Seafood Risk Assessment

New Zealand Blue Cod Fishery

Prepared for the OpenSeas Programme

Assessment Summary

New Zealand Blue Cod Fishery	Unit/s of Assessment:	
	Product Name/s:	***Blue cod***
	Species:	*Parapercis colias*
	Stock:	New Zealand BCO4, BCO5
	Gear type:	Pot
	Year of Assessment:	2017

Fishery Overview

This summary is adapted from MPI (2017):

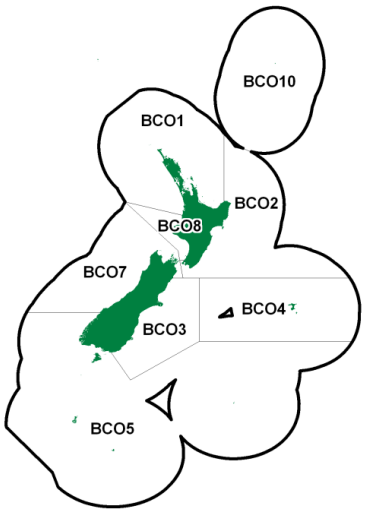

Figure 1: Management areas for the New Zealand blue cod fishery.

Blue cod is a bottom-dwelling species endemic to New Zealand. The species is taken predominantly in inshore domestic fisheries with very little deepwater catch. The major commercial blue cod (BCO) fisheries in New Zealand are off Southland (BCO5) and the Chatham Islands (BCO4), with smaller but regionally-significant fisheries off Otago, Canterbury, the Marlborough Sounds, and Wanganui. In the past, many blue cod fishers were primarily rock lobster fishers. Therefore, the amount of effort in the blue cod fishery tended to depend on the success of the rock lobster season, with weather conditions in Southland affecting the number of "fishable" days.

Blue cod are found at a depth of up to 150 m. Spawning occurs in late winter and spring within inshore and mid-shelf waters. Length at maturity varies by location. In Southland, maturity is reached at 26-28 cm but is 10-19 cm in Northland (BCO1) and 21-26 cm in Marlborough Sounds (BCO7). Blue cod have also been shown to be protogynous hermaphrodites, with individuals over a large length range changing sex from female to male (Carbines 1998). The maximum recorded age for this species is about 32 years.

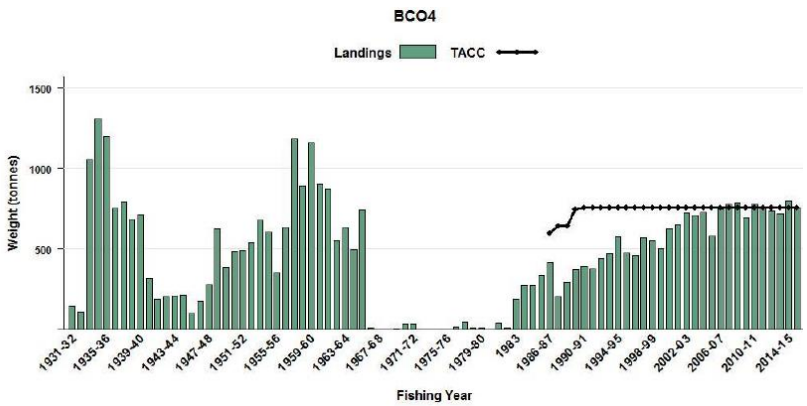

Figure 2: Catch history and TACC for New Zealand blue cod from BCO4.

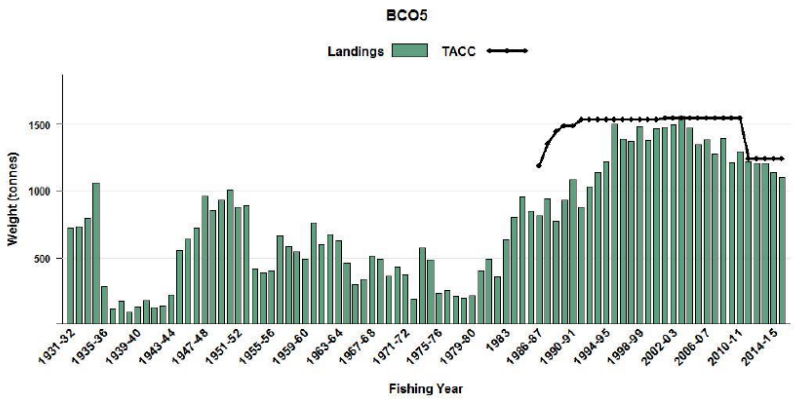

Figure 3: Catch history and TACC for New Zealand blue cod from BCO5.

Blue cod are generally the most important recreational finfish in Marlborough, Otago, Canterbury, Southland and the Chatham Islands. Blue cod are taken predominantly by line fishing, but also by longlining, set netting, potting and spearfishing.

Scoring

Performance Indicator	BCO4	BCO5
COMPONENT 1		
1A: Stock Status	LOW RISK	LOW RISK
1B: Harvest Strategy	MEDIUM RISK	LOW RISK
1C: Information and Assessment	LOW RISK	LOW RISK
OVERALL	LOW RISK	LOW RISK
COMPONENT 2		
2A: Non-target Species	MEDIUM RISK	MEDIUM RISK
2B: ETP Species	LOW RISK	LOW RISK
2C: Habitats	LOW RISK	LOW RISK
2D: Ecosystems	LOW RISK	LOW RISK
OVERALL	LOW RISK	LOW RISK
COMPONENT 3		
3A: Governance and Policy	LOW RISK	LOW RISK
3B: Fishery-specific Management System	LOW RISK	LOW RISK
OVERALL	LOW RISK	LOW RISK

Summary of main issues

- Relative exploitation rate was above the overfishing threshold for BCO4 for a number of years from 2008-09, but has since declined below the threshold in 2013-14.
- There is limited information on non-target species impacts in the blue cod fishery, albeit impacts are probably minimal.
- There are no fishery specific management objectives at present, although a National Blue Cod Strategy is currently under development by MPI.

Outlook

BCO4

Component	Outlook	Comments
Target species	Stable	Although variable, recent levels of fishing intensity have been at or around F_{MSY}.
Environmental impact of fishing	Stable	No major changes are expected to P2 risk scoring, although the introduction of the Integrated Electronic Monitoring and Reporting System (IEMRS) should improve understanding of catch composition and allow more informed assessments of the impact of the fishery on non-target species.
Management system	Improving	A National Blue Cod Strategy is currently being developed through MPI which may result in fishery specific objectives.

BCO5

Component	Outlook	Comments
Target species	Stable	Stock projections indicate that at the current TACC and recruitment at recent levels the BCO 5 biomass is unlikely to change much over the next 10 years.
Environmental impact of fishing	Stable	No major changes are expected to P2 risk scoring, although the introduction of the Integrated Electronic Monitoring and Reporting System (IEMRS) should improve understanding of catch composition and allow more informed assessments of the impact of the fishery on non-target species.
Management system	Improving	A National Blue Cod Strategy is currently being developed through MPI which may result in fishery specific objectives.

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Disclaimer

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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

BCO4 **LOW RISK**

The BCO4 stock assessment was last updated in 2015 using standardised CPUE (MPI, 2017). The stock was assessed against reference points consistent with the New Zealand Harvest Strategy Standard (MFish, 2008), namely:

- Interim target – B_{MSY} proxy based on mean CPUE for the period 2002-2003 to 2013-2014 (a period with high yield when both catch and CPUE were stable) (Figure 4, orange line)
- Soft limit – 50% B_{MSY} proxy (Figure 4, purple line)
- Hard limit – 25% B_{MSY} proxy (Figure 4, grey line)
- Overfishing threshold – F_{MSY} proxy based on mean relative exploitation rate for the period 2002-2003 to 2013-2014

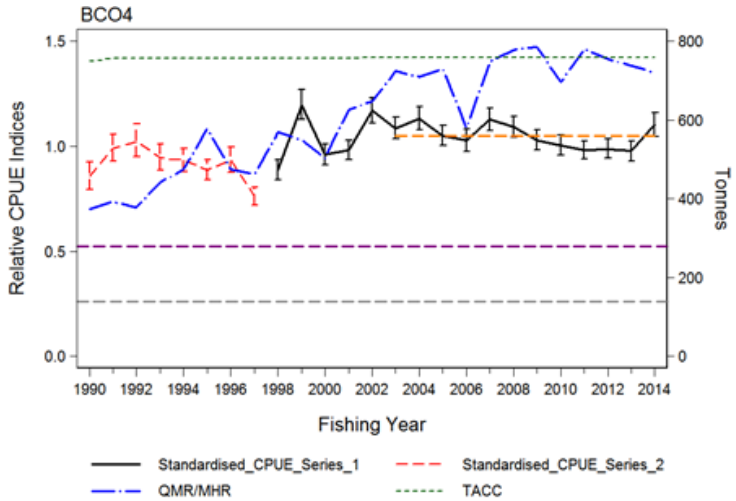

Figure 4: BCO4 standardized CPUE plotted as two series: 1990-1997 and 1998-2014. Source: MPI 2017

Standardised CPUE has fluctuated without trend since the late 1990s (Figure 4). From 2006/07 to 2012/13 there was a decline in the index, although this was almost fully reversed by a large increase in the index in 2013/14. From 2002 to 2014, CPUE has fluctuated at or around the interim B_{MSY} target level. MPI (2017) conclude the stock is "about as likely as not" (40-60%) to be at or above target, and very unlikely (<10%) to be below the soft limit. Accordingly, it is highly likely that the stock is above the point of recruitment impairment (PRI) and likely to be fluctuating at or around a level consistent with MSY.

BCO5 **LOW RISK**

The BCO5 fishery assessment was last updated in 2013. The assessment was based on a length-based model with Bayesian estimation of posterior distributions. Reference points are:

- Interim target – 40% B_0
- Soft limit – 20% B_0
- Hard limit – 10% B_0
- Overfishing threshold – F_{MSY}

B_{2013} was estimated to be 39.4% of B_0 (Figure 5). B_{2013} is very unlikely (<10%) to be below the soft limit and exceptionally unlikely (<1%) to be below the hard limit. MPI (2017) concludes that the stock is "as likely as not" (40-60%) to be at or above the target reference level and that it is unlikely (<40%) that overfishing is occurring. The biomass has been slowly decreasing since 2000 whereas fishing intensity has remained relatively constant since 2000. Given the stock is highly likely to be above the PRI and likely to be fluctuating at or around a level of consistent with BMSY we have scored this SI low risk.

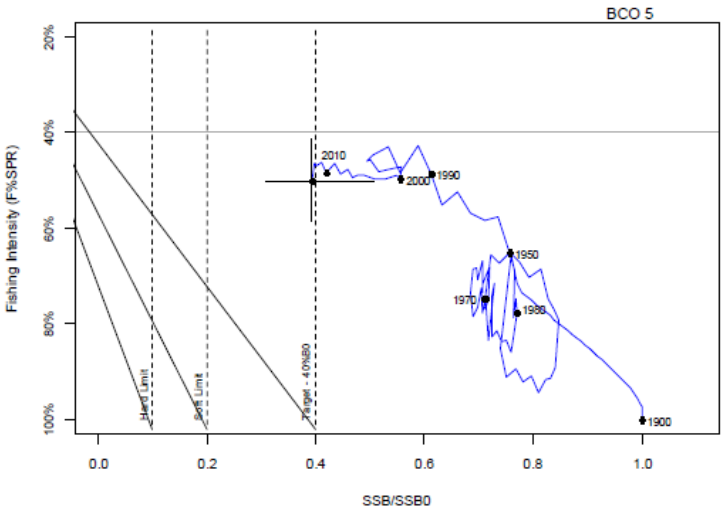

Figure 5: Trajectory of fishing intensity (F%SPR) and spawning biomass (%B_0) for BCO5 for 1990-2012. The 2012 90% CI is shown by the crossed lines. Source: MPI 2017

PI SCORE	LOW RISK - BCO4, BCO5

1B: Harvest Strategy

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

(a) Harvest Strategy

The harvest strategy in the commercial blue cod fisheries consists of:

- Catch controls through TACs and ITQs;
- Disincentives to over-catch through application of deemed values;
- Gear restrictions (including a minimum 48 mm mesh size was introduced to BCO 5 in 1994 to reduce catch of undersized blue cod);
- Monitoring through logbooks and catch returns;
- Periodic review of stock status and recommended TAC levels through the MPI Working Group process.

TACs and TACCs are set according to the NZ Harvest Strategy Standard which establishes default target (25% - 45% B_0, depending on the productivity of the stock), soft limit (20% B_0) and hard limit (10% B_0) reference points which guide Ministry advice to the Minister (MFish, 2008; MFish, 2011). Under the Standard, TACs are set at levels that aim to maintain biomass at levels consistent with the Target Reference Point (TRP), a breach of the soft limit triggers a requirement for a formal, time-constrained rebuilding plan and a breach of the hard limits leads to consideration for closure.

The main methods used to manage recreational harvests of blue cod are minimum legal size limits (MLS), method restrictions and daily bag limits (MPI, 2017). Daily bag limits are specified as either blue cod specific (DL) or a combined species limit (CDL). In addition, there have been temporary and seasonal closures in the Marlborough Sounds and several Fiordland Sounds. An allowance is made in the TAC for recreational harvests. Periodic estimates are made of recreational harvests.

MPI is also currently working on a National Blue Cod Strategy (https://www.mpi.govt.nz/law-and-policy/legal-overviews/fisheries/national-blue-cod-strategy/), which is intended to:

- Provide an overarching, consistent management framework
- Improve fisheries under pressure
- Maintain and enhance well-performing fisheries.

BCO4 MEDIUM RISK

The TACC in BCO 4 has remained static since the early 1990s, although catches have generally increased over the same period and have slightly exceeded the TACC in some recent years (Figure 2). Relative exploitation rate has declined since 2010–11 and in 2013–14 was below the overfishing threshold (F_{MSY} proxy based on mean relative exploitation rate for the period 2002–03 to 2013–14) (Figure 6). While there is limited evidence that the harvest strategy is responsive to the state of the stock, and fishing intensity has exceeded the overfishing threshold in some recent years, MPI (2017) conclude that the current catch and TACC are unlikely (< 40%) to cause the stock to decline. Accordingly, the harvest strategy is expected to achieve the stock management objectives reflected in criteria 1A(i).

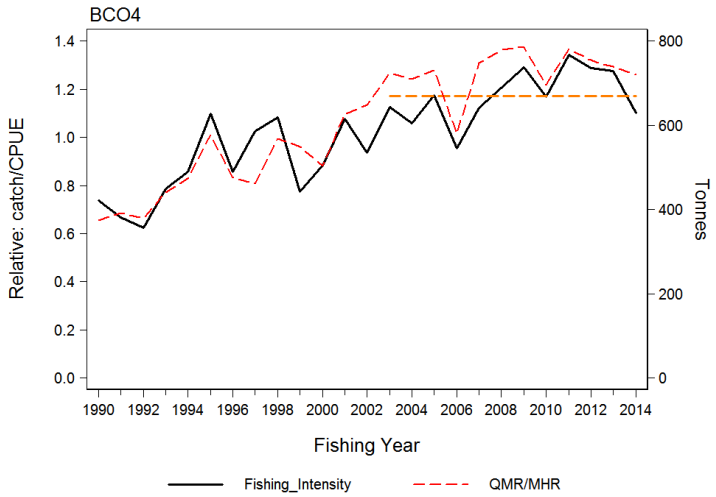

Figure 6: BCO4 fishing intensity (=catch/CPUE). The red line represents landings. Orange line = F_{MSY} Source: MPI 2017

BCO5 **LOW RISK**

The TACC for BCO 5 was effectively stable from the early 1990s at 1536-1548t until 2011-12 when it was reduced by 20% to 1239t. MPI (2017) conclude that it is very unlikely (<10%) that current catch levels will cause overfishing to commence.

Stock projections indicate that under the assumptions of commercial catch at the current TACC and recruitment at recent levels the BCO 5 biomass is unlikely to change much over the next 10 years (MPI, 2017). Recruitments closer to the long-term average or a reduction in catch from the current TACC results in slight increases in biomass and an increase in catch above the TACC results in a slight decrease in biomass. With catches at the current TACC, the probability of the stock being less than either the soft or hard limit over the next five years is negligible.

Given historical TACC adjustments, the harvest strategy appears responsive to the state of the stock and all of the elements work together toward achieving the stock management objectives reflected in criteria 1A(i).

(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 **LOW RISK**

Each of the UoAs is covered by the requirements of the *Fisheries Act 1996* to maintain stocks at levels capable of producing MSY or higher [e.g. sub-section 13(2A) states that "if the Minister considers that the current level of the stock or the level of the stock that can produce the maximum sustainable yield is not able to be estimated reliably using best available information, the Minister must … (c) set a total allowable catch … (ii) that is not inconsistent with the objective of maintaining the stock at or above, or moving the stock towards or above, a level that can produce the maximum sustainable yield." The Harvest Strategy Standard, which requires QMS stocks to be maintained at or above a target equivalent to B_{MSY}, and above a soft limit equating to ½ B_{MSY} (MFish, 2008). The Standard requires that target and limit biological reference points be set for all QMS fishstocks but is flexible about the means by which this is achieved. The intention is to make best use of available information for each individual stock.

For both UoAs, the harvest strategy has the key elements needed to ensure that exploitation is reduced as PRI is approached; a sound and measurable index of relative biomass, a suite of performance measures based on these estimates of relative biomass and a TACC to control harvest levels. While there is no formal mathematical harvest control rule (HCR) for these stocks, there is a process in place to identify, examine, and respond to issues of decline. TACC reductions in BCO 5 provide some evidence that the management system is willing to reduce exploitation as PRI is approached. Therefore, we have scored these UoAs as low risk.

PI SCORE	LOW RISK – BCO5
	MEDIUM RISK – BCO4

1C: Information and Assessment

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

(a) Range of information **LOW RISK**

MPI (2017) report that tagging experiments suggest that blue cod populations may be geographically isolated from each other, and there may be several distinct populations within each management area (particularly those occurring in sounds and inlets). In BCO5, blue cod in Statistical Areas 025, 027 and 030 of BCO 5 are treated as a unit stock. Dusky Sound and Patterson Inlet are assumed to contain discreet populations of BCO, which are monitored with potting surveys. Nevertheless, MPI (2017) concluded there was no data that would alter current stock management boundaries. Good information on fleet composition is available through QMS

monitoring, as well as periodic recreational fishing surveys (MPI, 2017). The biology of blue cod is relatively well studied, with feasible estimates of many key life history parameters (e.g. age, natural mortality). The available information has been sufficient for the development of a fully quantitative stock assessment for blue cod in BCO 5 and a credible standardised CPUE in BCO4. This information is sufficient to support the harvest strategy.

(b) Monitoring and comprehensiveness **LOW RISK**

In the commercial sector, removals from the UoA are closely monitored through the QMS reporting arrangements, while recreational removals are estimated through periodic surveys (MPI, 2017). Stock abundance in BCO4 is monitored through standardised commercial CPUE analysis, most recently in 2015. Recent commercial catch and effort data underpinning the standardised CPUE index were rated high quality by the relevant working group (MPI, 2017). In BCO5, abundance of the unit stock in Statistical Areas 025, 027 and 030 (comprising around 92% of recent commercial landings; MPI, 2017) is monitored through an integrated stock assessments. Abundance in other parts of BCO5 (Dusky Sound and Patterson Inlet) are monitored with potting surveys. This information appears to be monitored with sufficient frequency to support the HCR.

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

(a) Stock assessment

BCO4 **LOW RISK**

The most recent stock assessment for BCO4 was done in 2015. The assessment is based on fishery characterisation and analyses of standardised CPUE against B_{MSY} proxy reference points (MPI, 2017). The B_{MSY} proxy is based on mean CPUE for the period 2002–03 to 2013–14 (a period with high yield when both catch and CPUE were stable). The assessment was deemed high quality by the working group (MPI, 2017). Although not based on an integrated assessment model, the assessment is appropriate for the stock and estimates status relative to stock specific reference points.

BCO5 **LOW RISK**

For BCO5, the most recent stock assessment was done in 2013. The assessment uses a length-based model with Bayesian estimation of posterior distributions and incorporates catch and landings, fishery and survey length frequency data, abundance indices and biological information on growth, maturation, and sex change (MPI, 2017). The assessment was deemed high quality by the working group (MPI, 2017). The assessment is appropriate for the stock and estimates status relative to stock specific reference points.

(b) Uncertainty and Peer review **LOW RISK**

For BCO4, the process of CPUE standardisation accounts for some uncertainties, and alternative methods of standardisation have been explored to examine those with the best fit to the data (MPI, 2017). For BCO5, the 2013 model uses Markov Chain Monte Carlo (MCMC) simulations together with base case and alternative runs to test sensitivity to alternative input parameters.

The assessments were considered by the MPI Fishery Working Group, including independent scientists, who review the data and the model assumptions before agreeing on accepted models. The results were then published in the MPI Fisheries Assessment Plenary Report (MPI 2017).

PI SCORE	LOW RISK – BCO4, BCO5

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 **MEDIUM 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.

According to landings data (Bentley et al, 2013), the BCO4 retained catch is 99% blue cod and 1% "other". The BCO5 retained catch is also almost entirely blue cod (97%) with 1% each for conger eel and octopus and 2% for "other". Neither of these species/groups reaches the threshold of 5% to be considered 'main' other. Information on discards is limited, although MPI (2017) reports that there are few significant bycatch problems. We have scored the UoAs medium risk on the basis of the quantitative information available on retained non-target species, and qualitative information on discards. Additional quantitative information confirming minimal discards would be required to demonstrate it is highly likely that main other species were above PRI. The fishery would be better placed against this indicator with some analysis of the total catch composition.

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 — LOW RISK

The strategy to manage main other species includes:

- Controls on catch and effort through TACs and ITQs on QMS species;
- Gear restrictions;
- Monitoring through logbooks and catch returns;
- Periodic assessments of stock status (e.g. MPI, 2017).

It is likely that the fishery has no main non-target species. The use of pots with minimal landing of non-target species constitutes a form of strategy. Nevertheless, we note that the UoAs would be better placed against this indicator with some quantitative confirmation of minimal discarding.

(b) Management strategy evaluation — LOW RISK

Quota reporting information available in Bentley (2013) provides evidence that the fishery is highly targeted, with few retained non-target species. MPI (2017) also reports there are few bycatch issues. To that end, there is some evidence that the strategy will work and is being implemented effectively. Nevertheless, the fishery would be better placed with some quantitative analysis of discards in the UoAs.

(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 — MEDIUM RISK

Data for non-target landed species is likely enough to detect changes in risks to retained non-target species. Qualitative information appears to be sufficient for MPI to determine there are few significant bycatch problems, although it is not clear that quantitative data are available on discards.

PI SCORE	MEDIUM RISK - BCO4, BCO5

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 — LOW RISK

The BCO fisheries overlap the general distribution of a number of ETP species groups including seabirds, marine malls and protected corals[1].

Seabirds

Risks to sea birds associated with New Zealand's commercial fisheries have been assessed through a hierarchical series of risk assessments (e.g. Rowe, 2013, Richard and Abraham, 2013; Richard and Abraham, 2015, Richard and Abraham, in prep.; in MPI, 2016a). The most recent iteration derives for each taxon a risk ratio, which is an estimate of annual potential fatalities (APF) across trawl and longline fisheries relative to the Population Sustainability Threshold, PST (an analogue of the Potential Biological Removals, PBR, approach) (Richard & Abraham in prep; in MPI, 2016a). This index represents the amount of human-induced mortality a population can sustain without compromising its ability to achieve and maintain a population size above its maximum net productivity (MNPL) or to achieve rapid recovery from a depleted state. The management criterion used for developing the seabird risk assessment was that seabird populations should have a 95% probability of being above half the carrying capacity after 200 years, in the presence of ongoing human-caused mortalities, and environmental and demographic stochasticity (Richard & Abraham, 2013).

In the most recent assessment, only one species of seabird, black petrel (1.15), had a median risk ratio higher than 1 (or upper 95% confidence limit higher than 2) taking into account fishing related mortality across all trawl and longline fisheries (Richard & Abraham in prep; in MPI, 2016a). For all other species, current rates of fishing related mortality were not expected to hinder the achievement of management targets (i.e. the risk ratio was <1). Blue cod potting is not known to interaction with black petrel or seabird species in general.

Marine mammals

The BCO fisheries overlap the general distribution of a range of marine mammal species, including New Zealand fur seals, New Zealand sea lions, humpback whales, killer whales, southern right whales, and Hector's and common dolphins. Blue Planet Marine (2017) reports that whale entanglement has occurred in commercial fishing pots, though only rock lobster fisheries have implicated. Moreover, while rock lobster pots have been implicated in some entanglements with Hector's dolphins (MPI, 2016a), blue cod pots are not implicated in the literature available. While the information is limited, the available evidence suggests that blue cod pots are highly unlikely to hinder recovery of marine mammal populations.

Corals

[1] http://www.nabis.govt.nz/NabisHome.aspx

Black corals (all species in the order Antipatharia), gorgonian corals (all species in the order Gorgonacea), stony corals (all species in the order Scleractinia), and hydrocorals (all species in the family Stylasteridae) are protected in New Zealand under the Wildlife Act.

The nature and distribution of protected corals in New Zealand's EEZ, as well as fishery interactions with them, was examined by Baird et al (2013). While interactions with protected corals are possible in BCO fisheries, Baird et al (2013) reported that fewer reports of coral catch from observed fisheries in waters shallower than 800 m. These authors reported that all protected coral orders typically occur in areas where middle depths and deepwater species are targeted, particularly in areas of higher seabed relief, with concentrations evident on features such as seamounts and on the shelf breaks. Given the inshore nature of blue cod potting and the likely very limited footprint of the fishery, it is probably highly unlikely that BCO fishing would hinder recovery of protected corals.

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 **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

Cold water corals are fully protected under the Wildlife Act 1953, and nteractions between fisheries and ETP species are monitored through the NZ Observer Programme and vessel reporting. Overall, policy frameworks and their implementation through a series of measures explicitly designed to manage the impact of fisheries on ETP species comprise a strategy in place for managing the fishery's impact on ETP species, including measures to minimise mortality, which is designed to be highly likely to achieve national and international requirements for the protection of ETP species.

Furthermore, with respect to seabirds and sharks, the respective NPOAs comprise comprehensive strategies in place for managing the fishery's impact on ETP species, including measures to minimise mortality, which is designed to achieve above national and international requirements for the protection of ETP species.

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

There is an objective basis of confidence that the above-described strategy will work based on information directly about the fishery and species involved. Interactions between the BCO fisheries and protected seabirds are minimal, albeit not known with precision for some protected species groups (e.g. corals).

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 **MEDIUM RISK**

There is limited direct quantitative information on ETP species interactions in the blue cod fisheries, although qualitative information is sufficient to estimate the UoA related mortality and to support measures to mitigate impacts where necessary. While pots are reportedly typically set on areas of sand and gravel, additional analysis of potential impacts on protected benthic species would likely better position the UoAs against this SI.

PI SCORE	LOW RISK – BCO4, BCO5

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 **LOW 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.

The BCO4 and BCO5 fisheries use pot apparatus which is likely to be largely benign as well as having a very small (albeit unquantified) footprint in the context of the habitats they encounter. Pots are reportedly set largely on sand and gravel amongst 'rough ground'

which some studies have shown recovers more quickly from the effects of fishing than other habitat types (e.g. Collie et al. 2000; Moore and Jennings 2000). 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 (2017) report that large areas of the fishery are unfished. Accordingly, while there is little direct information on the habitat impact of blue cod potting, there is probably a plausible argument that the gear type and fishing method is highly unlikely to reduce habitat structure and function to the point of serious or irreversible harm.

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 **LOW RISK**

The main strategy in place to limit habitat impacts from the fishery is the use of benign gear which is likely to have a very small spatial footprint in the context of the habitats it encounters. Benign gear is supplemented with a range of regulatory measures including the designation or Marine Protected Areas (MPAs) and Marine Reserves which serve to minimize benthic impact, safeguard habitats and protect representative marine benthic ecosystems and biodiversity in accordance with s 8(1) of the Fisheries Act 1996 which focuses on avoidance, mitigation or remedy of "*any adverse effects of fishing on the aquatic environment*". To qualify as Marine Protected Areas (MPAs), sites must be under a level of protection that allows their habitats and ecosystems to remain at (or recover to) a healthy state. The use of benign apparatus together with the network of MPAs and Marine Reserves probably comprise at least a partial strategy that is expected to achieve the outcome stated in Criteria 2C(i).

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

The use of relatively benign apparatus together with research on other pot fisheries showing limited and habitats (e.g. Eno et al, 2001) and enforcement of areas closed to fishing provides some objective basis for confidence that the strategy will work and is being implemented successfully. Nevertheless, the fisheries would be better placed against this SI with some analysis of the degree of spatial overlap with potentially vulnerable habitats.

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 main impacts of the gear on the main habitats, and there is sufficient information through catch and effort returns to detect increased risk. Nevertheless, mapping of the spatial extent of the fishery in the context of potentially vulnerable habitats has not yet been done for blue cod.

PI SCORE	**LOW RISK – BCO4, BCO5**

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 **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.

Given the relatively targeted and benign nature of the gear and limited ETP species interactions, the main impact from the fishery is likely to come from the removal of harvested blue cod from the ecosystem. Given the relatively healthy position of both stocks, there is a reasonable basis to conclude that the UoAs are highly unlikely to disrupt the key elements of the ecosystem to the point where there would be serious or irreversible harm. We note that a number of fisheries which harvest larger volumes of fish with more mobile gear types, and therefore more intuitive potential to result in disruptions to the ecosystem, have been scored at 80 and above against equivalent MSC indicators in New Zealand (e.g. hoki). Moreover, general research on potential trophic effects from fisheries in some areas where blue cod is harvested do not point to serious or irreversible changes in the ecosystem. For example, the mean trophic index (MTI) of the Chatham Rise demersal fish community showed no long-term change between 1992 and 2014[3]. In this area,

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

[3] http://www.stats.govt.nz/browse_for_stats/environment/environmental-reporting-series/environmental-indicators/Home/Marine/marine-trophic-index-chatham-rise.aspx (methodology in Pinkerton et al, 2015)

changes in MTI are driven by biomass of hoki rather than species such as blue cod. Monitoring of mesopelagic biomass on the Chatham Rise also suggested no significant change between 2001 and 2010 (O'Driscoll et al., 2011).

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). The use of benign apparatus coupled with good quality monitoring of all fisheries removals that might impact on trophic structure and function and management of fishery removals (e.g., through TACCs) represent a partial strategy to restrain impacts from causing serious and irreversible harm to the ecosystem.

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

Strategic and operational measures that are in place are considered likely to work, based on information about the fishery and ecosystem components involved (e.g. target and retained species, some ETP species, habitat). Detailed monitoring of many aspects of the fishery (e.g. catches of target, retained species) allows for review of performance and identification of ongoing and new issues. Independent monitoring indicating an absence of change in MTI in key fishing areas (e.g. Chatham Rise[4]) provides some evidence that the partial strategy is being implemented successfully.

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

(a) Information quality **LOW RISK**

The main impacts of the fishery on the ecosystem elements can be inferred from the stock assessments (for key species), QMS catch trends, and observer data that cover the target species, related species, and most levels of the ecosystem. The lack of significant levels of retained and discarded by-catch, limited ETP interactions and potentially limited benthic impacts indicate a limited ecosystem impact. Dietary analyses (e.g. Stevens et al 2011) provide information on the position of blue cod in the food web and monitoring of MTI in some areas provides some capacity to detect increased risk at the broad scale. The information available appears sufficient to broadly understand the key elements of the ecosystem and to detect increased risk to them.

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

The main impacts of the fishery on the ecosystem elements such as structure and function can be inferred from the stock assessments (for most fished species), QMS catch trends and periodic potting surveys (MPI, 2017). Nevertheless, it is not clear that any of the main ecosystem impacts have been investigated in detail.

PI SCORE	LOW RISK – BCO4, BCO5

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*

[4] http://www.stats.govt.nz/browse_for_stats/environment/environmental-reporting-series/environmental-indicators/Home/Marine/marine-trophic-index-chatham-rise.aspx

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 Fishery Act, the Ministry of Primary Industries (responsible for effective fishery management), the Department of Conservation (responsible for conservation issues such as ETP species and MPAs) are the main government entities involved in the management process. Each has clearly and explicitly defined roles. Stakeholders and independent experts are involved in the fisheries working group process which provides advice to MPI and the Minister.

(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.

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 the outcomes expressed by 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**

While objectives broadly consistent with Components 1 and 2 are specified in the Act and Fisheries 2030, and are therefore implicit in the fishery specific management system, it is not clear that explicit short and long term objectives for blue cod fisheries are in place at this stage. Accordingly, we have scored this SI medium risk. We note that a National Blue Cod Strategy is currently under development by MPI[5] and may result in fishery specific objectives.

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.

[5] http://www.mpi.govt.nz/law-and-policy/legal-overviews/fisheries/national-blue-cod-strategy/

(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, 2015).

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 blue cod 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 — MEDIUM 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 medium risk SG against this SI, sanctions to deal with non-compliance must exist and fishers must be generally thought to comply with the management system, including providing information of importance to the effective management of the fishery. The low risk SG requires some evidence to demonstrate fishers comply with the management system. 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 (e.g. Heron, 2016). It is also true that fishers are required by law to submit a range of information of importance to the management of the fishery (e.g. catch-effort returns, which are cross-checked against returns from Licensed Fish Receivers (LFRs). While there is no specific information available on compliance rates in the blue cod UoAs, there is some evidence that fishers are generally compliant with the management system. For example, MPI (2016b) reports that rates of compliance generally amongst the commercial and recreational sectors in the 2015/6 year were 89% and 94% respectively (Table 2). Moreover, Kazmierow et al (2010) concluded there were likely to be relatively high levels of compliance based on interviews with fishers in the South East fin fish fishery. Accordingly, we have scored the fishery medium risk.

Table 2: Compliances rates amongst New Zealand fisheries (from MPI, 2016b).

SERVICE PERFORMANCE MEASURE	ACTUAL 2015/16	STANDARD 2015/16	VARIANCE
Percentage of commercial operators inspected found to be voluntarily compliant	89%	90%	-1%
Percentage of recreational fishers inspected found to be voluntarily compliant	94%	95%	-1%
Percentage of serious offenders do not reoffend within the next year	96%	95%	1%
Percentage of complex investigations completed within legislative requirements	98%	100%	-2%
Percentage of non-complex investigations completed within six months	92%	100%	-8%

Nevertheless, we note there has been considerable debate in recent years about the adequacy of the MPI compliance system, and in particular its response to alleged dumping of QMS species (e.g. Simmons et al, 2016; Heron, 2016). Email correspondence quoted by Heron (2016) suggests there has been a view internally amongst MPI that discarding has been a more general problem amongst inshore fisheries harvesting a diverse mix of species. The fishery would be better placed against this scoring issue if evidence of strong compliance with all laws was available.

(c) Systematic non-compliance

Limited evidence is available in the extent of compliance specifically in the blue cod 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**

The Fisheries Working Group process and annual Plenary reporting provide mechanisms to evaluate key parts of the management system (e.g. stock assessments; biomass against reference points). Where changes are required to sustainability measures, IPPs/FAPs are prepared to evaluate and present alternative management options. Processes for review are also built into policy and regulatory documents (e.g. NPOAs).

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

The fishery management system has internal and external review through fisheries plenary/working group process.

PI SCORE **LOW RISK**

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