach with progressively increasing hammer energy to alert sawfish of impending noise increase. Future work should validate use of the Spoil Bank and surrounding tidal creeks to determine the timing and extent of residency following Morgan et al. (2017).

## Introduction

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Sawfishes are considered to be the most imperiled group of fishes and two of the five species are ranked in the top two for species likely to go extinct on the Evolutionarily Distinct and Globally Endangered (EDGE) Existence programme (Dulvy et al. 2016, Lear et al. 2019). Northern Australia provides habitat for four of the world's five sawfish species, and each is listed as either Critically Endangered or Endangered at the international level (IUCN Red List), with each having a population trend that is decreasing (see Dulvy et al. 2016).

Western Australia's four species include the Freshwater Sawfish (*Pristis pristis*), the Dwarf Sawfish (*Pristis clavata*), the Green Sawfish (*Pristis zijsron*) and the Narrow Sawfish (*Anoxypristis cuspidata*). Within Australian waters, the three species that belong to the genus *Pristis* are listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act 1999) as Vulnerable, while all species are protected in Western Australian waters under the *Fish Resources Management Act 1994*, with the Green Sawfish (*Pristis zijsron*) listed as Schedule 3 (Fauna that is rare or likely to become extinct as vulnerable fauna) under the *Wildlife Conservation Act 1950*.



Recent studies suggest that the Kimberley and Pilbara regions are hotspots for at least the three *Pristis* species (Thorburn et al. 2009; Morgan et al. 2011, 2015, 2017; Lear et al. 2019); with most records of two species (globally) being from the Kimberley (King Sound for *Pristis clavata* and the Fitzroy River for *Pristis pristis*). In contrast, most recent records of *Pristis zijsron* have come from the south Pilbara in the vicinity of Onslow (see Morgan et al. 2015, 2017).

Here we collate recent records of sawfish from the Pilbara region of Western Australia between 80 Mile Beach and south to Karratha.

## Methods

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We used published records of sawfish that were either collected through targeted sawfish surveys, or via the collections of rostra donated to various studies (see Stevens et al. 2008, Morgan et al. 2011, Phillips et al. 2017,) and unpublished records from the Sharks and Rays Australia database and social media searches (mainly via the Sawfish Conservation Society). Since 2016, Sharks And Rays Australia (SARA) accepts submissions of sawfish sightings by members of the general public. On average, 12 submissions are received per year. In January 2019, SARA ran a media campaign specifically asking members of the general public to submit sawfish sightings to our homepage [www.cytags.com](http://www.cytags.com). Over 420 sightings were received in 2019 (as of 30 November). Records included newspaper articles of sawfish captures, accidental captures, details of saws in private collections as well as information on saws displayed in public locations. Every single submission that included contact details by



the submitter was queried. People often did not provide images or videos with the initial submission, but were quite happy to provide them upon contact.

Presented here are sawfish sightings submitted to SARA that fulfilled the following criteria: a sighting occurred after 2010 (=recent sighting), and included sufficient information to determine an exact location of where the sawfish was encountered. This either means that GPS coordinates were submitted with the sighting, or that submission of a location plus nearest landmark (example 'mouth of Airport Creek, Karratha') allowed narrowing down the location sufficiently to create a GPS mark. Names of localities and fishing spots were identified with the help of a local fishing guidebook (anonymous, 2016), or camping homepage ([www.exploreoz.com.au](http://www.exploreoz.com.au)), in the respective order. Sightings or captures from the SARA, SCS or published records included only those between longitude 116.60939°E and 121.27°E. Most published data was from prior to 2009. Only sightings that included a picture of the animal or an ID was a sawfish researcher are presented. Some animals could be identified to species level, after the characters provided by Whitty et al. (2014), in combination with the position of dorsal and other fins (Last and Stevens 1994, Morgan et al. 2011).

## Results

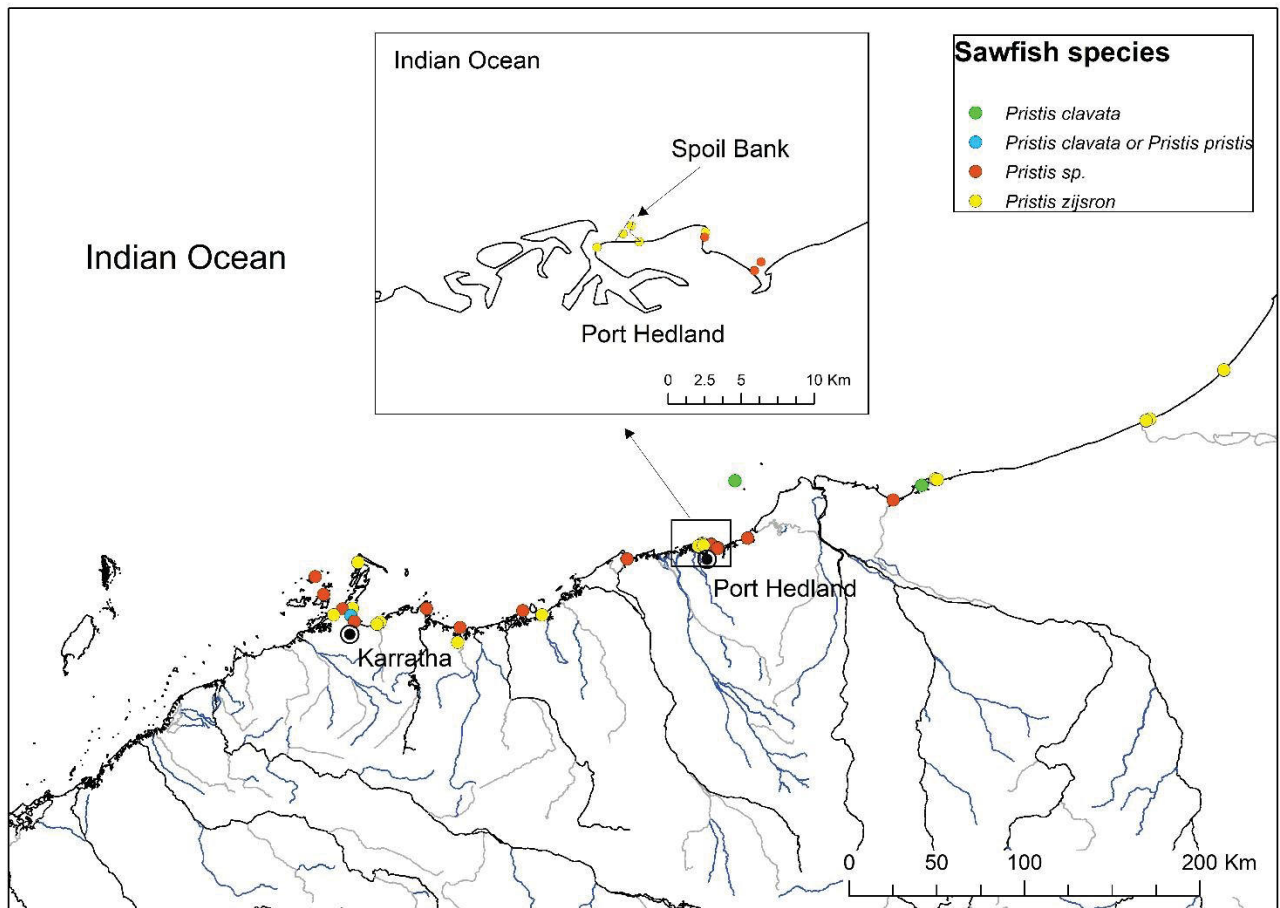
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A total of 66 sightings of sawfish fell within a 400 km radius around Port Headland from west of Karratha to 80-Mile Beach. Of the 58 individuals where length could be estimated, these ranged from new born pups (~60-70 cm total length) to individuals that would have been mature and exceeded 4 m total length. We positively identified two species (*P. zijsron* and *P. clavata*), while one sample was identified as either *P. clavata* or *P. pristis*. Thirteen individuals were positively identified as *Pristis clavata*, while 38 were identified as *P. zijsron*, the remainder identified only to genus. Within Port Hedland, a total of 16 individual sawfish were recorded, 11 of which were positively identified as *P. zijsron*, the remaining 5 individuals only identifiable to genus. Locations in Port Hedland included two on the Spoil



A Green Sawfish (*Pristis zijsron*) captured at the Spoil Bank (2017) (source facebook)

Bank, one at the Port Hedland jetty, 6 which gave a location as Port Hedland, two as Cooke Point, one as Intakes and two as 6 Mile Creek, one as south of Port Hedland and one as Pretty Pool. These fish ranged in length from ~0.6 m to 3 m in total length and are thus considered to be pups, juveniles or sub-adults, noting that maturity is not attained until lengths greater than 3 m are achieved (Morgan et al. 2011, 2017).



**Figure 1** Recent sightings or captures of sawfish from a 400 km stretch of coastline between Karratha and Eighty Mile Beach. Inset includes sightings from around the Spoil Bank at Port Hedland (N.B. Some data points are represented by multiple captures (n = 16 from Port Hedland)).

## Discussion

There is increasing evidence that the Pilbara is a global hotspot for sawfish. For example, Morgan et al. (2015, 2017) provide important data on a pupping location for Green Sawfish (*Pristis zijsron*) and detail the intercreek and nearshore movement patterns over two years near Onslow using passive acoustic telemetry. Morgan et al. (2011, 2015) also detail a potential sub-adult and adult migratory route for Kimberley (Fitzroy River) Freshwater Sawfish (*Pristis pristis*) into the Pilbara which Phillips et al. (2017) demonstrates is a phylopatric migration for adult females; with females returning to their natal river to release their pups. Both *P. zijsron* and *P. clavata* exhibit regional philopatry in northern Australia, with genetic divergence between Western Australian populations and those elsewhere in northern Australia (Phillips et al. 2017). Of the 16 individual sawfish that were recorded in the vicinity of Port Hedland, 11 of which were identified as *P. zijsron*, but although this does not preclude *P. clavata* or *P. pristis* being present in the area, both species have been recorded south of Port Hedland, and presumably migrated passed the area from their primary nursery sites in King Sound or the Fitzroy River, respectively, to the north.

There has not been research into the movement patterns of sawfish in the Port Hedland area, and although the majority of records found during this study appear to be *P. zijsron*, from

multiple juvenile size classes (i.e. new born pups to 3 m total length), the area may be a key nursery habitat for the species. At least further south, larger individuals are more nomadic than small age classes, which have a comparatively smaller home range (see Morgan et al. 2017). If *P. zijsron* are pupped in the tidal creeks around Port Hedland, it is hypothesised that their narrow home range may render them susceptible to any habitat modification. This may cause fragmentation or adversely impact juvenile movement patterns as a result of the construction of breakwaters and resulting shift in sediments as well as through the construction of a deeper channel (Table 1). Small Green Sawfish generally have a very small home range and occupy very shallow waters (see Morgan et al. 2017).

During construction of a marina, the possible impacts to foraging are unknown but may lead to short-term increases in turbidity from dredging. As the key movement periods of *P. zijsron* were found to be between 18:00 and 09:00 in the southern Pilbara (Morgan et al. 2017), any proposed dredging should occur during daylight hours so as to not impact with these generally nocturnal fishes. Other mitigation strategies could be to use small to moderate size dredge to reduce the broad dispersion of very high turbidity and limit the potential for maceration of sawfish. However, sawfish are likely to move away from the site during dredging. Underwater noise from piling activities should be managed through a soft start-up approach with progressively increasing hammer energy to alert sawfish of impending noise increase. A ‘sawfish spotter’ should be employed during any construction work that may be impacting with the substrate.

Future work should validate use of the Spoil Bank and surrounding tidal creeks to determine the timing and extent of residency following Morgan et al. (2017); particularly as the area may represent a significant stronghold for the species.

**Table 1:** Potential impact predictions and assessments during and post-construction in relation to sawfishes.

<b>Consideration</b>	<b>Impact prediction and assessment</b>
Lead to a long-term decrease in the size of an important population of a species	Without fine-scale population genetic studies for all species within the Pilbara region, the information to suggest that the proposal will lead to a long-term decrease in the populations is lacking. Broadly, there are population differences between Western Australian sawfishes and those elsewhere, and there are also know morphological differences. Some studies suggest that each population requires individual management and that there is fine scale differences (e.g. Feutry et al. 2015), and Phillips et al. (2017) recommend the preservation of the remaining genetic diversity as a high conservation priority for the three <i>Pristis</i> spp.
Reduce the area of occupancy of an important population	The proposal is unlikely to noticeably reduce the AOO for any sawfish species.
Fragment an existing important population into two or more populations	Some fragmentation of juvenile habitat may occur as a result of the development, although the main port is potentially a greater cause of any fragmentation should it be occurring. There is some likelihood that disturbance of the Spoil Bank through construction of the marina may disturb sawfish in the immediate vicinity of the impact site. The loss of shallow habitats, construction of breakwaters and subsequent redistribution of sediment and the dredge channel may disrupt the ability of small juvenile Green Sawfish, which typically inhabit water depths of <1 m (Morgan et al. 2017), to migrate around the site. It is less likely to impact larger individuals (of all species) which typically utilise deeper waters (Whitty et al. 2009, 2017; Morgan et al. 2017).
Adversely affect habitat critical to the survival of a species	It is unknown as to the importance of the Spoil Bank as juvenile sawfish habitat; although records of small individuals appear to frequent the area. The shallow, sandy substrate appears suitable as feeding grounds during high and low tides. There are similar suitable habitats along the Pilbara coast. Home range of Green Sawfish increases with growth, and therefore impact to resident sawfish is most likely for small juveniles of <i>P. zijsron</i> only (<1.2 m TL).
Disruption of breeding cycles	Very little is known in relation to the breeding biology of sawfishes in Western Australia. It is known that maturity occurs at

	sizes >3 m in Green Sawfish and Freshwater Sawfish. New-born pups of Freshwater Sawfish, in Western Australia, are generally known only from the Kimberley, but sub-adults and adults are found along the Pilbara coast, where they are thought to breed, with females returning to their natal river to breed. In contrast, while Green Sawfish also are believed to be philopatric, pups have been recorded along the Pilbara coast. Breeding is likely to occur offshore in both species, and should not be impacted during or post construction.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Unlikely to occur as a result of the proposed development; most likely to occur as a result of transportation to the area via international shipping routes into the Port Hedland harbour.
Introduce disease that may cause the species to decline	Unlikely (see above).
Interfere substantially with the recovery of a species.	All sawfishes have decline substantially over the last few decades (Dulvy et al. 2016); Western Australia remains a stronghold for the species. Although the current project will have an unknown localised impact, it is likely to be minor compared to the cumulative impacts of other larger proposals occurring along the Pilbara coastline.

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