Department of
Primary Industries and
Regional Development

GOVERNMENT OF
WESTERN AUSTRALIA

Western
ROCK
LOBSTER
World leading sustainable fishery

Fisheries Occasional Publication No. 142

Ecological Risk Assessment for the Western Rock Lobster Resource; Workshop Procedure and Outcomes

Stoklosa, R

September 2022

Important disclaimer

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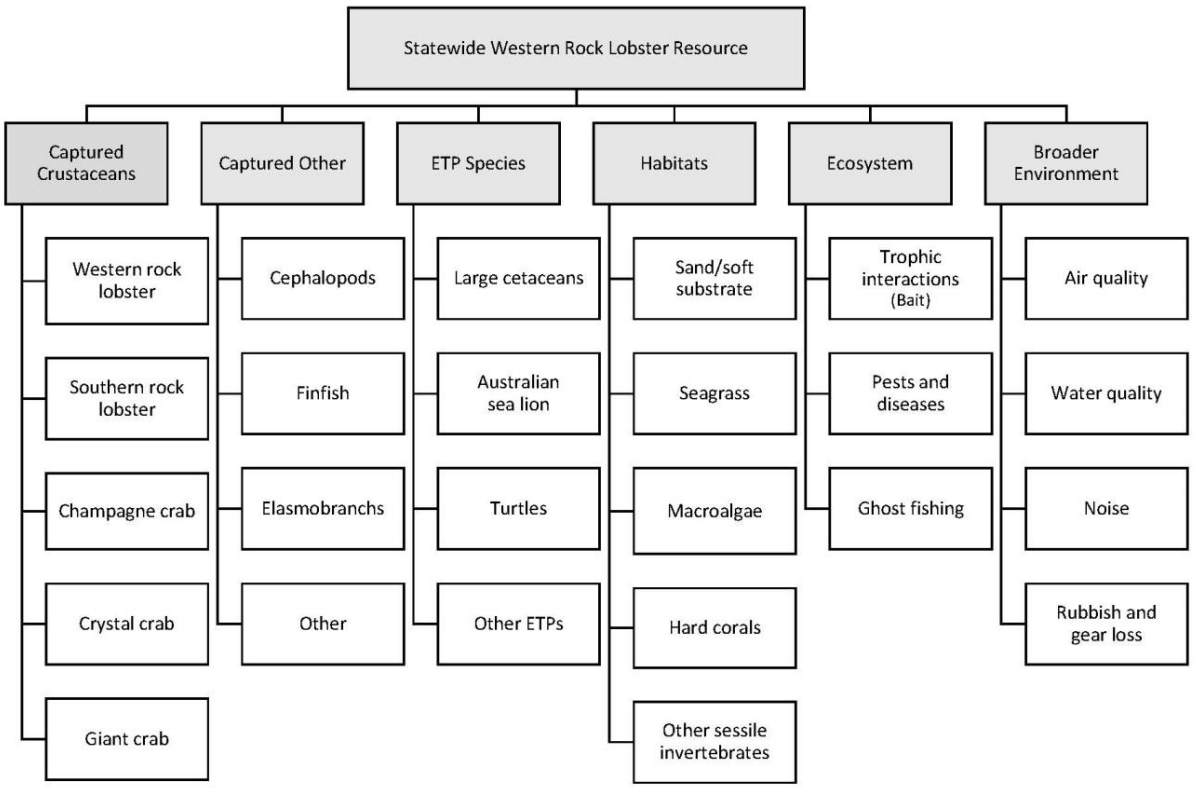
Department of Primary Industries and Regional Development
Western Australia

Ecosystem Based Fisheries Management

Ecological Risk Assessment of the Western Rock Lobster Resource



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Revision B	17 May 2022	Draft incorporating DPIRD review and clarifications.
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Executive Summary

An ecological risk assessment (ERA) of the state-wide Western Rock Lobster Resource was convened with stakeholders on 7 April 2022 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 framework and the outputs inform the development and review of harvest strategies. The Resource is harvested by the West Coast Rock Lobster Managed Fishery (WCRLMF), Zone 1 of the South Coast Crustacean Managed Fishery (SCCMF Zone 1) and recreational diving and potting for Western Rock Lobster.

This 2022 ERA was also undertaken in support of Marine Stewardship Council (MSC) re-certification of the commercial West Coast Rock Lobster Fishery. The starting point for this 2022 ERA was the previous ERA undertaken to support MSC certification in 2013 (Stoklosa 2013). Prior to 2013, ERAs were undertaken for the fishery in 2000, 2005 and 2007 (Stoklosa 2007).

The Workshop Procedure (Stoklosa 2022) adopted the methodology published by Fletcher et al. (2002, 2015) and subsequently developed for Ecosystem Based Fisheries Management. Consequence and likelihood ratings for ecological components were adopted from Department standards being applied to all fisheries in Western Australia. The risk analysis methodology utilised for this 2022 ERA is based on the global standard for risk management (AS ISO 31000:2018). The methodology utilises a qualitative 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.

Initial scoping work to identify potential issues and risks was undertaken by Departmental research and management staff, and *Background information for the ecological risk assessment for the Western Rock Lobster Resource* (Background Document, How et. al. 2022) was prepared and distributed to all participants prior to the workshop. The Background Document includes an ecological component tree to assist in the identification of threats to ecological values in the areas where fishing occurs. The Workshop Procedure (Stoklosa 2022) and Background Document were distributed widely to all invited stakeholders in March 2022.

A formal stakeholder workshop involving industry, government, research and non-government organisations was convened online on 7 April 2022. A diverse group of 35 people participated in the online workshop. This ERA resulted in detailed outcomes which were documented in the risk assessment workshop record and communicated to all participants. All of the threats on the agenda were assessed using a consultative and structured workshop procedure. Consensus was reached on the expert judgements by a Technical Panel in this qualitative ERA.

The threats were ranked from negligible to high under present management. The two threats ranked high risk are stock reductions of Giant crab and Baldchin groper, both retained as secondary species in the SCCMF and WCRLMF, respectively. These high risks are being mitigated with planned management action that will be implemented in the short term, reducing the two threats to medium risk. As such, no additional management response is required to reduce the risk ranking of these threats. However, some risk treatment measures have been suggested to further reduce risk, as advice to the Department and the fishing industry for consideration.

Risk rankings of medium or less are considered acceptable risks for well-managed fisheries, subject to ongoing performance monitoring. Monitoring of the fishery should confirm that these risks remain negligible to medium. In the event that circumstances of the fishery change or performance monitoring detects an unexpected change, the relevant threats should be re-assessed.

It is recommended that the risks be reviewed in five years, or prior to the next review of the harvest strategy for the resource, where the risk scores are used as the performance indicator for the non-target ecological values. Monitoring and assessment of the key target species will be ongoing, with the performance indicators for those stocks evaluated on an annual basis.

Introduction

An ecological risk assessment (ERA) of the state-wide Western Rock Lobster Resource (the Resource) was convened with stakeholders on 7 April 2022 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 framework and the outputs inform the development and review of harvest strategies. The Resource is harvested by the West Coast Rock Lobster Managed Fishery (WCRLMF), Zone 1 of the South Coast Crustacean Managed Fishery (SCCMF Zone 1) and recreational diving and potting for Western Rock Lobster.

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Western Rock Lobster Resource[1]

Western rock lobster (WRL; *Panulirus cygnus*) is a decapod crustacean of the family Palinuridae (Figure 1). Palinuridae, or spiny lobsters, are found throughout tropical, sub-tropical, and temperate waters, and globally comprise of 47 species in eight genre. WRL is endemic to the waters off WA, with a distribution extending from the North West Cape in the north, to around Albany in the south (Figure 2). It is the dominant lobster throughout its range, with minimal overlap with tropical species (e.g. *P. ornatus*, *P. versicolor*) in the north of its range, and *Jasus edwardsii* in the south.

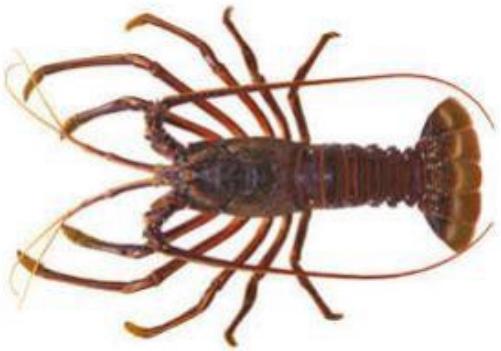

Figure 1. The western rock lobster, *Panulirus cygnus.* Illustration © R. Swainston.

[1] All citations in this section are referenced in the bibliography of the Background Document (How et.al. 2022), incorporated here by reference.

Figure 2. Distribution of the western rock lobster (de Lestang et al., 2016).

WRL is considered a single management unit in the West Coast Bioregion and the same genetic stock extends into the South Coast Bioregion (Figure 3).

The Resource is accessed by two commercial fisheries; the WCRLMF and the SCCMF Zone 1 which are responsible for approximately 92% and 1%, respectively, of total annual landings (averaged over the past five years). The Resource also supports a highly valued recreational and charter fishery which takes approximately 7% of all WRL landings (averaged over the past five years).

Under the Integrated Fisheries Management (IFM) allocation decision, the recreational fishing sector has been formally allocated 5% of the western rock lobster Allowable Harvest Level (AHL), and 95% has been allocated to the WCRLMF. The AHL is determined annually in accordance with the sustainability and harvest (economic) objectives outlined in the West Coast Rock Lobster Harvest Strategy and Control Rules 2014-2019. To date, the recreational sector has not exceeded its 5% allocation under IFM.

A notional allocation exists for customary fishing of 1 tonne annually. If this allocation was fully accessed, it would account for less than 0.02% of total annual landings.

Harvest by the SCCMF is currently not considered within the IFM allocation decision.

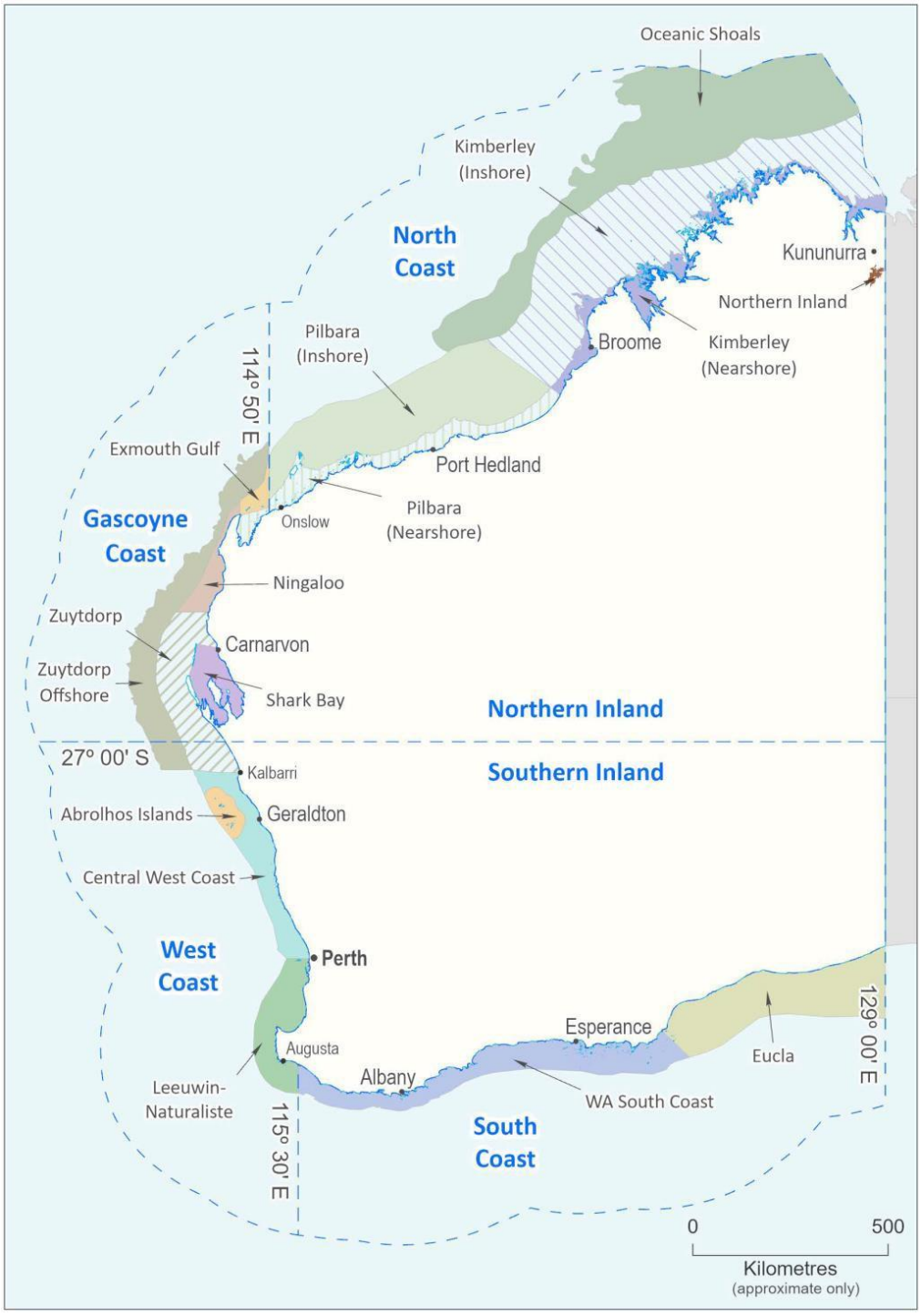

Figure 3. The Bioregions of Western Australia.

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 2022) 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).

Using the risk assessment methodology adopted by the Department and recognised for MSC certification, the ERA identified potential threats to the sustainability objectives of the Resource 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 2022) and the technical documents that were assembled to underpin the assessment of the threats that were assessed (How et. al. 2022). 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 discussions of each particular threat, and perform a qualitative risk analysis.

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

Mr Richard Stoklosa, E-Systems, Hobart was engaged by the Department to facilitate and chair this ERA. He previously facilitated and chaired ERAs of the Western Rock Lobster Fishery in 2007 and 2013, and Western Australian invertebrate fisheries in 2019.

The composition and roles of the Stakeholder Working Group and the Technical Panel are elaborated below.

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 Ecosystem Based Fisheries Management and MSC certification, 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 2022) and the Background Document (How et. al. 2022).

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

- Western Rock Lobster Council;
- Department of Primary Industries and Regional Development;
- Department of Biodiversity, Conservation and Attractions;
- Marine Stewardship Council;
- Western Australian Fishing Industry Council;

- Conservation Council;
- Australian Marine Conservation Society;
- University of Western Australia;
- Murdoch University;
- Edith Cowan University;
- Commonwealth Scientific and Industrial Research Organisation;
- Institute of Marine and Antarctic Science;
- Birdlife Australia;
- World Wildlife Fund for Nature;
- South Australian Research and Development Institute;
- Marine Parks and Reserves Authority;
- Recfishwest;
- Sea Shepherd;
- Western Australian Ocean Foundation;
- Commonwealth Department of Agriculture, Water and the Environment;
- South West Aboriginal Land and Sea Council;
- Yamatji Marlpa Aboriginal Corporation;
- Marine Tourism Western Australia;
- Local Shire representatives;
- Western Australian Professional Fishers Association; and
- Western Australian license holders and seafood industry representatives.

There were 35 people from a cross-section of these organisations who participated in the ERA (Appendix 1).

Technical Panel

A Technical Panel was convened for the ERA with the support of a range of stakeholders, as a subset of the Stakeholder Working Group. The Technical Panel encompassed a range of scientific disciplines relevant to the assessment of the Resource.

Although there is no formula to obtain a 'perfect' mix of expert representation, the goal was to represent the range of stakeholder interests with persons who demonstrate recognised experience and qualifications in the subject matter, and have the capacity to provide high quality technical expertise for risk analysis.

The persons serving on the Technical Panel were:

Dr Nick Caputi	Senior Principal Research Scientist DPIRD
Dr Tim Langlois	Fisheries Research Scientist University of Western Australia
Dr Adrian Linnane	Sub-program Leader, Crustaceans South Australian Research and Development Institute
Dr Neil Loneragan	Professor Emeritus of Marine Ecology and Conservation Murdoch University
Dr Chandra Salgado-Kent	Oceans Blueprint, Marine Ecology, Marine Mammology Edith Cowan University

The Technical Panel's role in the workshop was to participate in the discussion of the threats identified for each of the fishing interactions with ecological assessment components, and to assess the risk level for these hazards under existing circumstances and fisheries management controls. Assessment was based on full consideration of published technical information and the management actions formally adopted by the Department. New threats to ecological components were considered and assessed as necessary.

The Technical Panel also re-assessed the residual, or treated risk level for new or alternative management actions that were suggested by the Stakeholder Working Group.

Workshop proceedings

A workshop agenda was distributed prior to the workshop. The agenda and ERA Workshop Procedure (Stoklosa 2022) were adopted by all participants. The workshop agenda and list of participants is presented in Appendix 1.

During the workshop, the recording of workshop proceedings in a structured risk assessment template was shared online, 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.

Ecological risk assessment

The starting point for the workshop was the information contained in the Background Document (How et.al. 2022), which identifies the assessment components for the target species, secondary retained species, bycatch species, ETP species, habitats, 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 and decisions of the Technical Panel.

Prior to the workshop, a Workshop Procedure (Stoklosa 2022, Appendix 2) was distributed to all participants. The Workshop Procedure documents the adopted criteria for risk analysis (consequence and likelihood ratings), risk ranking criteria and expected action to mitigate risk.

The Department has developed a 'tree' of the ecological components to be assessed, presented in Figure 5 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 Appendix 3. Only the Technical Panel contributed to the judgments made in the risk analysis, with considerable input from the Stakeholder Working Group.

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. Specific interaction scenarios were discussed and recorded to allow consideration of varied consequence and likelihood ratings. This approach allows the range of credible risk rankings to be determined for each threat and the highest risk rankings to be identified.

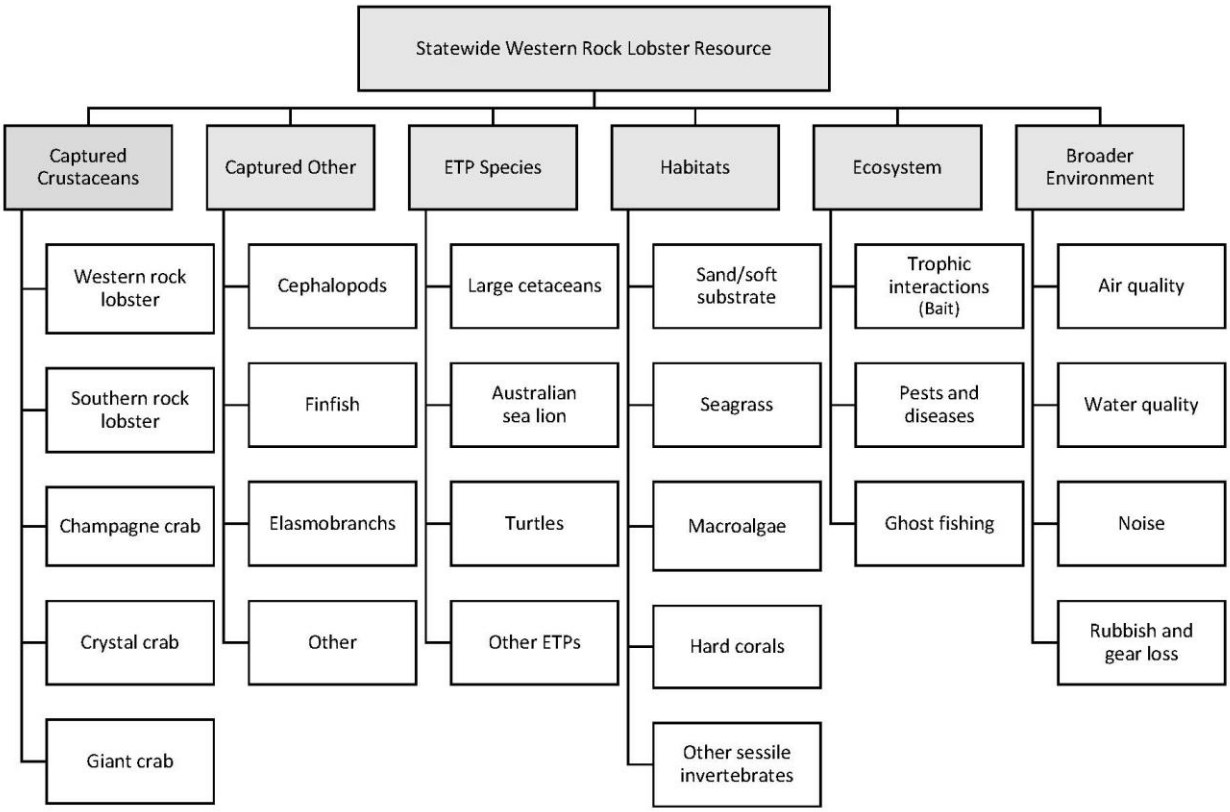

Figure 5. Western Rock Lobster Resource ecological components for assessment.

The outcomes of the ecological risk assessment for the Western Rock Lobster Resource are presented in Table 1. Note that the risk rankings shown in Table 1 represent the 'untreated risk' for each ecological component. The treatment of high and medium risk rankings is discussed in the next section of this report.

Table 1. Overview of the objectives, components, and untreated risk scores and ratings from the 2022 ecological risk assessment of the Western Rock Lobster Resource (with reference to the component tree and the full workshop record).[2]

Aspect	Fishery objective	Ecological component	Fishing sector	Interaction	Untreated risk analysis	
					Risk scoring	Risk ranking
Captured crustaceans	To maintain spawning stock biomass of each retained species at a level where the main factor affecting recruitment is the environment	Western Rock Lobster	WCRLMF	Commercial target species, reduction in stock	C1, L4	LOW
			SCCMF Zone 1	Commercial target species, reduction in stock	C1, L4	LOW
			Recreational	Pots and divers, reduction in stock	C1, L4	LOW
			All fishing sectors – Cumulative risk		C1, L4	**LOW**
		Southern rock lobster	WCRLMF	Secondary retained species	C1, L2	NEGLIGIBLE
			SCCMF Zone 1	Secondary retained species	C1, L2	NEGLIGIBLE
			Recreational	Secondary retained species	C1, L2	NEGLIGIBLE
			All fishing sectors – Cumulative risk		C1, L2	**NEGLIGIBLE**
		Champagne crab	WCRLMF	Secondary retained species	C1, L4	LOW
			SCCMF Zone 1	Secondary retained species	C1, L4	LOW
			All fishing sectors – Cumulative risk		C1, L4	**LOW**
		Crystal crab	SCCMF Zone 1	Secondary retained species	C2, L4	MEDIUM
			All fishing sectors – Cumulative risk		C1, L4	**MEDIUM**
		Giant crab	SCCMF Zone 1	Secondary retained species, reduction in stock (about 1.5 tonnes of slow growing, long lived species)	C2, L4	MEDIUM
			SCCMF Zone 1	Secondary retained species, reduction in stock below maximum sustainable yield	C3, L3	HIGH
			All fishing sectors – Cumulative risk		C3, L3	**HIGH**

[2] Fishing sectors which have no interaction with the relevant ecological component are not presented in this overview.

Aspect	Fishery objective	Ecological component	Fishing sector	Interaction	Untreated risk analysis	
					Risk scoring	Risk ranking
Captured other	To maintain spawning stock biomass of each species at a level where the main factor affecting recruitment is the environment	Cephalopods — Western Rock Octopus	WCRLMF	Incidental capture, potential retention and reduction of stock	C1, L3	LOW
			SCCMF Zone 1	Incidental capture, potential retention and reduction of stock	C1, L2	NEGLIGIBLE
			Recreational	Incidental capture, potential retention and reduction of stock	C1, L2	NEGLIGIBLE
			All fishing sectors – Cumulative risk		C1, L3	**LOW**
		Finfish — Baldchin groper	WCRLMF	Reduction in stock (about 2 tonnes out of an overall catch of about 54 tonnes across all sectors)	C3, L3	HIGH
			Recreational	Reduction of stock	C3, L2	MEDIUM
			All fishing sectors – Cumulative risk		C3, L3	**HIGH**
		Finfish — Pink snapper	WCRLMF	Reduction in stock (about 0.5 tonnes out of an overall catch of about 140 tonnes across all sectors)	C1, L3	LOW
			Recreational	Reduction of stock	C1, L3	LOW
			All fishing sectors – Cumulative risk		C1, L3	**LOW**
		Elasmobranchs	WCRLMF	Reduction in Wobbegong shark stock	C1, L2	NEGLIGIBLE
			SCCMF Zone 1	Reduction of shark stocks	C1, L2	NEGLIGIBLE
			Recreational	Incidental capture and reduction of shark stocks	C1, L2	NEGLIGIBLE
			All fishing sectors – Cumulative risk		C1, L2	**NEGLIGIBLE**

Aspect	Fishery objective	Ecological component	Fishing sector	Interaction	Untreated risk analysis	
					Risk scoring	Risk ranking
ETP species	To ensure fishing impacts do not result in serious or irreversible harm to ETP species populations	Large cetaceans — Humpback whale	WCRLMF	Entanglement in pot gear, mortality	C1, L4	LOW
			SCCMF Zone 1	Entanglement in pot gear, mortality	C1, L4	LOW
			Recreational	Entanglement in pot gear resulting in health impacts if whales cannot be released before significant injury or exhaustion	C1, L4	LOW
			All fishing sectors – Cumulative risk		C1, L4	**LOW**
		Large cetaceans — Southern Right whale	WCRLMF	Entanglement in pot gear, mortality	C2, L2	LOW
			SCCMF Zone 1	Entanglement in pot gear, mortality	C3, L2	MEDIUM
			Recreational	Entanglement in pot gear resulting in health impacts if whales cannot be released before significant injury or exhaustion	C3, L1	LOW
			All fishing sectors – Cumulative risk		C3, L2	**MEDIUM**
		Turtles	WCRLMF	Entanglement in ropes, mortality	C1, L3	NEGLIGIBLE
			SCCMF Zone 1	Entanglement in ropes, mortality	C1, L3	NEGLIGIBLE
			Recreational	Entanglement in ropes, mortality	C1, L3	NEGLIGIBLE
			All fishing sectors – Cumulative risk		C1, L3	**NEGLIGIBLE**
		Other ETPs — Syngnathids	WCRLMF	Appendix to ropes and gear, post-release mortality	C1, L3	LOW
			SCCMF Zone 1	Appendix to ropes and gear, post-release mortality	C1, L3	LOW
			Recreational	Appendix to ropes and gear, post-release mortality	C1, L3	LOW
			All fishing sectors – Cumulative risk		C1, L3	**LOW**

Aspect	Fishery objective	Ecological component	Fishing sector	Interaction	Untreated risk analysis	
					Risk scoring	Risk ranking
Habitats	To ensure the effects of fishing do not result in serious or irreversible harm to habitat structure and function	Seagrass	WCRLMF	Physical damage from dragging of pots	C1, L3	LOW
			SCCMF Zone 1	Physical damage from dragging of pots	C1, L3	LOW
			Recreational	Physical damage from dragging of pots	C1, L4	NEGLIGIBLE
			All fishing sectors – Cumulative risk		C1, L3	**LOW**
		Macroalgae	WCRLMF	Physical damage to macroalgae	C1, L4	LOW
			SCCMF Zone 1	Physical damage to macroalgae	C1, L4	LOW
			Recreational	Physical damage to macroalgae	C1, L2	NEGLIGIBLE
			All fishing sectors – Cumulative risk		C1, L4	**LOW**
		Hard corals	WCRLMF	Physical damage to coral reef	C1, L3	LOW
			All fishing sectors – Cumulative risk		C1, L3	**LOW**
		Other sessile invertebrates	WCRLMF	Physical damage to sessile invertebrates	C1, L4	LOW
			SCCMF Zone 1	Physical damage to sessile invertebrates	C1, L4	LOW
			Recreational	Physical damage to sessile invertebrates	C1, L2	NEGLIGIBLE
			All fishing sectors – Cumulative risk		C1, L4	**LOW**

Aspect	Fishery objective	Ecological component or stressor	Fishing sector	Interaction	Untreated risk analysis	
					Risk scoring	Risk ranking
Ecosystem	To ensure the effects of fishing do not result in serious or irreversible harm to ecological processes	Trophic interactions — Discarding bait (provisioning)	WCRLMF	Provisioning and potential reliance on alternative food source, potential attraction of dolphins and sea lions and vulnerability to vessel strikes	C1, L4	LOW
			SCCMF Zone 1	Provisioning and potential reliance on alternative food source, potential attraction of dolphins and sea lions and vulnerability to vessel strikes	C1, L3	LOW
			Recreational	Provisioning and potential reliance on alternative food source, potential attraction of dolphins and sea lions and vulnerability to vessel strikes	C1, L4	LOW
			All fishing sectors – Cumulative risk		C1, L4	**LOW**
		Trophic interactions — Exposure of captured or injured lobsters to predators	WCRLMF	Exposure of captured or injured lobsters to increased predation from octopus	C1, L3	LOW
			SCCMF Zone 1	Exposure of captured or injured lobsters to increased predation from octopus	C1, L3	LOW
			Recreational	Exposure of captured or injured lobsters to increased predation from octopus	C1, L3	LOW
			All fishing sectors – Cumulative risk		C1, L3	**LOW**
		Trophic interactions — Removal of lobster	WCRLMF	Removal of lobster from trophic interactions	C1, L3	LOW
			SCCMF Zone 1	Removal of lobster from trophic interactions	C1, L2	NEGLIGIBLE
			Recreational	Removal of lobster from trophic interactions	C1, L3	LOW
			All fishing sectors – Cumulative risk		C1, L3	**LOW**

Translocation of pests and diseases —Ports	WCRLMF	Port infection spreading to vessels operating in shallow water fishing grounds	C3 L2	MEDIUM
	SCCMF Zone 1	Port infection spreading to vessels operating in shallow water fishing grounds	C3 L2	MEDIUM
	Recreational	Port infection spreading to vessels operating in shallow water fishing grounds	C3 L2	MEDIUM
	All fishing sectors – Cumulative risk		C3 L2	**MEDIUM**
Translocation of pests and diseases — Bait	WCRLMF	Bait infected with viruses	C3 L2	MEDIUM
	SCCMF Zone 1	Bait infected with viruses	C3 L2	MEDIUM
	Recreational	Bait infected with viruses	C3 L2	MEDIUM
	All fishing sectors – Cumulative risk		C3 L2	**MEDIUM**
Ghost fishing	WCRLMF	Captured animals cannot escape gear, resulting in mortality	C1, L1	NEGLIGIBLE
	SCCMF Zone 1	Captured animals cannot escape gear, resulting in mortality	C1, L1	NEGLIGIBLE
	Recreational	Captured animals cannot escape gear, resulting in mortality	C1, L1	NEGLIGIBLE
	All fishing sectors – Cumulative risk		C1, L1	**NEGLIGIBLE**

Aspect	Fishery objective	Ecological component or stressor	Fishing sector	Interaction	Untreated risk analysis	
					Risk scoring	Risk ranking
Broader environment	To ensure the effects of fishing do not result in serious or irreversible harm to the broader environment	Air quality	WCRLMF	Human and animal exposure to fuel exhaust	C1, L1	NEGLIGIBLE
			SCCMF Zone 1	Human and animal exposure to fuel exhaust	C1, L1	NEGLIGIBLE
			Recreational	Human and animal exposure to fuel exhaust	C1, L1	NEGLIGIBLE
			All fishing sectors – Cumulative risk		C1, L1	**NEGLIGIBLE**
		Water quality	WCRLMF	Oil/fuel discharge, turbidity, wastewater resulting in smothering or pollution of benthic habitats, fauna, human health risk	C1, L2	NEGLIGIBLE
			SCCMF Zone 1	Oil/fuel discharge, turbidity, wastewater resulting in smothering or pollution of benthic habitats, fauna, human health risk	C1, L1	NEGLIGIBLE
			Recreational	Oil/fuel discharge, turbidity, wastewater resulting in smothering or pollution of benthic habitats, fauna, human health risk	C1, L2	NEGLIGIBLE
			All fishing sectors – Cumulative risk		C1, L2	**NEGLIGIBLE**
		Noise	WCRLMF	Noise emissions from vessels resulting in potential behavioural changes of fauna	C1, L2	NEGLIGIBLE
			SCCMF Zone 1	Noise emissions from vessels resulting in potential behavioural changes of fauna	C1, L2	NEGLIGIBLE
			Recreational	Noise emissions from vessels resulting in potential behavioural changes of fauna	C1, L2	NEGLIGIBLE
			All fishing sectors – Cumulative risk		C1, L2	**NEGLIGIBLE**

Aspect	Fishery objective	Ecological component or stressor	Fishing sector	Interaction	Untreated risk analysis	
					Risk scoring	Risk ranking
		Gear loss / rubbish	WCRLMF	Ingestion of lost or discarded soft plastic waste by fauna (seabirds), resulting in mortality	C1, L3	LOW
			SCCMF Zone 1	Ingestion of lost or discarded soft plastic waste by fauna (seabirds), resulting in mortality	C1, L1	NEGLIGIBLE
			Recreational	Ingestion of lost or discarded soft plastic waste by fauna (seabirds), resulting in mortality	C1, L4	LOW
			All fishing sectors – Cumulative risk		C1, L4	**LOW**
		Gear loss / rubbish	WCRLMF	Entanglement of seabirds with soft plastic waste, resulting in mortality	C1, L3	LOW
			SCCMF Zone 1	Entanglement of seabirds with soft plastic waste, resulting in mortality	C1, L1	NEGLIGIBLE
			Recreational	Entanglement of seabirds with soft plastic waste, resulting in mortality	C1, L4	LOW
			All fishing sectors – Cumulative risk		C1, L4	**LOW**
		Gear loss / rubbish	WCRLMF	Human health impacts from consuming fish exposed to plastic ingestion (eg microplastics)	C1, L3	LOW
			SCCMF Zone 1	Human health impacts from consuming fish exposed to plastic ingestion (eg microplastics)	C1, L1	NEGLIGIBLE
			Recreational	Human health impacts from consuming fish exposed to plastic ingestion (eg microplastics)	C1, L4	LOW
			All fishing sectors – Cumulative risk		C1, L4	**LOW**

Risk ranking

Risk ranking is used to set priorities for risk management actions, as explained in Appendix 2.

Using the adopted risk assessment methodology (Appendix 2), this ERA identified potential threats to the sustainability objectives for the Western Rock Lobster Resource and assessed the risks. The risk analysis revealed a number of potential threats to marine ecosystem components that require management attention (refer to Table 2 in Appendix 2). Each of these is discussed below for the most significant threats assessed in the workshop. The threats for assessment components are numbered for reference to the ERA Workshop Record presented in Appendix 3.

A cumulative risk ranking for all fishing sectors (WCRLMF, SCCMF Zone 1 and recreational) was recorded by the Technical Panel for each threat that was assessed (Appendix 3). It was the view of the Technical Panel and the Stakeholder Working Group that the cumulative risk for each of the threats is identical to the highest risk ranking of the individual fishing sectors. Therefore, this discussion of risk ranking is focused on the relevant fishing sectors rather than the cumulative risk of fishing.

No severe risks were identified in this ERA.

High risk

Two high risks were identified in the risk assessment:

ERA reference number	Nature of risk
5	Retention of Giant crab as a secondary retained species in the SCCMF
7	Retention of Baldchin groper as a secondary retained species in the WCRLMF

Giant crab in the SCCMF (5)

Giant crab (*Pseudocarcinus gigas*) is data-rich for estimating the consequences of retention. The potential for a reduction of stock below the maximum sustainable yield (MSY) is considered an unacceptable depletion of stock, but not affecting the recruitment level, with possible occurrence during the five-year management timeframe for the assessment (C3, L3). The Giant crab is a slow-growing, long-lived species vulnerable to overfishing, and the Technical Panel noted a precautionary approach toward estimating risk to this species.

Future commitments for remedial action include the introduction of specific quotas on the retention of this species in the South Coast in the coming months to rebuild stocks to sustainable levels. It is reported that the stocks in the Zone 1 area of the South Coast do not require rebuilding due to intermittent harvest and the introduction of quotas, which will ensure catches are maintained at acceptable levels.

Baldchin groper in the WCRLMF (7)

Baldchin groper (*Choerodon rubescens*) is endemic to Western Australia and is an 'indicator species' in the West Coast Bioregion—meaning that the stock status is used to indicate the status of other species in the region. The Western Australian Baldchin groper stock is classified as 'recovering' from a recruitment-impaired state. Retention of Baldchin groper of about four percent of the overall catch of this species is considered a potentially unacceptable depletion of stock, but not affecting the recruitment level, with possible occurrence (C3, L3).

Approval for a 50 percent reduction in the total catch across all fishing sectors is being implemented.

Medium risk

Six medium risks were identified in the risk assessment:

ERA reference number	Nature of risk
4	Retention of Crystal crab as a secondary retained species in the SCCMF
5	Retention of Giant crab as a secondary retained species in the SCCMF
7	Retention of Baldchin groper captured in recreational pots
10	Entanglement and mortality of Southern right whale in the SCCMF
20	Translocation of pests and diseases from ports (all sectors)
20	Bait infected with viruses (all sectors)

Crystal crab in the SCCMF (4)

Crystal crab (*Chaceon albus*) is a deep water crustacean taken by commercial fishers in the South Coast. Retention of less than one tonne of this species out of a total catch of about 155 tonnes is considered a maximum acceptable level of depletion of the stock (C2, L4).

Future management commitments include the introduction of quotas for the Crystal crab fishery to rebuild stock levels.

Giant crab in the SCCMF (5)

A second interaction scenario for Giant crab in the SCCMF is the reduction in stock of about 1.5 tonnes in the South Coast which is considered the maximum acceptable level of depletion of the stock (C2, L4). Most of the catch of Giant crab occurs in Zones 2 and 3 of the South Coast (outside the area assessed for the Western Rock Lobster Resource). However, there is a question of whether the catch at the periphery of the Giant crab distribution is significant for estimating risk.

Baldchin groper captured in recreational pots (7)

The reduction of stock from capture in recreational pots is potentially unacceptable but not affecting the recruitment level of the stock, rated to be an unlikely consequence (C3, L2). The majority of recreational fishing occurs near metropolitan areas, mainly near Perth, which was judged to be a lower likelihood of 'high' consequences (C3) than the likelihood of 'high' consequences in the WCRLMF. The recreational line catch of Baldchin groper is about 36 tonnes and considered to be overfished.

Again, approval for a 50 percent reduction in the total catch across all fishing sectors is being implemented.

Southern right whale in the SCCMF (10)

Southern right whale (*Eubalaena australis*) entanglements with pot gear and mortality on the South Coast may affect recovery of the species, judged to be unlikely during the five-year management timeframe of the assessment (C3, L2). One entanglement was reported in recent years, with entanglements in the Albany and Esperance regions which are outside the assessment area for the Western Rock Lobster Resource. Only two license holders operate vessels in the SCCMF Zone 1.

Year-round fishing is being planned, which will require gear modifications to reduce the likelihood of entanglement under current regulations.

Translocation of pests and diseases from ports (20)

The threat of spreading marine pests and diseases from ports to shallow water environments could unacceptably alter ecosystem function with a loss of major ecological components and the prevalence of new (invasive) species, which was judged to be an unlikely occurrence (C3, L2). Commercial vessels operate only within Western Australian waters and visit ports for dry dock maintenance and antifouling at least annually. The number of commercial vessels has decreased in recent years, with an estimate of only 90 annual fishing trips in the WCRLMF, and only two vessels operating in the SCCMF Zone 1 (with no visits by international vessels in Zone 1). Recreational vessels operate near shore in predominantly metropolitan areas.

Bait infected with viruses (20)

Bait for commercial pots is soured from Australia and New Zealand under mature phytosanitary controls to prevent the infection and spread of marine viruses. There is no control over the source of commercial bait. As with the translocation of pests and diseases noted above, the potential for unacceptable alteration of ecosystem function with a loss of major ecological components was judged to be an unlikely occurrence (C3, L2).

The threat of introducing marine viruses in bait generated a suggestion to consider legislation or regulations for sourcing only low risk bait in all fishing sectors to reduce the likelihood of infection. It was also suggested for industry bodies to encourage low risk bait selection for commercial fishers.

Low and negligible risk

Thirty-seven low risk rankings were recorded for the ecological components that were assessed. Most of these low risk rankings are attributed to the availability of stock assessments for non-target species, gear modifications to prevent interactions with TEP species, and the reduction in vessels and effort leading to reduced trophic interactions. The exceptions are noted in the ERA Workshop Record (Appendix 3).

For the threat of potential entanglement of Humpback whales in the SCCMF Zone 1 (ERA Workshop Record, Reference number 10), the Technical Panel and Stakeholder Working Group noted that year-round commercial fishing is planned, which will require gear modifications to prevent entanglements. A suggestion was also recorded to consider implementing a requirement for shortened pot lines as already required in the West Coast region.

Thirty negligible risk rankings were recorded for the ecological components that were assessed.

Other observations

Fifteen of the interactions of fishing activities with ecological assessment components were regarded as having no credible threat to ecological values but were retained by workshop participants in the ERA Workshop Record (Appendix 3) as 'not a credible threat'. Retaining these interactions as 'not a credible threat' was decided to demonstrate that the interactions were genuinely considered in view of previous ERAs or potential stakeholder or public concern.

The Technical Panel noted that the criteria for consequence ratings with regard to ETP species (refer to Appendix 2) could be improved and clarified by referring to consequences at a population level.

Prior to the ERA workshop, participants were invited to comment on the Background Document (How et. al. 2022) or to provide other documents or information relevant to the assessment of the Western Rock Lobster Resource. It is noted that no additional documents were tabled for the ERA.

The Department commented that it was seeking consistency in approach across all ERAs for fisheries management. There were occasions where the Department noted previous assessment of some of the threats considered here; however, the facilitator encouraged workshop participants to discuss each threat and for the Technical Panel to perform risk analysis on the basis of all available information without any undue bias from the reported results of previous assessments.

Risk treatment

Medium risk assessed for Crystal crab, Giant crab, Baldchin groper, Southern right whale, translocation of pests and diseases, and infection of bait are 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 these risks (beyond already planned actions); however, a review should be undertaken in not less than five years—or prior to the next review of the harvest strategy.

Risk treatment is not strictly required for low and negligible risk (refer to Appendix 2). 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 (Appendix 3) 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 Western Rock Lobster Resource.

Two high risk interactions were recorded for the Western Rock Lobster Resource. High risk threats are not desirable and require increased management activities in the short term (refer to Appendix 2). The treatment actions for these two high risk threats for Giant crab and Baldchin groper are discussed below, and the treated risk rankings were assessed by the Technical Panel with assistance from the Stakeholder Working Group.

Risk treatment reduces the high risk rankings for Giant crab and Baldchin groper shown in Table 1 to medium risk rankings. Similarly, the associated high risk rankings for cumulative risk from all fishing sectors is reduced to medium risk.

Treated risk for Giant crab

High risk assessed for Giant crab requires a full performance report and regular monitoring by fisheries managers. A commitment to implement specific quotas in the coming months to rebuild stock levels will reduce the likelihood of an unacceptable reduction of stock. Stock levels are not confirmed as requiring rebuilding in the subject area of the Resource; however, there is uncertainty in the nation-wide stock levels (primarily in Tasmania). Adoption of this planned remedial action was judged to reduce the likelihood of high consequences from 'possible' to 'unlikely' (C3, L2). This results in an acceptable treated risk level of medium over the assessment timeframe of five years.

Treated risk for Baldchin groper

High risk assessed for Baldchin groper also requires a full performance report and regular monitoring by fisheries managers. Approved management commitments to reduce the catch by 50 percent will reduce the consequences of reduction of stock from 'high' to 'moderate', and the likelihood of the acceptable consequences was judged to be 'likely' (C2, L4). This results in an acceptable treated risk level of medium over the assessment timeframe of five years.

Risk management

Risk management of the Western Rock Lobster Resource 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 independent certification of the State's commercial fisheries, and the commercial Western Rock Lobster fishery is currently certified by the MSC.

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 the Fisheries:

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.

Conclusion

The ERA undertaken on 7 April 2022 resulted in the outcomes documented in the risk assessment workshop record presented as Appendix 3. All of the assessment components on the agenda were assessed using a consultative and structured workshop procedure and ecological component tree. Consensus was reached on the expert judgements of the Technical Panel in this qualitative ERA.

Except for the interaction of fishing with two species, the threats assessed for fishing interactions with ecological assessment components in the ERA were ranked medium, low or negligible using the adopted methodology. The WCRLMF generally represents more intensive effort than SCCMF Zone 1 and recreational fisheries and tends to dominate the cumulative risk rankings. Risk rankings of medium or less are considered acceptable risks for well-managed fisheries, subject to ongoing performance monitoring.

Risks to the sustainability of stocks of two retained species were ranked high: Giant crab in the SCCMF Zone 1 and Baldchin groper in the WCRLMF. Corrective management actions already committed in Western Australia are expected to reduce the residual risk ranking to an acceptable level of medium risk over the assessment timeframe of five years.

Ongoing performance monitoring of the Western Rock Lobster Resource should confirm that these risks remain acceptably low. In the event that circumstances of the commercial or recreational fisheries change, or performance monitoring detects an unexpected change, the relevant threats assessed in this ERA should be reviewed.

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Appendix 1

Workshop Participants and Agenda

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Western Rock Lobster Resource Ecological Risk Assessment Workshop Participants, 7 April 2022

Name	Organisation / company affiliation	Title / position / area of expertise
Stakeholders		
Todd Avard	DPIRD Fisheries	
Graeme Baudains	DPIRD Fisheries	Principal Management Officer, Rock Lobster
Kristi Bouwer	DPIRD Fisheries	Recreational and Charter
Simon de Lestang	DPIRD Fisheries	Research Scientist, Rock Lobster Stock Assessment
Scott Evans	DPIRD Fisheries	ETPs, Habitat, Ecosystem, Broader Environment
Carey-Ann Harper	Western Rock Lobster Council	EO
Klaas Hartmann	Institute of Marine and Antarctic Science	Bio-economic Fisheries Assessment Methods
Mat Hourston	DPIRD Fisheries	ETPs, Habitat, Ecosystem, Broader Environment
Jason How	DPIRD Fisheries	Scientist, Rock Lobster
Nicola Hutchinson	Western Rock Lobster Council	Program Officer
Mick Kelly	DPIRD Fisheries	
Rafael Leon	Institute of Marine and Antarctic Science	Southern Rock Lobster
Terry Lissiman	Western Rock Lobster Council	Chair
Aaron Moses	Recfishwest	Recreational Fishers
Rebecca Oliver	DPIRD Fisheries	
Laura Orme	Western Australian Fishing Industry Council	Industry Development Manager
Luke Parish	Professional Fishers Association	Industry
Matt Pember	Western Australian Fishing Industry Council	Rock Lobster Ecology
Adam Radford	Indian Ocean Rock Lobster and CWCPFA	Industry
Kim Smith	DPIRD Fisheries	ETPs, Habitat, Ecosystem, Broader Environment
Matt Taylor	Western Rock Lobster Council	CEO

Name	Organisation / company affiliation	Title / position / area of expertise
Steve Taylor	DPIRD Fisheries	ETPs, Habitat, Ecosystem, Broader Environment
Leith Teakle	Geraldton Fishermen's Cooperative	Industry
Adam Towers-Hammond	SCCF Licence Holder (Zone 1)	Industry
Emma-Jade Tuffley	DPIRD Fisheries	
Gil Waller	Professional Fishers Association	Industry
Kelly Waples	Department of Biodiversity, Conservation and Attractions	Science Coordinator
Linda Wiberg	DPIRD Fisheries	SCCF
Observers		
Matt Watson	Marine Stewardship Council	Senior Fisheries Program Manager, Asia Pacific
Technical Panel		
Nick Caputi	WA Department of Fisheries	Senior Principal Research Scientist
Tim Langlois	University of Western Australia	Fisheries Research, Ecosystems, Broader Environment
Adrian Linnane	South Australian Research and Development Institute	Sub-program Leader, Crustaceans
Neil Loneragan	Murdoch University	Professor Emeritus of Marine Ecology and Conservation
Chandra Salgado-Kent	Edith Cowan University	Oceans Blueprint, Marine Ecology, Marine Mammalogy
Facilitator		
Richard Stoklosa	E-Systems	Consultant, Ecological Risk Assessment

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Western Rock Lobster Resource Ecological Risk Assessment
Persons who were invited to the workshop but did not attend

Name	Organisation / company affiliation	Title / position / area of expertise
Monica Awasthy	Birdlife Australia	Non-government organisation
Lynda Bellchambers	DPIRD Fisheries	Government
Glen Davidson	Geraldton Fishermen's Cooperative	Industry
Jo Elphinstone	Department of Agriculture, Water and the Environment	Government
Caleb Gardner	Institute of Marine and Antarctic Science	Non-government organisation
Matt Gillett	Recfishwest	Recreational
Leo Guida	Australian Marine Conservation Society	Non-government organisation
Jeff Hansen	Sea Shepherd	Non-government organisation
Tom Hatton	Marine Parks and Reserves Authority	Non-government organisation
Phil Hobbs	KB Food Company	Industry
Darryl Hockey	Western Australian Fishing Industry Council	Industry
Matt Howard	Marine Tourism Western Australia	Tourism
Peter Hughes	SCCMF Licence Holder (Zone 1)	Industry
Glenn Hyndes	Edith Cowan University	Research
Danielle Johnston	DPIRD Fisheries	Government
Jose Kalpers	Yamatji Marlpa Aboriginal Corporation	Traditional
John Keesing	Commonwealth Scientific and Industrial Research Organisation	Non-government organisation
JoAnne McCrea	World Wild Fund for Nature	Non-government organisation
Brett Molony	Commonwealth Scientific and Industrial Research Organisation	Non-government organisation
Ngongo Mwanangoi	Blu Wave	Industry
Grant Oldfield	Western Australia Ocean Foundation	Non-government organisation

Name	Organisation / company affiliation	Title / position / area of expertise
Andrew Rowland	Recfishwest	Recreational
Matt Rutter	Geraldton Fishermen's Cooperative	Industry
George Stavrinos	Blu Wave	Industry
Dave Thompson	Indian Ocean Rock Lobster	Industry
Piers Verstegen	Conservation Council of Western Australia	Non-government organisation
Maggie Wood	Conservation Council of Western Australia	Non-government organisation
	City of Fremantle	Government
	City of Greater Geraldton	Government
	South West Aboriginal Land and Sea Council	Traditional
	Southern Seafood Producers	Industry

Appendix 2

Ecological Risk Assessment Workshop Procedure

Ecological Risk Assessment
Western Rock Lobster Resource

Workshop Procedure:
Re-assessment of fishing interactions and risks from the 2013 ERA, and consideration of new risks

Prepared for the
Department of Primary Industries and Regional Development
Western Australia

March 2022

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Stoklosa, R 2022. *Ecological Risk Assessment, Western Rock Lobster Fishery—Workshop Procedure: Re-assessment of fishing interactions and threats from the 2013 ERA, and consideration of new threats*. Prepared for the Western Australian Department of Primary Industries and Regional Development.

Revision 0	9 March 2022	For distribution, incorporating DPIRD input.

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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, social, economic and governance issues to deliver community outcomes (Fletcher et al. 2010; 2012). Ecological risk assessments (ERA) 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 ERAs are used to inform EBFM-based harvest strategies and to prioritise the Department's monitoring, research and management activities (Fletcher 2015; Fletcher et al. 2016).

An ERA was last undertaken for the West Coast Rock Lobster Managed Fishery (WCRLMF) in 2013 (Stoklosa 2013) and is due for review. As such, DPIRD has scheduled an ERA for the Western Rock Lobster Resource (Resource) on 7 April 2022.

Differing from the approach adopted for the 2013 ERA, the 2022 ERA will be used consider the potential ecological impacts of the harvest of the Resource by all sectors. This will include assessment of the impact of commercial fisheries; WCRLMF and South Coast Crustacean Managed Fishery (SCCMF), recreational (including charter) fishers and customary fishing.

The assessment will focus on evaluating the impact of each fishing sector on all relevant retained and bycatch species, endangered, threatened and protected (ETP) species, habitats and the broader environment.

This document describes the procedure for conducting the ERA workshop with persons having specialised expertise in the subject matter, facilitated by E-Systems.

The ERA workshop will have two components:

1. Updating the risk estimates from the 2013 ERA based on scientific monitoring of the fishery, ecological studies and data, current fishery regulations and management actions, and circumstances of current fishery interactions with the environment.
2. Assessing new or different interactions of the fishery with the environment, resulting in risks that have not been previously considered.

This re-assessment of the fishery is to conform with the AS ISO 31000 Risk management—Guidelines (Standards Australia 2018) and the methodology adopted by DPIRD (formerly Department of Fisheries Western Australia) (Fletcher et al. 2002). The methodology relies on the familiar likelihood-consequence method of estimating risk using a qualitative Delphi approach to elicit expert judgement.

DPIRD proposes to engage stakeholders in a Stakeholder Workshop, which will include persons nominated for a Technical Panel to review the effect of management actions implemented since the 2013 ERA, and update estimates of risk. The Stakeholder Workshop will also assess current fishing activities and any new risks that are identified for assessment.

Once potential threats are assessed and risk is estimated, consideration of possible risk management options is common practice. Risk management seeks to eliminate or otherwise reduce the risk of threats, obviating the need for more rigorous risk analysis which does not in itself contribute to risk management. The possibility of remedial action is not limited to high risk activities, nor should it be precluded for less serious risks that cannot be classified with certainty. Appropriate risk management action may be considered in these cases as a precautionary measure.

This risk assessment will help inform the review of the West Coast Rock Lobster Harvest Strategy planned for 2022-23, and development of the South Coast Crustacean Harvest Strategy planned for 2023. It will also assist to meet the requirements of other processes, including the WCRLMF's Marine Stewardship Council (MSC) re-certification.

Stakeholder Workshop

Stakeholders will be invited by DPIRD to participate in the ERA Stakeholder Workshop. Stakeholders may include individuals, organisations, companies, government agencies and research scientists with an interest and/or technical expertise. DPIRD has nominated a list of stakeholders who have previously expressed an interest in previous ERA processes or the MSC certification process for the WCRLMF. Stakeholders with an interest in the SCCMF, recreational and customary fishing have also been identified and will be invited to participate.

Stakeholder Workshop participants will receive information from the 2013 ERA, with updated information regarding ecological components of the fishery and management actions that will be considered to re-assess risk. There will be an opportunity for any member of the Stakeholder Workshop to propose other published information to DPIRD for review by all participants prior to the workshop. Documents will need to be received by DPIRD in digital format, at least 7 working days prior to the workshop date for distribution.

The total number of persons attending the workshop should be limited to allow for efficient consideration of technical issues, whilst ensuring that all stakeholder views are appropriately represented. It would also be appropriate to include non-participating observers from special interest groups (observers include persons with management roles and officers of organisations).

Technical Panel

A Technical Panel will be identified to participate in the Stakeholder Workshop. The Technical Panel will encompass appropriate scientific disciplines, with a balanced representation of government, industry, non-government organisation and independent conservation specialists. Although there is no formula to use to obtain a 'perfect' mix of representation, the goal should be to represent the range of stakeholder interests with persons who demonstrate recognised experience and qualifications in the subject matter, and have the capacity to provide high quality technical expertise for risk analysis. The Technical Panel will be limited to a stakeholder cross section of four to six scientific experts, and determined by DPIRD prior to the Stakeholder Workshop.

The Technical Panel's role in the workshop is to re-assess the treated risk level for the risks identified in the 2013 ERA and any new risks identified, based on full consideration of published information and the management actions formally adopted by the Resource, as well as any information put forward by stakeholders.

It is the role of the facilitator to guide the process and maintain the integrity of the approach. The main focus of the workshop is to re-assess credible threats to ecological components — based on available expert knowledge, technical documentation and data. DPIRD will provide results of scientific studies and other information that has become available since the 2013 ERA.

Workshop procedure

The starting point for the subject workshop is the information contained in the 2013 ERA and the technical documents that will be provided to workshop participants in advance of the workshop date. Risks which were previously identified in the 2013 ERA may be re-assessed based on a review and discussion of technical documents and any commitments to relevant risk management measures. After risk assessments of the WRL fishery in 2002, 2005, 2007 and 2013, it is expected that a comprehensive identification of risks had been completed in the 2013 ERA. The 2022 ERA provides an opportunity to consider any changes in fishing activities and monitoring of the Resource since the 2013 workshop.

A listing of the threats considered and assessed in the 2013 ERA is presented in Attachment 2. The table shows the identified causes and consequences of each threat (or 'hazard', noting the hazard reference number and groupings used in the previous ERAs of the WRL fishery).

Attachment 2 also contains a listing of existing management controls relevant to each hazard, and risk analysis judgments that were made in the 2013 ERA (likelihood, consequences and resulting risk ranking). These judgments will be updated as necessary, based on a review and discussion of relevant technical documents and new information that will be distributed by DPIRD prior to the workshop date.

Stakeholders present at the workshop will be given the opportunity to propose any other interactions and threats that should be assessed in the ERA.

The risk scores determined for each ecological component during the Stakeholder Workshop, and associated justification for those scores, will be documented and published as an ERA report.

Risk Assessment Methodology

Risk assessments have been extensively used as a means to filter and prioritise the various fisheries management issues identified in Australia (Fletcher et al. 2002). The risk analysis methodology utilised for this risk assessment of the Resource 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 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. Secondly, risk identification involves the process of recognising and describing the relevant sources of risk. 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.

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.

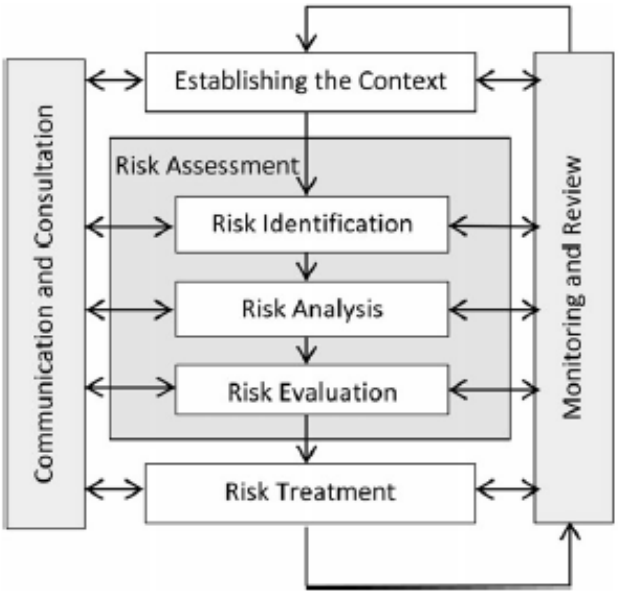

Figure 1. Position of risk assessment within the risk management process.

Scope

This risk assessment considers the ecological impacts of harvest of western rock lobster by all sectors; commercial, recreational and customary. The calculation of risk in the context of a resource is usually determined within a specified period, which for this assessment is the next five years (i.e. until 2027).

For the purpose of this assessment, risk is defined as *the uncertainty associated with achieving a specific management objective or outcome* (adapted from Fletcher 2015). For the Department, 'risk' is the chance of something affecting the agency's performance against the objectives laid out in their relevant legislation. In contrast, for the commercial fishing industry, the term 'risk' generally relates to the potential impacts on their long-term profitability. For the general community, 'risk' could relate to possible impact on their enjoyment of the marine environment. The aim for each of these groups is to ensure the 'risk' of an unacceptable impact is kept to an acceptable level.

An important part of the risk assessment and risk management process is communication and consultation with stakeholders. Ecological risk assessments undertaken by the Department typically engage all stakeholders of the Resource to participate in a workshop for collectively scoring risk issues. This allows the assessment to consider not only the ecological sustainability of all fishing activities but also how different external environmental, social and economic drivers may affect the Resource. The current assessment considers only the ecological impacts of fishing, as required to inform the harvest strategy for the Resource.

Risk Identification

The first step in the risk assessment process is to identify issues relevant to the Resource being assessed. Issues are identified using a component tree approach (see Figure 2), 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 Resource being examined by adding and expanding some components and collapsing or removing others.

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

- ☐ previous risk assessments undertaken for the fisheries to achieve approval for Wildlife Trade Operations;
- ☐ previous ERAs undertaken for the WCRLMF;
- ☐ identified gaps in the WCRLMF MSC assessment; and
- ☐ alignment with components to be considered in harvest strategy review/development.

Issues may be added to the component tree during the ERA Stakeholder Workshop.

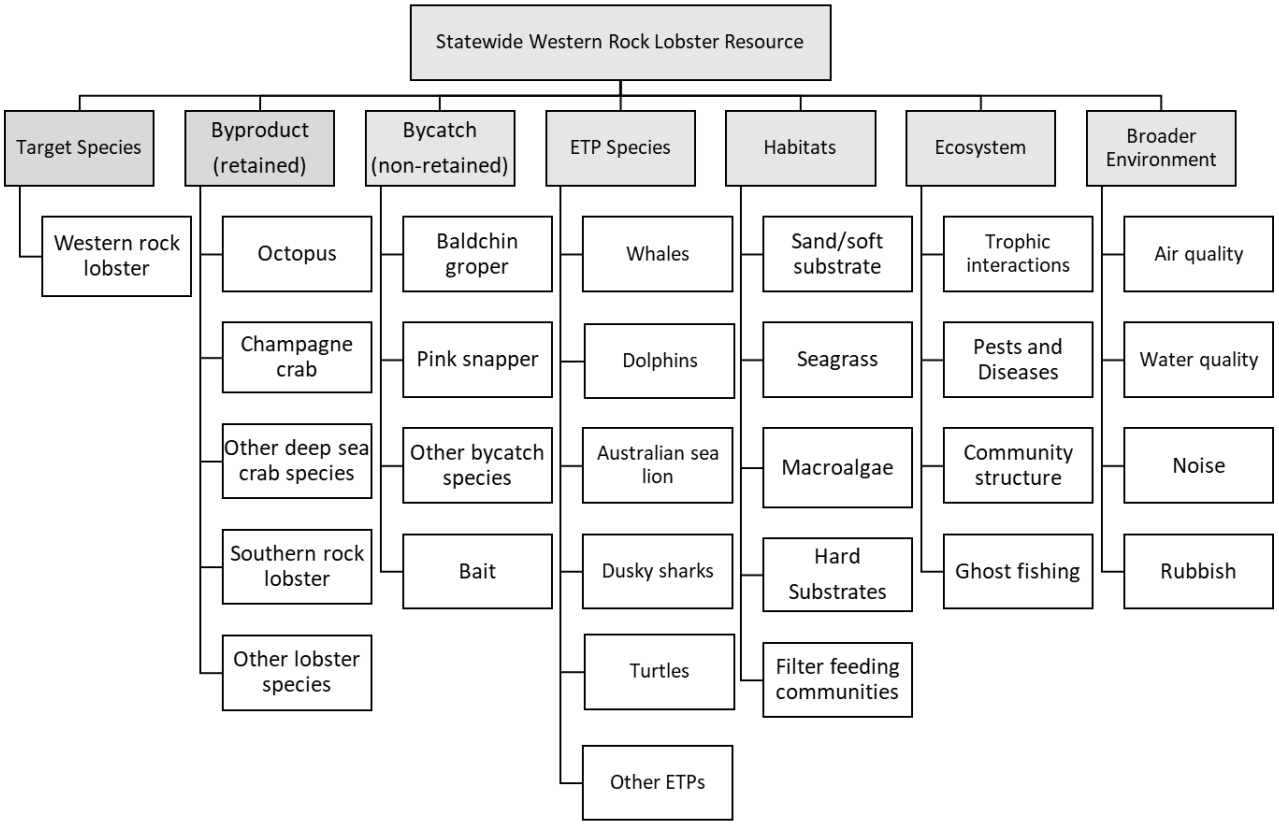

Figure 2. Preliminary component tree for assessing the ecological sustainability of the Western Rock Lobster Resource.

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 for the Resource were identified, the process to prioritise each was undertaken using the ISO 31000-based qualitative risk assessment methodology. This methodology utilised a consequence-likelihood analysis, which involved 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 (Table 1). 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 five-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.

The ERA used a set of pre-defined likelihood and consequence levels (Attachment 1). In total five consequence tables were used in the risk analysis to accommodate for the variety of issues and potential outcomes:

- ☐ Target/retained species – measured at a stock level;
- ☐ Non-retained (bycatch) species – measured at a stock level;

- ☐ ETP species – measured at a population or regional level;
- ☐ Habitats – measured at a regional level; and
- ☐ Ecosystem/Environment – measured at a regional level.

For this ERA, where relevant, the risks of each fishing sector considered within the scope of the assessment will be assessed separately, as well as cumulatively. For each issue, the consequence and likelihood scores will be evaluated to determine the highest risk score using the risk matrix (Table 1). Each issue will then be assigned a risk level within one of five categories: Negligible, Low, Medium, High or Severe.

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).

The risks should be reviewed in 5 years, or prior to the next review of the Western Rock Lobster 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.

Table 1. Consequence – Likelihood Risk Matrix (AS/ISO 31000; adapted from Department of Fisheries 2015).

		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

Risk treatment

For any interactions which result in higher levels of risk, and particularly for 'high' and 'severe' risk rankings, workshop participants are asked to suggest risk treatment measures which might reduce the consequences and/or likelihood scores (Table 2). These risk treatment measures are recorded as important advice to DPIRD for consideration, but are not automatically adopted by the fishing industry or government to manage risk in the WRL fishery. The risk analysis is then repeated for the 'treated risk' by the Technical Panel, as a reflection of the residual level of risk if the risk treatment measures were in fact adopted. Further consideration of possible risk treatment measures includes feasibility analysis and cost-benefit analysis.

Table 2. Risk levels and risk treatment response.

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

Risk management

Risk management of the WRL fishery involves standardised fishing practices and fishing gear, industry standards and codes of practice, legislation, and research and monitoring of management effectiveness.

Expected outcomes

The desired outcomes of the ERA process are:

- ☐ Identification of all relevant technical documents and data underpinning the risk analysis of threats identified in the ERA. The status of the technical information should be documented as peer reviewed, otherwise published, or unpublished work or data.
- ☐ Re-assessment of risks previously assessed for the fishery. Management of threats since the 2013 ERA will be considered when ranking risk.
- ☐ Assessment of any new threats that have been identified since the 2013 ERA, including assessment of other commercial and recreational fishing.
- ☐ Consideration of all planned, contemplated, and suggested risk treatment options for threats which are ranked 'high' or 'severe'. Treated risk is to be analysed and documented to show how effectively risk treatment options would be expected to manage threats.
- ☐ Full documentation of the proceedings of the workshop for stakeholder communication and input to the MSC certification process.

Bibliography

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Attachment 1

Risk Analysis Criteria

Likelihood criteria

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

Consequence criteria (five categories of ecological components)

1. Ecological: Target/Primary Species		
1	Minor	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
2	Moderate	Fishery operating at maximum acceptable level of depletion. Spawning biomass < Target level but > Threshold level (B_{MSY})
3	High	Level of depletion unacceptable but still not affecting recruitment levels of stock. Spawning biomass < Threshold level (B_{MSY}) but > Limit level (B_{REC})
4	Major	Level of depletion is already affecting (or will definitely affect) future recruitment potential of the stock. Spawning biomass < Limit level (B_{REC})

2. Ecological: Non-Target/Secondary (Retained & Discarded) Species		
1	Minor	Measurable but minor levels of depletion of fish stock.
2	Moderate	Maximum acceptable level of depletion of stock.
3	High	Level of depletion of stock unacceptable but still not affecting recruitment level of the stock.
4	Major	Level of depletion of stock are already affecting (or will definitely affect) future recruitment potential of the stock.

3. Ecological: Threatened, Endangered and Protected Species (ETPs)		
1	Minor	Few individuals directly impacted in most years.
2	Moderate	Level of capture is the maximum that will not impact on recovery.
3	High	Recovery may be affected.
4	Major	Recover times are clearly being impacted.

4. Ecological: Habitat		
1	Minor	Measurable impacts but very localized. Area directly affected well below maximum accepted.
2	Moderate	Maximum acceptable level of impact to habitat with no long-term impacts on region-wide habitat dynamics.
3	High	Above acceptable level of loss/impact with region-wide dynamics or related systems may begin to be impacted.
4	Major	Level of habitat loss clearly generating region-wide effects on dynamics and related systems.

5. Ecological: Ecosystem/Environment		
1	Minor	Measurable but minor changes to the environment or ecosystem structure but no measurable change to function.
2	Moderate	Maximum acceptable level of change to the environment or ecosystem structure with no material change in function.
3	High	Ecosystem function altered to an unacceptable level with some function or major components now missing and/or new species are prevalent.
4	Major	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.

Attachment 2

2013 ERA Record

Western Rock Lobster Ecological Risk Assessment, referring to threats assessed in the 2007 ERA

ERA Ref No.	Threats	ERA Date	Cause	Effect	Interaction scenario	Existing risk management responses	Existing risk - Adopted DFWA methodology			Planned commitments for remedial action (date to be implemented)	Suggested remedial action for consideration	Treated risk - Adopted DFWA methodology			Remarks
							Consequences	Likelihood	Risk ranking			Consequences	Likelihood	Risk ranking	
2005 ERA 'Group A'															
3	Efficiency changes	2007	Increase in the size of fishing vessels, fish-finding technology and fishing patterns.	Higher catch efficiency, local depletion of larger concentrations of the target species and breeding stock. Fishing of residual stocks inshore.	Reduction in breeding stock below a target level (below 1980's level of breeding stock)..	Depletion analysis to measure efficiency increase and exploitation rate on an annual basis, presented to management committee. Stock assessment review in 2007 (N Hall to complete April 2007, workshopped in July 2007 with international panel). Review of harvest strategy on breeding stock, exploitation rate. Eighteen percent of pots removed in 1993/94 season. In 2005/06 season, fifteen percent equivalent effort reduction in northern zone and five percent in southern areas. Management strategy overrides the potential consequences of efficiency gains.	3	2 to 3	Low to medium		Contemplating offsetting efficiency with effort reductions. Opinion expressed that no speciifc new management response is needed -- ongoing management is appropriate for mitigating this hazard. Improve the estimate of the efficiency gains in the fishery.	3	2	Low	
		2013				Quota system implemented.	1 (due to quota system)	2	Negligible						
21	Central west coast - shallow	2007	Change to population size structure and abundance	Possible change to community structure and function (predator/prey relationships). Possible loss of ecosystem resilience.	Loss of large animals from the shallow water environment leads to long term ecological consequences.	Deep water research project may reveal information on predator/prey relationships. Sanctuary zone study at Jurien Bay to look at community structure of lobsters in shallow water. Jurien Bay ecosystem study to model interactions of species in the community using tagging and tracking of lobsters and fish and diets. Trophodynamic modelling study to help understand the ecosystem effects of fishing (particularly lobsters). Fished versus unfished areas offer the best possibility of determining what effect reducing rock lobster abundance has on the community.	3	2	Low						Shallow water 30 - 80% of fishery depending on location. Undersize in shallow water comprises a large proportion of the total population of lobsters in shallow water. Rock lobster important species in community, can have local depletion. Impact of removal of lobsters from shallow water likely to be small as approximately legal size move offshore as in the migration of the whites. Rottnest Island research indicates that further research on removal of lobsters from shallow water communities needs to be undertaken, in more representative areas of the fishery. Research in the 1980's at Dongara indicated they have an effect on benthic communities. Does not seem to be severe impact of removing lobsters by fishing. Three years of study has not revealed any obvious change in community structure relating to lobster fishing. The proportion of legal size rock lobster in shallow water is <10% of total shallow water rock lobster biomass. Risk analysis is based on preliminary findings of the research over the first three years.
		2013	Change to population size structure and abundance	Possible change to community structure and function (predator/prey relationships). Possible loss of ecosystem resilience.	Loss of large animals from the shallow water environment leads to long term ecological consequences.	Shallow water research project has not detected community level impacts from removal of biomass in fished and unfished areas. Closed area is having an effect on lobster abundance (Leeman closed area). Greater inrease in the closed areas, but fished areas have evidence of increasing abundance. Eight years of research has not revealed chages to ecosystem structure or function from the removal of lobster biomass. Results are pointing to a conclusion that lobster biomass is not a driver for ecological effects. Effort levels are much lower (70 percent less). Harvest rates are much lower. Research has not identified a way to measure potential ecologial effects because so far the indicators are not clear and the variability in the putative indicators has been too great.	2	1	Negligible						Recent changes to the management structure has seen an improvement in standing stocks both shallow and deep. More so for deep water (3-4 fold increase). Undersize in shallow water comprises a large proportion of the total population of lobsters in shallow water. Can have local depletion. Impact of removal of lobsters from shallow water likely to be small as approximately legal size move offshore as in the migration of the whites. Does not seem to be severe impact of removing lobsters by fishing. Eight years of study has not revealed any obvious change in community structure relating to lobster fishing. The proportion of legal size rock lobster in shallow water is <10% of total shallow water rock lobster biomass. Risk analysis is based on findings of the research over the first eight years. Research has been unable to detect changes less than 25% .
22	Central west coast - deep	2007	Capture has unknown trophic relationships with respect to migrating whites.	Changes to species relative abundance in the region.	No change from the opinions expressed in the 2005 ERA.	FRDC project to investigate deep water ecology. Marine Futures (NHT) project undertaking habitat mapping and biodiversity sampling at Abrolhos, Jurien, Rottnest and Capes areas.	2	3	Low	Planned workshop in August with international experts and the rock lobster Eco SRG to review deepwater research projects, and to develop an ongoing project proposal including the possible use of fished and unfished areas. WA Marine Science Institution (WAMSI) projects. Research to begin informing management decisions beginning about 2008 (as expressed in MSC timetable).						Paucity of data from deep water, and proportion of legal size/large lobsters in deep water has been made a research priority by the Scientific Reference Group. Comparison of fishing intensity (looking for a low to high abundance gradient) to detect changes. Focused on detailed habitat mapping, lobster denisty and size/structure, diet, effect on habitat on catchability, foraging range, behaviour, etc. Subject of three year FRDC project (ongoing).
		2013	Depletion of biomass has unknown trophic and/or ecosystem impacts.	Changes to species relative abundance in the region.	No change from the opinions expressed in the 2007 ERA.	Continuing research (FRDC project) to investigate deep water ecology. FRDC project for spatially accurate habitat mapping and baseline information to monitor in repeat (future) surveys of fished (Jurien) and unfished (Leeman) areas (five year project). Cameras on pots being deployed at Leeman (IBSS data).	2	2	Low						Subject of eight year FRDC project (ongoing). Significant management changes to reduce capture.

Western Rock Lobster Ecological Risk Assessment, referring to threats assessed in the 2007 ERA

ERA Ref No.	Threats	ERA Date	Cause	Effect	Interaction scenario	Existing risk management responses	Existing risk - Adopted DFWA methodology			Planned commitments for remedial action (date to be implemented)	Suggested remedial action for consideration	Treated risk - Adopted DFWA methodology			Remarks
							Consequences	Likelihood	Risk ranking			Consequences	Likelihood	Risk ranking	
2005 ERA 'Group B'															
7	Octopus	2007, 2013 (no change)	Retention of species for sale to processors with increasing marketability.	Depletion of octopus stocks (short lifespan and highly variable recruitment). Tetricus species are most commonly captured in pots (95%). About 3.5 octopus per 100 pot lifts.	Capture of octopus impacting on sustainablity of octopus population.		1	3	Low						Distribution very similar to lobster fishery. Octopus catch rates have increased slightly since the 1990's. Octopus is major prey of sealions.
14	Sea turtles	2007, 2013 (no change)	Collision of leatherback turtles with fishing vessels or entanglement in pot lines.	Mortality of individuals (1-2 annually reported).		Interaction reports from fishery. Code of practice for whale entanglement. Capes region code of conduct. DVD - how to reduce marine interactions.	1	3	Low		Better reporting. Follow up logbooks.				A study to understand whether the fishery is having impact on stock is worthy of investigation.
23	Kalbarri - Big Bank	2007	Capture has some impact on the ecosystem of the region.	Depletion of species abundance in the region.	The shallow water hazard cannot be distinguished from the hazard identified for the Central West Coast shallow and deep water situation (2005 ERA Hazard Nos. 21 and 22).	Special management area, to prevent conflict among fishing vessels (congestion).	2 (shallow) 2 (deep: Big Bank)	2 (shallow) 1 (deep: Big Bank, as long as area is closed)	Low (shallow) Negligible (deep: Big Bank)	Planned workshop in August 2007 with international experts and the rock lobster Eco SRG to review deepwater research projects, and to develop an ongoing project proposal including the possible use of fished and unfished areas. WA Marine Science Institution (WAMSI) projects. Research to begin informing management decisions beginning about 2008 (as expressed in MSC timetable).					Refer to remarks for 2005 ERA Hazard Nos. 21 and 22 above.
	Kalbarri	2013	Depletion of biomass has unknown trophic and/or ecosystem impacts.	Depletion of species abundance in the region has effect on ecosystem function.			2 (shallow) 2 (deep: Big Bank)	2 (shallow) 1 (deep: Big Bank, as long as area is closed)	Low (shallow) Negligible (deep: Big Bank)						No fishing pressure in Big Bank (closed indefinitely since 2009). Big Bank is treated as the 'deep water' area. Kalbarri is considered to be the remainder of Zone B. Significant depletion occurrred prior to closure of deep water area.
32	Bait bands: dusky whalers	2007	Discarding of bait bands by fishermen. Dusky whalers distribution is in the southwest for juveniles, adult sharks much further north to Ningaloo. Adult migration thought to be on the shelf. Anecdotal view that sharks are attracted to fishing vessels. 500,000 bait bands go on board vessels annually. About one percent are discarded. Source of some bands are non-rock lobster fishery vessels.	Mortality of dusky whalers (shark species), which take 30 years to mature and have low fecundity. Potential for rapid decline in stock numbers and listing as an endangered species (with additional pressure from illegal fishing activities). 2000-2003, 37 Dusky whaler mortalities observed to be entagled with bait bands, but not necessarily cause of mortality (observed in demersal gillnet and demersal longline). 1-2% mortality annually estimated from all sources (equates to a small number of adult animals).	Bait bands (persistent material) are contributing to the mortality to adult Dusky whalers. The number of entangled animals are unknown.	Bait Handling Code of Conduct -- disposal of bait and rubbish.	3	3	Medium		Zero tolerance of bait bands by the rock lobster fishery.	(none)	(no interaction)	—	Age of Dusky whaler maturity is older than previously thought (~30 yrs insteady of ~20 years). Reporting is not systematic, but no mortalities reported last couple of years. WAFIC Board will proceed with initiative to prohibit bait bands with the Mlnister. Problematic for fishermen in Abrolhos Islands. Bait bands are observed in the Abrolhos with entanglement of pinnipeds. Demersal gillnet fishery targets juveniles. Adult mortality is estimated at about 100 individuals per year (introduced size limits have probably reduced mortality by half. Loss of adults as a result of rock lobster bait bands is not known. Critical component of the stock is the adult population. Sharks and rays are protected with respect to commercial fishing only (since June 2006). View expressed that exploitation of the fishery is not consistent with the scientific view that the population is at risk of collapse as a result of adult mortalities.
		2013			Bait bands being discarded illegally, not detected by fisheries officers or other fishermen.	Bait Handling Code of Conduct -- disposal of bait and rubbish. Prohibition of bait bands on fishing vessels in 2011. Fisheries officers are monitorinng compliance. Good uptake with fishers.	1	1	Negligible						Threat virtually eliminated through the prohibition of bait bands in 2011.

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							Consequences	Likelihood	Risk ranking			Consequences	Likelihood	Risk ranking	
2005 ERA 'Group C'															
19	Abrolhos ecosystem	2007	Removal of lobsters from the region. Only a small proportion of lobsters are available for capture, and only during a short period (3.5 months).	Depletion of species abundance in the region.	Considered to be similar situation to West Coast shallow.		3	2	Low						Greater abundance of undersize lobsters compared to mainland coast. Biomass removal is therefore significantly lower than mainland coast. Females mature at smaller size. Consistent removal of legal size lobsters. Three and a half month fishing season. Coral community, shallow water.
		2013	Depletion of biomass has unknown trophic and/or ecosystem impacts.	Depletion of species abundance in the region has effect on ecosystem function.	Loss of large animals from the shallow water environment leads to long term ecological consequences.	Move to quota management has reduced fishing pressure in this region and redirected effort elsewhere. Exploitation is not concentrated on particular areas.	2	2	Low						The proportion of legal size rock lobster in shallow water is <10% of total shallow water rock lobster biomass. Quota management and year-round fishing.
20	Leeuwin - Naturaliste	2007	A pulse in recruitment.	Peaks in abundance are observed in this region, leading to higher level of fishing effort when this occurs.	Disproportionate impact on the environment. Removal of 'standing stock'.	Eighteen small scale areas closed to fishing permanently (commercial and recreational pot fishing), which is considered a response to social risk, not ecological risk.	1	2	Negligible						Large increase of fishing vessels in the region prompted a question about the potential impacts to the community structure/function. Area exhibits historically low recruitment. Risk is related to how the fishery is managed (200-250 boats in the southern region), with respect to settlement and recruitment. Social interactions (and conflict) were significant with other users of the marine environment. There is no unique hazard associated with the Leeuwin-Naturaliste region that should be considered here.
		2013					1	1	Negligible						Risk is related to how the fishery is managed (200-250 boats in the southern region), with respect to settlement and recruitment. Social interactions (and conflict) were significant with other users of the marine environment. In 2013, there are only 140 boats left in the C Zone. No pulse in recruitment has been observed sincce 2001, which would have been a driver for fishing effort in the region. Actual fishing effort is negligible due to high cost of exploitation (distance to fishing ground). Decreased exploitation attributed to quota system. If a future pulse of recruitment occurred, it would be exploited in other fishing grounds that are more economical.
4	Mortality and loss of productivity from handling.	2007, 2013 (no change)	Inappropriate handling of lobsters. Potential damage during high-grading. Larger female, setose and undersize lobsters repeatedly caught and handled.	Appendage loss. Displacement of animals during discarding.	Reduced productivity and increased mortality. Reduced egg production. (10% in deep water, more frequent in shallow water???)	Two year education study in 1980s. Requirement to return setose animals increases handling. Escape gaps in pots to avoid undersize lobsters. Number of pot lifts have declined - lowest in 35 years.	1	5	Low		Increase gap size on pots to reduce capture of undersize animals. Recommence education programs for handling. Enforcement of the 'five minute rule'.				Fishers have recognised value of washing down decks and gear to reduce salt build-up, which tends to cause lobsters to shed legs.
25	Benthic biota — shallow water, limestone	2007	Pot sets and lifts. Anchoring of boats.	Mechanical damage to benthic habitat.	Shallow water interaction of pots with benthic habitat. Limestone		1	3	Low						Pot footprint (size) is very small when compared to areal extent of habitat types.
		2013			Shallow water interaction of pots with benthic habitat. Limestone (not restricted to C Zone).	Move to quota management has reduced fishing pressure in this region and redirected effort elsewhere. Exploitation is not concentrated on particular areas.	1	3	Low						Increasing efficiency is being observed by fishers with much lower quota. Result is lower frequency of pot interactions with habitat .
25	Benthic biota — shallow water, coral	2007	Pot sets and lifts. Anchoring of boats.	Mechanical damage to benthic habitat.	Shallow water interaction of pots with benthic habitat. Coral	Move to quota management has reduced fishing pressure in this region and redirected effort elsewhere. Exploitation is not concentrated on particular areas. Repeat surveys of shallow water corals at the Abrolhos Islands is not detectiing any significant loss of coral habitat.	1	3	Low						Anecdotal opinion expressed that comparison of benthic habitat damage from storm damage appears to be very significant when compared to the mechanical damage of pot sets and lifts.
		2013			Shallow water interaction of pots with benthic habitat. Coral (not restricted to C Zone).	Move to quota management has reduced fishing pressure in this region and redirected effort elsewhere. Exploitation is not concentrated on particular areas. Repeat surveys of shallow water corals at the Abrolhos Islands is not detectiing any significant loss of coral habitat.	1	2	Negligible						Increasing efficiency is being observed by fishers with much lower quota. Result is lower frequency of pot interactions with habitat . 12 month season has decreased fishing effort in shallow water coral areas. Fishers avoid coral habitats when setting pots due to damage to gear. Fewer boats fishing. Mooring occurs in deeper water or on fixed moorings.
25	Benthic biota — shallow water, seagrass	2007	Pot sets and lifts. Anchoring of boats.	Mechanical damage to benthic habitat. Seagrass interaction is infrequent.	Shallow water interaction of pots with benthic habitat. Seagrass	Move to quota management has reduced fishing pressure in this region and redirected effort elsewhere. Exploitation is not concentrated on particular areas.	1	2	Negligible						
		2013			Shallow water interaction of pots with benthic habitat. Seagrass (not restricted to C Zone).	Move to quota management has reduced fishing pressure in this region and redirected effort elsewhere. Exploitation is not concentrated on particular areas.	1	2	Negligible						Increasing efficiency is being observed by fishers with much lower quota. Result is lower frequency of pot interactions with habitat .
25	Benthic biota — deep water, limestone	2007	Pot sets and lifts. Anchoring of boats.	Mechanical damage to benthic habitat.	Deep water interaction of pots with benthic habitat. Limestone		2	3	Low						
		2013			Deep water interaction of pots with benthic habitat. Limestone (not restricted to C Zone).		1	3	Low						Increasing efficiency is being observed by fishers with much lower quota. Result is lower frequency of pot interactions with habitat .
25	Benthic biota — deep water, coral	2007	Pot sets and lifts. Anchoring of boats.	Mechanical damage to benthic habitat.	Deep water interaction of pots with benthic habitat. Coral		2	3	Low						
		2013			Deep water interaction of pots with benthic habitat. Coral (not restricted to C Zone).		2	3	Low						Increasing efficiency is being observed by fishers with much lower quota. Result is lower frequency of pot interactions with habitat . Deep water corals are less abundant and are possibly more vulnerable to loss (more fragile, longer recovery); however, there is no evidence to suggest any significant change from pot interaction.

Western Rock Lobster Ecological Risk Assessment, referring to threats assessed in the 2007 ERA

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							Consequences	Likelihood	Risk ranking			Consequences	Likelihood	Risk ranking	
25	Benthic biota — deep water, seagrass	2007	Pot sets and lifts. Anchoring of boats.	Mechanical damage to benthic habitat. Seagrass interaction is infrequent.	Deep water interaction of pots with benthic habitat. Seagrass		2	2	Low						
		2013			Deep water interaction of pots with benthic habitat. Seagrass (not restricted to C Zone).		1	2	Negligible						Increasing efficiency is being observed by fishers with much lower quota. Result is lower frequency of pot interactions with habitat .
25	Benthic biota — deep water, soft sediments	2007	Pot sets and lifts. Anchoring of boats.	Mechanical damage to benthic habitat (infauna).	Deep water soft sediments.		—	2	Negligible						
		2013			Deep water soft sediments (not restricted to C Zone).		—	2	Negligible						Not a target habitat for pot sets.
25	Benthic biota — deep water, hard bottom	2007	Pot sets and lifts. Anchoring of boats.	Mechanical damage to benthic habitat (filter feeding organisms).	Deep water hard bottom.		1	2	Negligible						Impact of pots and recovery rates of filter-feeding benthos is unknown and worthy of investigation.
		2013			Deep water hard bottom (not restricted to C Zone).		1	2	Negligible						Increasing efficiency is being observed by fishers with much lower quota. Result is lower frequency of pot interactions with habitat .
10	Whales (ecological)	2007	Entanglement in gear. An important contributing factor is excess rope floating on the surface of the sea where whales are present.	45 incidents of capture since 1992 for all fisheries (7 out of 9 by lobster fishers in 2006, one mortality source unknown). Migration overlaps end and start of lobster season. Effect of mortality has different impact on different species. Small effective population size of Southern Right Whale (SRW) are more vulnerable. Recent data (since 2007) on entanglements suggesting increased frequency. Public perception.	Impact on whale population recovery	Disentanglement policy and incident response. Code of practice identifying what to do, safety. Mandatory reporting under EPBC and catch and effort statistics (CAES). Outreach education program for fishers using DEC and WRLC DVD.	Minor (SRW) Minor (Humpback)	Unlikely (SRW) Unlikely (Humpback)	Low (SRW) Low (Humpback)		More efficient fewer numbers of pots would reduce risk of entanglements.				Southern Right Whale has minimal spatial overlap with the fishery.
	Whales (ecological assessment, but with reference to public concern for comparison)	2013		Recent data (since 2007) on entanglements suggesting increased frequency. Public perception of threat resulting in concern.	Impact on public perception of whale entanglements with observed **mortality** as a threat to whales. Possibility of more frequent public awareness of entanglement resulting in mortality.		Whale stock: 1 (SRW) 1 (Humpback) _____ Dead animal on the beach causing public concern: 3 (SRW) 3 (Humpback)	Whale stock: 1 (SRW) 1 (Humpback) _____ Dead animal on the beach causing public concern: 1 (SRW) 1 (Humpback)	Whale stock: Low (SRW) Low (Humpback) _____ Dead animal on beach, public concern: Low (SRW) Low (Humpback)		Increase public awareness of engtanglement and present the full picture of whale population size increases, entanglement response, consequences of entanglement—guided by expert opinion on the issue. Consider mitigation strategies being developed by fishers from February 2013 meeting. Research proposal being submittted to FRDC TRF for satellite monitoring of entangled whales.				Move in fishing effort through June-September. Southern migration closer to shore, with little interaction with southern migration to date. Industry workshop in February 2013 to explore mitigation strategies. Code of practice introduced in 2006. Longer soak times are occurring in recent times. The loss of 4 animals in 20 years, out of a population size of 30,000 does not represent a threat to population size or recovery. The social consequences of entanglement depend on media coverage and the possibility of sharks presenting a threat to the public close to shore. In the last two years there has been a numerical increase in entanglement frequency, however its long term trend cannot be determined. Root cause of increased whale entanglements is not clear. The queston of legislation around export permits is not in the scope of this assessment. There is no guidance for what constitutes 'acceptable risk'. Advice of Groom and Coughran (2012) is to continue reporting with the prospect of aiding dis-entanglement. Setting a trigger level to stop fishing is not recommended. There is not enough data to predict future incidence of entanglements with respet to the continuous fishing season.
	Whales (with reference to public concern for comparison)	2013		Recent data (since 2007) on entanglements suggesting increased frequency. Public perception of threat resulting in concern.	Impact on public perception of whale **entanglements** (without observed mortality) as a threat to whales. Possibility of more frequent public awareness of entanglement.		Freed animal causing public concern: 1 (SRW) 1 (Humpback) _____ Entangled animal causing public concern: 2 (SRW) 2 (Humpback)	Freed number causing public concern: 3 (SRW) 3 (Humpback) _____ Entangled animal causing public concern: 3 (SRW) 3 (Humpback)	Freed animal public concern: Low (SRW) Low (Humpback) _____ Entangled animal public concern: Low (SRW) Low (Hback)		Increase public awareness of engtanglement and present the full picture of whale population size increases, entanglement response, consequences of entanglement—guided by expert opinion on the issue. Consider mitigation strategies being developed by fishers from February 2013 meeting. Research proposal being submittted to FRDC TRF for satellite monitoring of entangled whales.				Southern Right Whale has minimal spatial overlap with the fishery. Move in fishing effort through June-September. Southern migration closer to shore, with little interaction with southern migration to date. Industry workshop in February 2013 to explore mitigation strategies. Code of practice introduced in 2006. Longer soak times are occurring in recent times. The loss of 4 animals in 20 years, out of a population size of 30,000 does not represent a threat to population size or recovery. The social consequences of entanglement depend on media coverage and the possibility of sharks presenting a threat to the public close to shore. In the last two years there has been a numerical increase in entanglement frequency, however its long term trend cannot be determined. Root cause of increased whale entanglements is not clear. The queston of legislation around export permits is not in the scope of this assessment. There is no guidance for what constitutes 'acceptable risk'. Advice of Groom and Coughran (2012) is to continue reporting with the prospect of aiding dis-entanglement. Setting a trigger level to stop fishing is not recommended. There is not enough data to predict future incidence of entanglements with respet to the continuous fishing season.
30	Marine issues - Abrolhos water quality	2007	Potential for human occupation of Abrolhos Islands to cause an elevated level of nutrients and domestic waste discharged to the sea.	Impact on marine biodiversity at the Abrolhos Islands from elevated nutrients, and physical damage to corals from pots and vessel activities.	Increased nutrient loading in surrounding waters.	Security of tenure to encourage implementation of long term management practices (waste). Water sampling program for nutrients and bacteria. Treatment of sewage prior to discharge. Returning household and fishing activity waste to mainland instead of incineration for non-paper waste (bait bands, plastic, waste oil, oil filters, etc).	1	2	Negligible	DEC Waste Management Strategy (Draft).					Background sources of nutrients are seabirds, plant decay on beaches. Waste Management Plan includes three year sampling program. Maceration of food scraps prior to discharge and disposal at night to avoid attracting seabirds.
		2013		Impact on marine biodiversity at the Abrolhos Islands from elevated nutrients and bacteria.	Increased nutrient and bacterial loading in surrounding waters.		1	2	Negligible	DFWA Waste Management Strategy (Draft). Requirement for secondary treatment by 2014.					Background sources of nutrients are seabirds, plant decay on beaches. Waste Management Plan includes three year sampling program. Maceration of food scraps prior to discharge and disposal at night to avoid attracting seabirds. Early experience with quota system has led to significantly lower occupancy of the Abrolhos Island camps. Potential for seabird interactions of camps with the year-round use of the camps. The Fish Management Act has the capacity to regulate threats to the Abrolhos Reserve. New least deals with waste water managment, waste management and pollution threats to the Reserve. Strategi managmeent plan has been developed for the Abrolhos Reserve (eg management of visitor access during sea lion breeding). Question of current practices on the Reserve (eg. operation of flood lights on the jetty during the seabird breeding season as a threat to seabirds (used as load foro the gensets?). Water monitoring sites (33) monitored monthly for coliforms against multiple use criteria. Water quality at 26 of 33 sites were within acceptable limits. Thirteen of 862 samples exceeded coliform limits (does not discriminate between human and fauna faecal material). Waste water systems to be approved under Health Act for WA and meet required standards. Secondary treatment due to be implemented by 2014. Nutrient loading ontribution from detritus and animals.

Western Rock Lobster Ecological Risk Assessment, referring to threats assessed in the 2007 ERA

ERA Ref No.	Threats	ERA Date	Cause	Effect	Interaction scenario	Existing risk management responses	Existing risk - Adopted DFWA methodology			Planned commitments for remedial action (date to be implemented)	Suggested remedial action for consideration	Treated risk - Adopted DFWA methodology			Remarks
							Consequences	Likelihood	Risk ranking			Consequences	Likelihood	Risk ranking	
37	Terrestrial issues - Abrolhos seabirds	2013 (new threat)	Continuous fishing season and assoociated occupancy.	Reduction in reproductive performance due to disturbance by light, noise, presence of people near colonies.	Reduction of population of seabirds, using example of Lesser Noddy (breeding during September through February).	In scope of the Abrolhos Management Plan to develop mitigation strategy and plans.	3	2 (judged with a great deal of uuncertainty due to lack of data and short perriod since commencement of year-round fishing)	Low		Monitor bird populations and level of disturbance. Develop requirements for avoid disturbance under current legislative powers.	1	1	Negligible	Climate change impacts overlay impacts from fishing activities. No scientific data on population size or quantified impacts. Refer to tourism management plans to seek successful mitigation strategies and plans.
8	Scalefish and sharks	2007, 2013 (no change)	Bald chin groper, Break sea cod, Western wirrah are major species captured and generally kept. Port Jackson shark, Wobbegong shark, eels, and Leather jacket exceed a catch rate of 0.1/100 pot lifts.	Impacts to Break sea cod population are being considered, but no data available as yet.	The rock lobster catch of Break sea cod if significant compared to fin fish fishery, but no particular concerns have been articulated with respect to the fishery.	Moon closures in rock lobster fishery (reduces scalefish capture in pots).	1	1	Negligible		Expand detail of bycatch retention/return recording in logbooks.				About 75% of fish captured in pots are returned to the sea. Eight tonnes of Break sea cod retained bycatch (40% of recreational fishery take). The management of the fin fish fishery will reportedly maintain a sustainable population through regulation. Reduce effort in fishery presumed to reduce bycatch species take. Nine and a half million pot lifts estimated next season, on downward trend. Proportion of 'stick pots' is about 10-20%.
12	Sea lions (managed)	2007	Small pups attracted to pots to take bait or rock lobsters.	Drowning of pups from about 5-24 months of age. The historically reported rate of interactions is 10 pup deaths per season, or about 8% of the pup count (regarded in 2005 ERA as the minimum mortality estimate).	Exclusion of sea lions from pots with implementation of SLEDs results in a significant reduction in drowning (none recorded to date). Assumption is that additional data will not reveal any change to SLED performance.	Scientific Reference Group advice for gear changes to prevent capture of sealions. Sealion exclusion devices (SLEDs) introduced in the 2006 fishing season (mandatory). SLEDs trialled in commercial fishery to validate design.	1	3	Low	Studies ongoing with regard to foraging range of juveniles. Management strategy to be checked to ensure that SLED requirements are correct for depth and range of vulnerable juveniles. Continue to monitor efficacy of SLEDs via underwater video. Compliance validation of the use of SLEDs within the SLED management zone. Research underway to investigate the interaction of sea lions with rock lobster pots in the vicinity of the Abrolhos Islands. However, there is no current evidence that sea lions are entering pots in the Abrolhos (tiny remnant population).					Breeding on 18 month cycle, about 60 pups per colony. Recovery of impacted colonies reportedly unsuccessful. SLEDs introduced in water depths less than 20 metres, within 30 kilometers of breeding range, where juveniles are considered to be most vulnerable. High level of SLED compliance observed to date. No reports of sea lion mortality this fishing season, following introduction of SLEDs. Video observations of SLED trials suggest that they are very effective.
		2013				Mandatory use of SLEDs at the Abrolhos Islands commenced in 2011. Fisheries officers are monitoring compliance.	1	—	Negligible	Continue monitoring performance of SLEDs, as in the existing CDR.					SLEDs virtually eliminate capture of pups. However loss of a single individual is considered important in the Abrolhos.

Appendix 3

Ecological Risk Assessment Workshop Record

Western Rock Lobster Resource — with reference to the Ecological Component Tree

Ref No.	Assessment component	Interaction threat	Consequences	Existing management and operational safeguards	Risk analysis: Conse-quence	Risk analysis: Likelihood	Risk analysis: Risk ranking	Future commitments for remedial action (date to be implemented)	Suggested remedial action for consideration	Treated risk: Conse-quence	Treated risk: Likelihood	Treated risk: Risk ranking	Remarks
Captured crustaceans													
1	**Western rock lobster**												
	WCRLMF	Target species of commercial fishing.	Reduction in stock.	Weight-of-evidence stock assessment. Independent survey catch rates. Integrated stock assessment model and biomass dynamics model. B_{MEY} for all catch.	Minor	Likely	Low						
	SCCMF Zone 1	Target species of commercial fishing.	Reduction in stock, characterised as a 'sink' location.	Same as above.	Minor	Likely	Low						
	Recreational	Recreational pots and divers.	Reduction in stock.	Recreational bag limit, size limit, protection of breeding stock. TARC managed up to 5% B_{MEY} under IFM.	Minor	Likely	Low						Annual surveys of recreational catch. Annual catch compared on three year rolling average. Question of trend in catch rate potentially increasing above 5%--but impact on stock is considered a minor consequence over the management timeframe of 5 years. Question of impact on stocks from opening market for WRL in India. Issue of resource allocation and sharing addressed in annual harvest strategy.
	All fishing — cumulative risk				Minor	Likely	Low						
2	**Southern rock lobster**												
	WCRLMF	Secondary retained species.	Slight reduction in stock, minimal catch in WCRLMF.		Minor	Unlikely	Negligible						Western end of species distribution. Catch of about 500 kg.
	SCCMF Zone 1	Secondary retained species.	Slight reduction in stock.		Minor	Unlikely	Negligible						Main catches in Zones 3 and 4, outside scope of WRL Resource assessment.
	Recreational	Secondary retained species.	Reduction in stock.		Minor	Unlikely	Negligible						
	All fishing — cumulative risk				Minor	Unlikely	Negligible						
3	**Champagne crab**												
	WCRLMF	Secondary retained species.	Reduction in stock. Well above threshold level.		Minor	Likely	Low						
	SCCMF Zone 1	Secondary retained species.	Reduction in stock. Well above threshold level.		Minor	Likely	Low						
	Recreational fishing		Not accessed by rec fishers.										
	All fishing — cumulative risk				Minor	Likely	Low						
4	**Crystal crab**												
	WCRLMF		No take.										
	SCCMF Zone 1	Secondary retained species.	Reduction in stock (< 1 tonne up to 20 tonnes).	Monitoring of catch rates.	Moderate	Likely	Medium	Quota reduction of Crystal crab fishery to rebuild stock levels.					South coast is a portion of west coast stock.
	Recreational		Not accessed by rec fishers.										
	All fishing — cumulative risk				Moderate	Likely	Medium						

Western Rock Lobster Resource — with reference to the Ecological Component Tree

Ref No.	Assessment component	Interaction threat	Consequences	Existing management and operational safeguards	Risk analysis: Conse-quence	Risk analysis: Likelihood	Risk analysis: Risk ranking	Future commitments for remedial action (date to be implemented)	Suggested remedial action for consideration	Treated risk: Conse-quence	Treated risk: Likelihood	Treated risk: Risk ranking	Remarks
5	**Giant crab**												
	WCRLMF		No take.										
	SCCMF Zone 1	Secondary retained species.	Reduction in stock (about 1.5 tonnes) of slow growing, long lived species.	Monitoring of catch rates.	Moderate	Likely	Medium						Annual catches elsewhere (TAS, VIC, SA) in the range of 10-20 tonnes. WA reported 9 tonnes of catch (mostly Zone 3 and Zone 2). Question of whether the catch at the periphery of the distribution is significant.
	SCCMF Zone 1	Secondary retained species.	Reduction in stock Below MSY.	Monitoring of catch rates.	High	Possible	High	Specific quotas on south coast in the coming weeks to rebuild stocks to sustainable levels.		High	Unlikely	Medium	Recommend approaching this type of analysis with a precautionary approach. This species is data rich for estimating consequences. Status of Australian Fish Stocks has assessed the stock as sustainable in WA (compared against limit level).
	Recreational		No take.										
	All fishing — cumulative risk				High	Possible	High			High	Unlikely	Medium	
Captured other													
6	**Cephalopods**												
	WCRLMF	Capture of Western Rock Octopus.	Minor stock reduction compared to WRO fishery.		Minor	Possible	Low						Main take is from an octopus development fishery and characterised as low risk overall. Risk level is lower for squid and cuttlefish. Squid and cuttlefish take is extremely low.
	SCCMF Zone 1	Capture of Western Rock Octopus.	Very low numbers taken (<30 annually).		Minor	Unlikely	Negligible						
	Recreational	Capture of Western Rock Octopus.	Very low catch rates.		Minor	Unlikely	Negligible						
	All fishing — cumulative risk				Minor	Possible	Low						
7	**Finfish**												
	WCRLMF	Capture of Baldchin groper.	Reduction in stock (about 2 tonnes annually out of an overall catch of about 54 tonnes across all sectors).	Monitoring of catch rates and stock assessment with management plans and recovery plans.	High	Possible	High	Approval of reduction in commercial catch by 31 tonnes across all sectors (50% reduction).		Moderate	Likely	Medium	Commercial catch is about 6-10 tonnes overall annually.
	SCCMF Zone 1		Very low take of finfish on South coast.										Almost non-existent discard or retention of finfish.
	Recreational	Capture of Baldchin groper in pots.	Reduction of stock.	Recreational bag limits.	High	Unlikely	Medium						Recreational line catch of BG is about 36 tonnes and considered overfished. Majority of fishing occurs near Perth, BG is far more prevalent near Abrolhos Islands and Midwest.
	All fishing — cumulative risk				High	Possible	High			Moderate	Likely	Medium	
	WCRLMF	Capture of Pink snapper.	Reduction in stock (about 0.5 tonnes annually out of an overall catch of about 140 tonnes across all sectors 2018/2019).	Monitoring of catch rates and stock assessment with management plans and recovery plans.	Minor	Possible	Low						
	SCCMF Zone 1												
	Recreational	Capture of Pink snapper in pots.	Reduction of stock.	Recreational bag limits.	Minor	Possible	Low						
	All fishing — cumulative risk				Minor	Possible	Low						

Western Rock Lobster Resource — with reference to the Ecological Component Tree

Ref No.	Assessment component	Interaction threat	Consequences	Existing management and operational safeguards	Risk analysis			Future commitments for remedial action (date to be implemented)	Suggested remedial action for consideration	Treated risk			Remarks
					Conse-quence	Likelihood	Risk ranking			Conse-quence	Likelihood	Risk ranking	
8	**Elasmobranchs**												
	WCRLMF	Capture of Wobbegong shark.	Potential reduction of stock. Good post-release survival.		Minor	Unlikely	Negligible						Total take of Resource activities is less than 1% of overall fishing. Question of whether retention is allowed--retention is not allowed.
	SCCMF Zone 1	Capture of sharks.	Potential reduction of stock. Good post-release survival.		Minor	Unlikely	Negligible						Retention is not allowed. No records for Wobbegong in SCCMF, only for all sharks as a group.
	Recreational	Capture of sharks.	Potential reduction of stock. Good post-release survival. Very few individuals captured.		Minor	Unlikely	Negligible						
	All fishing — cumulative risk				Minor	Unlikely	Negligible						
9	**Other**												
	WCRLMF	(No other threats identified)											
	SCCMF Zone 1	(No other threats identified)											
	Recreational	(No other threats identified)											
	All fishing — cumulative risk												
Endangered, threatened and protected (ETP) species													
10	**Large cetaceans**												
	WCRLMF	Humpback whale entanglement in pot gear.	Infrequent reported entanglement with mortality to Humpback whales.	Gear modifications have been introduced since high number of 17 whale entanglements in 2013.	Minor	Likely	Low						95% of historic entanglements have been Humpbacks. Some entanglements result in dis-entanglement. Criteria for judging consequences are not relevant for all marine mammal species. Population size has not been evaluated since 2008.
	SCCMF Zone 1	Humpback whale entanglement in pot gear.	Infrequent reported entanglement with mortality to Humpback whales.	Gear modifications have been introduced since high number of 17 whale entanglements in 2013.	Minor	Likely	Low	Year-round fishing is planned and will require gear modifications and continued monitoring.	Implement shortened pot lines as in the West Coast region.	Minor	Likely	Low	More frequent entanglements reported in the Esperance and Albany regions--outside Resource. Minimal fishing south of Mandurah. Season currently closes 30 June. Only two licence holders in Zone 1.
	Recreational	Humpback whale entanglement in pot gear (2019 and 2020).	Health impacts are possible if whales cannot be released before significant injury or exhaustion.		Minor	Likely	Low						No real effort on South Coast. Year round fishing on West Coast, with required gear modifications.
	All fishing — cumulative risk				Minor	Likely	Low						

Western Rock Lobster Resource — with reference to the Ecological Component Tree

Ref No.	Assessment component	Interaction threat	Consequences	Existing management and operational safeguards	Risk analysis			Future commitments for remedial action (date to be implemented)	Suggested remedial action for consideration	Treated risk			Remarks
					Conse-quence	Likelihood	Risk ranking			Conse-quence	Likelihood	Risk ranking	
	WCRLMF	Southern Right whale entanglement in pot gear.	Infrequent reported entanglement with mortality to Southern Right whales (less than incidence of Humpback interactions--one reported in last couple of years).	Gear modifications have been introduced since high number of 17 whale entanglements in 2013.	Moderate	Unlikely	Low						Individuals come back to same breeding ground. Geographe Bay has become a more important calving ground in recent years. Population recovering slowly. There has been major reduction in pot sets and vessel numbers over the past decade. Evidence for recovery noted. Uncertainty suggested Moderate consequences and Possible likelihood as also being a valid judgement.
	SCCMF Zone 1	Southern Right whale entanglement in pot gear.	Infrequent reported entanglement with mortality to Southern Right whales (less than incidence of Humpback interactions--one reported in last couple of years).	Reporting of entanglements by fishers, tour operators, etc.	High	Unlikely	Medium	Year-round fishing is planned and will require gear modifications and continued monitoring.	Implement shortened pot lines as in the West Coast region.	High	Unlikely	Medium	More frequent entanglements reported in the Esperance and Albany regions--outside Resource. Minimal fishing south of Mandurah. Season currently closes 30 June. Only two licence holders in Zone 1.
	Recreational	Southern Right whale entanglement in pot gear (2019 and 2020).	Health impacts are possible if whales cannot be released before significant injury or exhaustion.		High	Remote	Low						No real effort on South Coast.
	All fishing — cumulative risk				High	Unlikely	Medium						
	WCRLMF	Entanglement of dolphins.	Mortality.				Not a credible threat						Anecdotal evidence of one incident.
11	**Australian sea lion**												
	WCRLMF	Capture of pups in pots.	Mortality not observed.	Sea lion exclusion devices.			Not a credible threat						Status changed to endangered. No interactions with sea lion pups since introduction of SLEDs. Update the information on SLED requirements relative to the foraging extent of juveniles (20-30 km reported).
	SCCMF Zone 1	Capture of pups in pots.	Mortality not observed.	Sea lion exclusion devices.			Not a credible threat						
	Recreational	Capture of pups in pots.	Mortality not observed.	Sea lion exclusion devices.			Not a credible threat						
	All fishing — cumulative risk												
12	**Turtles**												
	WCRLMF	Entanglement in ropes.	Mortality.		Minor	Unlikely	Negligible						Two turtle interactions since 2013. Fewer vessel trips result in lower incidence of boat strikes.
	SCCMF Zone 1	Entanglement in ropes.	Mortality.		Minor	Unlikely	Negligible						
	Recreational	Entanglement in ropes.	Mortality.		Minor	Unlikely	Negligible						
	All fishing — cumulative risk				Minor	Unlikely	Negligible						
13	**Other ETPs**												
	WCRLMF	Syngnathids attached to ropes and gear.	Captured alive and post-release mortality.		Minor	Possible	Low						Syngnathids are mainly found on mangrove and seagrass habitats. Reports of syngnathids on deeper reefs.
	SCCMF Zone 1	Syngnathids attached to ropes and gear.	Captured alive and post-release mortality.		Minor	Possible	Low						
	Recreational	Syngnathids attached to ropes and gear.	Captured alive and post-release mortality.		Minor	Possible	Low						
	All fishing — cumulative risk				Minor	Possible	Low						

Western Rock Lobster Resource — with reference to the Ecological Component Tree

Ref No.	Assessment component	Interaction threat	Consequences	Existing management and operational safeguards	Risk analysis			Future commitments for remedial action (date to be implemented)	Suggested remedial action for consideration	Treated risk			Remarks
					Conse-quence	Likelihood	Risk ranking			Conse-quence	Likelihood	Risk ranking	
	WCRLMF	Bird strikes with vessel lights operating at night.					Not a credible threat						Unheard of in open waters, as reported by fishers.
	SCCMF Zone 1	Bird strikes with vessel lights operating at night.					Not a credible threat						
	Recreational	Bird strikes with vessel lights operating at night.					Not a credible threat						
	All fishing — cumulative risk												
Habitats													
14	**Sand / soft substrate**												
	WCRLMF	Setting pots, dragging across substrate.	No adverse consequences.				Not a credible threat.						
	SCCMF Zone 1	Setting pots, dragging across substrate.	No adverse consequences.				Not a credible threat.						
	Recreational	Anchoring of dive vessels in sand.					Not a credible threat.						
	All fishing — cumulative risk												
15	**Seagrass**												
	WCRLMF	Setting pots on seagrass meadows.	Physical damage to seagrass from dragging of pots.		Minor	Possible	Low						Higher incidence on Abrolhos Islands. Generally fishers do not primarily target seagrass. Mapping/sounding does not necessarily distinguish between seagrass and macroalgae.
	SCCMF Zone 1	Setting pots on seagrass meadows.	Physical damage to seagrass from dragging of pots.		Minor	Possible	Low						
	Recreational	Anchoring of dive vessels on seagrass.	Physical damage to seagrass from dragging of pots.		Minor	Unlikely	Negligible						
	All fishing — cumulative risk				Minor	Possible	Low						
16	**Macroalgae**												
	WCRLMF	Setting pots.	Physical damage to macroalgae (relatively resilient).		Minor	Likely	Low						
	SCCMF Zone 1	Setting pots.	Physical damage to macroalgae (relatively resilient).		Minor	Likely	Low						
	Recreational	Setting pots or anchoring.	Physical damage to macroalgae (relatively resilient).		Minor	Unlikely	Negligible						Recreational pots are lighter than commercial pots.
	All fishing — cumulative risk				Minor	Likely	Low						
17	**Hard corals**												
	WCRLMF	Setting pots and pot lifts.	Physical damage to coral reef (uncertain extent).	Reduction of effort in recent years.	Minor	Possible	Low						Mainly concerned with Abrolhos Fish Habitat Protection Area. Seventy years of fishing history. Fishermen avoid hard corals to prevent gear damage, but coarse data estimates 40% of fishing on hard coral. Abrolhos has been impacted by coral bleaching/heatwaves/storms.
	SCCMF Zone 1	Setting pots and pot lifts.					Not a credible threat						
	Recreational	Setting pots and pot lifts.					Not a credible threat						Most fishing targets migration of whites on sand.
	All fishing — cumulative risk				Minor	Possible	Low						

Western Rock Lobster Resource — with reference to the Ecological Component Tree

Ref No.	Assessment component	Interaction threat	Consequences	Existing management and operational safeguards	Risk analysis: Conse-quence	Risk analysis: Likelihood	Risk analysis: Risk ranking	Future commitments for remedial action (date to be implemented)	Suggested remedial action for consideration	Treated risk: Conse-quence	Treated risk: Likelihood	Treated risk: Risk ranking	Remarks
18	**Other sessile invertebrates**												
	WCRLMF	Setting pots and pot lifts.	Physical damage to sessile invertebrates.		Minor	Likely	Low						Predominantly sponge communities.
	SCCMF Zone 1	Setting pots and pot lifts.	Physical damage to sessile invertebrates.		Minor	Likely	Low						
	Recreational	Setting pots and pot lifts.	Physical damage to sessile invertebrates.		Minor	Unlikely	Negligible						
	All fishing — cumulative risk												
Ecosystem													
19	**Trophic interactions**												
	WCRLMF	Discarding bait (provisioning).	Provisioning for species (small invertebrates, fishes) and potential reliance on alternative food source. Unclear consequences to trophic interactions. Potential attraction of dolphins and sea lions, potential vulnerability to vessel strikes.		Minor	Likely	Low						Reports of lobsters obtaining food from discarded bait, increasing production. Bait use reduced by 20-30% in recent years.
	SCCMF Zone 1	Discarding bait (provisioning).	Provisioning for species (small invertebrates, fishes) and potential reliance on alternative food source. Unclear consequences to trophic interactions. Potential attraction of dolphins and sea lions, potential vulnerability to vessel strikes.		Minor	Possible	Low						Only 2 vessels operating in South Coast.
	Recreational	Discarding bait (provisioning).	Provisioning for species (small invertebrates, fishes) and potential reliance on alternative food source. Unclear consequences to trophic interactions. Potential attraction of dolphins and sea lions, potential vulnerability to vessel strikes.		Minor	Likely	Low						Fishing concentrated in near-shore metropolitan areas. Rec discards contributes to depredation, with potential shark interactions and negative interactions with line fishing. If moderate consequences are contemplated, the likelihood would be judged to be unlikely (low risk ranking).
	All fishing — cumulative risk				Minor	Likely	Low						
	WCRLMF	Exposure of captured or injured lobsters to increased predation from octopus entering pots.	Increased productivity of octopus.	Much lower number of pots being set and lower fishing effort.	Minor	Possible	Low						High uncertainty in these interactions.
	SCCMF Zone 1	Exposure of captured or injured lobsters to increased predation from octopus entering pots.	Increased productivity of octopus.	Much lower number of pots being set and lower fishing effort.	Minor	Possible	Low						
	Recreational	Exposure of captured or injured lobsters to increased predation from octopus entering pots.	Increased productivity of octopus.	Much lower number of pots being set and lower fishing effort.	Minor	Possible	Low						
	All fishing — cumulative risk				Minor	Possible	Low						

Western Rock Lobster Resource — with reference to the Ecological Component Tree

Ref No.	Assessment component	Interaction threat	Consequences	Existing management and operational safeguards	Risk analysis			Future commitments for remedial action (date to be implemented)	Suggested remedial action for consideration	Treated risk			Remarks
					Conse-quence	Likelihood	Risk ranking			Conse-quence	Likelihood	Risk ranking	
	WCRLMF	Removal of lobster from trophic interactions.	Evidence of very limited influence on trophic flows.	Lower quotas in recent years.	Minor	Possible	Low						Being investigated with the closure at Lehman. Re-asses when information becomes available. Shallow water impact is difficult to study.
	SCCMF Zone 1	Removal of lobster from trophic interactions.	Evidence of very limited influence on trophic flows.	Lower quotas in recent years.	Minor	Unlikely	Negligible						
	Recreational	Removal of lobster from trophic interactions.	Evidence of very limited influence on trophic flows.	Lower quotas in recent years.	Minor	Possible	Low						Narrower area of removal.
	All fishing — cumulative risk				Minor	Possible	Low						
20	**Translocation of pests and diseases**												
	WCRLMF	Translocation of pests and diseases from a port (eg Geraldton) to offshore shallow water environments.	Alteration of habitats, degrading lobster habitat in the Abrolhos or other shallow water fishing grounds.	Vessels dry docked and antifouled at least annually. Only 90 trips per year. Port surveys.	High	Unlikely	Medium						
	SCCMF Zone 1	Translocation of pests and diseases from a port to offshore shallow water environments.	Alteration of habitats, degrading lobster habitat in shallow water fishing grounds.	No major ports handling international vessels in Zone 1.	High	Unlikely	Medium						
	Recreational	Translocation of pests and diseases from a port (eg Geraldton) to offshore shallow water environments.	Alteration of habitats, degrading lobster habitat in the Abrolhos or other shallow water fishing grounds.		High	Unlikely	Medium						
	All fishing — cumulative risk				High	Unlikely	Medium						
	WCRLMF	Bait infected with viruses.	Infection of vulnerable species.	Bait sourced from Australia and New Zealand.	High	Unlikely	Medium		Consider legislation for sourcing bait from low risk sources. Use industry bodies to encourage low risk bait selection.				
	SCCMF Zone 1	Bait infected with viruses.	Infection of vulnerable species.	Bait sourced from Australia and New Zealand.	High	Unlikely	Medium		Consider legislation for sourcing bait from low risk sources. Use industry bodies to encourage low risk bait selection.				
	Recreational	Bait infected with viruses.	Infection of vulnerable species.		High	Unlikely	Medium		Consider legislation for sourcing bait from low risk sources.				No control over the source of bait.
	All fishing — cumulative risk				High	Unlikely	Medium						
21	**Ghost fishing**												
	WCRLMF	Loss of pots.	Captured animals cannot escape, resulting in mortality.		Minor	Remote	Negligible						Very low incidence of gear loss (<0.1%).
	SCCMF Zone 1	Loss of pots.	Captured animals cannot escape, resulting in mortality.		Minor	Remote	Negligible						
	Recreational	Pots left unattended for lengthy periods.	Captured animals cannot escape, resulting in mortality.		Minor	Remote	Negligible						Fines imposed for the public and industry to remove derelict pots (some exceptions).
	All fishing — cumulative risk				Minor	Remote	Negligible						

Western Rock Lobster Resource — with reference to the Ecological Component Tree

Ref No.	Assessment component	Interaction threat	Consequences	Existing management and operational safeguards	Risk analysis: Conse-quence	Risk analysis: Likelihood	Risk analysis: Risk ranking	Future commitments for remedial action (date to be implemented)	Suggested remedial action for consideration	Treated risk: Conse-quence	Treated risk: Likelihood	Treated risk: Risk ranking	Remarks
Broader environment													
22	**Air quality**												
	WCRLMF	Fuel exhaust.	Exposure of animals and humans to exhaust and health impacts.	Effort reduction.	Minor	Remote	Negligible						Knowledge gap of emissions from recreational vessels.
	SCCMF Zone 1	Fuel exhaust.	Exposure of animals and humans to exhaust and health impacts.	Effort reduction.	Minor	Remote	Negligible						Knowledge gap of emissions from recreational vessels.
	Recreational	Fuel exhaust.	Exposure of animals and humans to exhaust and health impacts.		Minor	Remote	Negligible						Knowledge gap of emissions from recreational vessels.
	All fishing — cumulative risk				Minor	Remote	Negligible						
23	**Water quality**												
	WCRLMF	Oil/fuel discharge, turbidity, wastewater.	Smothering or pollution of benthic habitats, fauna, human health risks.	Emissions reduced over the past decade.	Minor	Unlikely	Negligible						
	SCCMF Zone 1	Oil/fuel discharge, turbidity, wastewater.	Smothering or pollution of benthic habitats, fauna, human health risks.	Emissions reduced over the past decade.	Minor	Remote	Negligible						
	Recreational	Oil/fuel discharge, turbidity, wastewater.	Smothering or pollution of benthic habitats, fauna, human health risks.		Minor	Unlikely	Negligible						
	All fishing — cumulative risk				Minor	Unlikely	Negligible						
24	**Noise**												
	WCRLMF	Noise emissions from vessels.	Potential behavioural changes of fauna (eg fish spawning, communications between marine mammals, attraction of predators).		Minor	Unlikely	Negligible						Observations recorded for whales show that noise will elicit a response to swim away. History of fishing activity does not include data for the consequences of noise interactions with whales in fishing grounds. Question of the impact of vessel movement with whale interactions.
	SCCMF Zone 1	Noise emissions from	Potential behavioural		Minor	Unlikely	Negligible						
	Recreational	Noise emissions from	Potential behavioural		Minor	Unlikely	Negligible						
	All fishing — cumulative risk				Minor	Unlikely	Negligible						
25	**Gear loss / rubbish**												
	WCRLMF	Entanglement of Dusky whalers in bait bands.	Mortality of dusky whalers.	Marked reduction in bait bands (only due to non-compliance). Monitoring of mortalities as part of MSC certification. Compliance regarded as very good.			Not a credible threat						Recovery of Dusky whalers. Only one non-compliance infringement issued in the last four years.
	SCCMF Zone 1	Entanglement of Dusky whalers in bait bands.	Mortality of dusky whalers.	Marked reduction in bait bands (only due to non-compliance). Monitoring of mortalities as part of MSC certification. Compliance regarded as very good.			Not a credible threat						
	Recreational	Entanglement of Dusky whalers in bait bands.	Mortality of dusky whalers.				Not a credible threat						
	All fishing — cumulative risk												

Western Rock Lobster Resource — with reference to the Ecological Component Tree

Ref No.	Assessment component	Interaction threat	Consequences	Existing management and operational safeguards	Risk analysis			Future commitments for remedial action (date to be implemented)	Suggested remedial action for consideration	Treated risk			Remarks
					Conse-quence	Likelihood	Risk ranking			Conse-quence	Likelihood	Risk ranking	
	WCRLMF	Plastic waste lost or discarded at sea from rock lobster vessels.	Ingestion of soft plastics by fauna (eg seabirds) resulting in mortality.	Minimal use of soft plastics are onboard vessels.	Minor	Possible	Low						Amount of plastic waste from rock lobster vessels is not quantified. Fishing vessels carry bins on board for proper disposal.
	SCCMF Zone 1	Plastic waste lost or discarded at sea from rock lobster vessels.	Ingestion of soft plastics by fauna (eg seabirds) resulting in mortality.	Minimal use of soft plastics are onboard vessels.	Minor	Remote	Negligible						
	Recreational	Plastic waste lost or discarded at sea from rec vessels.	Ingestion of soft plastics by fauna (eg seabirds) resulting in mortality.		Minor	Likely	Low						Recreational fishers use plastic pots and perform less maintenance of gear. Estimated 80% wooden pots, 20% plastic. More attention is being given to placing a value on plastics to incentivize control of plastic waste (applies to all fishing sectors).
	All fishing — cumulative risk				Minor	Likely	Low						
	WCRLMF	Plastic waste lost or discarded at sea from rock lobster vessels.	Entanglement of seabirds with soft plastics resulting in mortality.	Minimal use of soft plastics are onboard vessels.	Minor	Possible	Low						
	SCCMF Zone 1	Plastic waste lost or discarded at sea from rock lobster vessels.	Entanglement of seabirds with soft plastics resulting in mortality.	Minimal use of soft plastics are onboard vessels.	Minor	Remote	Negligible						
	Recreational	Plastic waste lost or discarded at sea from rock lobster vessels.	Entanglement of seabirds with soft plastics resulting in mortality.		Minor	Likely	Low						
	All fishing — cumulative risk				Minor	Likely	Low						
	WCRLMF	Plastic waste lost or discarded at sea from rock lobster vessels.	Human health impacts from consuming fish exposed to plastic ingestion.		Minor	Possible	Low						Microplastics are routinely detected in most fish, but source is not known.
	SCCMF Zone 1	Plastic waste lost or discarded at sea from rock lobster vessels.	Human health impacts from consuming fish exposed to plastic ingestion.		Minor	Remote	Negligible						
	Recreational	Plastic waste lost or discarded at sea from rec vessels.	Human health impacts from consuming fish exposed to plastic ingestion.		Minor	Likely	Low						
	All fishing — cumulative risk				Minor	Likely	Low						