Seafood Risk Assessment

New Zealand Rock Lobster Fishery

Prepared for the OpenSeas Programme

New Zealand Rock Lobster Fishery	Unit/s of Assessment:	
	Product Name/s:	***Rock Lobster***
	Species:	*Jasus edwardsii*
	Stock:	CRA2, CRA3, CRA4, CRA5, CRA6, CRA8
	Gear type:	Pot
	Year of Assessment:	2017

Fishery Overview

This summary is adapted from MPI (2016a):

Rock lobsters are the most commercially valuable of New Zealand's inshore fisheries species, earning $250 million a year in export receipts[1]. Two species of rock lobsters are taken in New Zealand coastal waters. The red rock lobster (*Jasus edwardsii*) supports nearly all the landings and is caught all around the North and South Islands, Stewart Island and the Chatham Islands. The packhorse rock lobster (*Sagmariasus verreauxi*) is taken mainly in the north of the North Island.

The rock lobster fisheries were brought into the Quota Management System (QMS) on 1 April 1990, when Total Allowable Commercial Catches (TACCs) were set for each Quota Management Area (QMA) shown in

Figure 1. Before this, rock lobster fishing was managed by input controls, including limited entry, minimum legal size (MLS) regulations, a prohibition on the taking of berried females and soft-shelled lobsters, and some local area closures.

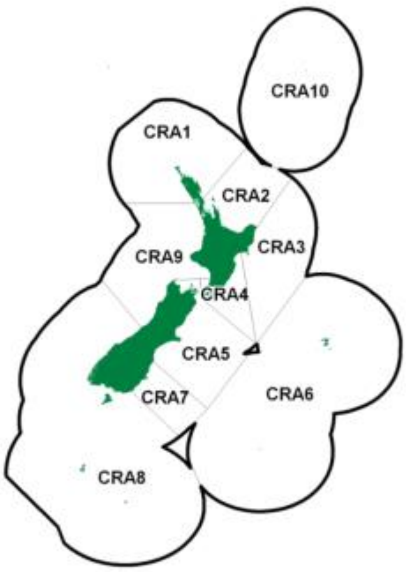

Figure 1: New Zealand rock lobster (CRA) quota management areas (MPI, 2016a).

The fishing year runs from 1 April to 31 March. In the commercial fishery, rock lobster are harvested using baited pots. Total commercial catch of rock lobsters has remained stable between 2,400t and 3,000t between 1990-91 and 2014-15, albeit catches have fluctuated within individual QMAs (Figure 2).

The rock lobster fishery also supports important recreational and customary catches. A National Panel recreational fishing survey undertaken between October 2011 and September 2012 estimated recreational catch across all QMAs (except QMA6) totalled around 185t. Estimates of customary catches used for stock assessment purposes are 10t in CRA5, 1t in CRA7 and 15t in CRA8.

[1] http://www.nzrocklobster.co.nz/qms.html

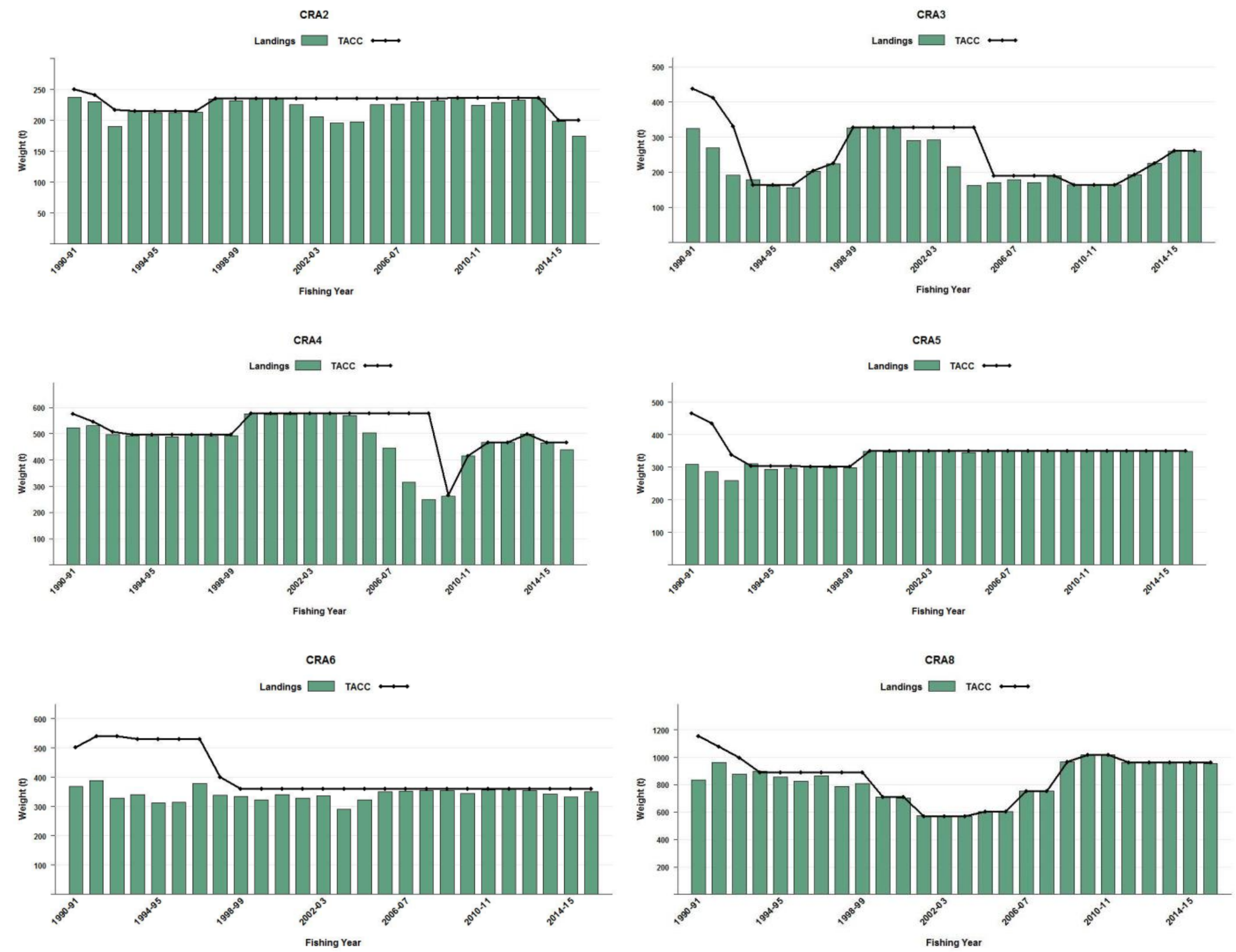

Figure 2: Rock lobster commercial catch and TACC between 1990-91 and 2015-16 for each CRA QMA (MPI, 2016a).

Scoring

Performance Indicator	CRA2	CRA3	CRA4	CRA5	CRA6	CRA8
COMPONENT 1						
1A: Stock Status	LOW	LOW	LOW	LOW	MEDIUM	LOW
1B: Harvest Strategy	LOW	LOW	LOW	LOW	MEDIUM	LOW
1C: Information and Assessment	LOW	LOW	LOW	LOW	PHR	LOW
OVERALL	LOW	LOW	LOW	LOW	MEDIUM	LOW
COMPONENT 2						
2A: Non-target Species	LOW	LOW	LOW	LOW	LOW	LOW
2B: ETP Species	LOW	LOW	LOW	LOW	LOW	LOW
2C: Habitats	MEDIUM	MEDIUM	MEDIUM	MEDIUM	MEDIUM	MEDIUM
2D: Ecosystems	LOW	LOW	LOW	LOW	LOW	LOW
OVERALL	LOW	LOW	LOW	LOW	LOW	LOW
COMPONENT 3						
3A: Governance and Policy	LOW	LOW	LOW	LOW	LOW	LOW

3B: Fishery-specific Management System	LOW	LOW	LOW	LOW	LOW	LOW
OVERALL	LOW	LOW	LOW	LOW	LOW	LOW

Summary of main issues

- All stocks except CRA6 are very well placed against P1 performance indicators. The most recent stock assessment for CRA6 was undertaken in 1996 and the position of the stock relative to reference points is unknown. Nevertheless, standardised CPUE has remained comparatively stable since the mid-1980s and current catch is within the range of estimates for maximum constant yield.
- Lobster pots are generally considered a relatively benign apparatus, although there is limited analysis of the overlap between fishing effort and potentially vulnerable habitats.
- The removal of lobsters from the ecosystem has been implicated in trophic cascades in some areas, although effects appear to be reversible. Maintenance of stock sizes above levels capable of producing maximum sustainable yield should assist to maintain the natural role of lobsters in the ecosystem.

Outlook

CRA2, CRA3, CRA4, CRA5, CRA8

Component	Outlook	Comments
Target species	Stable	Risk scoring unlikely to change. Fishing mortality is below F_{MSY} for all stocks.
Environmental impact of fishing	Stable	No major changes are expected to P2 risk scoring
Management system	Stable	No major changes are expected to P3 risk scoring

CRA6

Component	Outlook	Comments
Target species	Stable	No stock assessment/management procedure planned.
Environmental impact of fishing	Stable	No major changes are expected to P2 risk scoring
Management system	Stable	No major changes are expected to P3 risk scoring

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Disclaimer

Background

This report sets out the results of an assessment against a seafood risk assessment procedure, originally developed for Coles Supermarkets Australia by MRAG Asia Pacific. The aim of the procedure is to allow for the rapid screening of uncertified source fisheries to identify major sustainability problems, and to assist seafood buyers in procuring seafood from fisheries that are relatively well-managed and have lower relative risk to the aquatic environment. While it uses elements from the GSSI benchmarked MSC Fishery Standard version 2.0, the framework is not a duplicate of it nor a substitute for it. The methodology used to apply the framework differs substantially from an MSC Certification. Consequently, any claim made about the rating of the fishery based on this assessment should not make any reference to the MSC or any other third party scheme.

This report is a "live" document that will be reviewed and updated on an annual basis.

Methods

Risk Assessment

Detailed methodology for the risk assessment procedure is found in MRAG AP (2015). The following provides a brief summary of the method as it relates to the information provided in this report.

Assessments are undertaken according to a 'unit of assessment' (UoA). The UoA is a combination of three main components: (i) the target species and stock; (ii) the gear type used by the fishery; and (iii) the management system under which the UoA operates.

Each UoA is assessed against three components:

1. Target fish stocks;
2. Environmental impact of fishing; and
3. Management system.

Each component has a number of performance indicators (PIs). In turn, each PI has associated criteria, scoring issues (SIs) and scoring guideposts (SGs). For each UoA, each PI is assigned one of the following scores, according to how well the fishery performs against the SGs:

- Low risk;
- Medium risk;
- Precautionary high risk; or
- High risk

Scores at the PI level are determined by the aggregate of the SI scores. For example, if there are five SIs in a PI and three of them are scored low risk with two medium risk, the overall PI score is low risk. If three are medium risk and two are low risk, the overall PI score is medium risk. If there are an equal number of low risk and medium risk SI scores, the PI is scored medium risk. If any SI scores precautionary high risk, the PI scores precautionary high risk. If any SI scores high risk, the PI scores high risk.

For this assessment, each component has also been given an overall risk score based on the scores of the PIs. Overall risk scores are either low, medium or high. The overall component risk score is low where the majority of PI risk scores are low. The overall risk score is high where any one PI is scored high risk, or two or more PIs score precautionary high risk. The overall risk score is medium for all other combinations (e.g. equal number of medium/low risk PI scores; majority medium PI scores; one PHR score, others low/medium).

Outlook

For each UoA, an assessment of the future 'outlook' is provided against each component. Assessments are essentially a qualitative judgement of the assessor based on the likely future performance of the fishery against the relevant risk assessment criteria over the short to medium term (0-3 years). Assessments are based on the available information for the UoA and take into account any known management changes. Outlook scores are provided for information only and do not influence current or future risk scoring.

Table 1: Outlook scoring categories.

Outlook score	Guidance
Improving	The performance of the UoA is expected to improve against the relevant risk assessment criteria.
Stable	The performance of the UoA is expected to remain generally stable against the relevant risk assessment criteria.
Uncertain	The likely performance of the UoA against the relevant risk assessment criteria is uncertain.
Declining	The performance of the UoA is expected to decline against the relevant risk assessment criteria.

Information sources

Information to support scoring is obtained from publicly available sources, unless otherwise specified. Scores will be assigned on the basis of the objective evidence available to the assessor. A brief justification is provided to accompany the score for each PI.

Assessors will gather publicly available information as necessary to complete or update a PI. Information sources may include information gathered from the internet, fishery management agencies, scientific organisations or other sources.

Assessment Results

COMPONENT 1: Target fish stocks

1A: Stock Status

CRITERIA: (i)The stock is at a level which maintains high productivity and has a low probability of recruitment overfishing.

(a) Stock Status

While MPI (2016a) report there is no evidence for genetic subdivision of lobster stocks within New Zealand based on biochemical genetic and mtDNA studies, since 2001 rock lobsters in each of the CRA QMA areas have been assumed to constitute separate Fishstocks for the purposes of stock assessment and management. For the purposes of this assessment, we follow that convention.

CRA2 **LOW RISK**

The most recent assessment of CRA 2 was undertaken in 2013 using a single-stock version of the multi-stock length-based model (MSLM) (Haist et al 2009). The model incorporated CRA 2 annual catch rate data from 1963 to 1973, seasonal standardised CPUE from 1979-2012, length frequencies from observer and voluntary (logbook) catch sampling, and tag-recapture data. The model also estimated recreational catches from recreational surveys from 1994, 1996 and 2011 and commercial spring-summer (SS) CPUE (MPI, 2015).

The base case model estimated that biomass in 2013 was 136% of B_{MSY}, with a 99.5% probability that biomass was above B_{MSY}. The model results also indicate the stock is 'exceptionally unlikely' (<1%) to be below either soft or hard limits. MPI (2015) report that the history of the stock shows that fishing intensity exceeded Fmsy only from 1980–89 and that SSB was below SSBmsy only from 1986–88. The current position of the stock is near the 1978 position, with fishing intensity just below Fmsy and with biomass just above SSBmsy.

Based on this, it is highly likely that the stock is above the point of recruitment impairment (PRI) and above a level consistent with MSY. Accordingly, the stock is scored low risk.

CRA3 **LOW RISK**

The most recent assessment of CRA 3 was undertaken in 2014 using a single-stock version of the multi-stock length-based model (MSLM) (Haist et al 2015; in MPI, 2016a). MPI (2015) report that catch histories for CRA 3 were agreed by the RLFAWG. Other input data to the model included:

- tag-recapture data from 1975–1981 and from 1995–2013,
- standardised CPUE from 1979–2013,
- historical catch rate data from 1963–1973; and
- length frequency data from commercial catches (log book and catch sampling data) from 1989 to 2013.

The base case models estimated that current (2014) biomass was above *Bmsy* in all runs, and the median result was between three and five times *Bmsy*. Median estimates of spawning stock biomass in 2013 for the two base case models were 69% and 106% of SSB_0. Based on this, it is highly likely that the stock is above the point of recruitment impairment (PRI) and above a level consistent with MSY. Accordingly, the stock is scored low risk.

CRA4 **LOW RISK**

The most recent assessment of CRA 4 was undertaken in 2016 using a single-stock version of the multi-stock length-based model (MSLM) (Haist et al 2009). The model was fitted to two series of catch rate indices from different periods, and to size frequency, puerulus settlement and tagging data.

The model estimated that biomass in 2016 (Bcurr) was above (around 1.47 times) the biomass capable of producing MSY (B_{MSY}) (MPI, 2016a). Model projections to 2019 estimated that although biomass was likely to decrease, biomass remained above B_{MSY} in the base case and for all sensitivity trials.

When SSB was considered alone, median estimates from the base case model indicated SSBcurr was marginally below SSB_{MSY} (85%), with sensitivity trials ranging from 82% to 98%. The median estimate for the 2019 SSB was projected to increase slightly to 86% of SSB_{MSY}.

Based on this, it is highly likely that the stock is above the point of recruitment impairment (PRI) and at or fluctuating around a level consistent with MSY. Accordingly, the stock is scored low risk.

CRA5 **LOW RISK**

The most recent assessment of CRA 4 was undertaken in 2015 using a single-stock version of the multi-stock length-based model (MSLM) (Haist et al 2009). The model was fitted to two series of catch rate indices from different periods, and to size frequency, puerulus settlement and tagging data. The assessment used estimates of recreational catch derived from survey estimates in 1994, 1996 and an assumed value of 80 t in 2011.

In the base case and for all trials, current and projected biomass levels were larger than *Bmsy* reference levels by substantial amounts for both catch projection scenarios (294% - 411%) (MPI, 2016a). Model projections to 2018 indicated biomass was likely to decline but remained well above the reference levels in the base case and for all trials.

Based on this, it is highly likely that the stock is above the point of recruitment impairment (PRI) and at or fluctuating around a level consistent with MSY. Accordingly, the stock is scored low risk.

CRA6 **MEDIUM RISK**

The most recent stock assessment for CRA 6 was done in 1996, using catches and abundance indices current up to the 1995–96 fishing year. MPI (2016a) report that the status of this stock against reference points is unknonw. Catches were less than the TACC 1990–91 to 2004–05, but have been within 10 t of the TACC since then. CPUE showed a declining trend from 1979–80 to 1997–98, but has then increased in two stages to levels higher than seen in the early 1990s. These observations suggest a stable or increasing standing stock after an initial fishing down period. However, size frequency distributions in the lobster catch had not changed when they were examined in the mid-1990s, with a continuing high frequency of large lobsters.

Commercial removals in the 2012–13 fishing year (356 t) were within the range of estimates for MCY (300–380 t), and close to the current TACC (360 t). The current TAC (370 t) lies within the range of the estimated MCY (MPI, 2016a). While the status of the stock in relation to target and limit reference points is unknown, standardised CPUE remains at or around the long term average (Figure 3).

Although the information base for CRA 6 is weaker than other stocks, the relative stability of the standardised CPUE compared to historical levels suggests it probably at least likely that the stock is above the point of recruitment impairment. Nevertheless, there is limited evidence that the stock is fluctuating at or around MSY. Accordingly, the stock is scored medium risk.

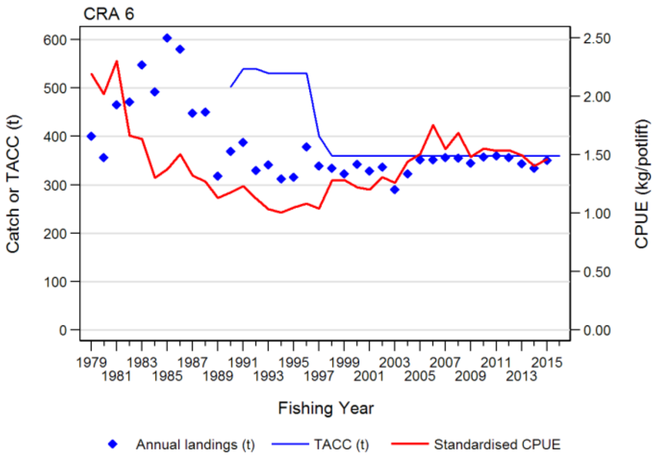

Figure 3: Annual landings, TACC and standardised CPUE for CRA6 from 1979 to 2016. (from MPI, 2016a).

CRA8 **LOW RISK**

The most recent assessment of CRA 8 was undertaken in 2015 using a two-stock version of the multi-stock length-based model (MSLM) (Haist et al 2009). The model was fitted to data from CRA 7 and CRA 8 including seasonal standardised CPUE from 1979-2014, older catch rate data (CR), length frequencies from observer and voluntary (logbook) catch sampling, and tag-recapture data.

MPI (2016a) reported that for CRA 8, base case results suggested that AW biomass decreased to a low point in 1990, remained relatively low until 2000, then increased strongly and has remained relatively high. B_{2015} was well above *Bmsy* (183%) and 35% above *Bref* (mean biomass for 1979-81). Biomass was projected to remain about the same in four years at the current level of catches and was projected to remain well above both *Bref* and *Bmsy*. Spawning biomass was a high proportion – 43% – of the unfished level. Neither current nor projected biomass was anywhere near the soft limit.

Based on this, it is highly likely that the stock is above the point of recruitment impairment (PRI) and at or fluctuating around a level consistent with MSY. Accordingly, the stock is scored low risk.

PI SCORE	**LOW RISK – CRA2, CRA3, CRA4, CRA5, CRA8**
	MEDIUM RISK – CRA6

1B: Harvest Strategy

CRITERIA: (i) There is a robust and precautionary harvest strategy in place.

(a) Harvest Strategy

The core components of the harvest strategy are largely consistent across each of the CRA stocks. The primary constraint on catch is through the application of a total allowable catch (TAC), divided into a total allowable commercial catch (TACC) and allowances for recreational and customary catches and other sources of mortality. TACs are set using management procedures in all rock lobster fisheries except for CRA 6 and CRA 10. In general, each procedure is designed to move or maintain stock abundance well above agreed reference levels (MPI, 2016b).

Management procedures are evaluated with a modified stock assessment model, known as the ‘operating model’. Data used in the stock assessment model include: customary, recreational, commercial and illegal catches, length frequencies of the catch from observer and industry logbook data, tag-recapture data (i.e. growth information) and larval settlement levels. The most important inputs to the assessment are commercial CPUE indices, which are considered to be proportional to abundance.

Four stock indicators are typically used in management procedure evaluations:

a) The statutory reference level, ***Bmsy***, the stock size that can produce the maximum sustainable yield.
b) The conceptual proxy, ***Bref,*** a reference biomass level. *Bref* is generally a stock size at or above the stock size associated with a period in the fishery that showed good productivity and was demonstrably safe.
c) The minimum stock size, ***Bmin***, which is the lowest stock size observed in the history of the fishery.
d) Spawning stock biomass, ***SSB***, which is the weight of all mature females in the autumn winter.

Management procedures are required to be consistent with the objectives of the Fisheries Act 1996 ('the Act') which requires that TACs be set at levels which move the stock to, or maintain the stock at, a size at or above a level that can produce the maximum sustainable yield or at a level that is not inconsistent with this objective. Management procedures are also required to be consistent with the Harvest Strategy Standard (HSS) for New Zealand fisheries (MFish, 2008) which specifies performance standards for Quota Management System (QMS) species and also provides guidance for TAC setting under the Act.

The HSS specifies that management procedures should be designed to ensure that the probability of:

- Achieving the MSY-compatible target or better is at least 50%;
- Breaching the soft limit does not exceed 10%;
- Breaching the hard limit does not exceed 2%.

For rock lobster:

- 'MSY-compatible target' reference points include those that relate to stock biomass (*Bmsy*) and conceptual proxies (*Bref*);
- The soft limit is defined as 20% of the unfished SSB level or 50% *Bref*;
- The hard limit is defined as 10% of the unfished SSB level or 25% *Bref*.

Peer-review of stock assessment models and management procedures occurs at the Rock Lobster Fisheries Assessment Working Group and at the November mid-year Fisheries Assessment Plenary. Each management procedure is also extensively simulation-tested, which includes testing for robustness to uncertainties in model assumptions (e.g. variable levels of recruitment and non-commercial catches) and modelling choices.

Management procedures are generally reviewed every five years unless an earlier review is requested and approved by the NRLMG. The history of current management procedures and scheduled review dates are outlined in Table 2.

Table 2: History of current management procedure use and their review schedule (MPI, 2016b)

	CRA 1	CRA 2	CRA 3	CRA 4	CRA 5	CRA 7	CRA 8	CRA 9
First year of the current management	2015	2014	2015	2012	2012	2013	2013	2014
Year of scheduled review	2019	2018	2019	2016	2015	2015	2015	2018

The National Rock Lobster Management Group (NRLMG) is the primary advisor to the Minister on catch limit, regulatory and other management actions that apply specifically to rock lobster fisheries. The NRLMG is a national-level, multi-stakeholder group comprising representatives of customary, recreational and commercial fishing sectors and MPI (MPI, 2016b). Every year the NRLMG considers the results from stock assessments and the operation of management procedures. These determine whether catch limit changes are required for the upcoming April fishing year to ensure the sustainable use of the rock lobster resource.

In addition to the TAC, other controls on catch include:

- minimum legal size (MLS) regulations,
- a prohibition on the taking of berried females and soft-shelled lobsters, and
- some local area closures.

CRA2 **LOW RISK**

Stock assessment modelling for CRA 2 shows fishing intensity has been lower than F_{MSY} since 1989, with median estimates of projected biomass in 2016 around 38% higher than B_{MSY}. MPI (2015) conclude that the probability of current catch or TACC causing biomass to remain below or to decline below the limit reference point is 'exceptionally unlikely' (<1%), and 'unlikely' (<40%) to cause overfishing to continue or commence.

Evidence of the application of the CRA 2 management procedure including TAC adjustments (e.g. MPI, 2014; Guy, 2014) demonstrate the harvest strategy is responsive to the state of the stock and all of the elements (monitoring, stock assessment, harvest control rules and management actions) appear to work together towards achieving stock management objectives reflected in criteria 1A(i). Accordingly, the stock is scored low risk.

CRA3 **LOW RISK**

Stock assessment modelling for CRA 3 estimated that biomass in 2014 was 261% of B_{MSY} and 85% of B_{REF}. Fishing intensity has been below F_{MSY} since 1991, and currently sits at well below FMSY under both stock assessment base case scenarios. Projections for the 2017 biomass estimated a >99% probability that biomass would be above B_{MSY}. MPI (2015a) conclude that the probability of current catch or TACC causing biomass to remain below or to decline below the limit reference point is 'exceptionally unlikely' (<1%), and 'unlikely' (<40%) to cause overfishing to continue or commence.

Evidence of the application of the CRA 3 management procedure including TAC adjustments (e.g. MPI, 2014; Guy, 2014; MPI, 2015) demonstrate the harvest strategy is responsive to the state of the stock and all of the elements (monitoring, stock assessment, harvest control rules and management actions) appear to work together towards achieving stock management objectives reflected in criteria 1A(i). Accordingly, the stock is scored low risk.

CRA4 **LOW RISK**

Stock assessment modelling for CRA 4 estimated that biomass in 2010 was 230% of B_{MSY} and 168% of B_{REF}. Fishing intensity has not exceeded F_{MSY} since the commencement of the time series in 1945. All model runs estimated that projected biomass in 2014 would exceed BMSY with 100% probability. MPI (2015a) conclude that overfishing is very unlikely (< 10%) to be occurring and equally very unlikely (< 10%) to cause overfishing to continue or commence.

Evidence of the application of the CRA 4 management procedure including TAC adjustments (e.g. MPI, 2014; Guy, 2014; MPI, 2016b; Guy, 2016) demonstrate the harvest strategy is responsive to the state of the stock and all of the elements (monitoring, stock assessment, harvest control rules and management actions) appear to work together towards achieving stock management objectives reflected in criteria 1A(i). Accordingly, the stock is scored low risk.

CRA5 **LOW RISK**

Stock assessment modelling for CRA 5 estimated that biomass in 2015 was either 411% or 294% of B_{MSY}, depending on whether density dependence was assumed. Spawning stock biomass in 2014 was 78 to 97% of the unfished level. Both model base case scenarios project that both biomass and SSB in 2018 will remain above B_{MSY} with near certainty. Fishing intensity has not exceeded FMSY since the early 1990s and remains substantially below F_{MSY}. MPI (2015a) report that biomass is expected to decrease over the next four years but will remain above all reference levels for either of the two base case results. They conclude that the probability of current catch or TACC causing biomass to remain below or to decline below limits is very unlikely (< 10%) and equally that it is very unlikely (< 10%) to cause overfishing to continue or commence.

In 2016, the Minister approved the use of a new management procedure for CRA 5 (Guy, 2016). Application of the new CRA 5 management procedure is expected to exceed the requirements of the MPI Harvest Strategy Standard and maintain the stock above *Bmsy* with greater than 99% probability and *Bmin* with greater than 99% probability (MPI, 2016b).

Evidence of the application of the CRA 5 management procedure including TAC adjustments (e.g. MPI, 2016b; Guy, 2016) demonstrate the harvest strategy is responsive to the state of the stock and all of the elements (monitoring, stock assessment, harvest control rules and management actions) appear to work together towards achieving stock management objectives reflected in criteria 1A(i). Accordingly, the stock is scored low risk.

CRA6 **MEDIUM RISK**

CRA 6 is one of only two QMAs that do not use a formal management procedure to guide TAC setting, although management procedure evaluations (MPEs) have been conducted (Breen, 2009). The TAC has remained stable at 370t since 1998-99. The stock was most recently assessed in 1996, with standardised CPUE – assumed to be used to proportional to abundance – used to monitor stock health since that time. Standardised CPUE calculations were last updated in 2016.

Because the status of the stock is not well-known, there is limited evidence to indicate that the harvest strategy is responsive to the state of the stock. Equally, because there is no ongoing monitoring of stock health against defined reference points appropriate to the stock, there is little evidence that the elements of the harvest strategy work together. Accordingly, the stock cannot score low risk. Nevertheless, the current TAC is reportedly within the range of estimates of maximum constant yield (MCY) (300-380t) (MPI, 2016a) and standardised CPUE remains at relatively high levels historically. Catches have remained within ~10t of the TAC since 2004-05. To this end, there is at least some evidence to indicate that the harvest strategy could be expected to achieve the stock management objectives reflected in criteria 1A(i). Accordingly, we have scored the stock medium risk.

CRA8 **LOW RISK**

Stock assessment modelling for CRA 8 estimated that biomass in 2015 was 183% of BMSY, with SSB in 2014 162% of SSB_{MSY}. Spawning stock biomass in 2014 was 44% of the unfished level. The model base case scenario projects that both biomass and SSB in 2018 will remain above B_{MSY} with near certainty. Fishing intensity exceeded F_{MSY} between the late 1970s and the mid-2000s, but has since stabilised at levels well below F_{MSY}. MPI (2015a) conclude that the probability of current catch or TACC causing biomass to remain below or to decline below limits is exceptionally unlikely (< 1%) and equally that it is very unlikely (< 10%) to cause overfishing to continue or commence.

In 2016, the Minister approved the use of a new management procedure to guide TAC setting in CRA 8 for a five year period (Guy, 2016). The new CRA 8 management procedure is expected to maintain the CRA 8 stock above the agreed reference levels with greater than 99% probability (MPI, 2016a).

Evidence of the application of the CRA 8 management procedure (e.g. MPI, 2016a; Guy, 2016) demonstrate the harvest strategy is responsive to the state of the stock and all of the elements (monitoring, stock assessment, harvest control rules and management actions) appear to work together towards achieving stock management objectives reflected in criteria 1A(i). Accordingly, the stock is scored low risk.

(b) Shark-finning

NA

CRITERIA: (ii) There are well defined and effective harvest control rules (HCRs) and tools in place.

(a) HCR Design and application

Management procedures used in New Zealand's CRA stock are described in detail in Breen (2016).

CRA2 — LOW RISK

The management procedure for the CRA 2 stock was implemented in the 2013–14 fishing year and is based on the 2013 stock assessment and MPEs (Starr et al 2014). Specifications for the CRA 2 MP include:

a) the output variable is TACC (t) and the input variable is offset year standardised CPUE (kg/potlift), calculated in November and scaled to the "LFX" destination code using the "F2" data preparation procedure.
b) the management procedure is to be evaluated every year (no "latent year"); and
c) there are no thresholds for maximum change, but a minimum 5% change.

The MP is described in Figure 4 below. Under the MP, where CPUE is between 0 and 0.5 kg/potlift, the TACC increases linearly with CPUE to a plateau of 200 t, which extends to a CPUE of 0.5 kg/potlift. As CPUE increases above 0.5 kg/potlift, TACC increases in steps with a width of 0.1 kg/potlift and a height of 10% of the preceding TACC.

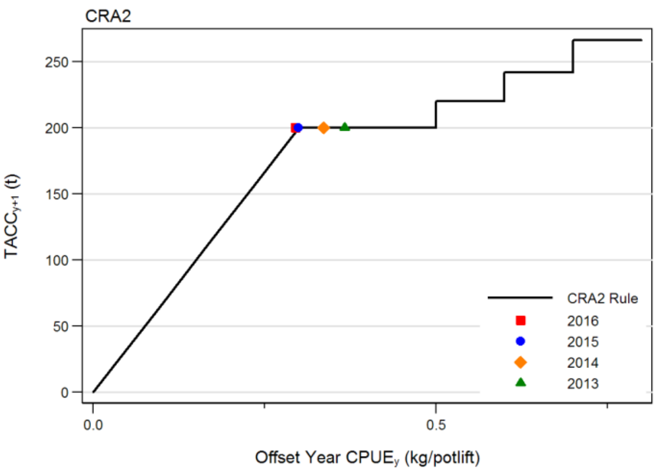

Figure 4: CRA 2 management procedure showing the provisional TACC in year y+1 as a function of offset year CPUE in year y, and showing the 2013 to 2016 results. (from MPI, 2016a)

The management procedure constitutes a well-defined harvest control rule which aims to maintain the stock at a level above BMSY. Moreover, sufficient tools exist under the QMS and through routine stock monitoring to ensure that exploitation rate can reduced as PRI is approached. Accordingly, we have scored the stock low risk.

CRA3 — LOW RISK

The CRA 3 MP was revised for the 2015–16 fishing year based on the 2014 stock assessment and MPEs (Haist et al. 2015). The output variable is TACC (t) and the input variable is offset year standardised CPUE (kg/potlift), calculated in November and scaled to the "LFX" destination code using the "F2" data preparation procedure. The rule has no latent year, a maximum change threshold of 10% and a minimum change of 5%. The MP is specified in Figure 5 below:

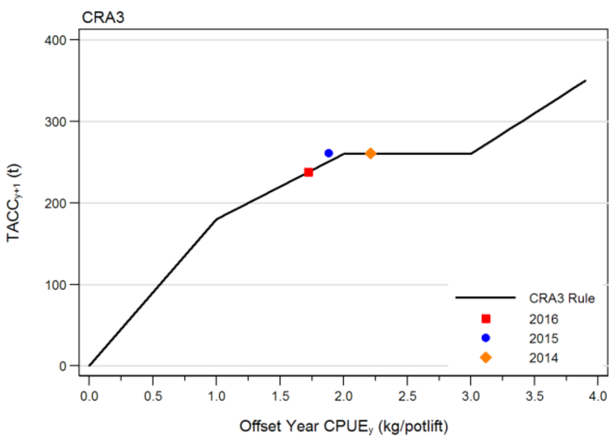

Figure 5: The CRA 3 harvest control rule; the red square shows the 2016 CPUE and TACC. (from MPI, 2016a)

When CPUE is between 0 and 1.0 kg/potlift, the TACC rises linearly to 180 t; when CPUE is between 1 and 2 kg/potlift, CPUE rises linearly from 180 to 260 t. A plateau of 260 extends from 2 to 3 kg/potlift, then TACC increases with a slope of 100 t per 1 kg/potlift.

The management procedure constitutes a well-defined harvest control rule which aims to maintain the stock at a level above BMSY. Moreover, sufficient tools exist under the QMS and through routine stock monitoring to ensure that exploitation rate can reduced as PRI is approached. Accordingly, we have scored the stock low risk.

CRA4 **LOW RISK**

The management procedure for CRA 4 is based on a stock assessment and MP evaluations completed in 2011 (Breen et al 2012). Specifications for the CRA 4 MP include:

a) the output variable is TACC (t) and the input variable is offset year standardised CPUE (kg/potlift), calculated in November and scaled to the "L" destination code using the "B4" data preparation procedure
b) the management procedure is to be evaluated every year (no "latent year"); and
c) there is no minimum change threshold but a maximum change threshold of 25% applies to increases below the plateau.

The MP is specified in Figure 6 below:

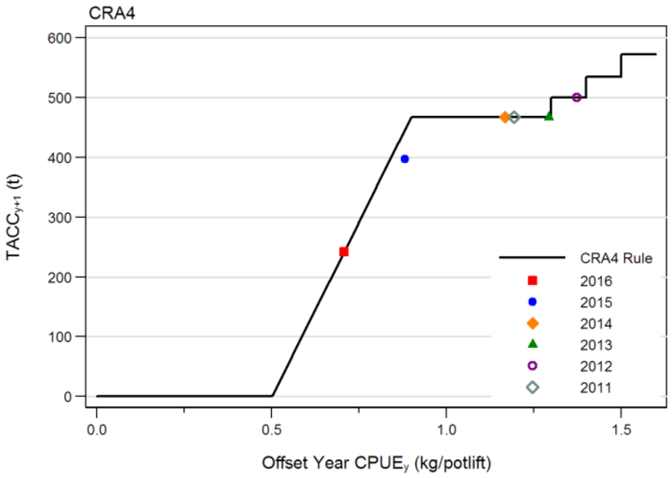

Figure 6: The CRA 4 management procedure, showing the TACC in year y+1 as a function of offset year CPUE in year y, and showing the TACCs resulting from the rule evaluations performed in 2011 through to 2016. (from MPI, 2016a)

Under this MP, where the CPUE is below 0.5 kg/potlift, the TACC is zero; between a CPUE of 0.5 and 0.9 kg/potlift, the TACC increases linearly with CPUE to a plateau of 467t which extends to a CPUE of 1.3 kg/potlift. As CPUE increases above 1.3 kg/potlift, TACC increases in steps with a width of 0.1 kg/potlift and a height of 7% of the preceding TACC.

The Minister accepted and implemented this management procedure for the 2012–13 fishing year. The TACC increased in 2013–14 but was reduced in 2014–15 in accordance with the rule evaluation.

The management procedure constitutes a well-defined harvest control rule which aims to maintain the stock at a level above BMSY. Moreover, sufficient tools exist under the QMS and through routine stock monitoring to ensure that exploitation rate can reduced as PRI is approached. Accordingly, we have scored the stock low risk.

CRA5 **LOW RISK**

The management procedure for CRA 5 is based on a stock assessment and MP evaluation completed in 2010 (Breen et al 2011). Specifications for the CRA 5 MP include:

a) the output variable is TACC (t) and the input variable is offset year standardised CPUE (kg/potlift), calculated in November and scaled to the "L" destination code using the "B4" data preparation procedure
b) the management procedure is to be evaluated every year (no "latent year"); and
c) there are no thresholds for minimum and maximum change.

Under the MP, where the CPUE is below 0.3 kg/potlift, the TACC is zero; between a CPUE of 0.3 and 1.4 kg/potlift, the TACC increases linearly with CPUE to a plateau of 350 t which extends to a CPUE of 2.0 kg/potlift (Figure 7). As CPUE increases above 2.0 kg/potlift, TACC increases in steps with a width of 0.2 kg/potlift and a height of 5% of the preceding TACC.

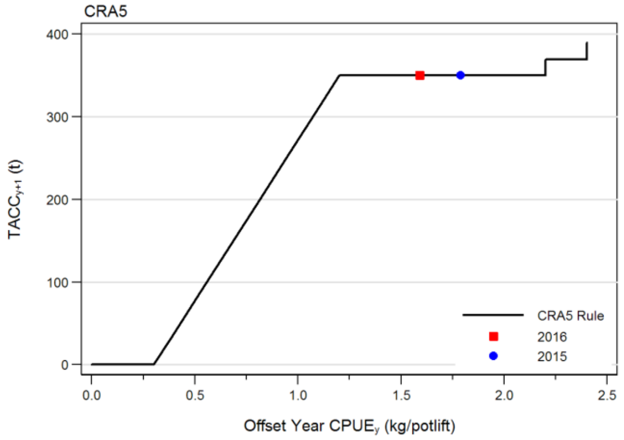

Figure 7: The CRA 5 management procedure, showing the TACC in year y+1 as a function of offset year CPUE in year y, and showing the TACCs resulting from the rule evaluations performed in 2011 through to 2016. (from MPI, 2016a)

The Minister accepted and implemented this management procedure for the 2012-13 fishing year.

The management procedure constitutes a well-defined harvest control rule which aims to maintain the stock at a level above BMSY. Moreover, sufficient tools exist under the QMS and through routine stock monitoring to ensure that exploitation rate can reduced as PRI is approached. Accordingly, we have scored the stock low risk.

CRA6 **MEDIUM RISK**

While no well-defined HCR is in place for the CRA 6 fishery, the legal and policy framework created by the requirement of the Act to move stocks towards MSY and the HSS which establishes default target and limit reference points arguably provides a generally understood HCR which will serve to reduce exploitation as PRI is approached. Clear tools exist through the QMS to reduce the TAC where necessary, and the management agency has considerable experience in the use of HCRs/TAC setting to achieve stock management objectives. The main weakness is the absence of recent assessments of stock status, including regular assessments of the position of the stock in relation to defined reference points.

CRA8 **LOW RISK**

CRA 8 has been managed since 1996 using management procedures based on the observed CPUE in the fishery. These have been revised several times, most recently in 2016, when a new management procedure was accepted by the Minister of Primary Industries for CRA 8 for the 2016-17 fishing year (Guy, 2016) (Figure 8). The new CRA 8 management procedure is expected to maintain the CRA 8 stock above the agreed reference levels with greater than 99% probability (MPI, 2016b). The new MP uses a new procedure for preparing data for CPUE standardisation, which is unique to CRA 8, and relates only to the fish that were landed and does not consider fish returned to the water. Retention of large fish is low in CRA 8 and it is estimated that about 40% by weight of legal rock lobsters caught are returned to the water (MPI, 2016b).

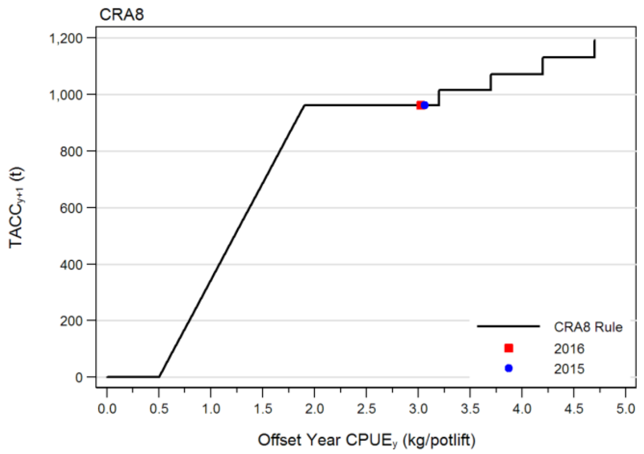

Figure 8: The new CRA 8 management procedure, showing the TACC for the 2016-17 fishing year resulting from the rule operation performed in 2016. (from MPI, 2016a)

The management procedure constitutes a well-defined harvest control rule which aims to maintain the stock at a level above BMSY. Moreover, sufficient tools exist under the QMS and through routine stock monitoring to ensure that exploitation rate can reduced as PRI is approached. Accordingly, we have scored the stock low risk.

PI SCORE	**LOW RISK – CRA2, CRA3, CRA4, CRA5, CRA8**
	MEDIUM RISK – CRA6

1C: Information and Assessment

CRITERIA: (i) Relevant information is collected to support the harvest strategy.

(a) Range of information

All stocks **LOW RISK**

A substantial body of information is available on stock structure and productivity of *J. edwardsii* from New Zealand, much of which summarised in MPI (2016a). Catches in the commercial sector are closely monitored consistent with the compliance regime under the QMS, while catches in the recreational and customary sectors are estimated using fisher surveys and other techniques (e.g. MPI, 2016a). The key input into the management procedure, standardised commercial CPUE, is monitored and estimated for each stock using the approaches described in Starr (2015). Collectively, this information is sufficient to support the harvest strategy across all stocks.

(b) Monitoring and comprehensiveness

CRA6 **MEDIUM RISK**

Standardised commercial CPUE has been shown to be a reliable indicator of stock abundance for other CRA stocks (e.g. MPI, 2016a) and is used as the primary indicator of stock health in CRA 6 (albeit the empirical basis for this assumption appears to be weaker for CRA 6). Commercial removals from the stock are monitored with high precision through the compliance regime under the QMS, while illegal catches have been estimated since 1990 (MPI, 2016a). Recreational catch is thought to be very small. While the CRA 6 stock appears to meet the medium risk guidepost – in that removals are monitored and one indicator of stock abundance is monitored to support a HCR – it is not clear that the stock meets the low risk guidepost – i.e. that abundance is regularly monitored with a level of accuracy and coverage consistent with the (generally understood) HCR. Accordingly, we have scored the stock medium risk.

All other stocks **LOW RISK**

All other CRA stocks are subject to regular integrated assessments, which support regular operations of their respective management procedures (e.g. MPI, 2016a; MPI, 2016b). Commercial removals from each stock are monitored with high precision through the compliance regime under the QMS, while other removals (e.g. recreational, customary, illegal) are estimated using a variety of surveys and other techniques (MPI, 2016a). Accordingly, these stocks have been scored low risk.

CRITERIA: (ii) There is an adequate assessment of the stock status.

(a) Stock assessment

CRA6 **PRECAUTIONARY HIGH RISK**

The most recent assessment of the CRA 6 stock was undertaken in 1996, using catches and abundance indices current up to the 1995–96 fishing year (MPI, 2016a). Simple surplus production and constant production models have been fitted to CRA 6 data since that time (Breen, 2009), although neither are considered reliable. Standardised CPUE is currently used as the indicator of stock health. Status relative to generic reference points in the HSS are unknown (MPI, 2016a). Given the lack of a recent integrated assessment and the uncertainty of status in relation to reference points, the stock does not appear to meet the medium risk SG. Nevertheless, the CPUE time series does not appear to indicate any serious sustainability concern with the stock and catches have remained within 10t of the TACC in recent years. Accordingly, we have scored this SI precautionary high risk.

All other stocks **LOW RISK**

All other CRA stocks are subject to regular integrated stock assessments which are appropriate to the stock and estimate status relative to a broad suite of reference points which are appropriate to the stock and can be estimated (e.g. see summary in MPI, 2016a). Assessments are typically undertaken using single-stock or two-stock versions of the multi-stock length-based model (MSLM, Haist et al. 2009) and fitted to data including seasonal standardised CPUE, length frequencies from observer and voluntary (logbook) catch sampling, and tag-recapture data. Model outputs estimate stock status against a range of analytically determined reference points (e.g. Bref, Bmsy, Bmin, SSBmsy). These stocks are scored low risk.

(b) Uncertainty and Peer review

CRA6 **PRECAUTIONARY HIGH RISK**

A formal assessment of the CRA 6 stock has not been undertaken since 1996.

All other stocks **LOW RISK**

Assessments for all other stocks identify the main sources of uncertainty and test sensitivity to uncertainty through a variety of techniques including undertaking multiple alternative models runs and Markov Chain Monte Carlo (MCMC) simulation (e.g. see summary in MPI, 2016a). Results of alternative model runs are presented along with the agreed base case. Peer-review of stock assessment models and management procedures occurs at the Rock Lobster Fisheries Assessment Working Group and at the November mid-year Fisheries Assessment Plenary.

PI SCORE	**LOW RISK – CRA2, CRA3, CRA4, CRA5, CRA8**

COMPONENT 2: Environmental impact of fishing

2A: Other Species

CRITERIA: (i) The UoA aims to maintain other species above the point where recruitment would be impaired (PRI) and does not hinder recovery of other species if they are below the PRI.

(a) Main other species stock status

All stocks **LOW RISK**

The intent of this scoring issue is to examine the impact of the UoA on 'main' other species taken while harvesting the target species. 'Main' is defined as any species which comprises >5% of the total catch (retained species + discards) by weight in the UoA, or >2% if it is a 'less resilient' species. The aim is to maintain other species above the point where recruitment would be impaired and ensure that, for species below PRI, there are effective measures in place to ensure the UoA does not hinder recovery and rebuilding.

Rock lobster potting is one of the most highly targeted fisheries in New Zealand (Breen, 2005). The pots are designed to be most effective for lobsters, so fish catch is incidental. Escape gaps provided for sublegal lobsters to escape also allow many fish and invertebrates to escape.

The levels of incidental catch landed from rock lobster potting were analysed for the period from 1989 to 2003 by Bentley et al (2005). Non-rock lobster catch landed ranged from 2 to 11 percent of the estimated rock lobster catch weight per QMA over this period (Table 3). MPI (2016a) note that these percentages are based on estimated catches only and it is likely that not all bycatch is reported (only the top five species are requested) and that the quality of the weight estimates will vary between species. There were 129 species recorded landed from lobster pots over this period.

Table 3: Percentage of catch-weight by species-code for each QMA for the period 1 Oct 1989 to 31 March 2003. (From Bentley et al, 2005)

Species code	CRA1	CRA2	CRA3	CRA4	CRA5	CRA6	CRA7	CRA8	CRA9
CRA	89.0	94.6	97.9	97.9	92.0	95.1	91.3	93.0	91.0
OCT	2.3	4.3	2.0	1.6	5.9	0.0	2.6	2.7	3.9
CON	0.3	0.1	0.0	0.2	0.8	1.0	0.8	2.1	2.3
BCO	1.4	0.0	0.0	0.0	1.0	0.8	3.0	1.0	0.9
TRU	0.0	0.0	0.0	0.0	0.0	2.5	0.1	0.1	0.0
PHC	1.9	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SPE	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.3	0.4
RCO	0.9	0.0	0.0	0.0	0.0	0.0	0.3	0.1	0.0
BUT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0
LEA	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.3
Other	4.2	0.5	0.1	0.2	0.3	0.5	1.2	0.5	1.1

In general, no non-target species or group in any of the QMAs meets the >5% threshold to be considered a 'main' other species, except for octopus in CRA5. None of the species comprising >2% of the overall catch are likely to be considered 'less resilient' and therefore qualify as 'main' other. Evidence from Bentley et al (2013) on retained species catches, also suggests non-target catch is very low (Figure 9).

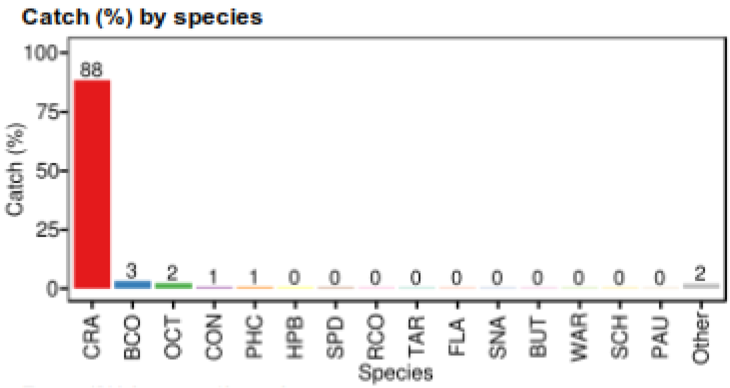

Figure 9: Retained species catch composition in the New Zealand rock lobster fishery between 1989-90 and 2012-13. (Source: Bentley et al, 2013)

Anecdotal evidence indicates that there is considerable variability in octopus catch rates across both seasons and areas, and that the octopus grouping may be made up of multiple species (primarily, *Octopus maorum* and *O. vulgaris*). Nevertheless, given the likelihood that the majority of catch is *O. maorum* (e.g. Breen, 2016) we have assessed this species as main other for the sake of conservatism.

While there have been no stock assessments of *O. maorum*, the available evidence suggests the fishery will have a limited impact on octopus stocks. An ecological risk assessment in the South Australian rock lobster fishery, which targets *J. edwardsii* using similar gear and has a similar bycatch of *O. maorum*, concluded that the fishery is likely to have either a negligible or low risk rating for octopus (PIRSA, 2011). Breen (2016) reported that catch rates of octopus in the New Zealand CRA4 fishery were lower than the South Australian fishery, probably because octopus have the ability to exit pots through escape gaps. Similar research in Western Australia also concluded the West Coast Rock Lobster Fishery was likely to have minimal impact on octopus populations as a result of octopus' ability to easily escape lobster pots, coupled with their short life span and fast growth rate (albeit this study was on different species - *Panuliris cygnus* and *O. tetricus*) (Hart et al, 2016).

On the basis of the relatively low catches of octopus, evidence from analogous fisheries indicating low or negligible impact on octopus populations and the resilient life history characteristics of *O. maorum*, it is probably highly unlikely that the stock either below PRI or that the fishery is hindering recovery. Nevertheless, we note the UoAs would be better placed against this indicator with more recent information on catch composition (retained and discarded) and more targeted analysis of impacts on any species comprising >5% of the catch in any CRA.

CRITERIA: (ii) There is a strategy in place that is designed to maintain or to not hinder rebuilding of other species; and the UoA regularly reviews and implements

(a) Management strategy in place

All stocks — **LOW RISK**

The strategy to manage main other species includes:

- Control on catch and effort through TACs and ITQs on QMS species;
- Monitoring through logbooks and catch returns;
- Monitoring through VMS; and
- Periodic assessments of QMS species through the NZ Plenary process.

In the case of the rock lobster fishery, gear design, and in particular mandatory escape gaps, are also likely to contribute to limiting the fishery's impact on non-target species.

Given the highly targeted nature of the fishery, these measures probably constitute at least a partial strategy that is expected to not hinder rebuilding of other species to levels above PRI. Nevertheless, as above, the fishery would be better placed to assess the need for, and usefulness, of a management strategy with more recent information on catch composition (retained and discarded).

(b) Management strategy evaluation

All stocks — **LOW RISK**

The evidence from Bentley et al (2005), Bentley et al (2013), Breen (2016) and studies on analogous fisheries from Australia with similar lobster pot/octopus interactions (PIRSA, 2011; Hart et al, 2016) provide some objective basis for confidence that the partial strategy will work.

(c) Shark-finning

NA

CRITERIA: (iii) Information on the nature and amount of other species taken is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage other species.

(a) Information

All stocks — **MEDIUM RISK**

While some quantitative information is available, it is unlikely to be sufficient to assess the impact of the UoAs on main other species with respect to status. Assuming *O. maorum* represents that only likely main other species, status is not well known and catch composition (retained and bycatch species) does not appear to be been independently monitored for many years. The fishery would be better placed against this indicator with a credible risk assessment of non-target species, supported where necessary by a short, directed observer study of bycatch of the type suggested by Breen (2005).

PI SCORE	LOW RISK – All stocks

2B: Endangered Threatened and/or Protected (ETP) Species

CRITERIA: (i) The UoA meets national and international requirements for protection of ETP species.
The UoA does not hinder recovery of ETP species.

(a) Effects of the UoA on populations/stocks

CRA6 — **MEDIUM RISK**

All other stocks — LOW RISK

There is limited published information on the interaction between the lobster fishery and protected species. From the available information, the main potential interactions are likely to be with seabirds and marine mammals.

Seabirds

MPI (2016a) report that recovery of shags from lobster pots has been documented in New Zealand.

A level 1 (qualitative) risk assessment of seabird interactions with various New Zealand fishing sectors in 2013 indicated that shags were at highest risk of interacting with the combined fish trap/pot fishery (Rowe, 2013). Greatest concern was identified for the Pitt Island shag, for which interactions were considered likely to occur occasionally (Table 4). There was also evidence to suggest that interactions are possible but uncommon for Chatham Island and pied shags, and possible but unlikely for king and Stewart Island shags. Pitt Island shags, Chatham Island shags and king shags are classified as Nationally Endangered. Pied shags and Stewart Island shags are listed as Recovering.

Table 4: Seabird species potentially at risk from the fish trap and potting fishery. (from Rowe, 2013)

COMMON NAME	EXPOSURE	CONSE-QUENCE	POTENTIAL RISK SCORE	RISK CATEGORY
Pitt Island shag	4	4	16	High
Chatham Island shag	3	4	12	Moderate
Pied shag	3	1	3	Low
King shag	2	4	8	Moderate
Spotted shag	2	1	2	Low
Stewart Island shag	2	2	4	Low
Chatham Island blue penguin	1	2	2	Low
Fiordland crested penguin	1	2	2	Low
Northern blue penguin	1	1	1	Negligible
Southern blue penguin	1	2	2	Low
White-flippered blue penguin	1	2	2	Low
Yellow-eyed penguin	1	2	2	Low
Little shag	1	1	1	Negligible
Little black shag	1	1	1	Negligible
Black shag	1	1	1	Negligible
Fluttering shearwater	1	1	1	Negligible
Hutton's shearwater	1	1	1	Negligible

Rowe (2013) reported that the risk scores indicated that Chatham Island shags and king shags were at moderate risk from the potting and trapping fishery, implying that some level of specific management is needed. Pitt Island shags scored a high potential risk value, suggesting that increases to current management are needed.

The most recent census of Chatham Island and Pitt Island shags in 2011 estimated a decline in the number of breeding colonies by 58% and 40% respectively, compared to an original census in 1997/8 (Debski et al, 2012). A range of land-based and at-sea pressures were identified including predation by natural predators and introduced pests, habitat loss and fishing related mortality. Because population declines were particularly steep at pest-free, protected outlying islands the authors concluded that at-sea factors were driving the decline although more research was needed to identify causal factors.

A survey of rock lobster fishers on the Chatham Islands (Bell 2012) reported no shag bycatch in the previous 5 years (2007/08 to 2011/12 fishing season), only 2 shag captures between 5-10 years ago (2001/02 to 2006/07 fishing season) and 18 shags caught more than 10 years ago (prior to 2000/01 season). All reported bycatch involved Pitt Island shag with no reports of Chatham Island shag being caught in pots. The fishers suggested the lack of reported shag captures in the past five years was attributable to changes in pot design and baiting methodologies (pots with smaller neck opening and smaller mesh; using 'snifters' rather than hanging baits).

The scoring is this SI is complicated by the anecdotal nature of the evidence of interaction rates, and the absence of independent verification. Bell (2012) concluded that "*there has been no recorded bycatch of Chatham Island shags and the historical levels of bycatch reported are unlikely to have been impacting on Pitt Island shag populations. However, the populations of both Chatham Island and Pitt Island shag have declined significantly. Without further study interpreting the causes of population declines is difficult*." For the purposes of this assessment, we have assumed that the outcomes of the Bell (2012) mean that the direct effects of the UA are 'known' and that they are likely to not hinder recovery of shag populations (i.e. medium risk). Nevertheless, we note that the evidence base is comparatively weak and in particular the evidence available to conclude that the UoA is 'highly likely' to not hinder recovery appears limited without some form of independent verification that new fishing techniques have eliminated shag bycatch.

Interactions with seabirds in the non-CRA 6 fisheries appears to be limited.

Marine mammals

MPI (2016a) report that from January, 2000 there have been 18 reported entanglements of 16 marine mammals attributed to commercial or recreational rock lobster pot lines from around New Zealand, mainly around Kaikoura (DOC Marine Mammal Entanglement Database, available for the DOC Kaikoura office). No mortalities were observed, although mortalities are likely to be caused by prolonged entanglement, and therefore might not be observed within the same area. Blue Planet Marine (2017) report that the majority of interactions have been with humpback whales, with smaller numbers of interactions with killer whales and southern right whales.

This level of interactions is probably highly unlikely to hinder recovery of marine mammal species.

CRITERIA: (ii) The UoA has in place precautionary management strategies designed to:

- meet national and international requirements; and
- ensure the UoA does not hinder recovery of ETP species.

Also, the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of ETP species

(a) Management strategy in place

All stocks **LOW RISK**

The strategic framework for managing protected species interactions in New Zealand fisheries currently includes:

- Legislation: the Fisheries Act, Wildlife Act, and Marine Mammals Protection Act
- The National Plan of Action—Seabirds (MPI 2013a)
- The National Plan of Action – Sharks (MPI 2013b)
- The Marine Conservation Services Programme

When impacts of fishing are such that they are causing an adverse effect on protected species, measures are to be taken pursuant to s 15 of the Fisheries Act to avoid, remedy or mitigate that effect. If a Population Management Plan has been approved by the Minister of Conservation under either the Wildlife Act 1953 or the Marine Mammals Protection Act 1978 the Minister responsible for fisheries must give effect to those plans when managing the effects of fishing.

The Department of Conservation and Ministry for Primary Industries also contract research, including:

- population monitoring protected species;
- research relating to fishing effects on protected species;
- research on measures to mitigate the adverse effects of commercial fishing on protected species.

All protected species interactions must be reported through mandatory MPI Protected Species Catch Return.

Within this framework, many of the CRA industry associations work to Codes of Practice or similar instruments designed to address potential ETP issues in their area. For example, the CRA6 Industry Association has been operating a seabird interaction code of practise since the issue of shag interactions was drawn to their attention in 2010 (Bell, 2012). CRA 5 commercial fishermen work to a voluntary code of practice to avoid marine mammal entanglements. The commercial fishermen in CRA 5 also cooperate with the Department of Conservation to assist releases when entanglements occur.

At the national level, the RLIC has also produced awareness raising material for fishers on whale identification, migratory routes and advice on techniques to avoid interactions and entanglement (RLIC, 2013). The Council has also developed Ocean Snap, and app that can send marine incident reports - including whale, dolphin, seabird sightings or strandings - using the camera and email functions on smartphones.

The NPOA-Seabirds reports that "*historical captures of shags in pot fisheries have been reported from the Chatham Islands, but based on fisher interviews this is reported by WMI [2012] as having been mitigated by changes in pot design*" (MPI, 2013). No additional measures are proposed.

Given the relatively low rates of interaction reported in the fishery, the measures above are likely to be considered a strategy to ensure the UoA does not hinder recovery of ETP species. The main uncertainty appears to be the cause of the decline in shag populations in CRA 6 and the extent to which potting is contributing. Nevertheless, we note this issue was considered in the NPOA-Seabirds and no specific management measures were adopted. Accordingly, we have scored this SI low risk.

(b) Management strategy implementation

All stocks **LOW RISK**

Low rates of interactions of interaction with marine mammals, low rates of mortality resulting from entanglement, and close cooperation between fishers and conservation officers (MPI, 2016a) provide an objective basis for confidence that the strategy will work for marine mammals.

For seabirds in CRA 6, much of the information indicating an absence of interactions in recent years is anecdotal, albeit generated through independent research (Bell, 2012). While this provides *some* evidence that the measures are being implemented successfully consistent with the low risk SG, the evidence base remains limited (and challenging to collect good information on given the rarity of interactions).

CRITERIA: (iii) 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.

(a) Information

All stocks **LOW RISK**

Some quantitative information is available on ETP species interactions, primarily through mandatory fisher reporting (e.g. MPI, 2016a) and fisher surveys (Bell, 2012).

Although the level of interactions in the fishery appears to be very low, there is limited independent evidence to verify fisher reporting. The fishery has never been subject to independent observer coverage. Breen (2005) noted that, at that stage, there was a need to collect better data on encounters with protected species to inform a credible risk assessment.

In the context of the various UoAs, the main uncertainty appears to be the level of seabird interactions in the CRA 6 fishery. We note that some (albeit anecdotal) quantitative data exists and this has been used to inform a strategy to manage impact through the NPOA-Seabirds. Accordingly, we have scored this SI low risk. Nevertheless, the fishery would be better placed with some mechanism to independently validate low reported rates of interaction and assess impacts on ETP species at the population level.

PI SCORE	**LOW RISK – All stocks**

2C: Habitats

CRITERIA: (i) The UoA does not cause serious or irreversible harm to habitat structure and function, considered on the basis of the area(s) covered by the governance body(s) responsible for fisheries management

(a) Habitat status MEDIUM RISK

Examples of "serious or irreversible harm" to habitats include the loss (extinction) of habitat types, depletion of key habitat forming species or associated species to the extent that they meet criteria for high risk of extinction, and significant alteration of habitat cover/mosaic that causes major change in the structure or diversity of the associated species assemblages (MSC, 2014). Further, MSC specifies that if a habitat extends beyond the area fished then the full range of the habitat should be considered when evaluating the effects of the fishery. The 'full range' of a habitat shall include areas that may be spatially disconnected from the area affected by the fishery and may include both pristine areas and areas affected by other fisheries.

Breen (2005) reports that lobster potting is a relatively benign method of fishing and direct effects are likely to be limited to impacts when a pot lands on the bottom. He notes that:

- "*on the mostly hard rock substrates, and certainly on soft substrates, there is little likelihood of harmful effects to the substrate itself. In Western Australia, concern was addressed about damage to limestone reefs. Prevalence of substrates likely to be damaged mechanically in New Zealand is unknown but probably small. Direct effects may occur on the animals and plants inhabiting the substrate. On soft substrates these would be mobile surface-dwellers such as starfish, which are remarkably hardy, and protruding burrowers such as horse mussels and sea pens. Damage to infauna is probably negligible*."
- "*On hard substrates, a wide variety of plants and animals might be involved. Fleshy macrophytes are very resilient and are probably not at risk; some fragile decumbent rhodophytes might be damaged. Animals that could be destroyed by a pot are very diverse, and range from sponges and corals (black and gorgonian corals) through nearly all the phyla. Some species might be locally important, such as black corals in Fiordland, brachipods in Paterson Inlet, pennatulids in the Narrows, bryozoans in parts of Tasman Bay, etc. Eno et al. (2001) studied effects of potting by direct diving observations, and concluded that even four weeks' intense potting had little effect on the species they selected for study, although one species of coral was damaged*."

MPI (2016a) reports that potting is usually assumed to have very little direct impact on non-target species, albeit no information exists regarding the benthic impacts of potting in New Zealand. Studies on the South Australian lobster fishery suggest limited benthic impact (e.g. Casement and Svane, 1999), while the most recent risk assessment of Western Australian Western Rock Lobster Fishery concluded the impacts are likely to be negligible or low (Stoklosa, 2013). Nevertheless, Breen (2005) suggests that additional finer scale effort information and more detailed information on habitats would be required to undertake fine scale assessments of potting benthic impact in New Zealand.

Accordingly, while it is probably at least likely (and in practice probably highly likely) that the UoA will not reduce habitat structure and function to the point of serious or irreversible harm, there is little detailed information from New Zealand and the fishery itself to support a conclusion of 'highly likely' at this stage. To that end, we have scored this SI medium risk.

CRITERIA: (ii) There is a strategy in place that is designed to ensure the UoA does not pose a risk of serious or irreversible harm to the habitats.

(a) Management strategy in place MEDIUM RISK

MPI (2016a) report that the only regulatory limitation on where lobster pots can be used is inside marine reserve boundaries (notwithstanding areas within Fiordland and Taputeranga which have been designated for commercial pot storage). The extent to which existing marine reserves mitigate against habitat impacts from potting is not known. Given the generally benign nature of the gear, it is probably likely that existing protection measures are sufficient to ensure the structure and function habitats are not reduced to the point of serious or irreversible harm, although there is limited information upon which to conclude this is highly likely.

(b) Management strategy implementation MEDIUM RISK

The measures are considered likely to work based on plausible argument and studies on analogous fisheries elsewhere (e.g. Casement and Svane, 1999), however there is little quantitative evidence directly from the fishery that the strategy is being implemented successfully.

CRITERIA: (iii) 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.

(a) Information quality LOW RISK

Inshore habitats within New Zealand's EEZ are relatively well mapped (e.g. DoC/MFish, 2011; DOC Maps[2]) and some more vulnerable habitats (e.g. protected corals) have been subject to intensive study (e.g. Baird et al., 2013). Given the relatively benign nature of the apparatus, this information is probably sufficient to understand the nature, distribution and vulnerability of the main habitats at a level of detail relevant to the nature of the fishery.

(b) Information and monitoring adequacy MEDIUM RISK

Information is adequate to broadly understand the nature of the gear on main habitats (through inference from studies in analogous fisheries), however it is not clear the information base is sufficient to allow for the main impacts on the main habitats and to detect increased risk. Likewise, there is a need for finer scale spatial analysis of effort patterns in relation to potentially vulnerable habitats to adequately understand risk.

PI SCORE	MEDIUM RISK – All stocks

2D: Ecosystems

CRITERIA: (i) The UoA does not cause serious or irreversible harm to the key elements of ecosystem structure and function.

(i)(a) Ecosystem Status

CRA6 MEDIUM RISK

All other stocks LOW RISK

Serious or irreversible harm in the ecosystem context should be interpreted in relation to the capacity of the ecosystem to deliver ecosystem services (MSC, 2014). Examples include trophic cascades, severely truncated size composition of the ecological community, gross changes in species diversity of the ecological community, or changes in genetic diversity of species caused by selective fishing.

MPI (2016a) reports that "*predation by rock lobsters has been implicated in contributing to trophic cascades in a number of studies in New Zealand and overseas (Mann and Breen 1972; Babcock, Kelly et al 1999; Edgar and Barrett 1999). For example, in Leigh marine reserve rock lobsters and snapper preyed on urchins, the densities of urchins decreased and kelp beds re-established in the absence of urchin grazing (Shears and Babcock 2003). This implies that rock lobster fishing is one of a number of factors that may alter the ecosystem from one more dominated by kelp beds to one more dominated by urchin barrens. Trophic cascades are hard to demonstrate however, as controlled experiments are difficult, food webs are complex and environmental factors are changeable (Breen 2005).*"

MPI (2015) report that observed changes in community dynamics in northern marine reserves (Babcock et al 1999; Shears & Babcock 2002, 2003; Salomon et al 2008; Babcock et al 2010; MPI, 2016a) are consistent with the results of ecosystem models of the role of rock lobsters in New Zealand rocky reef ecosystems, using both qualitative (Beaumont et al 2009; in MPI, 2016a) and quantitative frameworks (Pinkerton et al 2008; Eddy et al 2014; Pinkerton 2012 in MPI, 2016a). Nevertheless, Shears et al (2008) concluded that existence of potential trophic cascades is likely to be highly context dependent (e.g. (e.g. region, site, depth). Schiel (2013) reported that despite the removal of top predators, urchin outbreaks are comparatively rare and patchy in southern waters and that "*taken together, it appears that predator urchin interactions are comparatively weak in much of southern New Zealand and, consequently, trophic cascades have not been in evidence in this region*".

Breen (2005) also reports that the process observed in many parts of the world in which sea urchins have cleared plants from shallow habitats is reversible. That is, when sea urchins are removed by predators or experimentally, when they die off, algae return.

Given the highly targeted nature of the fishery, limited impacts on ETP species and likely limited impacts on habitats, the main ecosystem impacts of the UoAs are likely to be largely restricted to the removal of the target species. In 5 of the 6 QMAs assessed, lobster stocks are in a healthy position with current biomass at MSY levels or above. Given the health of the stocks and the evidence that changes in trophic impacts are reversible, in these QMAs, there is a sound argument that the UoAs are probably highly unlikely to disrupt the key elements underlying ecosystem structure and function to the point of serious or irreversible harm. In CRA6 there is less evidence to indicate that stocks are in a healthy position, however there is a plausible argument that serious or irreversible impacts are at least unlikely.

CRITERIA: (ii) There are measures in place to ensure the UoA does not pose a risk of serious or irreversible harm to ecosystem structure and function.

(a) Management Strategy in place LOW RISK

The New Zealand Fisheries Act 1996 s8 provides for "the utilisation of fisheries resources while ensuring sustainability." Ecosystem-based management is achieved through a multi-layered approach that considers fishery management (e.g. QMS), ETP management (protected species and related initiatives such as NPOA seabirds, the protection of marine mammals), and habitat considerations (e.g. MPAs, BPAs).

In the case of the rock lobster fishery, the main potential ecosystem impacts are likely to trophic effects as a result of the removal of the target species. To that end, the main strategy to limit ecosystem impacts is to ensure target stocks are maintained at levels above MSY on the understanding that healthier stock sizes will maintain a more natural functional role in the ecosystem. Five of the six

[2] http://maps.doc.govt.nz/mapviewer/index.html?viewer=docmaps

stocks assessed use formal management procedures to guide TAC setting, with the aim of moving or maintain stock abundance well above agreed reference levels (MPI, 2016a). In addition to the use of relatively benign apparatus and isolated spatial closures (marine reserves), this is likely to be considered at least a partial strategy which takes into account available information and is expected to ensure the UoAs do not cause serious or irreversible harm to key elements of ecosystem structure and function. For CRA6 the evidence is less clear, albeit recent catch levels have been maintained within estimates of MCY and the Fisheries Act and HSS provide default requirements to maintain the stock above MSY. Accordingly, we have also scored CRA 6 low risk, although we note the UoA would be better placed with a formal management procedure and evidence that the stock is being maintained at levels consistent with the Act/HSS.

(b) Management Strategy implementation **LOW RISK**

The results of stock assessments in the five UoAs utilising formal management procedures provide some objective basis for confidence that stocks remain in a healthy position, and by default lobsters are likely to have maintained their functional role in the ecosystem. CPUE analysis and previous estimates of MCY also provide some evidence for CRA6 albeit considerably weaker.

CRITERIA: (iii) There is adequate knowledge of the impacts of the UoA on the ecosystem.

(a) Information quality **LOW RISK**

New Zealand's coastal waters are relatively well-studied (e.g. Shiel, 2013; MPI, 2015), and information is adequate to broadly understand the key elements of the ecosystem and detect increased risk to them. The potential trophic impacts of lobster fishing have been comparatively well-studied (see references above).

(b) Investigations of UoA impacts **LOW RISK**

The main impacts from the UoAs can be inferred from existing information (e.g. stock assessments), and some (e.g. trophic cascades) have been investigated in detail (see references above).

PI SCORE	LOW RISK - All stocks

COMPONENT 3: Effective management

3A: Governance and Policy

CRITERIA: (i) The management system exists within an appropriate and effective legal and/or customary framework which ensures that it:

- Is capable of delivering sustainability in the UoA(s)
- Observes the legal rights
- Created explicitly or established by custom of people dependent on fishing for food or livelihood; and
- Incorporates an appropriate dispute resolution framework.

(a) Compatibility of laws or standards with effective management **LOW RISK**

The 1996 Fisheries Law and subsequent amendments provide a binding legislative and legal framework for delivering the objectives of Components 1 and 2. The law identifies and sets requirements for cooperation among the parties involved in fishing activities.

The legal system transparently deals with resolution of legal disputes, as demonstrated by the protracted negotiations and court cases that settled the Maori claims. The resolution demonstrated that the system is effective and has been tested.

(b) Respect for Rights **LOW RISK**

Ackroyd et al (2017) report that "*MPI is responsible for the administration of the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992, which implements the 1992 Fisheries Deed of Settlement under which historical Treaty of Waitangi claims relating to commercial fisheries have been fully and finally settled. The Ministry is also responsible for the Maori Fisheries Act 2004, which provides that the Crown allocates 20% of quota for any new quota management stocks brought into the QMS to the Treaty of Waitangi Fisheries commission. For non-commercial fisheries, the Kaimoana Customary Fishing Regulations 1998 and the Fisheries (South Island Customary Fishing) Regulations 1998 strengthen some of the rights of Tangata Whenua to manage their fisheries.*

These regulations let iwi and hapü manage their non-commercial fishing in a way that best fits their local practices, without having a major effect on the fishing rights of others.

The management system therefore has a mechanism to formally commit to the legal rights created explicitly or established by custom of people dependent on fishing for food and livelihood in a manner consistent with the objectives of MSC Principles 1 and 2."

CRITERIA: (ii) The management system has effective consultation processes that are open to interested and affected parties. The roles and responsibilities of organisations and individuals who are involved in the management process are clear and understood by all relevant parties.

(a) Roles and Responsibilities **LOW RISK**

The Minister responsible for the Fisheries Act, the Ministry of Primary Industries (responsible for effective fishery management) and the Department of Conservation (responsible for conservation issues such as ETP species and MPAs), are the key government agencies involved in the management process. The National Rock Lobster Management Group (NRLMG) is the primary advisor to the Minister on catch limit, regulatory and other management actions that apply specifically to rock lobster fisheries. The NRLMG is a national-level, multi-stakeholder group comprising representatives of customary, recreational and commercial fishing sectors and MPI. The NRLMG was first established in 1992. At the industry level, the RLIC provides representation services to rock lobster quota owners, and in 1997 became an accredited research provider to the (then) Minister of Fisheries. Each of these bodies has clearly and explicitly defined roles.

(b) Consultation Process **LOW RISK**

The Fishery Act requires consultations among stakeholders with an 'interest' in the decision to be made, and the Stakeholder Consultation Process Standard provides guidelines for implementing the consultations. The consultation regularly seeks and accepts information, explains the use and results, and provides opportunity and encouragement for engagement. The Minister of Fisheries is required to consult with those classes of persons having an interest (including, but not limited to, Maori, environmental, commercial and recreational interests) in the stock or the effects of fishing on the aquatic environment in the area concerned.

In practice, MPI has a number of forums that provide for interested party participation in the assessment and management of the fishery. All stakeholders are actively encouraged to participate in the meetings or to provide submissions. These forums include specific working groups on management and research issues. Commercial, customary, and environmental fishery interests participate in each of these processes. In addition, interested groups representing environmental and wildlife interests, along with local community interests, are given opportunities to participate in these discussions or provide submissions.

In the rock lobster fishery, decisions to vary TACs are made under section 13(4) of the Act; therefore, the consultation requirements of section 12(2) apply (e.g. MPI, 2016b). Decisions to vary TACCs are made under section 20(2), to which the consultation requirements of section 21(2) apply. These provisions require consultation with such persons or organisations representative of those classes of persons having an interest in the stock or the effects of fishing on the aquatic environment in the area concerned, including Maori, environmental, commercial and recreational interests. MPI posts consultation documents on the MPI website and alerts stakeholders to this through a letter sent to numerous tangata whenua, recreational and commercial contacts.

CRITERIA: (iii) The management policy has clear long-term objectives to guide decision making that are consistent with the outcomes expressed by Components 1 and 2, and incorporates the precautionary approach.

(a) Objectives **LOW RISK**

Long-term objectives to guide decision making are set out in the Fisheries Act, in Fisheries 2030 and other supporting documents (e.g. the Harvest Strategy Standard). These documents provide clear long-term objectives to guide decision-making, consistent with Components 1 and 2. The Fisheries Act (s10) also requires the application of a precautionary approach to decision making: "*All persons exercising or performing functions, duties, or powers under this Act, in relation to the utilisation of fisheries resources or ensuring sustainability, shall take into account the following information principles:*

a) Decisions should be based on the best available information;
b) Decision makers should consider any uncertainty in the information available in any case;
c) Decision makers should be cautious when information is uncertain, unreliable, or inadequate; and
d) *The absence of, or any uncertainty in, any information should not be used as a reason for postponing or failing to take any measure to achieve the purpose of this Act."*

Thus, there are clear long-term objectives that guide decision-making, consistent with Components 1 and 2 and the precautionary approach is explicit within management policy.

PI SCORE	LOW RISK

3B: Fishery Specific Management System

CRITERIA: (i) The fishery specific management system has clear, specific objectives designed to achieve the outcomes expressed by Components 1 and 2.

(a) Objectives **MEDIUM RISK**

The NRLMG's stock management goal is for all rock lobster fisheries: "*to be managed and maintained at or above the assessed and agreed reference levels, using a comprehensive approach that recognises a range of customary Maori, amateur, commercial and environmental concerns and benefits*". For the five of the 6 CRAs operating under formal management procedures, the goal is given practical expression through the MP. For CRA 6, the goal is achieved by setting TACs consistent with the intent of the Act and HSS. Together with the objectives outlined in the Fisheries Act and Fisheries 2030, these measures arguably provide short and long term objectives consistent with Component 1.

While objectives broadly consistent with Component 2 are specified in the Act and Fisheries 2030, and are therefore implicit in the fishery specific management system, explicit short and long term objectives consistent with Component 2 do not appear to be in place at this stage. Accordingly, we have scored this SI medium risk.

CRITERIA: (ii) The fishery specific management system includes effective decision making processes that result in measures and strategies to achieve the objectives and has an appropriate approach to actual disputes in the fishery.

(a) Decision making **LOW RISK**

Sections 10, 11, and 12 of the Fisheries Act establish the requirements for the decision-making process, and Section 10 further requires the use of best available information for all decisions. This results in measures and strategies to achieve the fishery-specific objectives. The Fisheries Act requirement for best available information leads to scientific evaluation in advance of decisions. The Fisheries Act further requires consultation with such persons or organisations as the Minister considers are representative of those classes of persons having an interest in the stock or the effects of fishing on the aquatic environment in the area concerned including Maori, environmental, commercial, and recreational interests.

The MPI ensures that the Minister is provided with analysed alternatives for consideration before making any decisions (information is both from within and outside the Ministry [stakeholders, science]). The feedback process is formalised, involving planning, consultation, project development, and scientific enquiry. The Initial Position Paper/Final Advice Paper process highlights the extent of consultation, engagement and transparency of the decision making process. Thus, decision-making processes respond to serious and other important issues identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take account of the wider implications of decisions.

(b) Use of the Precautionary approach **LOW RISK**

The precautionary approach must be followed by MPI. Section 10 of the Fisheries Act Information principles states: "*All persons exercising or performing functions, duties, or powers under this Act, in relation to the utilisation of fisheries resources or ensuring sustainability, shall take into account the following information principles:*

a) Decisions should be based on the best available information:
b) Decision makers should consider any uncertainty in the information available in any case:
c) Decision makers should be cautious when information is uncertain, unreliable, or inadequate:
d) *The absence of, or any uncertainty in, any information should not be used as a reason for postponing or failing to take any measure to achieve the purpose of this Act*."

(c) Accountability and Transparency **LOW RISK**

Information on the fishery's performance is produced annually through the MPI Fisheries Assessment Plenary process and is available on the MPI website. Scientific and other research reports commissioned by MPI are also available on the Ministry website. Information on proposed management changes are published through Initial Position Paper which allow for stakeholders to comment. MPI's Final Advice Paper to the Minister is also publicly available together with a summary of submissions and alternative policy options. Feedback on any actions or lack of action is provided to stakeholders through a variety of forums, as well as directly through published decision letters of the Minister (e.g. Guy, 2014; 2016).

Disclosure of information can be requested from the Ministry, under the Official Information Act. Information is released except when it is decreed by the Minister to be commercially sensitive or breaches confidentiality between the parties.

CRITERIA: (iii) Monitoring, control and surveillance mechanisms ensure the management measures in the fishery are enforced and complied with.

(a) MCS Implementation **LOW RISK**

MPI operates a comprehensive monitoring control and surveillance system including:

- fishing permit requirements;
- fishing permit and fishing vessel registers;
- vessel and gear marking requirements;
- fishing gear and method restrictions;
- vessel inspections;
- control of landings (e.g. requirement to land only to licensed fish receivers);
- auditing of licensed fish receivers;
- monitored unloads of fish;
- information management and intelligence analysis;
- analysis of catch and effort reporting and comparison with landing and trade data to confirm accuracy;
- boarding and inspection by fishery officers at sea; and
- aerial and surface surveillance.

In addition, MPI has a fishery outreach programme of informed and assisted compliance, in which enforcement agents work with the industry in a proactive way to ensure understanding of regulations and to prevent infractions (Ackroyd and McLoughlin, 2017). In combination with at-sea and air surveillance supported by the New Zealand joint forces, vessel activity can be monitored and verified to ensure compliance with regulations and with industry-agreed codes of practice.

While statistics on the rock lobster fishery specifically were not found, it is clear that the MPI MCS system has demonstrated an ability to enforce relevant management measures. For example, Heron (2016) reports that MPI undertakes about 300 fishing related prosecutions per year with (ordinarily) over 80% or more resulting in convictions.

(b) Sanctions and Compliance **LOW RISK**

For offences against the Fisheries Act 1996 or any of the Fisheries Regulations, the offender has to satisfy a reverse onus and establish that the offence was outside their control, that they took reasonable precautions and exercised due diligence to avoid the contravention, and, where applicable, they returned fish that was unlawfully taken and complied with all recording and reporting requirements. A wide range of sanctions from fines ($250 to 500,000) and imprisonment, forfeiture of catch and potential forfeiture of vessel, to prohibition from participating in fishing in the future constitute an effective deterrent to offenses and lead to industry compliance.

To meet the low risk SG against this SI, sanctions to deal with non-compliance must exist and some evidence must exist that fishers comply with the management system under assessment including, where required, providing information of importance to the effective management of the fishery. In the first instance, it is clear that sanctions to deal with non-compliance exist for a range of offences, and these sanctions are regularly applied by MPI (see for example, Heron, 2016). It is also clear that fishers provide information through catch returns of importance to the effective management of the fishery.

Nevertheless, MPI also acknowledge that some level of illegal catch exists through non-compliance by each of the three main fishing sectors, as well as through poaching. While estimates of illegal take in some CRAs are minimal in the context of the TAC (e.g. CRA 7 – 1t, CRA 8 – 3t), others are more substantial. For example, in CRA 3, MPI have advised that an annual estimated illegal harvest of 89.5t should be used for stock assessments, around 23% of the TAC. Similarly, the illegal harvest estimate used for CRA 2 (88t) is around 21% of the TAC (416.5t). MPI (2015a) notes that the RLFAWG members have little confidence in the estimates of illegal catch because the estimates cannot be verified.

On the basis that sanctions to deal with non-compliance exist and fishers provide information of importance to the management of the fishery, we have scored this SI low risk. Nevertheless, we note that relatively high and uncertain estimates of illegal take for some UoAs weaken the evidentiary base for this conclusion.

(c) Systematic non-compliance

Limited evidence is available in the extent of compliance specifically in the rock lobster fisheries.

CRITERIA: (iv) There is a system for monitoring and evaluating the performance of the fishery specific management system against its objectives.
There is effective and timely review of the fishery specific management system.

(a) Evaluation coverage **LOW RISK**

Mechanisms exist to evaluate key parts of the management including extensive simulating testing of management procedures to support TAC setting. The management system also undergoes annual review through the Plenary reporting process.

(b) Internal and/or external review **LOW RISK**

The fishery management system has internal and external review through the Fisheries 2030, Statements of Intention, management procedures, TAC setting and Plenary reporting process. The Ministry implements a comprehensive peer-review process for all science research that is used to inform fisheries management decisions.

PI SCORE	**LOW RISK**

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