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Ecological Risk Assessment of the Abrolhos Islands and Mid-West Trawl Managed Fishery

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Executive Summary

- The Department of Primary Industries and Regional Development in Western Australia uses an Ecosystem-Based Fisheries Management (EBFM) approach that considers all relevant ecological as well as social, economic and governance issues to deliver community outcomes. Ecological risk assessments (ERAs) are undertaken periodically to assess the impacts of fisheries on all the different components of the aquatic environments in which they operate.
- This report provides information relating to an ERA undertaken for the Abrolhos Islands and Mid-West Trawl Managed Fishery (AIMWTMF) in 2019. The assessment focused on evaluating the ecological impact of the scallop trawl component of this fishery (i.e. excluding the Port Gregory prawn fishery) on all retained species, bycatch, endangered, threatened and protected (ETP) species, habitats, and the broader ecosystem.
- The risk assessment methodology utilised for the 2019 ERA is based on the global standard for risk assessment and risk management (AS/NZS ISO 31000). This methodology applied a consequence-likelihood analysis, which involves the examination of the magnitude of potential consequences from fishing activities and the likelihood that those consequences will occur given current management controls. All of the risk issues were assessed using a consultative and structured workshop held at the Western Australian Fisheries and Marine Research Laboratories in Hillarys on 13 September 2019.
- All issues were scored medium, low or negligible risk using the adopted methodology. Risk rankings of medium or less are considered acceptable risks for a well-managed fishery, subject to ongoing management practices and performance monitoring.

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List of Abbreviations

AIMWTMF	Abrolhos Islands and Mid-West Trawl Managed Fishery
BRD	Bycatch Reduction Device
DPIRD	Department of Primary Industries and Regional Development (Western Australia, former Department of Fisheries)
EBFM	Ecosystem-Based Fisheries Management
ERA	Ecological Risk Assessment
ESD	Ecologically Sustainable Development
ETP	Endangered, Threatened and Protected (species)
FHPA	Fish Habitat Protection Area
MSC	Marine Stewardship Council
VMS	Vessel Monitoring System
WA	Western Australia

INTRODUCTION

The Department of Primary Industries and Regional Development (DPIRD, Department) in Western Australia (WA) uses an Ecosystem-Based Fisheries Management (EBFM) approach that considers all relevant ecological as well as social, economic and governance issues to deliver community outcomes (Fletcher et al. 2010; 2012). Ecological risk assessments (ERAs) are undertaken periodically to assess the impacts of fisheries on all the different components of the aquatic environments in which they operate. The outcomes of the risk assessments are used to inform EBFM-based harvest strategies and to prioritise Department monitoring, research and management activities (Fletcher 2015; Fletcher et al. 2016).

This report provides information relating to an ERA undertaken for the Abrolhos Islands and Mid-West Trawl Managed Fishery (AIMWTMF) in 2019. The assessment focused on evaluating the ecological impact of the scallop trawl component of this fishery (i.e. excluding the Port Gregory prawn fishery) on all retained species, bycatch, endangered, threatened and protected (ETP) species, habitats, and the broader ecosystem. The impact of any other fisheries that may retain scallops in the Abrolhos Islands, including the recreational fishing sector, was only considered when assessing the overall impact of fishing on the target stock (i.e. saucer scallops). As there have been two previous risk assessments undertaken for the AIMWTMF (Department of Fisheries 2004; 2008), this current assessment did not consider the social and economic drivers that may affect the performance of the fishery, as would typically be included in a full EBFM risk assessment.

The risk assessment methodology utilised a consequence-likelihood analysis, which involves the examination of the magnitude of potential consequences from fishing activities and the likelihood that those consequences will occur given current management controls. The assessment was initially undertaken by Department research staff, updating the results of previous risk assessments of the AIMWTF (Department of Fisheries 2004; 2008; see Appendix A). These risk scores were then reviewed and updated during an external ERA workshop held at the Western Australian Fisheries and Marine Research Laboratories in Hillarys on 13 September 2019. This external workshop, to which a range of stakeholders were invited, was facilitated by Richard Stoklosa (E-Systems).

The first component of this report provides background information about the fishery and the ecosystem components that have the potential to be impacted by these fishing activities. It also gives a broad overview of the risk assessment methodology on which this ERA was based. The latter part comprises the report prepared by Stoklosa following the external ERA workshop. The results from this ERA will help inform the recently developed harvest strategy for the AIMWTMF resource (DPIRD 2020).

The AIMWTMF has been assessed and accredited under the provisions of the Environment Protection and Biodiversity Conservation Act 1999 and has export approval until 2025.

PART 1

1 Aquatic Environment

The Houtman Abrolhos Islands are an archipelago of 122 small islands approximately 65-90 km offshore from Geraldton, WA (nominally 28°43'S 113°37′E) (Wells 1997). There are four main island groups, North Island, Wallabi Group, Easter Group and Southern (Pelsaert) Group, separated by 40 m deep channels (Wells 1997: Figure 1.1).

The waters surrounding the Abrolhos Islands are heavily influenced by the Leeuwin Current, which carries warm, low-nutrient water southward from north-western Australia. Water temperatures at around 20 to 22ºC are maintained throughout winter, supporting a unique blend of temperate and tropical species (Wells 1997). The islands are the southernmost area of major coral reef in the Indian Ocean and one of the highest latitude reef systems in the world and are extremely diverse with 184 species in 42 genera recorded (Veron and Marsh 1988; Wells 1997). Prevailing currents and wave action are from the southwest, and extensive reef development occurs in this part of each group.

The last full-scale mapping program for the entire shallow water regions of the Abrolhos was undertaken in the 1980's with the use orthophotomosaics to identify ecological classifications, which were then ground-truthed by submarine inspection (Hatcher et al. 1988). The process resulted in 12 geomorphological classes identified (Figure 1.1). Smaller project-specific habitat data collection has been undertaken since this period including;

- Benthic habitat information in areas of the Abrolhos with scallop trawling and rock lobster potting activities in the 1990s (Dibden and Joll 1998). The habitat survey involved a total of 31 towed video transects, which provided images coded for the different bottom types, as well as their position. Habitat types included Sand, Mixed Assemblage, Macro Algae, and Hard Coral Reefs.
- Satellite imagery (LANDSAT images collected in 1989) used to classify habitats for depth, slope and cover type (i.e. plant, coral, sand, pavement, etc.), followed by ground-truthing of selected sites around the four shallow water island groups of the Abrolhos (Marine Science Associates 1995). Seven habitat classifications were identified.
- Habitat mapping of the area around Long Island (part of the Wallabi Group) in 2005 in response to tourist development at the Islands (Oceanica 2006). The distribution of habitats was determined at a coarse scale using bathymetry information, digital charts and aerial images (Figure 1.2) (Oceanica 2006).

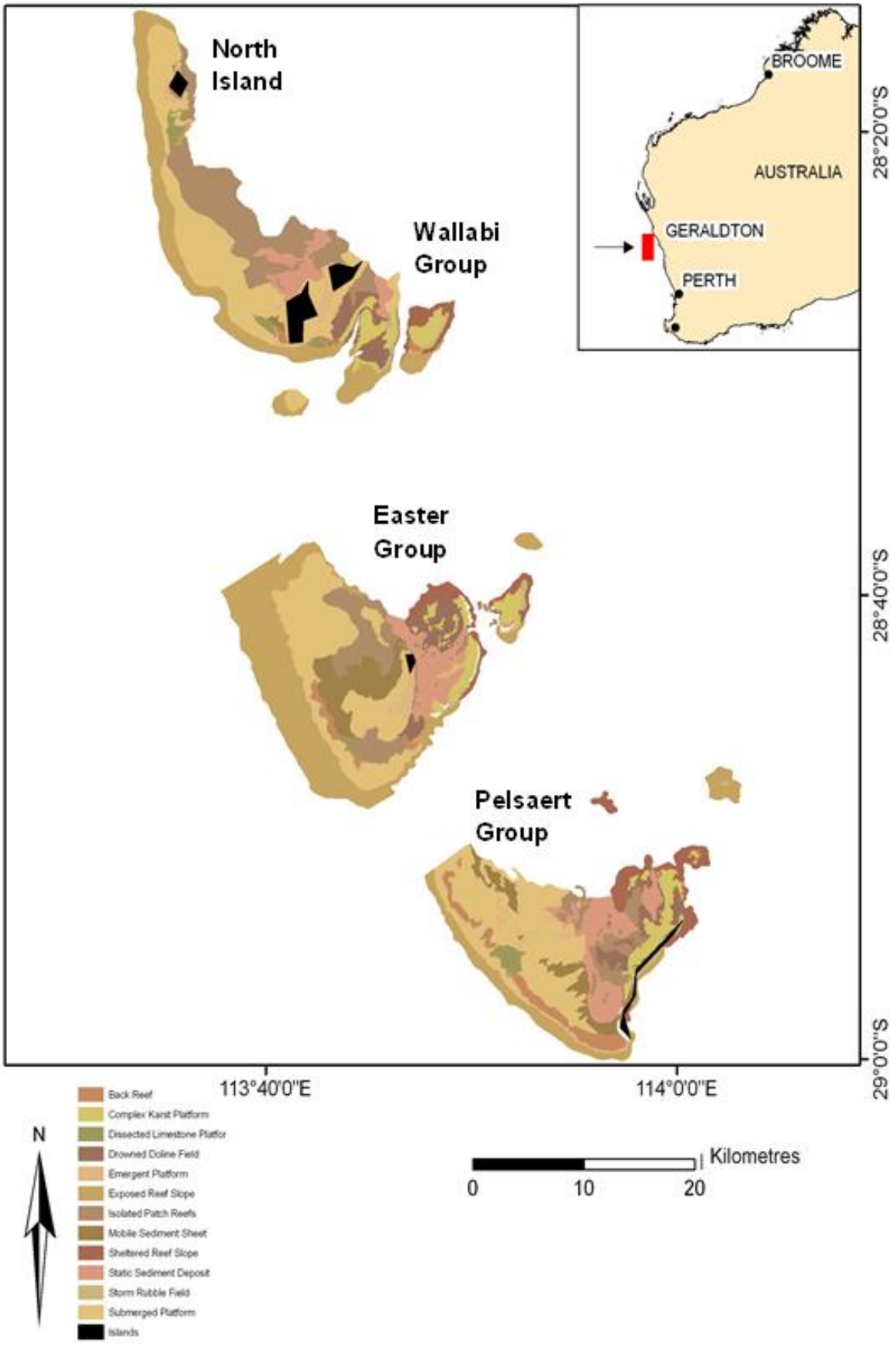

Figure 1.1. Location of the Houtman Abrolhos Islands in WA, including geomorphic units mapped by Hatcher et al. (1988).

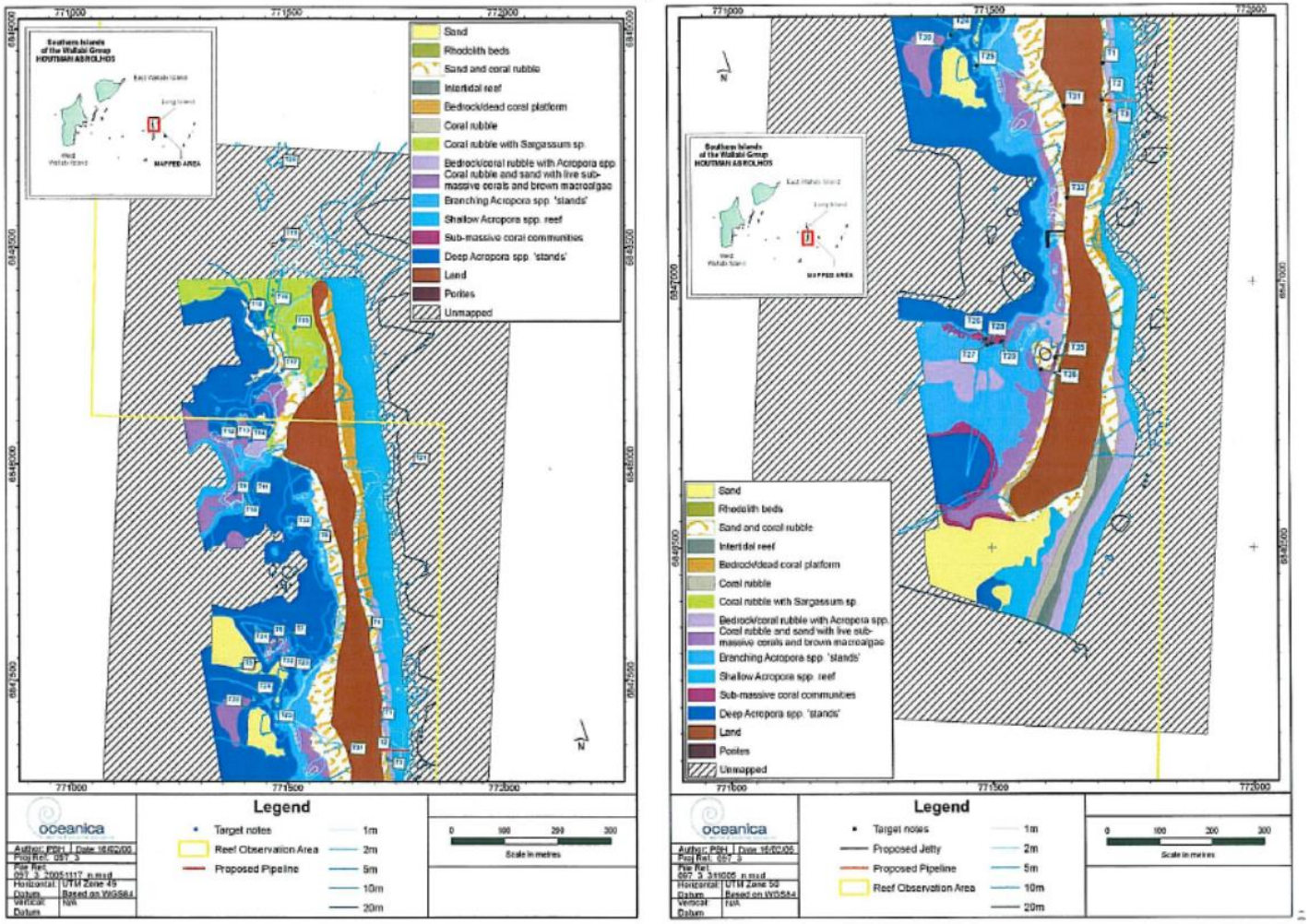

Figure 1.2. Distribution of benthic habitats surrounding the northern (left) and southern (right) portion of Long Island (Source: Oceanica 2006)

More recently, in 2010, DPIRD used remote sensing technologies to assess the ability to categorise and potentially monitor a large spatial area of shallow (< 20 m depth) marine benthic habitats at the Wallabi Group of the Abrolhos Islands (Evans et al. 2012). Two satellite sensors (ALOS AVNIR-2 and LANDSAT 5 TM) were used to provide unsupervised classifications of the habitats, followed by extensive ground truthing in March and April 2010. The eight-class habitat map shows that the east-southeast or leeward side of the Wallabi Group was dominated by coral habitat, while the northern and western sides were dominated by algae, seagrasses and abiotic habitats (Figure 1.3; Evans et al. 2012).

Habitat maps have also been produced for two deeper water areas (>20m) of the Abrolhos using hydroacoustic techniques. Both maps surveyed areas of the Zeewijk channel, near where effort for the AIMWTMF occurs, with the first map published in 2008 as part of the Marine Futures project (Radford et al. 2008). Radford et al. (2008) also mapped an area to the east of Easter group, closer to the coral environments. The maps were developed using multibeam hydroacoustic techniques and identified the area of the Zeewijk channel as predominantly composed of sand and patchy reefs, while the Easter Group was main reef substrate (Figure 1.4). The second map was developed as part of DPIRD baseline data collection for the Midwest aquaculture development zone and focused only on the Zeewijk channel. Data for this map was collected in 2014 using a single beam hydroacoustic sounder, with extensive video ground truthing soon after (Figure 1.5). As also shown by Radford et al. (2008), the mapped area is primarily sand substrate, intermixed with varying levels of mixed assemblage (Figure 1.5).

The Abrolhos Islands are located within a Fish Habitat Protection Area (FHPA) and are of great significance to recreational, commercial (particularly the western rock lobster industry), tourism and conservation sectors. The Reef Observation Areas within the FHPA are permanently closed to trawling. The Abrolhos Marine Park is located adjacent to the Abrolhos Islands. The Marine Park includes four zones, National Park Zone, Habitat Protection Zone, Multiple Use Zone and Special Purpose Zone. No trawl fishing is permitted in any of the zones that overlap the AIMWTMF (Figure 1.6). The Abrolhos Islands are one of the most important breeding sites for seabirds in the world and are the northernmost site of the Australian sea lion’s range (Commonwealth of Australia 2008).

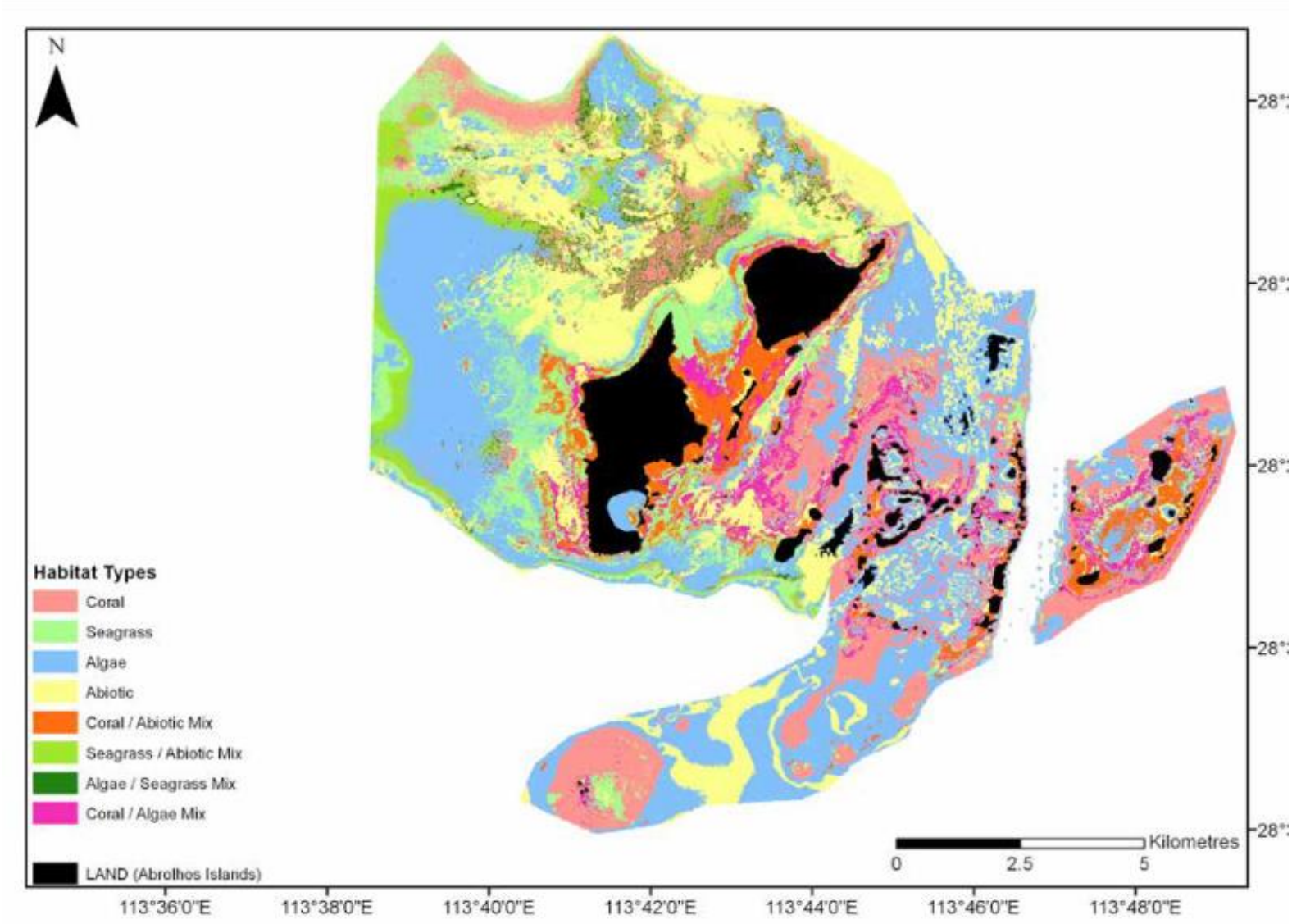

Figure 1.3. Eight habitat class benthic habitat map for the Wallabi group of the Houtman Abrolhos Islands (Source: Evans et al. 2012)

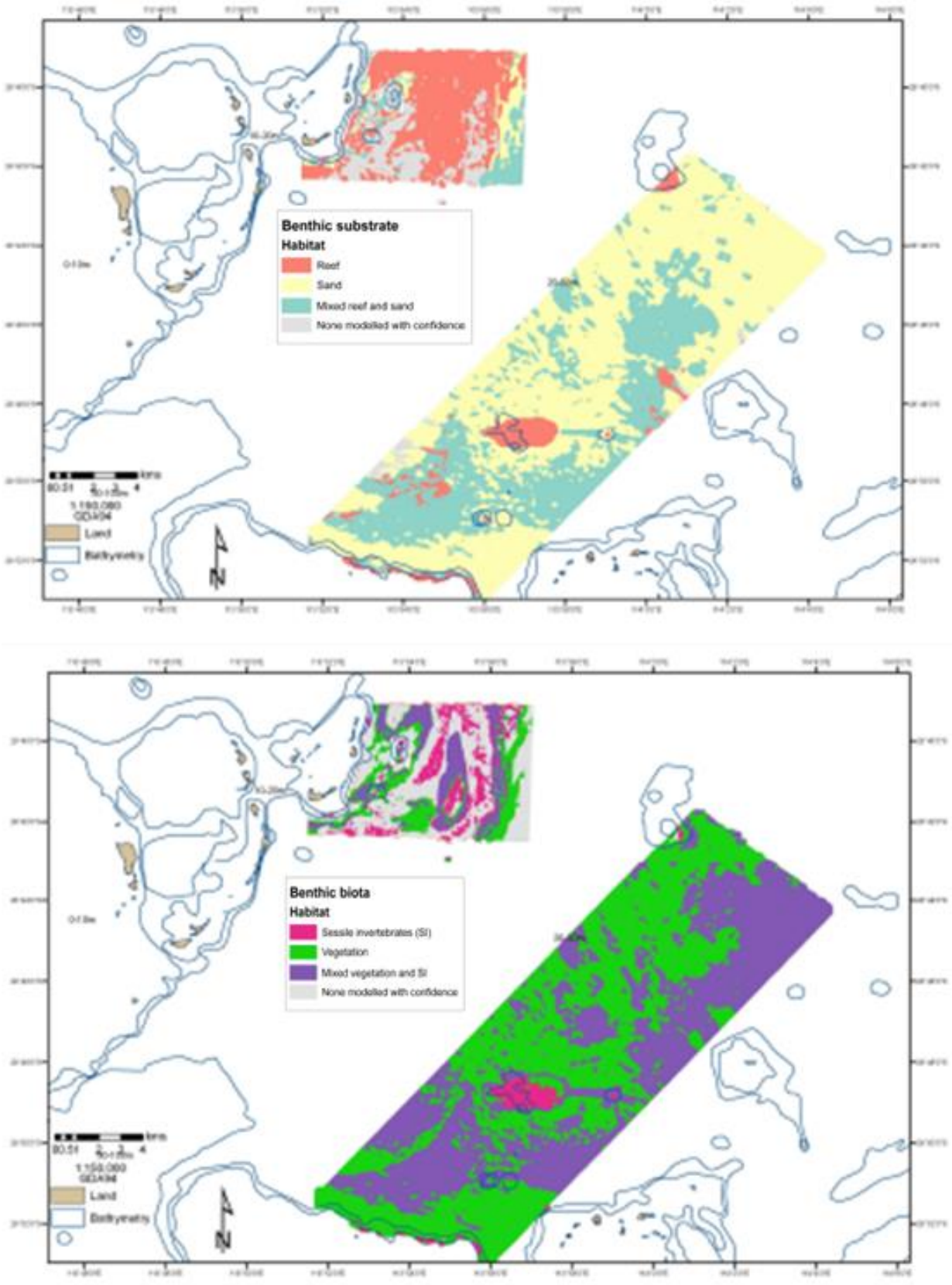

Figure 1.4. Deeper water regions of the Houtman Abrolhos Islands showing the benthic substrate (top) and biota (bottom) habitats (Source: Radford et al. 2008)

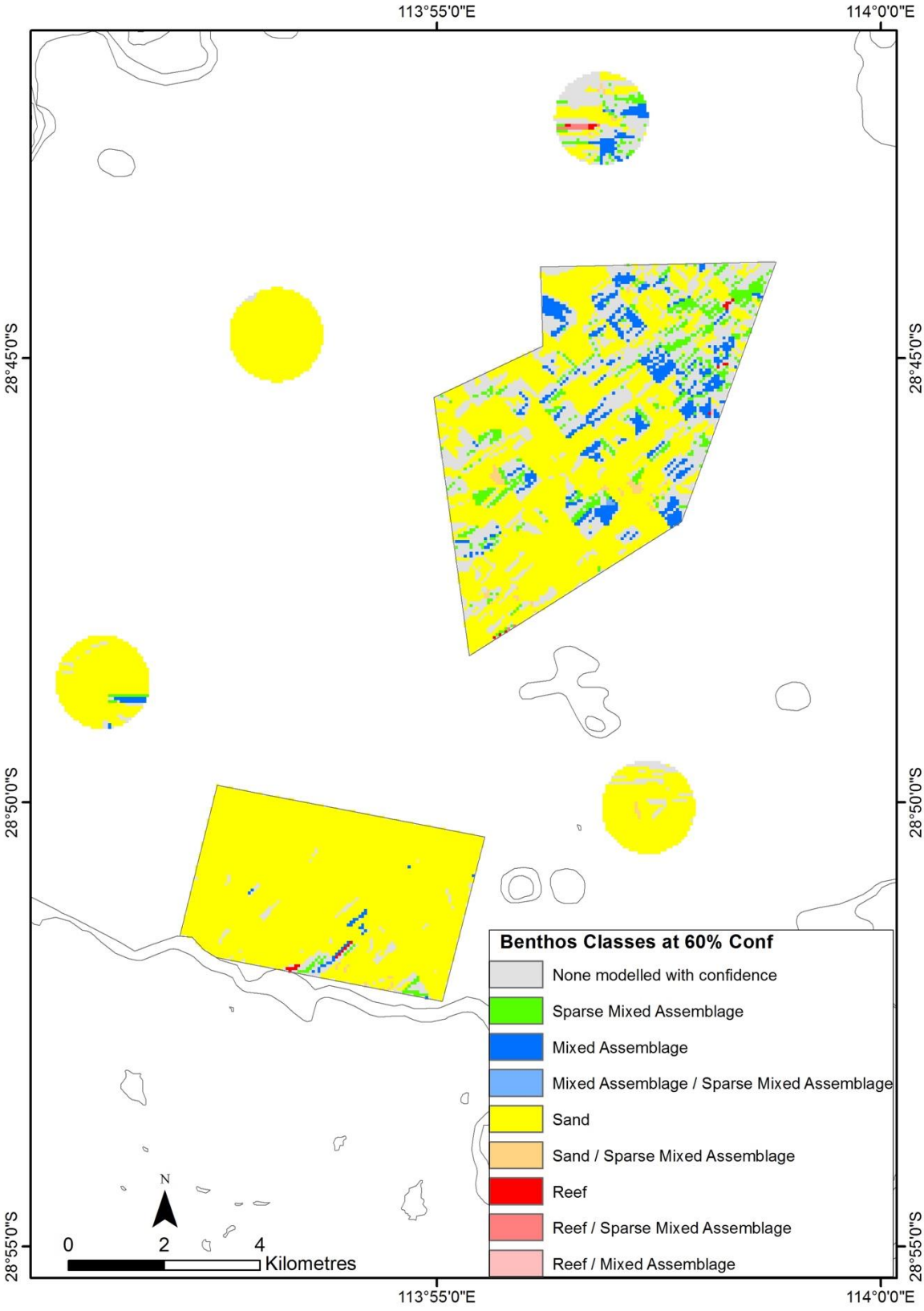

Figure 1.5. DPIRD mapping of the Midwest Aquaculture Development Zone (Unpublished Data) of the Houtman Abrolhos Islands.

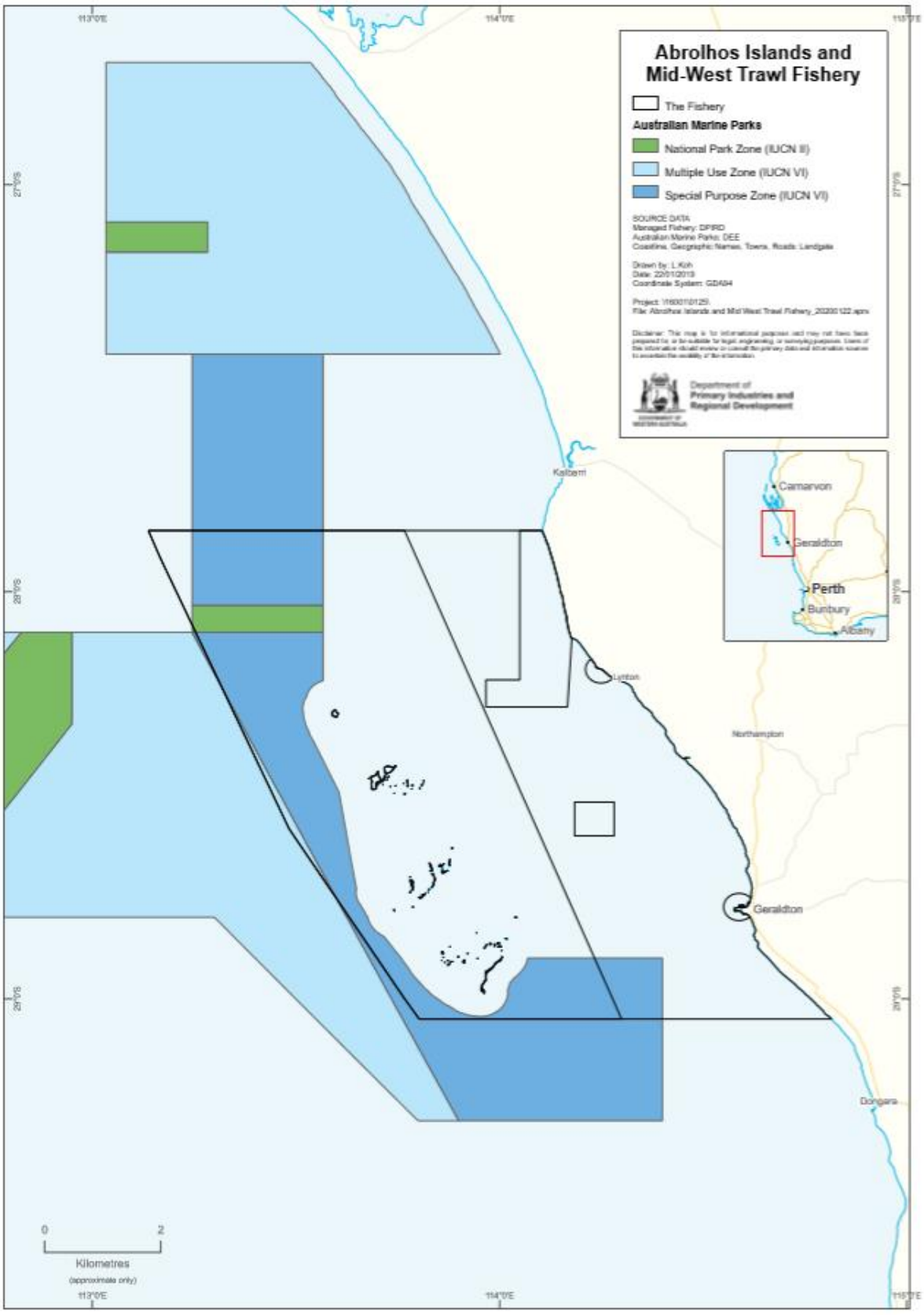

Figure 1.6. Boundaries of the Australian Marine Park zones in relation to the AIMWTMF area (see also Figure 2.1).

2 Abrolhos Islands and Mid-West Trawl Managed Fishery

2.1 Current Fishing Activities

The AIMWTMF has been operating within the waters of the Abrolhos Islands since the 1980s, using low-opening otter trawl systems to target primarily saucer scallops. The main fishing grounds have traditionally centred on the Abrolhos Islands, with a small component of fishers occasionally targeting western king prawns in the Port Gregory area (Figure 2.1). The physical area of the fishery includes the waters of the Indian Ocean between 27° 51' S and 29°03' S, on the landward side of the 200 m isobath. Although the licenced fishery area extends out into Commonwealth waters, many of the principal fishing grounds are within State waters (Department of Fisheries 2004).

The current AIMWTMF comprises of 10 licences with around five boats operating each year and the fishing season typically extending between March and August/September. The harvest strategy for the Abrolhos Islands saucer scallop resource is based on a constant escapement approach, which aims to maintain sufficient abundance of scallops prior to spawning (DPIRD 2020). The fishery operates under an input control system, with restrictions on boat numbers and trawl gear size, as well as seasonal closures and significant spatial closures protecting all nearshore waters. The fishery is highly variable, being dependent on sporadic recruitment of scallop, which appears to be strongly influenced by environmental conditions, e.g. the Leeuwin Current and water temperatures.

Scallop fishing in the Abrolhos Islands has traditionally been managed based primarily on fishery-independent survey information used to predict catches for the upcoming fishing season and ensure that fishing starts after the scallops have spawned (DPIRD 2020). A preliminary catch prediction based on data from a pre-season November survey is used to inform if or when the fishery will open. A second survey in February/March is used to provide an indication of abundance of residual (1+) and early recruiting (0+) scallops prior to the fishing season commencing.

Fishery-dependent catch rates are monitored throughout the season and ensures that fishing ceases when they have declined to a threshold level (DPIRD 2020). The daily monitoring of commercial catch rates during the fishing season is a key part of the harvest strategy because scallop stocks can be fished down rapidly (within days) and management needs to be very responsive to the state of the stock. The current strategy also relies on a co-management approach whereby industry abide by a voluntary closure in areas where 0+ (juvenile) scallops are abundant.

The AIMWTMF was closed to fishing for five years from 2012 to 2016 in response to low scallop abundance caused by adverse environmental conditions (marine heatwave). Since the fishery reopened to fishing in 2017, catches have been 150 t and 650 t whole weight in 2017 and 2018, respectively (~30 t and 130 t meat weight).

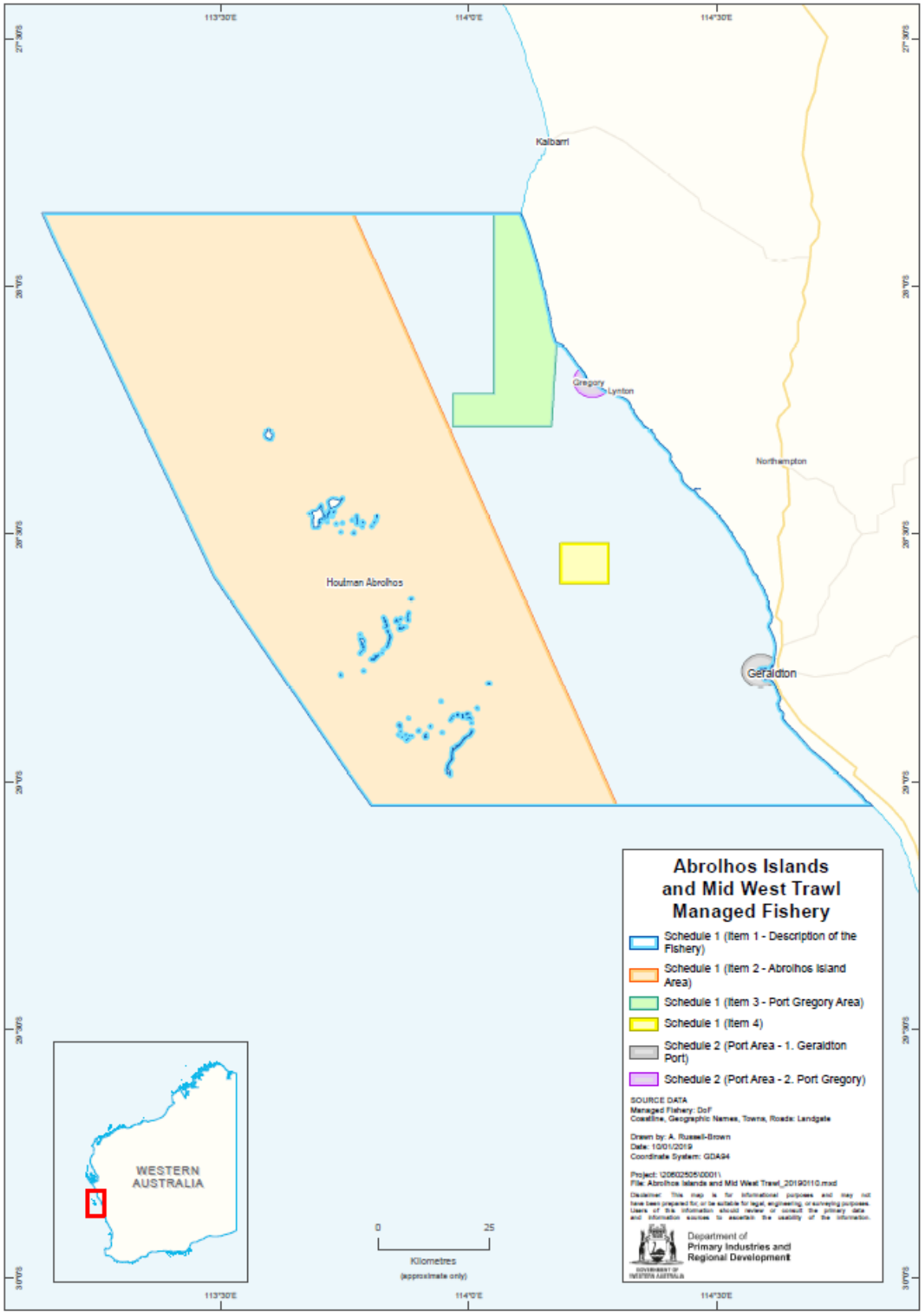

Figure 2.1. Boundaries and areas of the Abrolhos Islands and Mid West Trawl Managed Fishery in WA.

2.2 Fishing Gear and Methods

Scallop fishing vessels in the AIMWTMF use low-opening demersal otter trawl nets in twin-rigged formation (Figure 2.2), with a total headrope capacity of 256 m (140 fathoms). Each of the 10 vessels in fishery tow two 12.8 m (7 fathom) nets, which is the same gear as used by A Class licensees in the Shark Bay Scallop Managed Fishery (all licensees operate in both fisheries). The mesh size of nets must not be less than 100 mm and chafers or liners may not cover more than the bottom half of the codend.

Otter boards are attached to the extremities of each trawl net, with the height of the fishing gear set by the height at the point where they are connected to the otter boards. Forces produced by water flowing over the otter boards open the trawl nets laterally. This lateral spread controls the catching efficiency of trawl gear and determines the area swept. Generally, the headrope and footrope are spread between 60% and 85% of their length.

Scallop trawling is undertaken during day and night. Trawl shots typically vary from 30 minutes up to three hours, depending on catch rates. Trawling tow speed is around three knots. Scallops are shucked and processed at sea and frozen. The trawlers may carry the skipper and up to 12 crew.

Bycatch reduction devices (BRDs) to release large species are fully implemented in the AIMWTF. An industry-developed *Responsible Fishing Code of Conduct* (West Coast Trawl Association 2011) includes protocols for trawling in traditional areas, reducing interactions with rock lobster pots, anchoring and disposal of shell and disposal of rubbish and waste.

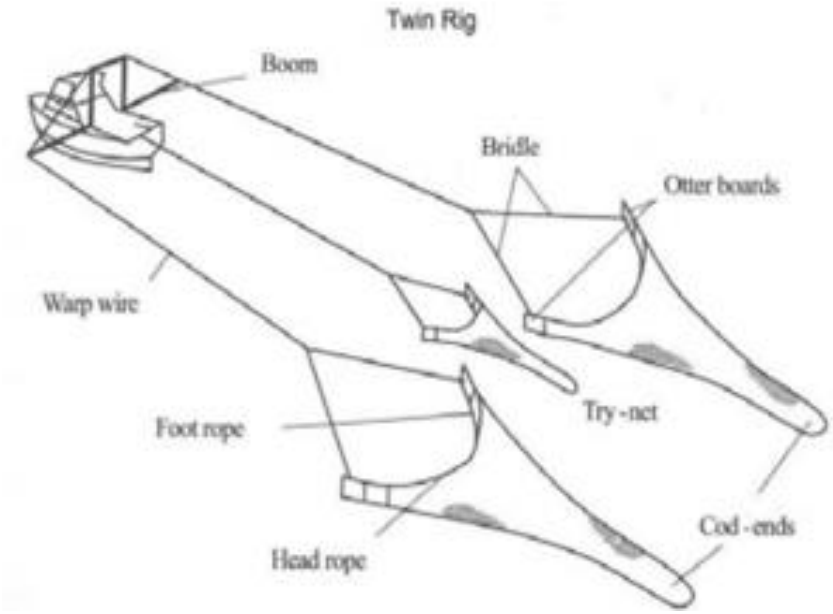

Figure 2.2. Standard twin-rig otter trawl (Adapted from Stirling 1998) that is currently used by all scallop vessels in the AIMWTMF.

2.3 Retained Species

The catches retained by scallop fishers in the AIMWTMF are summarised in Table 2.1.

Table 2.1. Retained catches by scallop fishers in the AIMWTMF in 2008, 2010-11 and 2017-18, noting that the fishery was closed between 2012 and 2016.

Species	Catch (tonnes, whole weight)						% of total
	2008	2010	2011	2017	2018	Average	
Saucer scallop	1216.2	806.3	2202.9	650.9	154.8	1006.2	100
Bugs					0.04	0.01	<0.1

2.3.1 Saucer scallops

The saucer scallop (*Ylistrum balloti*, formerly *Amusium balloti*) is a bivalve mollusc that belongs to the family Pectinidae. It occurs on the east and west coast of Australia and in New Caledonia. In WA, it is found between Broome and east of Esperance (as far as Israelite Bay), occurring in greatest numbers in Shark Bay and the Abrolhos Islands. It inhabits sandy and is often found in sheltered environments, in bays or the lee of islands and reef systems.

Saucer scallops are short-lived (2-3 years) and has fast growth (water temperature depending), attaining a maximum size of around 115 mm (Heald 1978). Scallops are broadcast spawners, releasing their eggs and sperm into the surrounding waters for fertilisation to occur. Annual recruitment and catches (Table 2.1) are naturally highly variable and primarily environmentally driven. Scallops are not target by any other commercial fisheries operating around the Abrolhos Islands, and recreational catches are considered negligible (Ryan et al. 2017).

Indices of abundance from fishery-independent surveys undertaken annually in November and February/March indicate that the scallop stock in the Abrolhos Islands is currently exploited at a sustainable level (Kangas et al. in prep.).

2.3.2 Other species

The only other species retained by scallop fishers in AIMWTMF in recent years is bugs (*Thenus* spp.). These have a wide geographical range and, although marketable and retained, comprise less than 0.1% of the retained catch between 2008 and 2018 (Table 2.1).

Note that, although not considered as part of this risk assessment, king prawns and coral prawns (*Metapenaeopsis* spp.) have historically been retained by prawn trawl vessels operating in the Port Gregory area to the east of the Abrolhos Islands.

2.4 Bycatch Species

As it is not mandatory for fishers in the AIMWTMF to report on the component of their catches that are discarded (i.e. non-retained), available bycatch information is limited to broad details of key bycatch species caught during pre-season stock surveys undertaken two times a year, and from a fishery-independent bycatch sampling program that commenced in 2019.

The available information suggest that bycatch is variable, dominated by mixed finfish and invertebrates. The AIMWTMF fleet operates over a small portion of the licensed fishing area and the level of bycatch generated from scallop trawling is less than that generated by prawn trawling, due to the larger mesh (100 mm) trawl nets. The provision to industry of information from the Departmental scallop surveys reduces search time and enable fishing effort to be applied where scallop abundance is higher. The low trawling speed of scallop vessels is also likely to allow for some of the stronger-swimming species to escape through the mouth of the net. The implementation of BRDs (grids) has largely eliminated the catch of large sharks and rays in the fishery (Kangas and Thomson 2004).

2.5 ETP Species

It is a statutory requirement for commercial fishers to report any interactions of ETP species in their logbooks, however, no interactions have been reported in logbooks (or during fishery-independent surveys) since 2008.

The main ETP species that have the potential to interact with the AIMWTMF include cetaceans (whales and dolphins), marine turtles, syngnathids, sea snakes and Australian sea lions. Trawl speed is very low (2 – 3 knots while trawling and up to 9 knots while steaming), making it highly unlikely that wildlife would be struck by the boat where avoidance behaviour is not impeded (Department of Fisheries 2004).

The full implementation of BRDs in the AIMWTMF has markedly reduced the capture of turtles in other trawl fisheries (Shark Bay and Exmouth Gulf). Syngnathids are typically associated with seagrass and macroalgal habitats, with large components of the nearshore waters to the east of the Abrolhos Islands closed to scallop trawling.

2.6 Habitat and Ecosystem Impacts

The location and intensity of trawling activities in the AIMWTMF are monitored using a vessel monitoring system (VMS) and daily logbooks, which allows scientists and managers to track changes in the spatial extent of fishing over time. The AIMWTMF operates in a small portion of the fishery area, which allows for significant refuge area that is not trawled. The spatial footprint of the fishery varies annually in relation to the patchiness of annual scallop settlement and the determination of areas of abundance through the fishery-independent surveys. Fishing activity since 2007 has primarily focused to the north and east of the island groups (Figure 2.3), mostly in waters deeper than 20 m.

Quantitative studies of other WA trawl fisheries suggest that sand habitats are relatively resilient to fishing (Pitcher et al. 2017). As demersal scallops are not found in sponge habitat, sponge gardens are not targeted by the trawl fleet. Fishers also actively avoid hard reef areas since trawl gear cannot withstand direct contact (Webster et al. 2002). As the scallop season is short (usually less than 3 months), any impacts on habitat would be confined to a limited period.

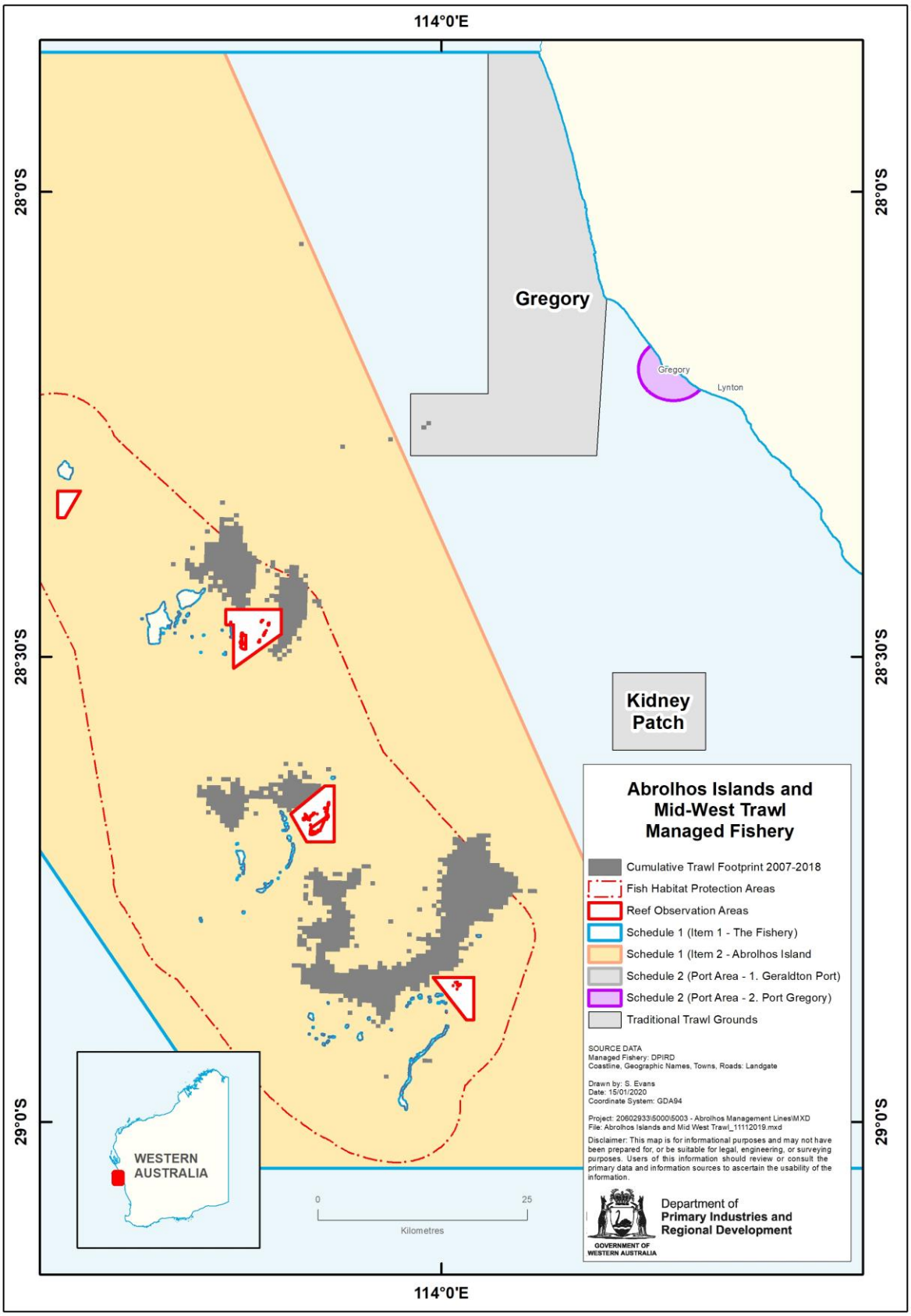

Figure 2.3. Cumulative trawl footprint by the AIMWTMF in all fishing years between 2007 and 2018 (n=6).

The main habitat impacts from scallop trawling are likely to be from exploratory fishing in areas outside of the traditional trawl grounds. The *Responsible Fishing Code of Conduct* (West Coast Trawl Association 2011) includes a protocol for exploring non-traditional areas of the fishery. Skippers are required to take every precaution to know and understand the ground they are working on before they commence fishing.

Research in similar fisheries has demonstrated that the otter trawl systems used by the AIMWTMF have the least impact on habitats of all forms of trawling (Collie et al. 2000). Although few studies have been done on the effects of scallop trawling, studies from prawn trawl fisheries can be used to evaluate the impacts of trawling activities. In southwest WA, Laurenson et al. (1993) compared trawled and untrawled areas using trawl samples and underwater video. Their study concluded that the dominant fauna of each area (sand bottom) showed marked similarities, although each group had a different composition of less abundant species. This difference was attributed to the fact that the untrawled area was small and encroached on in all directions by seagrass. Underwater video observation of both areas before and after the completion of the depletion experiment failed to detect any visual impact on the substrate or habitat. Similarly, Kangas et al. (2007) found no significant differences between trawled and untrawled sites in Shark Bay, Exmouth Gulf and Onslow, with respect to fish and invertebrate abundance, species richness, evenness or diversity. Results from these, and more recent studies (e.g. Mazor et al. 2017), indicate that trawling causes only minor and short-lived impacts to sandy habitats.

3 Risk Assessment Methodology

Risk assessments have been extensively used as a means to filter and prioritise the various identified fisheries management issues in Australia (Fletcher et al. 2002). The risk analysis methodology utilised for this risk assessment of the AIMWTMF is based on the global standard for risk assessment and risk management (AS/NZS ISO 31000), which has been adopted for use in a fisheries context (see Fletcher et al. 2002, Fletcher 2005; 2015). The broader risk assessment process is summarised in Figure 3.1.

The first stage establishes the context or scope of the risk assessment, including determining which activities and geographical extent will be covered, a timeframe for the assessment and the objectives to be delivered (Section 3.1). Secondly, risk identification involves the process of recognising and describing the relevant sources of risk (Section 3.2). Once these components have been identified, risk scores are determined by evaluating the potential consequences (impacts) associated with each issue, and the likelihood (probability) of a particular level of consequence actually occurring (Section 3.3).

Risk evaluation is completed by comparing the risk scores to established levels of acceptable and undesirable risk to help inform decisions about which risks need treatment. For issues with levels of risk that are considered undesirable, risk treatment involves identifying the likely monitoring and reporting requirements and associated management actions, which can either address and/or assist in reducing the risk to acceptable levels.

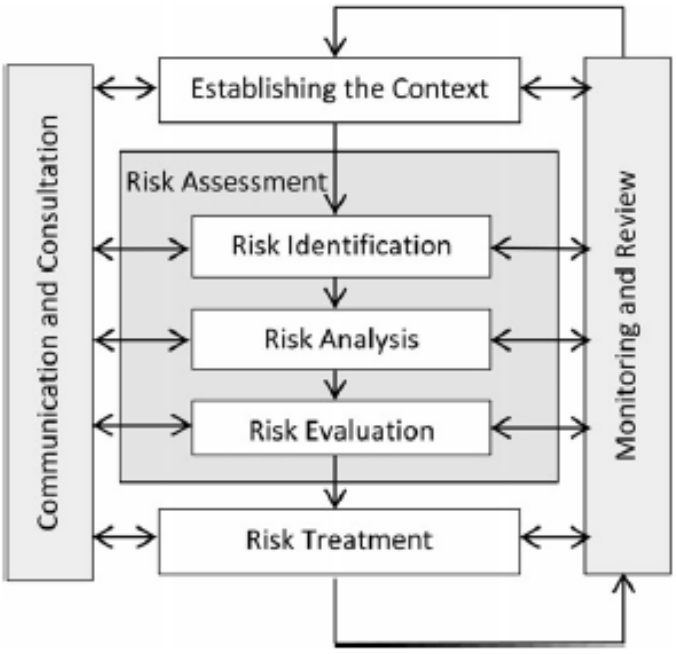

Figure 3.1. Position of risk assessment within the risk management process.

3.1 Scope

This risk assessment covers commercial scallop trawl fishing within the management boundaries of the AIMWTMF. The assessment considers only the ecological impacts of fishing with scallop trawl gear in twin configuration, thus excluding the Port Gregory prawn fishery, which has not operated for several years. The calculation of risk in the context of a fishery is usually determined within a specified period, which for this assessment is the next five years (i.e. until 2025).

3.2 Risk Identification

The first step in the risk assessment process was to identify issues relevant to the fishery being assessed. Issues were identified using a component tree approach (see Figure 3.2 for a generic example), where major risk components are deconstructed into smaller sub-components that are more specific to allow the development of operational objectives (Fletcher et al. 2002). The component trees are tailored to suit the individual circumstances of the fishery being examined by adding and expanding some components and collapsing or removing others.

The development of the component tree for evaluating the ecological sustainability of the AIMWTMF was based on:

- Previous risk assessments undertaken for the fisheries to achieve approval for Wildlife Trade Operations (Department of Fisheries 2004, 2008);
- Gaps identified during a pre-assessment of the AIMWTMF against the Marine Stewardship Council (MSC) Fisheries Standards in 2013;
- An internal risk assessment undertaken by Departmental staff in May 2019; and
- Consultation with industry and external stakeholders during an external ERA workshop in September 2019.

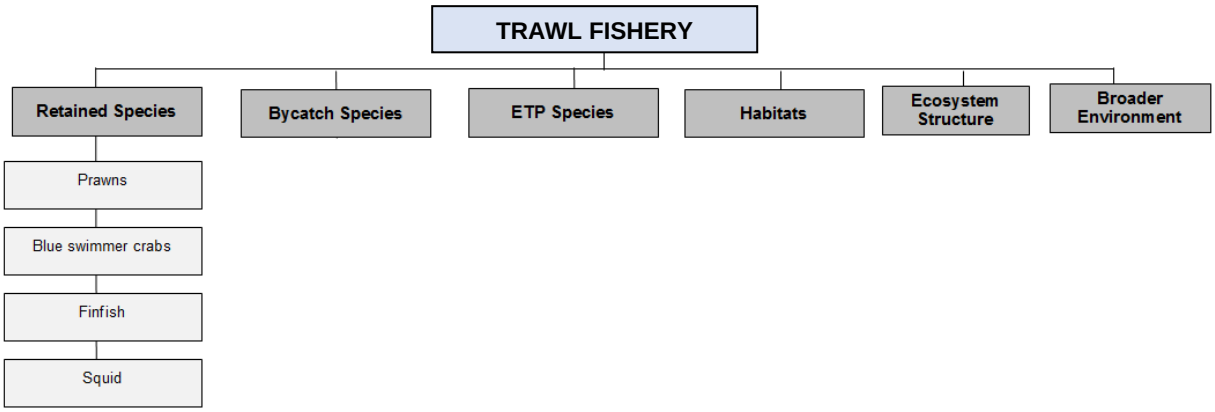

Figure 3.2. An example of a component tree for ecological sustainability, identifying the main components (dark grey boxes) and sub-components for retained species in a trawl fishery.

3.3 Risk Analysis, Evaluation and Treatment

The risk analysis process assists in separating minor acceptable risks from major, unacceptable risks and prioritising management actions. Once the relevant components and issues for the AIMWTMF were identified, the process to prioritise each was undertaken using the ISO 31000-based qualitative risk assessment methodology. This methodology utilises a consequence-likelihood analysis, which involves the examination of the magnitude of potential consequences from fishing activities and the likelihood that those consequences will occur given current management controls (Fletcher 2015).

Although consequence and likelihood analyses can range in complexity, this assessment utilised a 4×4 matrix, where the consequence levels ranged from 1 (e.g. minor impact to fish stocks) to 4 (e.g. major impact to fish stocks) and likelihood levels ranged from 1 (Remote; i.e. < 5 % probability) to 4 (Likely; i.e. ≥ 50 % probability). Scoring involved an assessment of the likelihood that each level of consequence is occurring, or is likely to occur within the 5-year period specified for this assessment. If an issue is not considered to have any detectable impact, it can be considered to be a 0 consequence; however, it is preferable to score such components as there being a remote (1) likelihood of a minor (1) consequence.

This ecological risk assessment used a set of pre-defined likelihood and consequence levels. In total five consequence tables were used in the risk analysis to accommodate for the variety of issues and potential outcomes:

1. Target (Primary) fish stocks – measured at a stock level;
2. Non-Target (Secondary, retained/bycatch) fish stocks – measured at a stock level;
3. ETP species – measured at a population or regional level;
4. Habitats – measured at a regional level; and
5. Ecosystem/Environment – measured at a regional level.

For each issue, the consequence and likelihood scores were evaluated to determine the highest risk score using the risk matrix (Figure 3.3). Each issue was thus assigned a risk level within one of five categories: Negligible, Low, Medium, High or Severe (Table 3.1).

Different levels of risk have different levels of acceptability, with different requirements for monitoring and reporting, and management actions. Risks identified as negligible or low are considered acceptable, requiring either no or periodic monitoring, and no specific management actions. Issues identified as medium risk are considered acceptable providing there is specific monitoring, reporting, and management measures are implemented. Risks identified as high are considered ‘not desirable’, requiring strong management actions or new control measures to be introduced in the near future. Severe risks are considered ‘unacceptable’ with major changes to management required in the immediate future (Fletcher et al. 2002).

It is recommended that the risks be reviewed in 5 years, or prior to the next review of the AIMWTMF harvest strategy, where the risk scores are used as the performance indicator for

the non-target ecological assets. Monitoring and assessment of the key target species will be ongoing, with the performance indicators for those stocks evaluated on an annual basis.

		Likelihood			
		Remote (1)	Unlikely (2)	Possible (3)	Likely (4)
Consequence	Minor (1)	Negligible	Negligible	Low	Low
	Moderate (2)	Negligible	Low	Medium	Medium
	High (3)	Low	Medium	High	High
	Major (4)	Low	Medium	Severe	Severe

Figure 3.3. 4×4 Consequence – Likelihood Risk Matrix (based on AS 4360 / ISO 31000; adapted from Fletcher 2015).

Table 3.1. Risk levels applied to evaluate individual risk issues (modified from Fletcher 2005).

Risk Levels	Description	Likely Reporting & Monitoring Requirements	Likely Management Action
Negligible	Acceptable; Not an issue	Brief Notes – no monitoring	Nil
Low	Acceptable; No specific control measures needed	Full Notes needed – periodic monitoring	None specific
Medium	Acceptable; With current risk control measures in place (no new management required)	Full Performance Report – regular monitoring	Specific management and/or monitoring required
High	Not desirable; Continue strong management actions OR new / further risk control measures to be introduced in the near future	Full Performance Report – regular monitoring	Increased management activities needed
Severe	Unacceptable; Major changes required to management in immediate future	Recovery strategy and detailed monitoring	Increased management activities needed urgently

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5 Appendix A

Risk ratings in previous risk assessments for the AIMWTMF

Component and Sub-component	2004	2008
Retained Species (Primary)		
Scallops	LOW	LOW
Retained Species (Secondary)		
Western king prawns	NEGLIGIBLE	NEGLIGIBLE
Coral prawns	NEGLIGIBLE	NEGLIGIBLE
Finfish	NEGLIGIBLE	NEGLIGIBLE
Bycatch Species		
Invertebrates	NEGLIGIBLE	NEGLIGIBLE
Finfish	NEGLIGIBLE	NEGLIGIBLE
ETP Species		
Sea snakes	LOW	LOW
Turtles	NEGLIGIBLE	NEGLIGIBLE
Syngnathids	LOW	LOW
Habitats		
Sand	LOW	LOW
Coral/sponge	LOW	LOW
Ecosystem		
Taking retained species	LOW	LOW
Discarding/Provisioning	LOW	LOW
Translocation (pests, disease)	NEGLIGIBLE	NEGLIGIBLE

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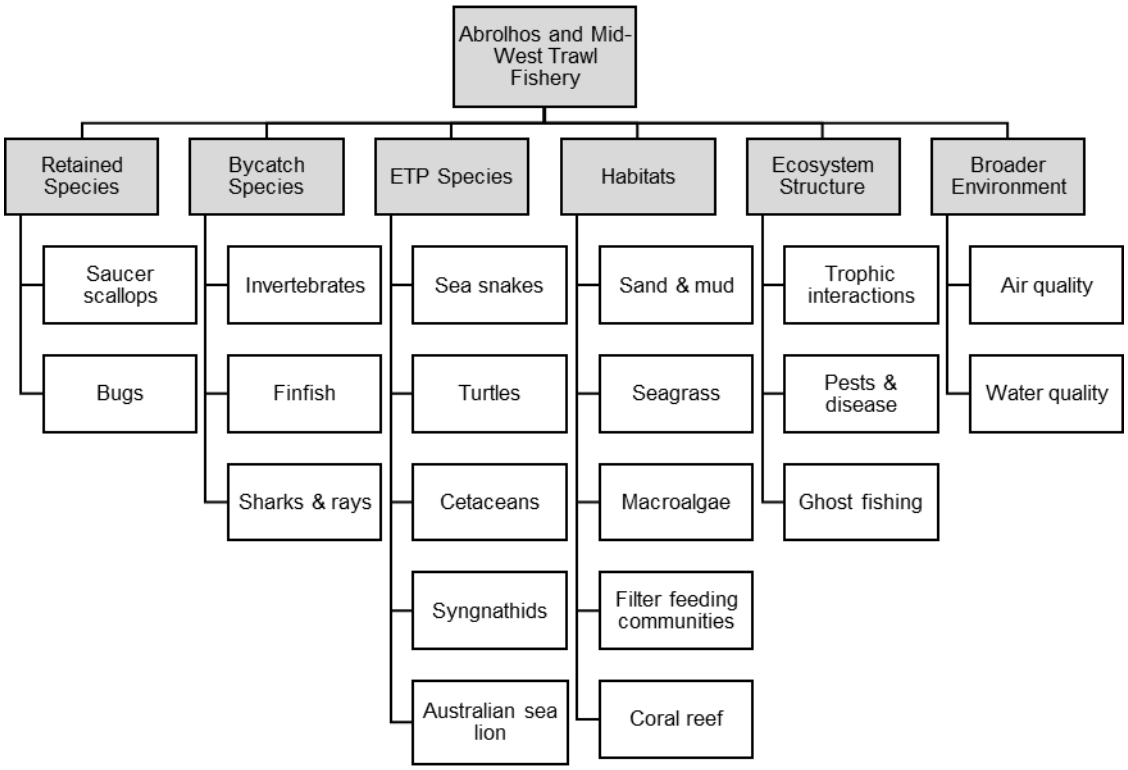
Department of Primary Industries and Regional Development
Western Australia

Ecosystem Based Fishery Management

Ecological Risk Assessment of the Abrolhos Islands and Mid-West Trawl Managed Fishery



September 2019

e-systems

Stoklosa, R. 2019. *Ecosystem Based Fishery Management—Ecological Risk Assessment of the Abrolhos Islands and Mid-West Trawl Managed Fishery*, prepared for the Department of Primary Industries and Regional Development, Fishery, Western Australia. E-Systems, Hobart.

Revision History:

Revision 0	8 October 2019	For DPIRD review with stakeholders.
Revision 1	6 November 2019	Incorporated comments and issued for distribution.

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Attachments

Executive Summary

An ecological risk assessment (ERA) of the Abrolhos Islands and Mid-West Trawl Managed Fishery (AIMWTMF, Fishery) was convened with industry experts and stakeholders on 13 September 2019 by the Department of Primary Industries and Regional Development (DPIRD, Department) in Western Australia. ERAs are conducted by the Department as part of its Ecosystem Based Fishery Management framework and the outputs inform the development and review of harvest strategies.

The ERA Workshop Procedure (Stoklosa 2019) was developed in consultation with the Department, based on the methodology published by Fletcher et al. (2002) and recently refined (Fletcher 2015). Consequence and likelihood ratings for ecological components were adopted from Department standards being applied to all fisheries in Western Australia (Dr Lynda Bellchambers, personal communication). These standards are consistent with the Australian Standard for risk management (AS ISO 31000:2018).

The ERA Workshop Procedure and an executive summary of the Department's internal ERA undertaken in July 2019 (DPIRD 2019) were distributed to all stakeholders that confirmed their intention to attend this subject ERA.

Using the risk assessment methodology adopted by the Department and recognised for Marine Stewardship Council (MSC) certification, the ERA identified potential impacts on sustainability objectives for the Fishery and assessed the risks. All of the threats on the agenda were assessed using a consultative and structured workshop procedure. Consensus was reached in the expert judgements of the Stakeholder Working Group in this qualitative ERA.

The threats assessed for fishing interactions with ecological assessment components.in the ERA were ranked medium, low or negligible using the adopted methodology. Risk rankings of medium or less are considered acceptable risks for a well-managed fishery, subject to ongoing management practices and performance monitoring.

Ongoing performance monitoring of the Fishery should confirm that these risks remain acceptably low. In the event that circumstances of the Fishery change, or performance monitoring detects an unexpected change, the relevant threats assessed in this ERA should be reviewed.

Introduction

An ecological risk assessment (ERA) of the Abrolhos Islands and Mid-West Trawl Managed Fishery (AIMWTMF, Fishery) was convened with industry experts and stakeholders on 13 September 2019 by the Department of Primary Industries and Regional Development (DPIRD, Department) in Western Australia (WA). ERAs are conducted by the Department as part of its Ecosystem Based Fisheries Management (EBFM) framework and the outputs inform the development and review of harvest strategies.

The ERA is in support of Marine Stewardship Council (MSC) certification of the commercial Fishery under the WA Government's 2012 commitment to support independent certification of the State's commercial fisheries. The target species of the subject Fishery is primarily saucer scallops (*Ylistrum balloti*, family *Pectinidae*).

The Department completed an internal ERA of the Fishery in July 2019 to evaluate the ecological impact of the scallop trawl component of this Fishery, which excludes the Port Gregory prawn fishery component. The potential impacts were identified and assessed for all retained species, bycatch, endangered, threatened and protected (ETP) species, habitats and the broader ecosystem. The impact of the recreational fishing sector was considered in the assessment of overall risk to the target species (scallops). Full documentation of the Department's internal ERA is available to industry and stakeholders.[1]

The Houtman Abrolhos Islands (Abrolhos) are an archipelago of 122 small islands approximately 65-90 km offshore from Geraldton, WA. The Abrolhos are divided into four main island groups: North Island, Wallabi Group, Easter Group, and Southern (Pelsaert) Group, separated by 40 m deep channels. The waters around the islands (to 3 nm) are protected as a Fish Habitat Protection Area (FHPA).

The Abrolhos Islands are located in the overlap between northern tropical and southern temperate waters, within the stream of the Leeuwin Current which carries warm, low-nutrient tropical water southward from northwestern Australia. Water temperatures of 20-22°C support a unique blend of temperate and tropical species. The islands are the southernmost area of major coral reef in the Indian Ocean.

The mapping of habitats commenced in the 1980's to identify ecological classifications and subsequently refined using satellite imagery, bathymetry data, digital charts, video transects and hydroacoustic techniques. Mapping of benthic habitats has been developed from towed video transects in shallow water areas (<20 m depth) of scallop trawling and rock lobster potting activities in the 1990's. Benthic habitat distributions from remote sensing in deeper water (>20 m depth) have been extensively ground-truthed at the Wallabi Group, the Zeewijk channel (near where Fishery effort is concentrated), and the Easter Group. The distribution of benthic habitats is referenced in the ERA when assessing the potential impacts of benthic trawling activities.

Some five boats operate in the Fishery using low-opening otter trawl systems to target saucer scallops on primarily sandy substrates in traditional fishing grounds. The fishing season typically extends from March through August/September, and the harvest strategy is based on a constant escapement approach which aims to maintain sufficient abundance of scallops prior to spawning. The Fishery operates under an input control system, with restrictions on boat numbers and trawl gear size, as well as seasonal closures and spatial closures that protect nearshore waters.

The catch is highly variable, dependent on the recruitment success of scallop which is influenced by environmental conditions (e.g. the Leeuwin Current and water temperatures). Fishing only starts after

[1] DPIRD 2019. *Ecosystem Based Fisheries Management (EBFM)—Risk assessment of the Abrolhos Islands and Mid-West Trawl Managed Fishery*. Department of Primary Industries and Regional Development, Western Australia.

scallops have spawned, and catch rates are monitored throughout the season to ensure that fishing ceases when stocks decline to a threshold level.

Saucer scallops, the target species, are short-lived (2-3 years) and fast growing depending on water temperature, attaining a maximum size of around 115 mm. Since the Fishery was closed from 2012 to 2016 in response to a marine heatwave, catches of the target species have been 651 t in 2017 and 155 t in 2018.

The only other species retained by scallop fishers in recent years is bugs (*Thenus* spp.). However, although commercially valuable they comprise less than 0.1 % of the retained catch.

Bycatch is variable, dominated by mixed finfish and invertebrates. Bycatch reduction devices (BRDs) have largely eliminated the bycatch of large sharks and rays in the Fishery and have been found to be highly effective in reducing the capture of turtles in other trawl fisheries.

No interactions of ETP species have been recorded by the Fishery since 2008 under statutory reporting requirements. The main ETP species of concern for interactions with boats and fishing gear are cetaceans, marine turtles, syngnathids, sea snakes and Australian sea lions. However, trawl speed is very slow (2-3 knots while trawling and up to 9 knots while steaming), making it highly unlikely that wildlife would be struck by vessels.

Trawling activities occur in variable areas of the Abrolhos due to the patchiness of annual scallop settlement and determination of areas of abundance through fishery-independent surveys. Fishing is usually east of the island groups and between island groups in waters deeper than 30 m, operating over a small portion of the licence area. Scallop season is short (usually less than three months) and impacts of fishing gear with habitats are therefore confined to a limited period. Trawlers necessarily avoid hard reef areas to avoid damage to fishing gear, and do not deliberately target sponge habitat where scallops are not present. The intensity of fishing activities is monitored by a vessel monitoring system (VMS) and daily logbooks, allowing fishery managers to monitor activities in relation to sensitive habitats and to track changes in fishing locations and intensity over time.

Exploratory fishing can occur under a Code of Conduct in non-traditional trawling areas, limiting the potential impacts to vulnerable habitats such as algae/marine plants, sponge gardens and coral reef.

Research of otter trawl systems has demonstrated that these have the least impact of all forms of trawling. Studies of trawling in other fisheries suggest that the scallop trawl activities of the Fishery would be expected to cause only minor and short-lived impacts to sandy habitats.

Selection of the assessment method

The Department has adopted the risk analysis methodology of Fletcher et al. (2002), with some recent refinement (Fletcher 2015). It is the policy of the Department that the adopted risk analysis methodology is consistently used across all fishery assessments in Western Australia. E-Systems developed an ERA Workshop Procedure (Stoklosa 2019) incorporating the adopted Department risk analysis methodology. The Department's risk analysis methodology is consistent with the Australian Standard for risk management (AS ISO 31000:2018).

The ERA Workshop Procedure and an executive summary of the Department's internal ERA undertaken in July 2019 (DPIRD 2019) were distributed to all stakeholders that confirmed their intention to attend this subject ERA.

Using the risk assessment methodology adopted by the Department and recognised for MSC certification, the ERA identified potential impacts on sustainability objectives for the Fishery and assessed the risks. The threats for each assessment component were assessed using a consultative and structured workshop procedure, recording the circumstances of each interaction and risk analysis for all participants to view and clarify as necessary during the workshop.

Consultation and workshop participants

A consultative and inclusive process was developed for this ERA, to ensure that all stakeholders were provided with the ERA Workshop Procedure (Stoklosa 2019) and the technical documents that were assembled to underpin the assessment of the threats that were assessed. Substantial effort was made to seek the participation of a cross-section of experts who could provide high quality analysis of technical documentation, engage with stakeholders in discussion of each particular threat, and perform a qualitative risk analysis.

A Stakeholder Working Group of subject matter experts were proposed for the ERA workshop. The Stakeholder Working Group comprised a wide range of stakeholders.

The workshop facilitator was Richard Stoklosa of E-Systems, engaged by the Department. Preparation and conduct of the workshop was strictly guided by the ERA Workshop Procedure.

Stakeholder Working Group

A Stakeholder Working Group was invited by the Department to participate in the ERA workshop, including those involved in previous ERAs and others identified as having an interest in the proceedings. Stakeholders included individuals, organisations, companies, government agencies and research scientists having an interest and/or technical expertise. The Department identified a list of stakeholders who have expressed an interest in the MSC certification process for the Fishery, so that nominated participants could be informed of preparations for the workshop and be invited to attend.

The Stakeholder Working Group received ERA Workshop Procedure (Stoklosa 2019) and executive summary of the Department's internal ERA from July 2019 (DPIRD 2019).

Numerous stakeholders were invited to attend, including persons from (in no particular order):

- Department of Primary Industries and Regional Development;
- Department of Biodiversity, Conservation and Attractions;
- Marine Stewardship Council;
- Australian Fishery Management Authority;
- Western Australian Fishing Industry Council;
- Western Australian Museum;
- Conservation Council;
- Conservation Commission;
- University of Western Australia;
- Curtin University;
- Murdoch University;
- Flinders University;
- Edith Cowan University;
- Western Australian Marine Science Institution;
- Australian Institute of Marine Sciences;
- Greenpeace;

- World Wildlife Fund for Nature;
- Wilderness Society;
- Pew Charitable Trusts;
- Yamatji Marlpa Aboriginal Corporation;
- Recfishwest;
- Shark Bay World Heritage Advisory Committee;
- Ningaloo Coast World Heritage Advisory Committee;
- Gascoyne Development Commission;
- Aquaculture Council of Western Australia;
- marine science consulting firms;
- local Shire representatives; and
- Abrolhos Islands fishing industry companies, licensees and fishermen.

There were 19 people from a cross-section of these organisations who expressed an interest in attending the ERA workshop, and 11 people who actually attended.

Workshop proceedings

A workshop agenda was distributed to all participants. All persons attending the workshop were invited to introduce themselves and area of expertise or interest. The agenda and ERA Workshop Procedure (Stoklosa 2019) were adopted by all participants, noting that the agenda would be flexible to accommodate the time availability of participants with specific expertise. The workshop agenda and list of participants is presented in Attachment 1.

During the workshop, the recording of workshop proceedings in a structured risk assessment template was digitally projected, to enable all workshop participants to observe the information that was captured from the discussions. All participants had the opportunity to clarify the technical record during the workshop to ensure accuracy and eliminate post-workshop wordsmithing or revisions.

Risk assessment

Identification of potential threats

The starting point for the workshop was the information contained in the Department's internal ERA from July 2019, which identifies the assessment components for the target species, secondary retained species, bycatch species, ETP species, habitats and ecological communities and broader ecosystem. The participants chose to proceed on this basis, with the understanding that additional threats could be identified and assessed, and that any of the Department's previous ERA findings could be debated and changed as necessary to reflect the views of the participants.

Consequence and likelihood ratings

For each assessment component of the Fishery, the consequences of the interaction of fishing activities with ecological components was described, and the existing management and operational measures to control or reduce the consequences or the likelihood of each threat were identified. The consequence ratings are reproduced here in Tables 1 through 5, and the likelihood ratings are reproduced in Table 6.

Table 1. Consequence ratings for primary target (retained) species.

Category	Rating	Description of consequences
Minor	1	Fishing impacts either not detectable against background variability for this population; or if detectable, minimal impact on population size and none on dynamics. Spawning biomass > Target level
Moderate	2	Fishery operating at maximum acceptable level of depletion. Spawning biomass < Target level but > Threshold level (BMSY)
High	3	Level of depletion unacceptable but still not affecting recruitment levels of stock. Spawning biomass < Threshold level (BMSY) but > Limit level
Major	4	Level of depletion is already affecting (or will definitely affect) future recruitment potential of the stock. Spawning biomass < Limit level

Table 2. Consequence ratings for non-target, secondary (retained and bycatch) species.

Category	Rating	Description of consequences
Minor	1	Measurable but minor levels of depletion of fish stock.
Moderate	2	Maximum acceptable level of depletion of stock.
High	3	Level of depletion of stock unacceptable but still not affecting recruitment level of the stock.
Major	4	Level of depletion of stock are already affecting (or will definitely affect) future recruitment potential of the stock.

Table 3. Consequence ratings for endangered, threatened and protected (ETP) species.

Category	Rating	Description of consequences
Minor	1	Few individuals directly but will not further impact on stock. Level of capture/interaction is well below that which will generate public concern.
Moderate	2	Level of capture is the maximum that will not impact on recovery or cause unacceptable public concern.
High	3	Recovery may be affected and/or some clear, but short-term public concern will be generated.
Major	4	Recovery times are clearly being impacted and/or public concern is widespread.

Table 4. Consequence ratings for habitats.

Category	Rating	Description of consequences
Minor	1	Measurable impacts to habitat but still not considered to impact on habitat dynamics or system. Area directly affected well below maximum accepted.
Moderate	2	Maximum acceptable level of impact to habitat with no long-term impacts on region-wide habitat dynamics.
High	3	Above acceptable level of loss/impact with region-wide dynamics or related systems may begin to be impacted.
Major	4	Level of habitat loss clearly generating region-wide effects on dynamics and related systems.

Table 5. Consequence ratings for ecosystem/communities.

Category	Rating	Description of consequences
Minor	1	Measurable but minor changes to the environment or ecosystem structure but no measurable change to function.
Moderate	2	Maximum acceptable level of change to the environment or ecosystem structure with no material change in function.
High	3	Ecosystem function altered to an unacceptable level with some function or major components now missing and/or new species are prevalent.
Major	4	Long-term, significant impact with an extreme change to both ecosystem structure and function; different dynamics now occur with different species/groups now the major targets of capture or surveys.

Table 6. Likelihood levels.

Category	Rating	Description of likelihood
Remote	1	The consequence has never been heard of in these circumstances, but it is not impossible within the timeframe* (probability <5%).
Unlikely	2	The consequence is not expected to occur in the timeframe, but it has been known to occur elsewhere under special circumstances (probability 5 to <20%).
Possible	3	Evidence to suggest this consequence level is possible and may occur in some circumstances within the timeframe (probability 20 to <50%).
Likely	4	A particular consequence level is expected to occur in the timeframe (probability ≥50%).

* The 'timeframe' is defined as the management period for the ERA, normally a five-year timeframe.

Risk ranking criteria

Using the Stakeholder Working Group's judgments of consequence and likelihood ratings, the risk is ranked as the product of the two ratings, as illustrated in the risk matrix in Figure 1. The risk matrix is used to rank risk in one of five levels, consistent with the adopted ESD Reporting Framework (Fletcher et al. 2002, Fletcher 2015).

		Likelihood rating			
		Remote (1)	**Unlikely (2)**	**Possible (3)**	**Likely (4)**
Consequence rating	**Minor (1)**	1	2	3	4
	Moderate (2)	2	4	6	8
	High (3)	3	6	9	12
	Major (4)	4	8	12	16

Figure 1. Risk ranking matrix.

Although the risk matrix depicts a 'risk score' of 1 to 16, it is based on a strictly qualitative risk analysis. The risk scores are used as a convenient means of classifying risk in five levels (negligible to severe) but should not be interpreted in quantitative terms. An explanation of the required management response and reporting requirements for each risk level is summarized in Table 7.

Table 7. Risk rankings and expected action.

Risk ranking	Risk outcome	Likely reporting and monitoring requirements	Likely management action
Negligible	Acceptable. Not an issue.	Brief justification – no monitoring.	Nil.
Low	Acceptable. No specific control measures needed.	Full justification required – periodic monitoring.	No specific response.
Medium	Acceptable. Continue with current risk control measures in place (no new management required).	Full performance report – regular monitoring.	Specific management and/or monitoring required.
High	Not desirable. Continue strong management actions OR new/further risk control measures to be introduced in near future.	Full performance report – regular monitoring.	Increases to management activities needed.
Severe	Unacceptable. If not already introduced, major changes are required to management in immediate future.	Full performance report – recovery strategy and detailed monitoring.	Increases to management activity needed urgently.

Assessment of ecological components

The Department has developed an 'assessment tree' of the ecological components to be assessed in the Abrolhos Islands and Mid-West Trawl Fishery, presented in Figure 2 for reference. Workshop participants were invited to suggest any additional ecological components to assess in the workshop, but no new components were identified.

Following the introduction of each threat to the assessment components and clarification of the causes and effects of the interaction, an 'interaction scenario' was discussed by workshop participants and recorded in the risk assessment record. Existing risk management controls were identified for each threat to assist with the risk analysis part of the assessment. The completed risk assessment record for all threats considered in the ERA is presented in Attachment 2.

Some of the assessment components were assessed multiple times for different types of threats. These distinctions were made to ensure that the risk analysis focused on very specific interactions rather than attempting to make judgments about broad scenario descriptions that could be interpreted in different ways.

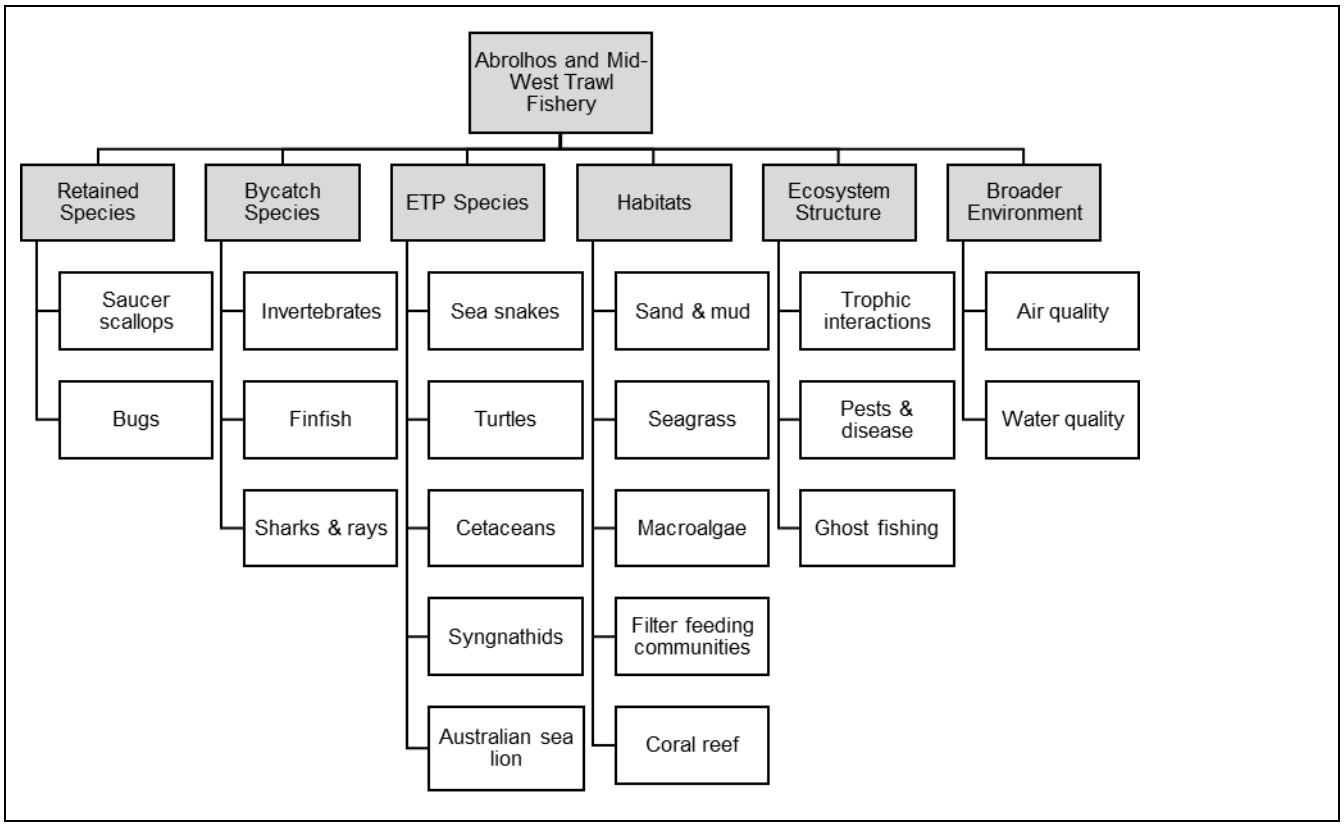

Figure 2. Abrolhos Islands and Mid-West Trawl Managed Fishery ecological components for assessment.

Risk ranking

Risk ranking is used to set priorities for risk management actions, as explained in Table 7.

Using the adopted risk assessment methodology, this ERA identified potential impacts on sustainability objectives for the Fishery and assessed the risks. The risk analysis revealed a number of potential threats to marine ecosystem components to be managed. Each of these is discussed below form the most significant threats assessed in the workshop. The threats for assessment components are numbered for reference to the ERA Workshop Record presented in Attachment 2.

No severe or high risk rankings were recorded in the ERA workshop.

Medium risk

One medium risk was identified in the risk assessment: the reduction in the stock of saucer scallops, the target species of the Fishery. Medium risk is considered the appropriate level of risk for exploitation of target scallop species at acceptable levels. No additional corrective actions were suggested.

Low and negligible risk

One low risk ranking and twenty-four negligible risk rankings were recorded for fishery interactions with ecological assessment components. No additional corrective actions were suggested to mitigate these low and negligible risks.

Other observations

Some of the interactions of fishing activities with ecological assessment components were regarded as having the lowest consequence rating (minor) and the lowest likelihood rating (remote). In some cases, these interactions were regarded as having no credible threat to ecological values but were retained by workshop participants in the ERA Workshop Record (Attachment 2) as negligible risk. Retaining these interactions as negligible risk was decided to acknowledge the possibility that these interactions might become relevant in the future, or to demonstrate that the interactions were given genuinely considered in view of potential stakeholder or public concern.

Risk treatment

Medium risk assessed for the target species of saucer scallop is considered acceptable if specific monitoring, reporting and management measures are implemented effectively and performance indicators are evaluated annually. No additional recommendations were suggested for managing this medium risk; however, a review should be undertaken in five years—or prior to the next review of the Fishery harvest strategy.

For medium risks, specific management and/or monitoring is required and is routinely implemented in the managed Fishery. Risk treatment is not strictly required for low and negligible risk (refer to Table 7). However, participants were encouraged to suggest practical and cost-effective risk treatment measures which might further reduce the consequences and/or likelihood rating. These measures were recorded in the ERA Workshop Record (Attachment 2) for the threats where risk treatment was suggested.

Suggested risk treatment measures (beyond those already planned) are recorded as important advice to the Department for consideration, but they are subject to feasibility and cost/benefit analyses by the fishing industry and/or the Department to manage risk in the Abrolhos Islands and Mid-West Trawl Managed Fishery.

Risk management

Risk management of the Abrolhos Islands and Mid-West Trawl Managed Fishery involves standardised fishing practices and fishing gear, industry standards and codes of practice, legislation, and research and monitoring of management effectiveness. In addition, the WA Government supports MSC certification of the State's commercial fisheries under its 2012 commitment to support independent certification.

MSC Principle 2 (Version 2.0) for sustainable fishing states:

> *Fishing operations need to be managed to maintain the structure, productivity, function and diversity of the ecosystem on which the fishery depends, including other species and habitats.*

There are five performance indicators for information under MSC Principle 2 that have been addressed by this ERA for managing risk, subject to specific assessment criteria for this Fishery:

2.1.3 *Information on the nature and amount of primary species taken is adequate to determine the risk posed by the unit of assessment (UoA) and the effectiveness of the strategy to manage primary species.*

2.2.3 *Information on the nature and amount of secondary species taken is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage secondary species.*

2.3.3 *Relevant information is collected to support the management of UoA impacts on ETP species, including:*

— information for the development of the management strategy;
— information to assess the effectiveness of the management strategy; and
— information to determine the outcome status of ETP species.

2.4.3 *Information is adequate to determine the risk posed to the habitat by the UoA and the effectiveness of the strategy to manage impacts on the habitat.*

2.5.3 *There is adequate knowledge of the impacts of the UoA on the ecosystem.*

The performance indicators, particularly with respect to understanding potential impacts and risk have been addressed through the process of conducting the subject ERA and the results of the assessment, as documented in this report.

The ERA Workshop Record (Attachment 2) functions as a risk register for fishery managers and provides input to the harvest strategy for the Fishery. A change in Fishery operations or adverse change from the ongoing performance monitoring of ecological components requires review of the risk rankings and recommendations of the ERA.

Conclusion

The ERA undertaken on 13 September 2019 resulted in the outcomes documented in the Ecological Risk Assessment Workshop Record presented as Attachment 2. All of the assessment components on the agenda were assessed using a consultative and structured workshop procedure. Consensus was reached on the expert judgements of the Stakeholder Working Group in this qualitative ERA.

The threats assessed for fishing interactions with ecological assessment components in the ERA were ranked medium, low or negligible using the adopted methodology. Risk rankings of medium or less are considered acceptable risks for a well-managed fishery, subject to ongoing performance monitoring. No additional risk management measures were recommended for consideration.

Ongoing performance monitoring of the Fishery should confirm that these risks remain acceptably low. In the event that circumstances of the Fishery change, or performance monitoring detects an unexpected change, the relevant threats assessed in this ERA should be reviewed.

References

AS ISO 31000:2018. *Risk management—Guidelines*. Standards Australia, Sydney.

DPIRD 2019. *Executive Summary: Ecosystem Based Fishery Management (EBFM)—Risk assessment of the Abrolhos Islands and Mid-West Trawl Managed Fishery*. Internal review, Department of Primary Industries and Regional Development, Western Australia.

Fletcher, W.J., J. Chesson, M Fisher, K.J. Sainsbury, T. Hundloe, A. Smith and B. Whitworth (2002). *National ESD reporting framework for Australian Fishery: The 'how to' guide for wild capture Fishery*. FRDC Project 2000/145, Canberra.

Fletcher, W.J. (2015). *Review and refinement of an existing qualitative risk assessment method for application within an ecosystem-based Fishery management framework*. ICES Journal of Marine Science 72: 1043-1056.

Stoklosa, R 2019. *Ecological Risk Assessment, Western Australian Fishery—Workshop Procedure*. Prepared for the Department of Primary Industries and Regional Development Western Australia.

Attachment 1

Workshop Participants and Agenda

Ecological Risk Assessment
Abrolhos Islands and Mid-West Trawl Managed Fishery

Workshop Participants
13 September 2019

Name	Company / Organisation	Position title / Area of expertise
Lynda Bellchambers	DPIRD OCD	Principal Res Sc EBFM
Shirree Blazeski	DPIRD ARM	
Patrick Cavalli	DPIRD ARM	Principal Management Officer
Hamish Ch'ng	Far West Scallops	
Scott Evans	DPIRD FSRA	Research Scientist EBFM
Emily Fisher	DPIRD FSRA	Research Scientist EBFM/MSC
Mervi Kangas	DPIRD FSRA	Principal Scientist Invertebrate Trawl
Mick Kelly	DPIRD OCD	
Matt Pember	WAFIC	Fisheries Rep, Resource Access Officer, Fisheries Scientist
Sharon Wilkin	DPIRD FSRA	Senior Technical Officer
Brent Wise	DPIRD FSRA	SPRS
Richard Stoklosa	*e-systems*	Ecological Risk Assessment Facilitator

e-systems

Agenda

Date	Friday, 13 September 2019
Location	Department of Primary Industry and Resource Development – Fisheries Western Australian Fisheries and Marine Research Laboratories Conference Rooms, 1st Floor 39 Northside Drive Hillarys, Western Australia
Facilitator	Richard Stoklosa, E-Systems
Purpose	**Ecological Risk Assessment** **Abrolhos Islands and Mid-West Trawl Managed Fishery — Scallop Trawl**

9:00	Welcome and introductions	Brent Wise / Richard Stoklosa
9:15	Adoption of workshop agenda and procedure	Richard Stoklosa
9:30	Introduction to fisheries and summary of current stock assessment	Mervi Kangas
9:45	Ecological risk assessment	Group discussion
11:00	Morning tea	
11:30	Continue ecological risk assessment	Group discussion
12:30	Lunch	
13:15	Continue ecological risk assessment	Group discussion
14:00	Review progress and next steps	Richard Stoklosa / Brent Wise
14:30	Adjourn	

Attachment 2

Ecological Risk Assessment Workshop Record

Abrolhos Islands and Mid-West Trawl Managed Fishery Ecological Risk Assessment

Ref No.	Assessment component	Interaction threat	Consequences	Existing management and operational safeguards	Risk analysis			Planned commitments for remedial action (date to be implemented)	Suggested remedial action for consideration	Treated risk			Remarks
					Consequences	Likelihood	Risk ranking			Consequences	Likelihood	Risk ranking	
Target / retained species													
1	Saucer scallops	Primary target species.	Reduction in stock.	Weight-of-evidence stock assessment.	Moderate	Likely	Medium						
2	Bugs	Secondary retained species.	Reduction in stock (captured in very low numbers).	Significant trawl closures in nearshore waters east of the Abrolhos Islands.	Minor	Remote	Negligible						
Bycatch species													
3	Invertebrates	Capture in trawl gear and discarded back to sea.	About 10% of catch is total bycatch (invertebrates, finfish and sharks & rays), which are typically returned alive.	Preliminary surveys of bycatch in four fishing areas.	Minor	Remote	Negligible		Further surveys are needed to improve confidence in bycatch information, although preliminary data is considered to be as expected.				It is unlikely that any individual species would represent more than 5% of the overall catch by weight.
4	Finfish	Capture in trawl gear and discarded back to sea.	Reduction in stock (generally small species). Trawl bycatch mortality is likely to be high.		Minor	Remote	Negligible						
5	Sharks & rays	Capture in trawl gear and discarded back to sea.	Reduction in stock (low numbers of small animals captured and released).	Bycatch reduction devices (BRDs) on trawl gear.	Minor	Remote	Negligible						
Endangered, threatened and protected (ETP) species													
6	Sea snakes	Capture in trawl gear and returned back to sea.	Potential reduction in stock.		Minor	Remote	Negligible						No reported interactions to date (to be verified). Probably at the extreme southern end of the distribution of these species. For all of the ETP species, there is an unknown potential for public concern regarding scallop trawl fishing activities--but the consequences for public concern would be regarded as no greater than 'moderate' during the timeframe of this assessment, and the risk ranking would remain 'negligible'.
7	Turtles	Capture in trawl gear and returned back to sea.	Potential reduction in stock. In other fisheries trawling with BRDs, turtles are generally released alive.	BRDs.	Minor	Remote	Negligible						No reported interactions date. Short shot duration (10 minutes to usually less than an hour) would likely increase survival if animals were captured. Try gear shot duration even shorter.
8	Cetaceans	Capture in trawl gear and returned back to sea.	Potential injury or mortality to dolphins.	BRDs. Likelihood of dolphin entry into trawl nets is low due to low-opening otter boards.	Minor	Remote	Negligible						No reported interactions to date. Migration through the area is largely occurring outside the fishing season in the Abrolhos Islands.
9	Cetaceans	Vessel strikes with cetaceans.	Potential injury or mortality.	Low speed of trawl vessels and significant noise when under way.	Minor	Remote	Negligible						No reported interactions to date.
10	Syngnathids	Capture in trawl gear and returned back to sea.	Potential reduction in stock.	Significant trawl closures in nearshore waters east of the Abrolhos Islands.	Minor	Remote	Negligible						No reported interactions to date. No significant habitat for syngnathids in sandy substrates of trawl grounds.
11	Australian sea lions	Capture in trawl gear and returned back to sea.	Potential injury or mortality.	BRDs.	Minor	Remote	Negligible		Follow up with modelling of Australian seal lion foraging.				No reported interactions to date. Unlikely to forage in trawl nets.
12	Sea birds	Entanglement in trawl gear.	Potential mortality to seabird species.	Trawl nets are set well below the surface. Fishing is primarily conducted at night.	Minor	Remote	Negligible						No reported interactions to date. Breeding season of seabirds does not overlap with fishing season. Low quantity of bycatch is not a significant attraction to seabirds.

Abrolhos Islands and Mid-West Trawl Managed Fishery Ecological Risk Assessment

Ref No.	Assessment component	Interaction threat	Consequences	Existing management and operational safeguards	Risk analysis			Planned commitments for remedial action (date to be implemented)	Suggested remedial action for consideration	Treated risk			Remarks
					Consequences	Likelihood	Risk ranking			Consequences	Likelihood	Risk ranking	
Habitats													
13	Sand	Interaction of trawl gear with benthic habitat.	Damage and loss of habitat sustaining associated benthos.	Quantitative studies suggest that sand and silt habitats are relatively resilient to trawl fishing.	Minor	Possible	Low						The majority of fishing occurs on sand habitats. Potential for ten vessels, although currently there are only 5-6 vessels likely to be in operation during the assessment timeframe. An increase in the number of vessels to ten would not alter the risk ranking. Generally, repeat trawling over the same ground is limited until catch rate drops. Trawling occurs seasonally, in practice during a very short period each year (days to weeks). MSC certification assessment is likely to require further mapping of habitats in the trawl fishery area. Depth will make habitat mapping challenging.
14	Seagrasses	Interaction of trawl gear with benthic habitat.	Damage and loss of habitat sustaining associated benthos.	Significant trawl closures in nearshore waters east of the Abrolhos Islands.	Minor	Unlikely	Negligible						Uncertainty in habitat mapping for the distribution of seagrass and every other habitat type. Trawling occurs in deep water where seagrass in unlikely to occur.
15	Macroalgae	Interaction of trawl gear with benthic habitat.	Damage and loss of habitat sustaining associated benthos.	Significant trawl closures in nearshore waters east of the Abrolhos Islands.	Minor	Unlikely	Negligible						Occurrence of macroalgae near the Easter Group has been observed to be ephemeral.
16	Filter feeding communities	Interaction of trawl gear with benthic habitat.	Damage and loss of habitat sustaining associated benthos.		Minor	Unlikely	Negligible						Filter feeding communities would be expected to be present in shallow waters, but trawling occasionally recovers small numbers of sponges. MSC certification assessment may include 'move-on rules' and permanent/temporal closures with respect to sponges.
17	Coral reefs	Interaction of trawl gear with benthic habitat.	Damage and loss of habitat sustaining associated benthos.	Closures of reef conservation areas.	Minor	Remote	Negligible						Coral reef would be expected to occur in relatively shallow water or where there is a level of protection. Evidence shows that trawler fleet avoids coral to prevent damage to trawl gear. MSC certification assessment may include 'move-on rules' and permanent/temporal closures with respect to coral habitat.
Ecosystem structure													
18	Trophic interactions — Removal of retained species	Removal of scallop biomass.	Reduction of stock for predators.	Significant trawl closures in nearshore waters east of the Abrolhos Islands.	Minor	Unlikely	Negligible						Due to naturally high recruitment variability of scallops, few predators are highly reliant on scallops as their only food source. Bycatch is small.
19	Trophic interactions — Discarding & provisioning	Discarding of bycatch biomass.	Changes in trophic structure due to various trophic groups preying on discarded species. Discarding shell with viscera.	Area over which animals are discarded is large, over relatively deep water.	Minor	Unlikely	Negligible						Australian sea lions and seabirds are unlikely to take discarded shell or bycatch. Short fishing season and variability of catch is not conducive to animals becoming reliant on discards.
20	Translocation (pests & disease)	Translocation of pests and diseases from Port of Fremantle, Geraldton and Shark Bay, where vessels call for annual maintenance or commute across different fisheries.	Introduction of marine pests or diseases to the Abrolhos Islands, with the potential to alter ecosystem structure.	Surveillance of marine pests and diseases in Ports of Fremantle and Geraldton. Passive surveillance throughout WA with emergency response capability. Diagnostic laboratories for pest and pathogen identification.	Minor	Remote	Negligible						

Abrolhos Islands and Mid-West Trawl Managed Fishery Ecological Risk Assessment

Ref No.	Assessment component	Interaction threat	Consequences	Existing management and operational safeguards	Risk analysis			Planned commitments for remedial action (date to be implemented)	Suggested remedial action for consideration	Treated risk			Remarks
					Consequences	Likelihood	Risk ranking			Consequences	Likelihood	Risk ranking	
21	Ghost fishing	Loss of trawl gear at sea.	Mortality of marine animals indiscriminately caught in lost nets.	The high cost of trawl gear incentivises fishers to retrieve it without any major losses. GPS and grapple is used to recover gear in the event that it is lost.	Minor	Remote	Negligible						
Broader environment													
22	Air quality — Fuel exhaust	Operation of 5-6 trawl vessels.	Air pollution affecting air-breathing marine mammals and humans.	Small number of vessels allowed to operate in the fishery.	Minor	Remote	Negligible						Up to ten vessels are permitted in the fishery, which would not change the risk ranking.
23	Air quality — Greenhouse gas emissions	Operation of 5-6 trawl vessels.	Contribution to global warming.	Small number of vessels allowed to operate in the fishery.	Minor	Remote	Negligible						Up to ten vessels are permitted in the fishery, which would not change the risk ranking.
24	Water quality — Debris / litter	Discarding of waste at sea.	Adverse impact to water quality.	Code of Conduct developed by fishers to prevent discarding of waste and store aboard vessels for disposal..	Minor	Remote	Negligible						
25	Water quality — Oil / fuel discharge	Operation of 5-6 trawl vessels.	Incidental oil or fuel spill at sea.	Small number of vessels allowed to operate in the fishery. Most vessels have inboard four stroke diesel engines and oil discharge is minimal. No fuel bunkering at sea.	Minor	Remote	Negligible						
26	Water quality — Turbidity	Deployment of benthic trawl gear from 5-6 vessels.	Increase of turbidity in water column.	Significant trawl closures in nearshore waters east of the Abrolhos Islands.	Minor	Remote	Negligible						Strong currents and swell in the Abrolhos Islands dominate potential sources of turbidity. The contribution from trawling would unlikely be measurable. The majority of trawling occurs on sand during very short fishing season. Trawling grounds are predominantly on sand that does not include silts which would otherwise remain longer in the water column before settling out.