Seafood Risk Assessment

New Zealand Inshore Trawl Fishery

Prepared for the OpenSeas Programme

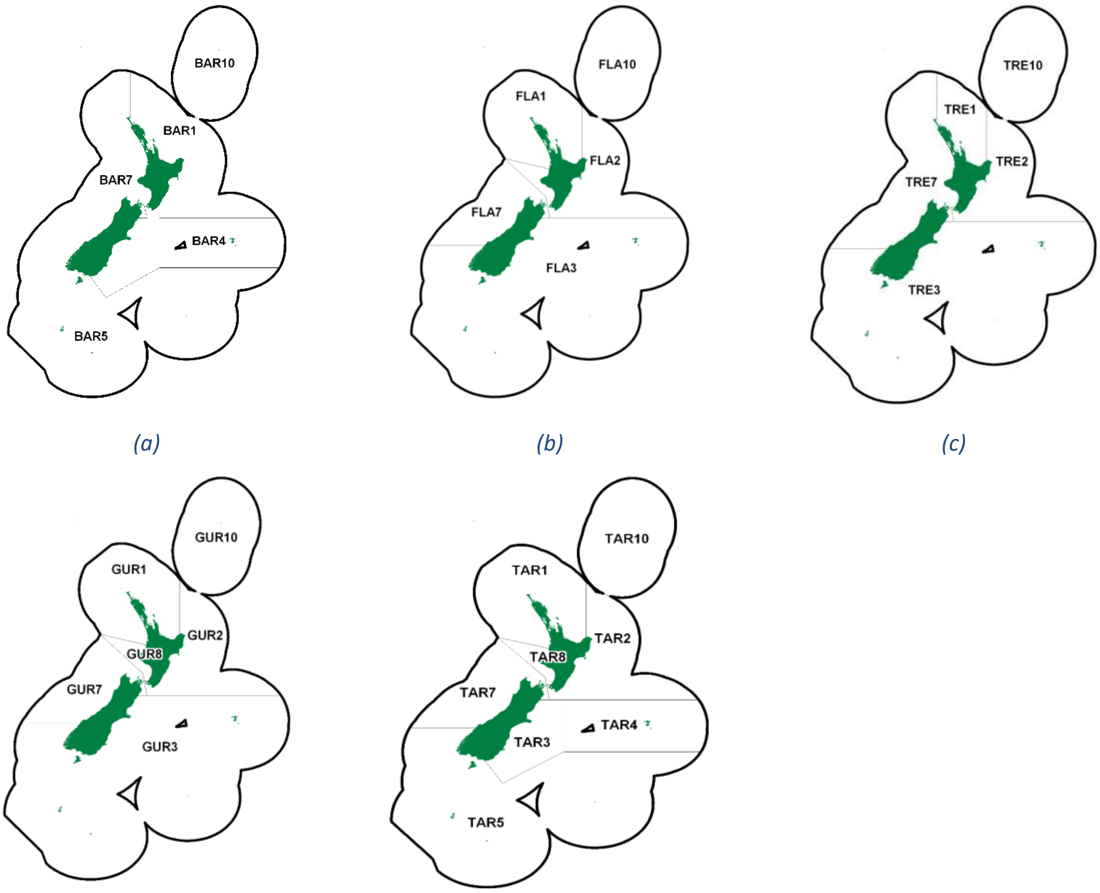
New Zealand Inshore Trawl Fishery

Unit/s of Assessment:

Product Name/s:	**Barracouta, Flatfish, Trevally, Red gurnard, Tarakihi**
Species:	*Thyrsites atun* *Colistium nudipinnis, Peltorhamphus novaezelandiae, Colistium guntheri, Rhombosolea retiaria, Rhombosolea plebeia, Rhombosolea leporina, Rhombosolea tapirina, Pelotretis flavilatus* *Pseudocaranx dentex* *Chelidonichthys kumu* *Nemadactylus macropterus*
Stock:	BAR1, BAR5, BAR7 FLA3, FLA7 GUR1, GUR2, GUR3, GUR7 TAR1, TAR2, TAR3, TAR7 TRE1, TRE7
Gear type:	Demersal Trawl, Purse seine (TRE1)
Year of Assessment:	2017

Fishery Overview

This summary is adapted from MPI (2017):



(a) (b) (c)

(d) (e)

Figure 1: Management areas for the New Zealand inshore trawl species: (a) barracouta[1], (b) flatfish, (c) trevally, (d) red gurnard and (e) tarakihi (MPI, 2017).

[1] BAR5 is primarily a deepwater fishery.

Barracouta

Barracouta are caught in coastal waters around mainland New Zealand, The Snares and Chatham Islands, down to about 400 m and have been managed under the Quota Management System since 1 October 1986. Over 99% of the recorded catch is taken by trawlers. Major target fisheries have been developed on spring spawning aggregations (Chatham Islands, Stewart Island, west coast South Island and northern and central east coast South Island) as well as on summer feeding aggregations, particularly around The Snares and on the east coast of the South Island. Barracouta also comprise a significant proportion of the bycatch in the west coast North Island jack mackerel fishery, The Snares squid fishery, and the east coast South Island red cod and tarakihi fisheries.

Barracouta are commonly encountered by recreational fishers in New Zealand, more frequently in the southern half of BAR 7 and BAR 1. Barracouta are typically harvested as bait for other fishing rather than for consumption.

Flatfish

Flatfish are shallow water species, taken mainly by target inshore trawl and Danish seine fleets around the South Island. Flatfish Individual Transferable Quota (ITQ) provides for the landing of eight species of flatfish. These are: the yellow-belly flounder, *Rhombosolea leporine* (YBF); sand flounder, *Rhombosolea plebeian* (SFL); black flounder, *Rhombosolea retiaria* (BFL); greenback flounder, *Rhombosolea tapirina* (GFL); lemon sole, *Pelotretis flavilatus* (LSO); New Zealand sole, *Peltorhamphus novaezeelandiae* (ESO); brill, *Colistium guntheri* (BRI); and turbot, *Colistium nudipinnis* (TUR). For management purposes landings of these species are combined.

Notwithstanding that, typically only a few are dominant in any one QMA and some are not found in all areas. In FLA 3, ESO, LSO, SFL, BFL and BRI are the main species taken. In FLA 7, the catch mainly comprises GFL, SFL and TUR. The proportion that each species contributes to the catch is expected to vary annually. Because the adult populations of most species generally consist of only one or two year classes at any time, the size of the populations depends heavily on the strength of the recruiting year class and is therefore thought to be highly variable.

Flatfish TACCs were originally set at high levels so as to provide fishers with the flexibility to take advantage of the perceived variability associated with annual flatfish abundance. This approach has been modified with an in-season increase procedure for FLA 3.

There are important recreational fisheries, mainly for the four flounder species, in most harbours, estuaries, coastal lakes and coastal inlets throughout New Zealand. The main methods are setnetting, drag netting (62.8% combined) and spearing (36.1%) (Wynne-Jones et al 2014).

Trevally

Trevally is caught around the North Island and the north of the South Island, with the main catches from the northern coasts of the North Island. Trevally is taken in the northern coastal mixed trawl fishery, mostly in conjunction with snapper. Since the mid-1970s trevally has been taken by purse seine, mainly in the Bay of Plenty (BoP), in variable but often substantial quantities.

Trevally was introduced into the QMS in 1986 with five QMAs.

Recreational fishers catch trevally by setnet and line methods. Although highly regarded as a table fish, some trevally may be used as bait.

Red gurnard

Red gurnard are a major bycatch of inshore trawl fisheries in most areas of New Zealand, including fisheries for red cod in the southern regions and flatfish on the west coast of the South Island (WCSI) and in Tasman Bay. They are also directly targeted in some areas e.g. GUR 2. Red gurnard is also a minor bycatch in the jack mackerel trawl fishery in the South Taranaki Bight.

Red gurnard was introduced into the Quota Management System (QMS) in 1986, and is managed according to six QMAs. GUR 1, 3, 5 and 7 accounted for over 96% of the reported landings in 2015-16.

Red gurnard is, by virtue of its wide distribution in harbours and shallow coastal waters, an important recreational species. It is often taken by fishers targeting snapper and tarakihi, particularly around the North Island.

Tarakihi

Tarakihi are caught by commercial vessels in all areas of New Zealand from the Three Kings Islands in the north to Stewart Island in the south. The main fishing method is trawling. The major target trawl fisheries occur at depths of 100–200 m and tarakihi are taken as a bycatch at other depths as well. The major fishing grounds are west and east Northland (QMA 1), the western Bay of Plenty to Cape Turnagain (QMAs 1 and 2), Cook Strait to the Canterbury Bight (mainly QMA 3), and Jackson Head to Cape Foulwind (QMA 7). Around the North Islands 70–80% of the tarakihi catch is targeted. Around the South Island only about 30% of the tarakihi catch is targeted; with much of the remainder reported as bycatch in target barracouta and red cod bottom trawl fisheries. In addition, there is a small target tarakihi setnet fishery off Kaikoura. The commercial minimum legal size (MLS) for all TAR stocks is 25 cm.

Since the introduction of the QMS in 1986, the total landings have fluctuated between 4,090t and 6,205t.

Units of assessment

Sixteen separate 'units of assessment' are assessed in this report:

Species	Stock	Gear type
Barracouta	BAR 1, BAR 5, BAR 7	Trawl
Flatfish	FLA 3, FLA 7	Trawl
Gurnard	GUR 1, GUR 2, GUR 3, GUR 7	Trawl
Tarakihi	TAR 1, TAR 2, TAR 3, TAR 7	Trawl
Trevally	TRE 1, TRE 7	Trawl, Purse seine (TRE 1)

Scoring

Performance Indicator	BAR1	BAR5	BAR7	FLA3	FLA7	GUR1	GUR2	GUR3
COMPONENT 1								
1A: Stock Status	LOW	MEDIUM	MEDIUM	MEDIUM	PHR	LOW	LOW	LOW
1B: Harvest Strategy	MEDIUM	LOW	LOW	MEDIUM	PHR	MEDIUM	MEDIUM	LOW
1C: Information and Assessment	LOW	LOW	LOW	LOW	PHR	LOW	LOW	LOW
OVERALL	LOW	LOW	LOW	MEDIUM	HIGH	LOW	LOW	LOW
COMPONENT 2								
2A: Non-target Species	PHR	PHR	PHR	PHR	PHR	PHR	PHR	PHR
2B: ETP Species	PHR	PHR	PHR	PHR	PHR	PHR	PHR	PHR
2C: Habitats	MEDIUM	MEDIUM	MEDIUM	MEDIUM	MEDIUM	MEDIUM	MEDIUM	MEDIUM
2D: Ecosystems	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW
OVERALL	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH
COMPONENT 3								
3A: Governance and Policy	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW
3B: Fishery-specific Management System	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW
OVERALL	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW

Performance Indicator	GUR7	TAR1	TAR2	TAR3	TAR7	TRE1	TRE1 - PS	TRE7
COMPONENT 1								
1A: Stock Status	LOW	PHR	PHR	PHR	LOW	PHR	PHR	LOW
1B: Harvest Strategy	MEDIUM	PHR	PHR	PHR	MEDIUM	MEDIUM	MEDIUM	LOW
1C: Information and Assessment	LOW	LOW	LOW	LOW	LOW	PHR	PHR	LOW
OVERALL	LOW	HIGH	HIGH	HIGH	LOW	HIGH	HIGH	LOW
COMPONENT 2								
2A: Non-target Species	PHR	PHR	PHR	PHR	PHR	PHR	PHR	PHR
2B: ETP Species	PHR	PHR	PHR	PHR	PHR	PHR	LOW	PHR
2C: Habitats	MEDIUM	MEDIUM	MEDIUM	MEDIUM	MEDIUM	MEDIUM	LOW	MEDIUM
2D: Ecosystems	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW
OVERALL	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	MEDIUM	HIGH
COMPONENT 3								
3A: Governance and Policy	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW
3B: Fishery-specific Management System	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW
OVERALL	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW

Summary of main issues

- The position of several target stocks against reference points is not known, as is the probability that current catch or TACC will result in a decline in biomass below soft and hard limits
- Observer coverage in inshore fisheries has been very low historically, and very limited information is available on composition and volume of discards.
- The inshore trawl fisheries interact with a range of ETP species. Although recent risk assessments indicate the extent of estimated captures of seabird species should not hinder recovery, there is uncertainty over the impact of the fishery on common dolphins. Preliminary results from the New Zealand Marine Mammal Risk Assessment identified common dolphin as the marine mammal species most at risk from commercial fishing.
- The widespread nature of bottom trawling suggests that fishing is the main anthropogenic disturbance agent to the seabed throughout most of New Zealand's EEZ. Recent research suggests moderate and high levels of trawling intensity occur in a relatively small proportion of areas shallower than 200m. The capacity of seabed communities to recover from trawling disturbance is not well known.
- There have been concerns about compliance with quota species retention provisions amongst inshore fisheries.

Outlook

Inshore trawl units of assessment

Component	Stock	Outlook	Comments
Target species	BAR1, BAR5, BAR7	Stable	All stocks appear to be well above the point of recruitment impairment. BAR 5 and BAR 7 may improve scoring is additional evidence is presented that stocks are fluctuating at or around levels consistent with MSY.
	FLA3	Stable	Likely outlook appears to differ by stock. Sand flounder and lemon sole appear to be in good health and responding well to the Management Procedure. It is possible New Zealand sole are being overfished.
	FLA7	Uncertain	No stock status information or stock projections
	GUR1	Uncertain	Red gurnard is taken mainly as a bycatch in GUR 1. Abundance appears to be somewhat cyclical, based on recruitment variation. Without information on recruitment it is not possible to predict future stock trends. The TACC is set substantially above current catches.
	GUR2	Stable	The stock is very likely to be at or above target levels, and it is unlikely that the current catch or TACC will result in the stock falling below the soft limit. Standardised CPUE in 2015–16 was well above the target.
	GUR3	Stable	Current abundance is at historically high levels and is unlikely to decline below the soft limit in 3–5 years.
	GUR7	Stable	The West Coast South Island trawl survey relative biomass indices from 2015 and (preliminary) 2017 were by far the highest of the entire time series. It is unlikely the stock will decline below soft limits in the next 3-5 years.
	TAR1	Uncertain	The current position of the stock against reference points is unknown. It is not known whether the current catch or TACC will cause the stock to fall below reference points. The next assessment of the stock is scheduled for 2018.
	TAR2, TAR3	Stable	The current position of the stocks against target and soft limit reference points is unknown, although it is unlikely to be below the hard limit. It is unlikely that the current catch or TACC will cause the stock to fall below the hard limit. The next assessment of the stock is scheduled for 2018.
	TAR7	Stable	The WCSI trawl survey biomass index is higher than in 2007, when it was likely the stock was at or above B40%. Biomass (WCSI) is expected to stay steady over the next 3–5 years assuming current (2012/13) catch levels.
	TRE1	Improving	Relative abundance series were increasing for both BoP and EN/HG. New stock assessments are expected to be completed once new catch-at-age data become available.
	TRE7	Stable	The stock is above the target reference point and fishing mortality is lower than FMSY.

Environmental impact of fishing	Improving	The information base to examine the ecosystem impacts of inshore trawling is growing. The introduction of the Integrated Electronic Monitoring and Reporting System (IEMRS) should improve understanding of catch composition and allow more sophisticated assessments of the impact of the fishery on non-target species. ETP species risk assessments have been continuously refined over recent years, generally resulting in reductions in estimated risks from inshore trawling. Habitat research is ongoing with new studies planned to better understand the dynamics around impact and recovery. Ecosystem modelling is also underway to better understand the trophic impacts of inshore fishing.
Management system	Stable	No major changes are expected to P3 risk scoring.

TRE1 – Purse seine

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	The introduction of the Integrated Electronic Monitoring and Reporting System (IEMRS) may reduce the other species risk score.
Management system	Stable	No major changes are expected to P3 risk scoring.

Contents

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

BAR1 **LOW RISK**

There are thought to be at least four main stocks of barracouta, based on known spawning locations and movements (MPI, 2017). Stock boundaries are not well understood, but the Chatham Islands stock is probably separate. There may be overlap between Southland fish and other areas, but information is not sufficient to alter existing stock boundaries. There are no integrated stock assessments available for any barracouta stocks (MPI, 2017).

The most recent assessment of BAR 1 was undertaken in 2016, using standardised CPUE as well as East Coast South Island (ECSI) trawl survey results. Assessments of status are made against a B_{MSY}-compatible proxy based on CPUE (average from 1989–90 to 2013–14 of the BAR 1 ECSI CELR/TCER model as defined by Baird (2016) in MPI, 2017). The BAR 1 CPUE series increased steeply from 2002–03 to a peak in 2012–13. The 2013–14 value was lower than the peak, but well above the series mean. The winter ECSI trawl survey series for recruited fish has a trend that is similar to the BAR 1 CPUE index, with a peak in 2014. MPI (2017) conclude that the stock is very likely (>90%) to be at or above the target reference point. Accordingly, we have scored this SI low risk.

BAR5 **MEDIUM RISK**

The most recent assessment of BAR 1 was undertaken in 2017, using standardised CPUE (MPI, 2017). The WG agreed that the CPUE from the SQU target fishery in Statistical Area 028 was the best series of abundance indices for BAR 5. CPUE has remained at a high level since 2008 despite catches at or above the TACC. MPI (2017) conclude that the stock is very unlikely (< 10%) to be below both the soft and hard limits. While the stock clearly meets the first part of the low risk SG (that the stock is highly likely to be above the point of recruitment impairment), the status in relation to the target reference point is unknown. Accordingly, there is less evidence that the stock is fluctuating around a level consistent with MSY. On that basis, we have scored this SI medium risk.

BAR7 **MEDIUM RISK**

The most recent assessment of BAR 7 was undertaken in 2016, using standardised CPUE (MPI, 2017). The WG considered that the tow level CPUE was the best data to use to monitor this stock. The CPUE shows an increasing trend from 2000 to 2004 and is then generally flat. Similar trends were observed in West Coast North Island (WCNI) and West Coast South Island (WCSI) trawl surveys. MPI (2017) conclude that the stock is very unlikely (< 10%) to be below both the soft and hard limits. While the stock clearly meets the first part of the low risk SG (that the stock is highly likely to be above the point of recruitment impairment), the status in relation to the target reference point is unknown. Accordingly, there is less evidence that the stock is fluctuating around a level consistent with MSY. On that basis, we have scored this SI medium risk.

FLA3 **MEDIUM RISK**

MPI (2017) report that there is evidence of many fairly localised stocks of flatfish, although there is no new data which would alter the existing stock boundaries used for assessment purposes.

The most recent assessment of stocks in FLA 3 was undertaken in 2015. Assessments were made of all three main stocks (ESO, SFL and LSO) combined, as well as for each stock individually (MPI, 2017). For the combined species assessment standardised lognormal bottom trawl CPUE for all flatfish combined in FLA 3 was used. Assessments were made against a BMSY proxy based on the mean standardised lognormal CPUE from 1989‑90 to 2006‑07 (the final year of unconstrained catches). MPI (2017) conclude that it is about as likely as not that the stock is at or above the target, unlikely (<40%) that the stock is below the soft limit (50% of the B_{MSY} proxy) and very unlikely to be below the hard limit (25% of the B_{MSY} proxy).

Notwithstanding that, differences exist in the status of the individual species. While sand flounder and lemon sole are very likely (<90%) and as likely as not (40-60%) to be at or around their species specific BMSY proxy, New Zealand sole, which has accounted for between 15-25% of the FLA 3 catch between 2005-06 and 2013-14, is unlikely (<40%) to be above the B_{MSY} proxy target and about as likely as not to be below the soft limit.

Accordingly, while the combined stock appears highly likely to be above PRI and probably fluctuating at or around a level consistent with MSY, there is less evidence this is the case some species. On that basis, we have scored the stock medium risk. If assessed separately, sand flounder and lemon sole would likely score low risk, and New Zealand sole either medium risk or precautionary high risk.

FLA7 **PRECAUTIONARY HIGH RISK**

No information is available on stock status in FLA 7.

GUR1 **LOW RISK**

MPI (2017) reports that GUR 1 is considered to be a single stock with three sub-stocks (GUR 1W, GUR 1E, GUR 1 Bay of Plenty).

The most recent stock assessments for each stock were undertaken in 2013 (MPI, 2017), using standardised CPUE. Each stock was assessed against stock-specific B_{MSY}-compatible reference points consistent with the HSS. MPI (2017) concluded that each stock was as likely as not to be above the B_{MSY} proxy target reference point, unlikely (<40%) to be below the soft limit (50% B_{MSY}) and very unlikely to be below the hard limit (25% B_{MSY}). Given the above, the combined stock appears highly likely to be above the point of recruitment impairment and fluctuating at or around levels consistent with MSY.

GUR2 **LOW RISK**

The most recent assessment of the GUR 2 stock was undertaken in 2017, using standardised CPUE from the bottom trawl fishery targeting gurnard, snapper or trevally. The stock was assessed against stock-specific B_{MSY}-compatible reference points consistent with the HSS. MPI (2017) concluded that the stock was very likely (>90%) to be above the B_{MSY} proxy target reference point, and very unlikely (<10%) to be below the soft limit (50% B_{MSY}) and hard limit (25% B_{MSY}). Given the above, the combined stock appears highly likely to be above the point of recruitment impairment and fluctuating at or around levels consistent with MSY.

GUR3 **LOW RISK**

MPI (2017) report that no information is available on the stock separation of red gurnard and Fishstock GUR 3 is treated as a unit stock. The stock was most recently assessed in 2015 using the CPUE series BT(MIX+FLA), which is the mean of two standardised bottom trawl CPUE series: one based on bottom trawls targeting mixed species (RCO, STA, BAR, TAR, GUR) and the other based on flatfish targeting (MPI, 2017). The stock was assessed against stock-specific B_{MSY}-compatible reference points consistent with the HSS. MPI (2017) concluded that the stock was likely (>60%) to be above the B_{MSY} proxy target reference point, and very unlikely (<10%) to be below the soft limit (50% B_{MSY}) and hard limit (25% B_{MSY}). Given the above, the combined stock appears highly likely to be above the point of recruitment impairment and fluctuating at or around levels consistent with MSY.

GUR7 **LOW RISK**

MPI (2017) report that stock boundaries for GUR 7 are unknown, but is considered to be a single management unit for assessment purposes. The most recent assessment of the GUR 7 stock was undertaken in 2017, using trawl survey indices from the west coast South Island (WCSI) trawl surveys. The stock was assessed against stock-specific B_{MSY}-compatible reference points consistent with the HSS. MPI (2017) concluded that the stock was very likely (>90%) to be above the B_{MSY} proxy target reference point, and very unlikely (<10%) to be below the soft limit (50% B_{MSY}) and hard limit (25% B_{MSY}). Given the above, the combined stock appears highly likely to be above the point of recruitment impairment and fluctuating at or around levels consistent with MSY.

TAR1 **PRECAUTIONARY HIGH RISK**

MPI (2017) report that three sub-stocks are recognised within TAR 1: Bay of Plenty (BoP), East Northland (EN) and west coast North Island (WCNI). The BoP fishery accounts for approximately 50% of the TAR 1 catch but is considered to be an extension of the TAR 2 stock with a primary spawning area around East Cape.

The three TAR 1 sub-stocks were most recently assessed in 2012 based on sub-stock-specific standardised CPUE indices: WCNI - West Coast North Island bottom trawl mixed target species EN - East Northland bottom trawl mixed target species BoP - Bay of Plenty bottom trawl mixed target species (MPI, 2017). CPUE trends vary between sub-stocks.

MPI (2017) report that overall trends in CPUE vary between sub-stocks. In the WCNI sub-stock, the series shows almost no trend, fluctuating around the long-term mean with fairly wide error bars, indicating that the model is not well determined. In the EN sub-stock, the series showed a long gradual declining trend beginning towards the end of the 1990s, which now appears to have stabilised at about 60% of the long-term mean since 2006–07. In the BoP sub-stock, the series shows no long-term trend, with current levels near to the levels observed at the beginning of the series, interrupted by about 5 years of increased CPUE in the early 2000s.

MPI (2017) conclude the position of the stock in relation to all reference points is unknown.

TAR2 **PRECAUTIONARY HIGH RISK**

MPI (2017) report that "the stock relationships between TAR 2 (including TAR 1 BoP) and TAR 3 are unclear. Data from the main fisheries reveal similarities in abundance trends and age composition and it is possible that the two areas represent a single tarakihi stock or, at a minimum, that there is substantial connectivity between the two areas. However, definitive conclusions regarding the stock structure are not possible" and hence TAR 2 and TAR 3 are assessed separately.

TAR 2 was most recently assessed in 2012 based on a standardised CPUE series from the mixed target species bottom trawl fishery. MPI (2017) report that there is "no strong long-term trend since the early 1990s, with current levels slightly below the levels observed at the beginning of the series, interrupted by 5 years of increased CPUE in the early 2000s". They conclude that the position of the stock against target and soft limit reference points is unknown, but it is unlikely (<40%) the stock is below the hard limit. Given it is not clear that the stock is above MSC's default PRI (20%B_0) where B_{MSY} is not known, we have scored this SI precautionary high risk.

TAR3 **PRECAUTIONARY HIGH RISK**

The TAR 3 stock was most recently assessed in 2012 using two standardised CPUE indices from the bottom trawl mixed target species fishery and setnet TAR target fishery respectively (MPI, 2017). MPI (2017) report that the mixed trawl CPUE series shows no long-term trend, with current levels near to the levels observed at the beginning of the series, interrupted by about 3 years of increased CPUE from the late 1990s. The increase in 2010–11 may indicate strong recent recruitment to the fishery. The setnet index is similar but the peak is offset by a few years, and the last few years are lower than the long-term mean. Similar to TAR 2, MPI (2017) conclude that the position of the stock against target and soft limit reference points is unknown, but it is unlikely (<40%) the stock is below the hard limit. While it is not clear that the stock is above MSC's default PRI where B_{MSY} is not known (20%B_0), there is some evidence of recent recruitment. Accordingly, we have scored this SI precautionary high risk.

TAR7 **LOW RISK**

MPI (2017) note that TAR 7 is assumed to be a discrete stock for assessment purposes.

The TAR 7 stock was most recently assessed in 2014 using WCSI trawl survey biomass and standardised CPUE indices (MPI, 2017). The stock was previously assessed in 2008 using an integrated statistical catch-at-age stock assessment incorporating data up to the end of the 2006–07 fishing year (Manning 2008; in MPI, 2017). MPI (2017) note that the range of model results for 2008 assessment estimated that the stock was likely (> 60%) to be at or above B_{MSY} (40% B_0). They also report that trawl survey recruited biomass index for WCSI in 2013 was 17% higher than in 2007, suggesting the stock is at a similar level and that the evaluation of stock status relative to B_{MSY} remains similar to that in 2007. WCSI CPUE index is marginally lower in 2013 than in 2007. They conclude the stock is unlikely (<40%) to be below the soft limit and very unlikely (<10%) to be below the hard limit. Accordingly, the stock is probably highly likely to be above PRI and the available evidence suggests is probably fluctuating somewhere at or around B_{MSY}.

TRE1 **PRECAUTIONARY HIGH RISK**

The TRE 1 QMA is believed to contain two biological stocks: East Northland to Hauraki Gulf, and Bay of Plenty. MPI (2017) note that preliminary assessments were undertaken for the BoP and EN/HG, using abundance indices derived from standardised CPUE analyses, bottom trawl catch-at-age and catch history. Stock assessments for each of these stocks were rejected by the Northern Inshore Working Group in 2015 and 2016. These assessments have not been finalised and will be updated once the new catch-at-age data become available. Relative abundance series were increasing for both BoP and EN/HG. The MPI stock status table does not draw a conclusion about the status of the stock in relation to reference points.

TRE7 **LOW RISK**

The TRE 7 stock was most recently assessed in 2015 using an age structured population model fitted to (a) a combined (either trevally or snapper targeted) bottom trawl CPUE index for the years 1990 to 2013, (b) a research sampling proportions-at-age series for 1971 to 1974, (c) a market sampling proportions-at-age series covering 1974 to 1976 and 1978 to 1979, (d) a commercial proportions-at-age series for 1997 to 2013 (Langley 2015; in MPI, 2017).

The base case model estimated that spawning biomass in 2014 was around 51% of B_0 and 127% of the target reference point ($SB_{40\%}$). MPI (2017) conclude that it is very likely (>90%) the stock is at or above the target reference point. Accordingly, there is strong evidence the stock is highly likely to be above PRI and fluctuating at or around a level consistent with MSY.

PI SCORE	**LOW RISK – BAR1, GUR1, GUR2, GUR3, GUR7, TAR7, TRE7**
	MEDIUM RISK – BAR5, BAR7, FLA3
	PRECAUTIONARY HIGH RISK – FLA7, TAR1, TAR2, TAR3, TRE1

1B: Harvest Strategy

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

(a) Harvest Strategy

The harvest strategy in the commercial inshore trawl fisheries consists of:

- Catch controls through TACs and ITQs;
- Disincentives to over-catch through application of deemed values;
- Gear restrictions;
- Monitoring through logbooks and catch returns;
- Monitoring through VMS on selected vessels
- 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.

BAR1 **LOW RISK**

Although there is limited evidence that the harvest strategy is responsive to the state of the stock from TAC adjustments over time, the position of the stock against B_{MSY} proxy reference points is regularly monitored using fishery CPUE and independent trawl surveys (MPI, 2017). The available evidence suggests that overfishing is unlikely to be occurring, and that the stock is at or above the proxy B_{MSY} target. Accordingly, there is good evidence that all of the elements of the harvest strategy work together towards achieving the stock management objectives reflected in criteria 1A(i). There is also strong evidence from other NZ stocks that adjustments to TACCs are made in response to evidence of changing stock status (e.g. BAR 5). Allowances for estimated recreational and customary catches, as well as other sources of mortality, are included in the TAC. Accordingly, we have scored this SI low risk.

BAR5 **LOW RISK**

The TAC in BAR 5 was increased from 7,475t to 8,370t in 2016 in response to 2016 CPUE analysis indicating that abundance remained high after a significant increase in 2007-09. This provides evidence that the harvest strategy is responsive to the state of the stock, while standardised CPUE trends indicate that the stock is a level that maintains high productivity with low probability of recruitment overfishing. All of the elements of the harvest strategy (monitoring of catch/effort, analysis of standardised CPUE, TAC decision making in the context of reference points) appears to work together to achieve the stock management objectives reflected in criteria 1A(i). Allowances for estimated recreational and customary catches, as well as other sources of mortality, are included in the TAC. Accordingly, we have scored this SI low risk.

BAR7 **LOW RISK**

Although there is limited evidence that the harvest strategy is responsive to the state of the stock from TAC adjustments over time, the position of the stock against reference points is regularly monitored using fishery CPUE and independent trawl surveys (MPI, 2017). The available evidence suggests that overfishing is unlikely to be occurring. Accordingly, there is good evidence that all of the elements of the harvest strategy work together towards achieving the stock management objectives reflected in criteria 1A(i). There is also strong evidence from other NZ stocks that adjustments to TACCs are made in response to evidence of changing stock status (e.g. BAR 5). Allowances for estimated recreational and customary catches, as well as other sources of mortality, are included in the TAC. Accordingly, we have scored this SI low risk.

FLA3 **MEDIUM RISK**

In addition to the generic harvest strategy measures outlined for all inshore species above, all FLA fisheries have been put on to Schedule 2 of the Fisheries Act 1996. Schedule 2 allows that for certain "highly variable" stocks, the Total Annual Catch (TAC) can be increased within a fishing season (MPI, 2017). The base TAC is not changed by this process and the "in season" TAC reverts to the original level at the end of each season. The FLA 3 management procedure (Section 4.3) is an implementation of this form of management. In addition, a commercial minimum legal size is set for sand flounder (23 cm), and for all other flatfish species (25 cm).

FLA 3 operates under a Management Procedure (MP) used to inform in-season adjustments to the FLA 3 TACC. The MP was most recently updated in 2015 (Starr & Kendrick in prep; in MPI, 2017). and uses the relationship between annual standardised CPUE for all FLA 3 species and the total annual FLA 3 landings to estimate an average exploitation rate which is then used to recommend a level of catch based on an early estimate of standardised CPUE (MPI, 2017) (Figure 2).

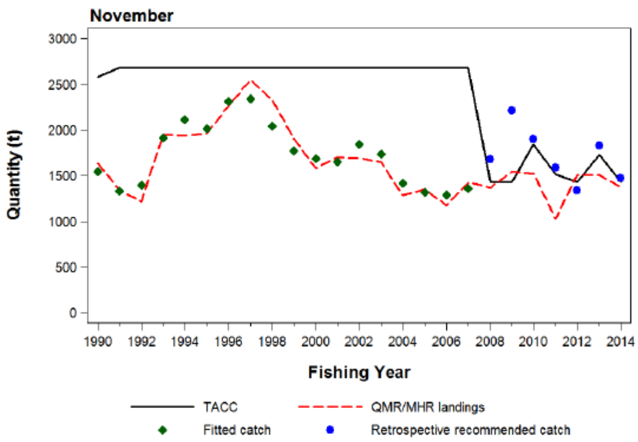


Figure 2: Operation of the 2015 FLA 3 MP, showing the relationship of the fitted catch estimates to the observed MHR/QMR landings and the annual recommended catches from 2008 onward based on the estimated standardised CPUE up to the end of November and only using the data available in the indicated year. (From MPI, 2017)

Across the three main species combined, MPI (2017) conclude that it is unlikely (<40%) that overfishing is occurring. They note that fishing intensity has dropped since the reduction of the TACC in 2007‑08 and the introduction of in-season TACC variation and remains below the F_{MSY} proxy. To that end, across all species, the harvest strategy appears responsive to the state of the stock and the elements of the harvest strategy work together towards achieving the stock management objectives reflected in criteria 1A(i). Nevertheless, the main uncertainty is the extent to which the MP will maintain New Zealand sole at levels with a low probability of overfishing. For this species, CPUE has declined from a peak reached in 2001‑02 and has been near the soft limit since 2010‑11 (MPI, 2017). MPI (2017) conclude that it is likely (>60%) that overfishing is occurring at current catch levels. We have these stocks medium risk overall, however we note that if scored individually sand flounder and lemon sole would likely score low risk, while New Zealand sole would score either precautionary high risk or high risk.

FLA7 **PRECAUTIONARY HIGH RISK**

No specific information is available on the extent to which the harvest strategy in FLA 7 is expected to meet the stock management objectives reflected in criteria 1A(i).

GUR1 **MEDIUM RISK**

MPI (2017) note that red gurnard is a short-lived species with variable recruitment and it is difficult to predict how the stock is going to respond in the next few years. They note that "the abundance of all three sub-stocks appears to be cyclical, probably in response to recruitment variation, and in two sub-stocks trends are currently downward. This makes it difficult to predict future trends without recruitment information. Given that the catch levels observed from 1986–87 to 2011–12 has been relatively consistent (averaging

1129 t for all of GUR 1) and that red gurnard are mainly taken as bycatch, current catch levels are unlikely to compromise the long-term viability of this stock." Together with periodic monitoring of the stock against reference points using agreed indices of abundance and in the context of legislative requirements for sustainability under the Fisheries Act and HSS, this provides some evidence that the harvest strategy could be expected to achieve the stock management objectives reflected in criteria 1A(i). Nevertheless, the main uncertainty is the position of the TACC (2,288t), which has been maintained at more than twice the reported catch since the early 1990s (presumably to allow for variable abundance in this mainly bycatch species). MPI (2017) note that "as the TACC is substantially higher than the current catch, it is not possible to evaluate potential impacts if catches increased to the level of the TACC". Given there is limited evidence the harvest strategy is responsive to the state of the stock and the scope to substantial increase catch under the current TACC, we have scored this SI medium risk.

GUR2 **MEDIUM RISK**

MPI (2017) report that GUR 2 stock abundance indices generally trended downwards between 1990 and 2007, then flattened to 2012, with a strong increase to 2016. Standardised CPUE in 2015–16 was well above the target. Relative exploitation rate increased gradually from 1989–90 to 2009–10 and then dropped to below the long-term average from 2013–14. MPI (2017) conclude that the current catch is unlikely (<40%) to result in the stock falling below the soft limit and very unlikely (<10%) to fall below the hard limit. Nevertheless, catch has generally been below the TACC since the early 1990s (except for 2009-10 and 2015-16) and it is unknown whether catches at the TACC would result in overfishing. Similar to GUR 1, while there is evidence that the harvest strategy is maintaining the stock at levels where there is low probability of recruitment overfishing, there is limited evidence the harvest strategy is responsive to the state of the stock and there is scope to increase catch under the current TACC with unknown outcomes for the stock. Accordingly, we have scored this SI medium risk.

GUR3 **LOW RISK**

MPI (2017) note that red gurnard exhibit cyclic fluctuations and were at low levels in the mid-1990s. Stock size has increased substantially since then and commercial fishers indicate that they find it difficult to stay within the TACC despite the low level of targeting on this species. Current abundance is at historically high levels and is unlikely to decline below limits in 3–5 years. The correspondence between relative abundance and catch suggests a constant exploitation rate. Based on that, MPI (2017) conclude that the current catch is unlikely (< 40%) to cause overfishing. For GUR 3 there is good evidence that harvest strategy is responsive to the state of the stock, with multiple TAC adjustments in response to changes in abundance over the past decade (e.g. Guy, 2015). In addition, all of the elements of the harvest strategy appear to work together. Accordingly, we have score this SI low risk.

GUR7 **LOW RISK**

GUR 7 is in a similar position to GUR 3. Trawl survey indices suggest that stocks are at historically high levels, with overfishing unlikely (<40%) to be occurring. Multiple adjustments to the TAC have been made over the past decade in response to changes in stock abundance (e.g. Guy, 2015). It appears all of the elements of the harvest strategy work together to maintain the stock at levels with a low probability of recruitment overfishing. Accordingly, we have score this SI low risk.

TAR1 **PRECAUTIONARY HIGH RISK**

The current position of the TAR 1 stock against HSS reference points is unknown, as is the probability that current catch or TACC will result in a decline in biomass below soft and hard limits (MPI, 2017). While standardised CPUE in the WCNI stock has remained stable, the BoP stock and EN stocks showed a declining trend over the decade to 2012. Accordingly, there is limited evidence at this stage to conclude that the harvest strategy is expected to achieve the stock management objectives reflected in criteria 1A(i).

TAR2 **PRECAUTIONARY HIGH RISK**

The current position of the TAR 2 and TAR 3 stocks against target and soft limits is unknown, as is the probability that current catch or TACC will result in a decline in biomass below soft limit (MPI, 2017). While MPI (2017) conclude that it is unlikely (<40%) that the stock will fall below the hard limit, the overall stock prognosis is unknown. Accordingly, there is limited evidence at this stage to conclude that the harvest strategy is expected to achieve the stock management objectives reflected in criteria 1A(i).

TAR3 **PRECAUTIONARY HIGH RISK**

As above for TAR2

TAR7 **LOW RISK**

Trawl survey recruited biomass index for WCSI in 2013 was 17% higher than when the stock was estimated to be at or around B_{MSY} in 2007, and biomass (WCSI) is expected to stay steady over the next 3–5 years assuming current (2012/13) catch levels (MPI, 2017). MPI (2017) conclude that it is unlikely (<40%) that current catch or TACC will result in the stock falling below the soft limit and very unlikely (<10%) that it will result in the stock falling below the hard limit. There is limited evidence from TAC adjustments that the harvest strategy is responsive to the state of the stock, albeit stock assessments are updated periodically (next scheduled for 2018) and the evidence to date suggests the TACC has served to maintain stock at levels at or around B_{MSY}. Notwithstanding the absence of TAC adjustments over time, all of the elements of the harvest strategy appear to work together.

TRE1 **MEDIUM RISK**

The extent to which current the TAC is expected to maintain the stock at a level which maintains high productivity and a low probability of recruitment overfishing is not certain, albeit indices of abundance accepted by the working group have shown a generally increasing trend between the mid-1990s and 2013 (MPI, 2017). Together with ongoing efforts to assess the stock and the requirement to adjust TACs where necessary consistent with the default settings of the Fisheries Act and HSS, this provides some evidence that the harvest strategy is expected to achieve the stock management objectives reflected in criteria 1A(i). Nevertheless, we note the stock would be better positioned against this SI with additional evidence that the current TAC will maintain the stock at B_{MSY}.

TRE7 **LOW RISK**

Stock projections were undertaken during the 2015 stock assessment using two catch scenarios: the current TACC or a constant catch equivalent to the 2013 catch level. The analysis projected a slight decline in spawning biomass (3%) to 2019, but only a low probability that the biomass will decline below the target biomass level. Overall, there was an 86% probability that the stock would remain above B40% in 2019 under the TACC catch scenario and a 92% probability under the 2013 catch scenario. Accordingly, notwithstanding no changes in the TAC since the early 1990s, there is good evidence that the harvest strategy is responsive to the state of the stock and all of the elements of the harvest strategy work together towards 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

BAR1, BAR5, BAR7, GUR1, GUR2, GUR3, GUR7, FLA3, TRE7 **LOW RISK**

FLA7, TAR1, TAR2, TAR3, TAR7, TRE1 **MEDIUM RISK**

The inshore trawl UoAs are 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*"], and the NZ Harvest Strategy Standard (HSS) 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 HSS 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 those stocks which have a sound and measurable index of relative biomass and stock specific reference points, the harvest strategy has the key elements needed to ensure that exploitation is reduced as PRI is approached: a robust index of abundance, a suite of performance measures based on these estimates of relative biomass, and a TAC adjustable annually. While there is no formal mathematical harvest control rule (HCR) for these stocks (except for FLA 3), there is clearly a process in place to identify, examine and respond to issues of stock decline, and a suite of available tools to implement reductions in exploitation if needed. Action taken to reduce the TACs in response to stock declines in several NZ fisheries provides evidence that the management system is willing to reduce exploitation as PRI is approached. Similar measures have been sufficient to meet at least the SG80 mark in full MSC assessments for other NZ deepwater fisheries (e.g. hoki, southern blue whiting).

The remaining stocks without a robust measure of abundance and/or stock specific reference points are subject to requirements of the Act and HSS which provide generally understood HCRs. These stocks are scored medium risk.

PI SCORE	**LOW RISK – BAR1, BAR5, BAR7, GUR3, GUR7, TRE7**
	MEDIUM RISK – FLA3, GUR1, GUR2, TRE1, TAR7
	PRECAUTIONARY HIGH RISK – FLA7, TAR1, TAR2, TAR3

1C: Information and Assessment

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

(a) Range of information

BAR1, BAR5, BAR7 **LOW RISK**

Notwithstanding some uncertainties around stock mixing (e.g. MPI, 2017), sufficient information is available on stock structure and productivity and fleet composition to support the harvest strategy. There is very good monitoring of catch and effort through the QMS system with VMS and some validation from independent observers. The available data are sufficient to support standardised CPUE analyses against reference points for all stocks. Trawl surveys also provide an independent index of abundance.

FLA3 **LOW RISK**

Notwithstanding some uncertainties around stock structure and reporting of multiple species within the one generic species code, sufficient information is available on stock structure and productivity and fleet composition to support the harvest strategy. There is very good monitoring of catch and effort through the QMS system, MPI (2017) indicates that reporting by flatfish species has substantially improved in FLA 3 in 2012‑13 and 2013‑14. The available data are sufficient to support standardised CPUE analyses against reference points for all stocks, as well as the operation of a quantitative Management Procedure (MP).

FLA7 **PRECAUTIONARY HIGH RISK**

Limited information has been found on FLA 7. This fishery is subject to the same reporting arrangements as other FLA stocks under the QMS, and information on catch, effort and fleet composition is likely to be very good. Nevertheless, given the limited information available on the harvest strategy it is difficult to gauge whether the existing fishery information is sufficient. Accordingly, we have scored this SI precautionary high risk.

GUR1, GUR2, GUR3, GUR7 **LOW RISK**

Although some uncertainty around stock structure remains, sufficient relevant information on stock structure, stock productivity and fleet composition are available to support the harvest strategy. There is very good monitoring of catch and effort through the QMS system, while recreational catches are estimated periodically which inform recreational allowances in the TAC. The basic biology of red gurnard has been relatively well studied (see summary in MPI, 2017).

TAR1, TAR2, TAR3, TAR7 **LOW RISK**

Although some uncertainty around stock structure remains (e.g. the inter-relationship between TAR 2 and TAR3), sufficient relevant information on stock structure, stock productivity and fleet composition are available to support the harvest strategy. There is very good monitoring of catch and effort through the QMS system, while recreational catches are estimated periodically which inform recreational allowances in the TAC. The basic biology of tarakihi has been relatively well studied (see summary in MPI, 2017).

TRE1, TRE7 **LOW RISK**

Sufficient information is known about the stock boundaries of trevally and stock productivity to support the harvest strategy. In addition, there is very good monitoring of catch and effort through the QMS system, and good information on fleet composition.

(b) Monitoring and comprehensiveness

BAR1, BAR5, BAR7 **LOW RISK**

Commercial removals from the UoA are closely monitored through the QMS reporting arrangements, with some level of validation from observers. Recreational catches are minor compared to commercial catch and are estimated periodically (MPI, 2017). Most recently, catches were estimated across all BAR stocks using a 'panel survey' method. No quantitative information customary catch is available, though anecdotal information suggests that catch is small. Standardised CPUE provides an index of abundance for each stock, while trawl surveys also provide an independent measure of abundance. This information is sufficient to support the HCRs.

FLA3 **LOW RISK**

Commercial removals from the UoA are closely monitored through the QMS reporting arrangements, with some level of validation from observers. Recreational catches are minor compared to commercial catch and are estimated periodically. Most recently, catches were estimated in 2012 using a 'panel survey' method. No quantitative information customary catch is available. Standardised CPUE provides an index of abundance for each stock, while trawl surveys also provide an independent measure of abundance for lemon sole. This information is sufficient to support the MP.

FLA7 **PRECAUTIONARY HIGH RISK**

While it is likely that removals from the UoA are closely monitored through the QMS, no information on FLA7 is presented in the Plenary reports (MPI, 2017) so it is not known whether a robust index of abundance exists.

GUR1, GUR2, GUR3, GUR7 **LOW RISK**

Stock abundance for each stock and sub-stock is regularly monitored, with stock-specific indices of abundance discussed and agreed at the relevant working group. Commercial removals from the UoA are closely monitored through the QMS reporting arrangements, with a low level of validation from observers. Recreational catches are small compared to commercial catch and are estimated periodically (MPI, 2017). Most recently, catches were estimated in 2012 using a 'panel survey' method. Red gurnard is an important species for customary non-commercial fishing interests, however no quantitative information on customary catch is available.

TAR1, TAR2, TAR3, TAR7 **LOW RISK**

Stock abundance for each stock and sub-stock is regularly monitored, with stock-specific indices of abundance (e.g. commercial trawl CPUE, independent trawl survey CPUE) discussed and agreed at the relevant working group. Commercial removals from the UoA are closely monitored through the QMS reporting arrangements, with a low level of validation from observers. Recreational catches are small compared to commercial catch and are estimated periodically (MPI, 2017). Most recently, catches were estimated in 2012 using a 'panel survey' method. Red gurnard is an important species for customary non-commercial fishing interests, however no quantitative information on customary catch is available.

TRE1 **MEDIUM RISK**

Commercial removals from the UoA are closely monitored through the QMS reporting arrangements, with a low level of validation from observers. Recreational catches are minor compared to commercial catch and are estimated periodically. Most recently, catches were estimated in 2012 using a 'panel survey' method. No quantitative information customary catch is available. Standardised bottom trawl CPUE index was accepted by the Working Group as an index of abundance.

TRE7 **LOW RISK**

Removals from the UoA are monitored similar to TRE 1. Stock abundance is monitored through multiple indices of abundance and periodic stock assessments. These are sufficient to support the harvest control framework established by the HSS.

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

(a) Stock assessment

BAR1 LOW RISK

BAR5, BAR7 MEDIUM RISK

Assessments of each stock are undertaken using standardised CPUE, based on the most appropriate sector of the fishery agreed by the working group. Although no estimate of biomass is available, analysis of CPUE trends allows for a probabilistic judgement about the position of the stock against the generic default reference points in the HSS in the case of BAR 5 and BAR 7, and B_{MSY} proxy reference points in the case of BAR 1. Both the quality of the assessments and main data inputs were rated 'high' by the working group. On the basis that the BAR 1 assessment is appropriate for the stock and estimates status relative to reference points that are appropriate to the stock and can be estimated we have scored it low risk. On the basis that BAR 5 and BAR 7 are assessed against the generic reference points in the HSS only, we have scored them medium risk.

FLA3 LOW RISK

Assessments of each stock are undertaken using standardised CPUE, with the approach agreed by the working group. Although no estimate of biomass is available, analysis of CPUE trends allows for a probabilistic judgement about the position of the stock against default B_{MSY}-based proxy reference points. Both the quality of the assessments and main data inputs for each species were rated 'high' by the working group. On that basis, the available assessments are appropriate for the stocks and estimates status relative to reference points that are appropriate to the stock and can be estimated.

FLA7 PRECAUTIONARY HIGH RISK

No stock assessment information was available.

GUR1, GUR2, GUR3, GUR7 LOW RISK

Although the indices of abundance differ, the overall approach to assessment of each of the GUR stock is similar with standardised commercial trawl or trawl survey CPUE (and survey length frequency in the case of GUR 7) assessed against stock-specific B_{MSY} proxies agreed by the working group (MPI, 2017). Both the assessments themselves and data inputs were rated 'high quality' by each of the relevant working groups. Accordingly, there is evidence that the assessments are appropriate for the stock and estimate status relative to reference points which are appropriate to the stock and can be estimated.

TAR1 MEDIUM RISK

The TAR 1 stock is assessed using standardised indices of abundance for each of the three sub-stocks. Indices of abundance are agreed by the relevant working group. At present, assessment outputs are assessed relative to generic reference points in the HSS. While the overall assessment quality and data inputs were rated 'high quality' in the 2012 assessment, conflicting trends across the different stocks meant a conclusion on the position of the stock against reference points was not possible.

In 2012, an assessment of the east coast mainland New Zealand tarakihi stocks was attempted (Langley & Starr 2013; in MPI, 2017), however the Northern Inshore Working Group concluded that uncertainties in key model assumptions (e.g. fishery selectivity and stock structure) meant the range of models investigated was not adequate for the formulation of management advice.

TAR2, TAR3 MEDIUM RISK

Both TAR 2 and TAR 3 are assessed using standardised CPUE indices agreed by the working group. Species-specific target reference points have not been established, but B_{MSY} is assumed (MPI, 2017). Assessment outcomes are currently assessed against the default reference points in the HSS. The 2012 assessment results were sufficient to make a probabilistic judgement about the position of the stock against the hard limit, but not the target or soft limit.

TAR7 LOW RISK

TAR 7 was assessed in 2014 using a time series of WCSI trawl survey biomass, as well as updated standardised CPUE indices from two sub-stock areas within TAR 7 (West Coast South Island and Tasman Bay/Cook Strait) (MPI, 2017). In 2008, the stock was assessed using an integrated statistical catch-at-age stock assessment incorporating data up to the end of the 2006–07 fishing year (Manning 2008; in MPI, 2017). The 2008 assessment estimated biomass in 2007 against biomass in the absence of fishing (B_0) and created an implicit benchmark against which more recent standardised CPUE results could be compared. Although B_{MSY} has not yet been analytically determined, $B_{40\%}$ has been assumed. Accordingly, there is evidence that the assessment estimates status relative to reference points which are appropriate to the stock and can be estimated.

TRE1 PRECAUTIONARY HIGH RISK

Stock assessments for the two TRE 1 QMA stocks (East Northland to Hauraki Gulf, and Bay of Plenty) were rejected by the Northern Inshore Working Group in 2015 and 2016 as a result of conflicts in the data (MPI, 2017). The Working Group recommended that assessments should be undertaken after the next catch-at-age study for TRE 1 had been completed. In the meantime, standardised trawl CPUE has been used to assess trends in catch rates. This is yet to estimate status against generic reference points.

TRE7 LOW RISK

The 2015 assessment used an age structured Stock Synthesis population model fitted to various indices of abundance described above. The working group rated both the assessment and data inputs high quality. The assessment is appropriate for the stock and estimates stock status relative to reference points which are appropriate and can be estimated.

(b) Uncertainty and Peer review

BAR1, BAR5, BAR7 **LOW RISK**

The process of CPUE standardisation accounts for some uncertainties, while trawl survey results provide an independent measure of abundance against which the CPUE analysis can be compared. Methods of standardisation and outputs are reviewed through the MPI working group process, which includes independent scientists and stakeholders. Any major sources of uncertainty are reported through the Fisheries Plenary reports.

FLA3 **LOW RISK**

The process of CPUE standardisation accounts for some uncertainties, while trawl survey results for lemon sole provide an independent measure of abundance against which the CPUE analysis can be compared. Methods of standardisation and outputs are reviewed through the MPI working group process, which includes independent scientists and stakeholders. Any major sources of uncertainty are reported through the Fisheries Plenary reports.

FLA7 **PRECAUTIONARY HIGH RISK**

No stock assessment information was available.

GUR1, GUR2, GUR3, GUR7 **LOW RISK**

The process of CPUE standardisation accounts for some uncertainties, while alternative indices of abundance are used where available (e.g. trawl survey CPUE for GUR 3 and GUR 7). Outcomes of assessments are reviewed through the MPI working group process which involves independent scientists and stakeholders.

TAR1, TAR2, TAR3, TAR7 **LOW RISK**

The process of CPUE standardisation accounts for some uncertainties, while alternative indices of abundance are used where available (e.g. TRA 3, TRA 7). The major uncertainties are set out in the Fisheries Plenary reports (stock structure, relationship between CPUE and biomass). Outcomes of assessments are reviewed through the MPI working group process which involves independent scientists and stakeholders.

TRE1 **PRECAUTIONARY HIGH RISK**

The 2015 and 2016 preliminary assessments of TRE 1 sub-stocks were rejected by the working group (MPI, 2017).

TRE7 **LOW RISK**

The 2015 assessment takes uncertainty into account using Bayesian techniques, as well as undertaking multiple model runs to test sensitivities to alternative parameters settings (MPI, 2017). The assessment is reviewed through the MPI working group process which involves independent scientists and stakeholders.

PI SCORE	**LOW RISK – BAR1, BAR5, BAR7, FLA3, GUR1, GUR2, GUR3, GUR7, TAR1, TAR2, TAR3, TAR7**
	PRECAUTIONARY HIGH RISK – FLA7, TRE1

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

Trawl UoAs **PRECAUTIONARY HIGH 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.

New Zealand's inshore trawl fisheries are complex, multi-species fisheries, harvesting a wide range of inshore finfish species. The composition of the catch can vary considerably in space and time based on variations in recruitment, changes in market demand and the like. Information on the retained portion of the catch is very strong, reported and verified through the QMS reporting arrangements. Information on the discarded portion of the catch is considerably more limited. Observer coverage in inshore fisheries has historically been very low (or absent from some sectors), and the main information on overall catch composition comes from independent trawl surveys, which may not be an accurate reflection of commercial catch composition (for example different gear may be used). There is also limited reporting of discards in commercial catch returns. The assessment of each UoA is further complicated because many of the species being assessed are in practice taken as bycatch species across a number of inshore trawl sectors.

Because no information is available on total catch composition (retained + discarded) for each UoA assessed here, for the purposes of this assessment we have examined information on retained and discarded species separately. Information on retained species composition was drawn from Bentley et al (2013) which summarises reported landings from 1989-90 to 2013 across different inshore trawl sectors. Based on this information, the stocks likely to comprise >5% of the retained catch for each UoA are outlined in Table 2. It is possible that a number of stocks below which comprise ~5-10% of the retained species catch may not comprise >5% of the total catch if discard information was available, and therefore would not ordinarily be considered. To that extent, the number of species considered below is likely to err on the side of being precautionary (at least for the retained species). Information on discards is considered separately below.

Table 2: Stocks likely to comprise >5% of the retained catch in the assessed UoAs, according to catch compositions reported by Bentley et al (2013).

Stock/UoA	Stocks likely to comprise >5% of retained catch
Barracouta	
BAR 1	TAR 1, TAR 2, SNA 1
BAR 5	RCO 3, STA 5, TAR 5, WAR 3,
BAR 7	TAR 1, TAR 8, SNA 8
Flatfish	
FLA 3	RCO 3, RSK 3, ELE 3, ELE 5, GUR 3
FLA 7	RCO 7, GUR 7
Gurnard	
GUR 1	SNA 1, SNA 8, JDO 1, LEA 1, TAR 1
GUR 2	TAR 2, SNA 2, TRE 2, BAR 1, FLA 2
GUR 3	RCO 3, BAR 4, BAR 5, FLA 3
GUR 7	FLA 7, BAR 7, STA 7, RCO 7, TAR 7
Tarakihi	
TAR 1	SNA 1, SNA 8, BAR 1, BAR 7, TRE 1, TRE 7
TAR 2	BAR 1, SNA 2, GUR 2
TAR 3	RCO 3, SPD 3, RSK 3, BAR 4, STA 3
TAR 7	BAR 7, RCO 7, STA 7, WAR 7
Trevally	
TRE 1 - trawl	SNA 1, TAR 1, BAR 1, JDO 1
TRE 1 – purse seine	JMA 1, KAH 1, EMA 1
TRE 7	SNA 7, SNA 8, GUR 7, BAR 7, TAR7

The likely position of each main other species stock against the scoring guidelines is summarised in Table 3. Information for summaries was drawn from the 2017 Fisheries Plenary MPI (2017).

Table 3: Status of main other species stocks in relation to the point of recruitment impairment, and extent to which measures are in place to ensure UoAs do not hinder recovery if below PRI.

Stock	Above PRI? Measures to ensure recovery?*	Comments
Snapper		
SNA 1		Two main stocks as likely as not to be below soft limit. Model five year projections using recent catches for the commercial fleet and recent exploitation rates for the recreational fishery predict increasing SSBs in East Northland and in the Hauraki Gulf-Bay of Plenty combined, however overfishing likely to be occurring at current catch levels. New management plan for SNA 1 under development.
SNA 2		The stock is unlikely to be below the soft limit; catches are below MSY; stock biomass expected to have increased slowly over the last decade if recruitment has been maintained at or above long-term average levels.
SNA 7		Stock unlikely to be below soft limit; catches below MSY; demonstrable evidence of recovery
SNA 8		Stock likely to be below PRI, however TACC was reduced to 1300 t from 1 October 2005 the to ensure a faster rebuild of the stock. At this TACC level the predicted rebuild to B_{MSY} (20% B_0) occurred after 2018. These measures would ordinary comprise a strategy, however there has been no stock assessment since 2005 so the extent to which the strategy has been successful is not clear.
Tarakihi		
TAR 1		See details above. Stock position against reference points unknown. Unknown if current catch limits will result in overfishing.

TAR 2		See details above. Stock position against target/soft limit reference points unknown; unlikely to be below hard limit. Stock prognosis against target/soft limits unknown at current catch levels. Unlikely to go below hard limit.
TAR 5		Not assessed in Plenary
TAR 7		Highly likely to be above PRI; Biomass (WCSI) is expected to stay steady over the next 3–5 years assuming current (2012/13) catch levels
TAR 8		Limited evidence, but Plenary reports "Given the long, stable catch history of this fishery, current catch levels and TACCs are thought to be sustainable".
Barracouta		
BAR 1		See above. Highly likely to be above PRI.
BAR 4		Not assessed in Plenary
BAR 5		See above. Highly likely to be above PRI.
BAR 7		See above. Highly likely to be above PRI.
Flatfish		
FLA 2		2017 assessment concluded the stock likely (> 60%) to be at or above the target.
FLA 3		2017 assessment concluded the combined species stock about as likely as not (40–60%) to be at or above the target.
FLA 7		Not assessed in Plenary
Trevally		
TRE 1		See above. Preliminary assessments of two sub-stocks rejected. Stock position against reference points is unknown.
TRE 2		No stock assessment. Trevally in TRE 2 are thought to be part of the biological stock located in the Bay of Plenty (TRE 1). Future assessments for TRE 2 will be undertaken in conjunction with TRE 1.
TRE 7		See above. Highly likely to be above PRI.
Red Gurnard		
GUR 2		See above. Highly likely to be above PRI.
GUR 3		See above. Highly likely to be above PRI.
GUR 7		See above. Highly likely to be above PRI.
Red Cod		
RCO 3		Red cod fishery is characterised by large variations in catches between years. Variation in catch is due to varied recruitment causing biomass fluctuations rather than a change in catchability. All RCO stocks fisheries have been put on to Schedule 2 of the Fisheries Act 1996, which allows for TAC increases within a fishing season. RCO 3 managed using in-season adjustments based on a decision rule and associated management procedure. Unknown if stock is below PRI, although measures are in place to ensure recovery not hindered.
RCO 7		Position of stock against target and soft limit reference points is unknown, but unlikely to be below hard limit. Stock prognosis against target/soft limit reference points is unknown.
Stargazer		
STA 3		2017 assessment concluded the stock about as likely as not (40–60%) to be at or above the target.
STA 5		2017 assessment concluded the stock about as likely as not (40–60%) to be at or above the target.
STA 7		2017 assessment concluded the stock likely (> 60%) to be at or above the target.
Blue warehou		
WAR 3		Estimates of reference and current biomass are not available. It is not known if recent landings or TACCs are at levels which will allow the stocks to move towards a size that will support the maximum sustainable yield.
WAR 7		As above.

Rough Skate		
RSK 3		No estimates of current and reference biomass are available.
Elephant fish		
ELE 3		2016 assessment concluded the stock about as likely as not (40–60%) to be at or above the target.
ELE 5		2017 assessment concluded the stock about as likely as not (40–60%) to be at or above B_{MSY}.
John Dory		
JDO 1		Of the two main JDO sub-stocks which overlap TRE 1, the Hauraki Gulf and east Northland (HGEN) stock is about as likely as not to be below the soft limit, and the Bay of Plenty (BoP) stock is very unlikely to be at or above the target but unlikely to be below the soft limit. For the HGEN stock, overfishing is unlikely to be occurring; for the BoP stock it is about as likely as not. Annual catches and fishing mortality have been relatively low over the last five years, although there is no indication that the stock is recovering. It is likely that recruitment has been low over the recent period (5–10 years). TACC exceeds catch by a substantial margin. There appears to be limited evidence that the current measures are resulting in stock recovery.
Leatherjacket		
LEA 1		Not assessed in Plenary
Spiny dogfish		
SPD 3		While no stock assessment of SPD 3 is available, there is some evidence from east coast South Island trawl surveys that recruitment into the fishery has continued.

* is the stock likely/highly likely to be above PRI? OR If not, are there measures/demonstrably effective strategy to ensure the UoA doesn't hinder recovery?

Overall indicative scores for each of the inshore trawl UoAs based on retained species only are given in Table 4.

Table 4: Indicative score for main other species taken in inshore trawl UoAs based on retained species only.

UoA	Overall Score	Stock scores			
		Low	Medium	PHR	High
Barracouta					
BAR 1				TAR 1, TAR 2, SNA 1	
BAR 5		STA 5	RCO 3	TAR 5, WAR 3	
BAR 7		TAR 8	SNA 8	TAR 1	
Flatfish					
FLA 3		ELE 3, ELE 5, GUR 3	RCO 3	RSK 3	
FLA 7		GUR 7		RCO 7	
Gurnard					
GUR 1			SNA 8	SNA 1, JDO 1, LEA 1, TAR 1	
GUR 2		SNA 2, BAR 1, FLA 2		TAR 2, TRE 2	
GUR 3		BAR 5, FLA 3	RCO 3	BAR 4	
GUR 7		BAR 7, STA 7, TAR 7		FLA 7, RCO 7	
Tarakihi					
TAR 1		BAR 1, BAR 7, TRE 7	SNA 8	SNA 1, TRE 1	
TAR 2		BAR 1, SNA 2, GUR 2			
TAR 3		STA 3	RCO 3, SPD 3	RSK 3, BAR 4	
TAR 7		BAR 7, STA 7		RCO 7, WAR 7	
Trevally					
TRE 1		BAR 1		SNA 1, TAR 1, JDO 1	
TRE 7		SNA 7, GUR 7, BAR 7, TAR 7	SNA 8		

Discards

MPI (2016a) reports that "*some bycatch information is available from some fishery characterisation studies*[2]*… but there were no detailed analyses of bycatch and discards from inshore fishing principally because of the lack of observer data. Most of the analyses of bycatch and discards for offshore fisheries were reliant on observer data, e.g., Anderson 2012, 2013a, and similar analyses for inshore fisheries are not currently possible. Past observer coverage of inshore fisheries was low (e.g., fewer than 2% of tows observed in 2009–10, Ramm 2012) and coverage was mainly focused on monitoring of Hector's and Maui's dolphin interactions and abundance for the Threat Management Plan. There are also practical and logistical problems with placing observers on smaller inshore vessels, and other options are being explored for the monitoring of these fisheries. This includes electronic monitoring using various configurations of video cameras, gear sensors, and position recording. Some progress has been made, but there remain some issues to surmount before electronic monitoring can provide all the information required to estimate fish and invertebrate bycatch. However for the SNA 1 fishery MPI has committed to 100% observer or camera coverage for all trawl vessels from October 1, 2015, and research into estimation of all fish bycatch and discards using electronic monitoring is planned for 2015–16 (ENV2015-04).*"

Given the absence of discard information for all sectors, it is not possible to assess impacts and all UoAs are assessed as precautionary high risk. The introduction of electronic monitoring in some sectors may help to better characterise discards.

TRE1 – Purse seine **PRECAUTIONARY HIGH RISK**

According to Bentley et al (2013) the main other species taken in TRE 1 purse seines are jack mackerel (JMA 1), Kahawai (KAH 1) and blue mackerel (EMA 1). No information on discarding was available.

The most recent assessment of JMA 1 was undertaken in 1993. The position of the stock against default reference points in the HSS is not known. MPI (2017) conclude that it is not known whether catches at the level of the current TACCs or recent catch levels are sustainable in the long-term.

A 2015 age-based stock assessment concluded that KAH 1 is very likely (>90%) to be at or above its target reference point (52%B_0) (MPI, 2017).

MPI (2017) report that "for EMA 1, the stability of the age composition data and the large number of age classes that comprise the catches suggests that blue mackerel may be capable of sustaining current commercial fishing mortality, at least in the short-term".

On the basis the JMA score, we have scored the UoA precautionary high risk.

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 **PRECAUTIONARY HIGH RISK**

The measures in place to manage main other species across the inshore trawl UoAs includes:

- Control on catch and effort through TACs and ITQs on the target species;
- Gear restrictions;
- Monitoring through logbooks and catch returns;
- Monitoring through VMS
- Spatial closures in some areas;
- Periodic assessments of QMS species through the NZ Plenary process.

Information on discarded species is very limited and insufficient to allow to the identification of 'main' other species according to the total weight of the catch. With the exception of two units of assessment (TAR 2 and TRE 7), the information available for the main retained species is not sufficient to conclude that the measures in place are expected to maintain main other species at levels which are likely to be above PRI. MPI (2016a) report that the National Fisheries Plans for Inshore species (finfish, shellfish and freshwater fisheries) included objectives which address non-protected species bycatch, but research on these objectives has yet to be conducted.

Current initiatives to introduce electronic monitoring in at least some inshore trawl sectors will improve the information base and assist with management.

The purse seine sector in TRE1 appears to be in a similar position to the inshore trawl sectors. Information on discards is limited and it is uncertain whether existing management measures are sufficient to maintain some main retained stocks above PRI.

(b) Management strategy evaluation **PRECAUTIONARY HIGH RISK**

For those retained species scored PHR, it is not known whether the current sustainability measures will serve to maintain stocks at levels above PRI. Information to assess sustainability measures for discarded species is not available.

(c) Shark-finning

Information to determine whether sharks constitute a main other species in any sector is not available.

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 **PRECAUTIONARY HIGH RISK**

Good quantitative information is available for several target species through the QMS reporting arrangements. For some stocks, this is sufficient to assess the impact of the UoA on main other species with respect to status and detect any increase in risk. For other main other species included in the QMS, the available quantitative information is not sufficient to assess the impact of the UoA on the

[2] Most of the cited examples are unpublished reports held by MPI.

stock. Information on discarded species is very limited. While some summaries of bycatch species have been included in fishery characterisation studies (e.g. Starr et al 2010a, b, c, Starr & Kendrick 2012, Starr & Kendrick 2013; in MPI, 2016a) these are often unpublished internal reports held by MPI. Given the absence of information on discards, and limitations in the information available for the stocks scored PHR under 1(a) above, we have scored this SI PHR. Current initiatives to introduce electronic monitoring in at least some inshore trawl sectors will improve the information base and assist with management.

PI SCORE	PRECAUTIONARY HIGH RISK – All units of assessment

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

Trawl Units of Assessment **PRECAUTIONARY HIGH RISK**

The main potential ETP species interactions in the inshore trawl fisheries are with seabirds and marine mammals.

Interactions with protected corals are also possible, although Consalvey et al (2006) report that there are no shallow-water corals which form reefs in New Zealand waters, and Baird et al (2013) reported that fewer reports of coral catch were reported from observed fisheries in waters shallower than 800 m.

Seabirds

Between 2002–03 and 2014–15, there were 77 observed captures of all birds in inshore trawl fisheries (Figure 3), including New Zealand white-capped albatross (21), Salvin's albatross (19), flesh-footed shearwater (17), black petrel (7), grey-faced petrel (3), sooty shearwater (2), shearwaters (2), Westland petrel (2), white-chinned petrel (1), petrels, prions, and shearwaters (1), common diving petrel (1), and albatrosses (1) (Abraham and Thompson, 2015). During the same period, there were 36 observed captures of all birds in flatfish trawl fisheries. Observed captures were of spotted shag (32), and New Zealand white-capped albatross (4).

Based on rates of observer coverage, Abraham and Thompson (2015) estimate that between 394 – 591 seabirds are captured annually in New Zealand's inshore trawl fisheries, and between 252 and 500 captures in flatfish trawl fisheries, each year.

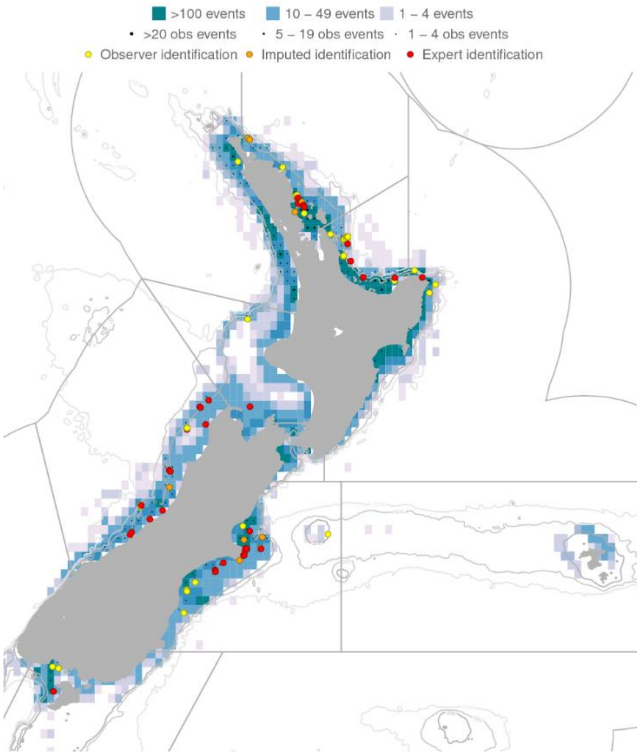


Figure 3: Map of fishing effort and observed captures in inshore trawl fisheries, 2002-03 to 2014-15 (Abraham and Thompson, 2015)

Risks to seabirds 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 (based on but not the same as 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 commercial fishing 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 and 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 median risk ratio was <1). There are no national or international limits on black petrel bycatch.

The most recent quantitative modelling for black petrels concluded that the mean rate of change of the population had not exceeded 2% per year, though the direction of change was uncertain (Bell et al, 2012; in MPI, 2016a). Total mean estimated captures of black petrels in inshore trawl fisheries over the period 2012-13 to 2014-15 was 56, which represents around 5.5% of total estimated captures (Abraham and Thompson, 2015). Only one black petrel was estimated to be captured in flatfish trawls fisheries each year over the same period. These rates of estimated captures are very low in the context of total commercial fishing related mortalities and appear highly unlikely to hinder recovery.

Of the other seabirds observed to be captured in inshore trawl fisheries, only Salvin's albatross (0.51 – 1.09), flesh-footed shearwaters (0.39 – 1.15) and Westland petrel (0.18 – 1.19) had risk ratios with an upper 95% confidence interval higher than 1. For Salvin's albatross, estimated captures in the inshore trawl fleet in the period 2012-13 to 2014-15 accounted for around 24% of the total estimated captures in commercial fisheries. For flesh-footed shearwaters, the inshore trawl fishery accounted for around 9% of estimated mortalities during the same period. For Westland petrels, numbers of estimated captures by sector were not available, although only 2 birds had been observed captured in the inshore trawl fishery between 2002-03 and 2014-15 (albeit observer coverage has been low in most years).

No species observed to be taken in flatfish trawls had a risk ratio with an upper 95% confidence interval higher than 1.

Accordingly, the direct effects of the inshore trawl fisheries appear highly unlikely to hinder recovery of ETP seabird species.

Marine Mammals

Pinnipeds

Between 2002–03 and 2014–15, there were six observed captures of New Zealand fur seals, and no observed captures of New Zealand sea lions, in inshore trawl fisheries (Abraham and Thompson, 2015). Estimated captures of fur seals in the same period ranged from 40 to 114 annually. There were no observed or estimated captures of either species over the same period in the flatfish targeted trawl fisheries.

New Zealand fur seals are the most common seals in New Zealand and are listed as 'least concern', with an increasing population trend. There are no national or international limits on incidental captures of fur seals. Based on this it appears highly likely that current rates of capture are not hindering recovery of either species.

Dolphins

Hector's and Maui dolphin

MPI (2016a) note that "it is widely accepted that incidental mortality in coastal fisheries, notably set nets and to a lesser extent trawls, is the most significant threat to Hector's and Māui dolphins (MFish & DOC 2007, Slooten & Dawson 2010, Currey et al 2012)". Nineteen individual Hector's dolphins were reported caught in trawl fisheries between 1921 and 2008 and none since 2008 (MPI, 2016a).

Maui's dolphin is listed as 'critically endangered' on the IUCN's Red List of threatened species and 'nationally critical' in the New Zealand Threat Classification System. Current population estimates indicate that about 63 Maui's dolphins over 1 year of age remain (Baker et al, 2016).

Hector's dolphin is listed as 'endangered' by the IUCN and 'nationally endangered' in New Zealand. MacKenzie & Clement (2016; in MPI, 2016a) estimate the total Hector's dolphin population around the South Island (excluding sounds and harbours) to be 14 849 (CV: 11%, 95% CI 11 923–18 492). This estimate is approximately twice as large as the previous estimate from surveys conducted in the late 1990s – early 2000s (7300; 95% CI 5303–9966), with the difference primarily due to a substantial number of dolphins estimated to be in offshore areas (> 4nm) along ECSI that had not been extensively surveyed previously (MPI, 2016a).

MPI and DOC (2012) note that "*there have been no reported Maui's dolphin interactions with trawlers but trawling activity does overlap with Maui's dolphins range. Trawling is also known to catch other dolphin species off the WCNI and Hector's dolphins in South Island waters (albeit South Island trawlers have a higher probability of catching a Hector's dolphin due to higher dolphin abundance). MPI cannot determine if the absence of reported mortalities necessarily equates to the absence of trawl-related mortalities because monitoring of the WCNI trawl fleet is low*."

Currey et al (2012) assessed the cumulative impact and associated population risk posed by all threats to Maui's dolphins and also disaggregated the impacts of the individual threats to identify those threats that pose the greatest risk. The risk assessment used a semi-quantitative approach informed by an expert panel of 9 members. Commercial trawl fishing was estimated to be responsible for a median estimated mortality of 1.13 (95% CI: 0.01 – 2.87) individuals per year.

More recently Abraham et al (in prep; in MPI, 2016a) estimated captures of Hector's and Māui dolphin in set net and trawl fisheries by estimating a vulnerability from observed effort, observed captures, and the distribution of Hector's and Māui dolphin used in the marine mammal risk assessment. When estimates of possible live-release and subsequent survival of dolphin and cryptic mortality are included, the estimated number of annual fatalities of Hector's and Māui dolphin in trawl fisheries is 9 (95% c.i.: 1.1 -26.6) and 0.0 (95% c.i.: 0.0 - 0.1), respectively (Abraham et al in prep; in MPI, 2016a). The estimated cumulative fisheries risk score for Hector's dolphin varies from approximately 0.25 to slightly less than 1; the risk score for Māui dolphin is even more uncertain, ranging 0 to greater than 1 (Abraham et al, in prep.; in MPI, 2016a). Given the very low median estimates of annual fatalities in the trawl sector, the results of Abraham et al (in prep) are probably sufficient evidence that it is highly likely that the trawl fishery will not hinder recovery of either species.

Other dolphins

Between 2002–03 and 2014–15, there were five observed captures of common dolphin and one observed capture of a bottlenose dolphin in inshore trawl fisheries (Abraham and Thompson, 2015). Estimated annual captures of common dolphins in inshore trawl fisheries were relatively stable between 38 and 52. The majority of captures are estimated to have occurred in the Taranaki area (Abraham and Thompson, 2015), although captures are estimates in most areas of the North Island and northern part of the South Island. In the flatfish trawl fisheries, estimated annual captures of common dolphins during the same period were between 31 and 74 with a generally declining trend over time (Abraham and Thompson, 2015).

MPI (2016a) report that MPI contract PRO2012-02 is currently in progress to deliver the first iteration of a New Zealand Marine Mammal Risk Assessment (NZMMRA, Abraham et al in prep) applying the Spatially Explicit Fisheries Risk Assessment (SEFRA) method. Preliminary results reviewed by the AEWG in 2016 suggest that common dolphins are the species most at risk from New Zealand commercial fisheries. Estimated fisheries related deaths to common dolphins are attributable primarily to pelagic trawl fisheries, for which historically observed captures are sufficient to estimate vulnerability and risk with some confidence, and also to inshore trawl and setnet fisheries, for which species vulnerability (hence total captures) is very poorly estimated due to very low historical observer coverage (MPI, 2016a).

Given the uncertainty around setnet and inshore trawl fishery mortalities, cumulative fisheries risk for common dolphins remains highly uncertain, with an estimated risk score that may be less than half the Population Sustainability Threshold (PST) or may exceed the PST by a factor of two (Abraham et al in prep, in MPI, 2016a). Preliminary estimates from the NZMMRA suggest setnets may account for the highest number of common dolphin mortalities, followed by pelagic trawl then inshore trawl, although the estimates for inshore trawl and setnets in particular are subject to very wide error bars.

Given the preliminary estimates of risk for common dolphins, including the possibility that the risk ratio from commercial fishing may be up to twice their PST, and that the inshore trawl fishery is important contributor to risk, we have scored this SI precautionary high risk. Final results from the NZMMRA are expected in 2017 and future scoring should take these into account.

TRE1 – purse seine **LOW RISK**

Between 2002–03 and 2014–15, there were no observed captures of any birds, pinnipeds or dolphins in minor purse seine fisheries (Abraham and Thompson, 2015).

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

Trawl Units of Assessment **PRECAUTIONARY HIGH 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

Seabirds

Management measures to mitigate impacts of commercial fisheries on seabirds are included in the NPOA-Seabirds (MPI, 2013a). The measures are given effect through the national fisheries planning process, and vary by vessel type. Table 5 summarises the measures across New Zealand's main commercial fishing gear/vessel types (MPI, 2013a)

Within cells in the table:

- R = regulated;
- SM = required via a self-managed regime (non-regulatory, but required by industry organisation and audited independently by Government);
- V = voluntary with at least some use known;
- Cells blacked out indicate that the measure is not relevant in a particular fishery;
- A year in ( ) indicates the year of implementation;
- Measures annotated with * are part of a vessel-specific seabird risk management plan; and
- Large vessels are those 28m and greater in length.

On trawl vessels, seabird scaring devices such as paired streamer (tori) lines, bird bafflers and warp deflectors have been required on vessels >28 m in length since 2006. These measures are designed to reduce seabird mortality from warp strike in order to achieve or maintain a favourable conservation status for albatrosses and petrels, as required by ACAP. Non-regulatory measures include vessel-specific Vessel Management Plans, which describe various operational procedures to reduce risk to seabirds, such as how fishery waste will be managed. Offal management plans, vessel specific seabird risk management plans and codes of practice are also implemented via a self-management regime on trawl vessels >28m. The NPOA defines a vessel-specific seabird risk management plan as "*a plan which specifies seabird mitigation devices to be used, operational management requirements to minimise the attraction of seabirds to vessels, and incident response requirements and other techniques or processes in place to minimise risk to seabirds from fishing operations*."

For smaller trawlers, no seabird specific mitigation measures are mandatorily required other than the prohibition of net sonde cables. Nevertheless, approximately 25% of the NZ inshore trawl fleet under 28m have developed vessel specific seabird risk plans through CSP managed programmes. These vessels are South Island based where risk is assessed to be greatest e.g. Salvin's and whitecapped albatross. In addition, inshore trawlers in the upper North island have been issued a set of specific guidelines to reduce risk of captures in the trawl net which is reported to be the primary risk of capture to black petrels and flesh footed shearwater.

Table 5: Mitigation measures in place for New Zealand's fisheries under the National Plan of Action for Seabirds. (MPI, 2013a)

Mitigation Measure	*Surface longline*		*Bottom longline*			*Trawl*		*Set net*	*Notes*
	Large-vessel	*Small-vessel*	*Vessels >20m*	*Vessels 7-20m*	*Vessels <7m*	*Large-vessel*	*Small-vessel*		
Net sonde cable prohibition						R (1992)	R (1992)		Net sonde cables are also referred to as third wires
Seabird scaring device	R (Streamer line)	R (Streamer line)	R (Streamer line)	R (Streamer line)		R (2006)	V		On trawlers this is a recognised device which is designed to prevent warp captures and collisions
Additional seabird scaring device			V (second streamer line, gas cannon)			SM (2008)*	V		
Night setting	R (or line weighting)	R (or line weighting)	R (or line weighting)	R (or line weighting)	R (or line weighting)				Longline fleets must use night setting if not line weighting, or vice-versa.
Line weighting	R (or night setting)	R (or night setting)	R (or night setting)	R (or night setting)	R (or night setting)				
Dyed bait	V	V							
Offal management	V	V	R	R	R	SM (2008)*			
Vessel-specific seabird risk management plans						SM (2008)	V		Some vessel-specific seabird risk management plans have been developed for vessels < 28m
Code of Practice	V	V	V			SM (Vessel-specific seabird risk manageme nt plans)			

For larger trawl vessels (>28m), the measures outlined in the NPOA-Seabirds together with observer coverage and periodic risk assessments form a strategy to ensure the UoAs do not hinder recovery of ETP species. For smaller trawl vessels (<28m), fewer measures to mitigate seabirds are required and observer coverage has historically been lower. Nevertheless, risk assessments are updated periodically and there is evidence that new measures have been progressively introduced over time where required. Estimated captures of black petrel in inshore trawl fisheries have been stable between 16 and 27 birds annually between 2002-03 and 2014-15 (MPI, 2016a), which is low in the context of the total captures (Abraham and Thompson, 2015). Other seabird species have median risk ratios <1. Accordingly, the existing strategy appears likely to ensure the trawl UoAs do not hinder recovery of seabird species.

Cetaceans

Hector's and Maui dolphin

The main management measure to limit interactions between trawling and Maui's dolphin is a prohibition on trawling between 0 and 2 nautical miles offshore between Maunganui Bluff and the Manukau Harbour, and Port Waikato to Pariokariwa Point (MPI/DOC, 2012). Within this area, between the Manukau Harbour and Port Waikato, trawling is prohibited between 0 and 4 nautical miles offshore. The restrictions were put in place in 2008 to manage the risk that trawlers in this area could catch Maui's dolphins. Trawling is also prohibited in defined areas including: Kaipara Harbour, Manukau Harbour, Hokianga Harbour, Waikato River Mouth, Raglan Harbour, Aotea Harbour, and Kawhia Harbour (Figure 4).

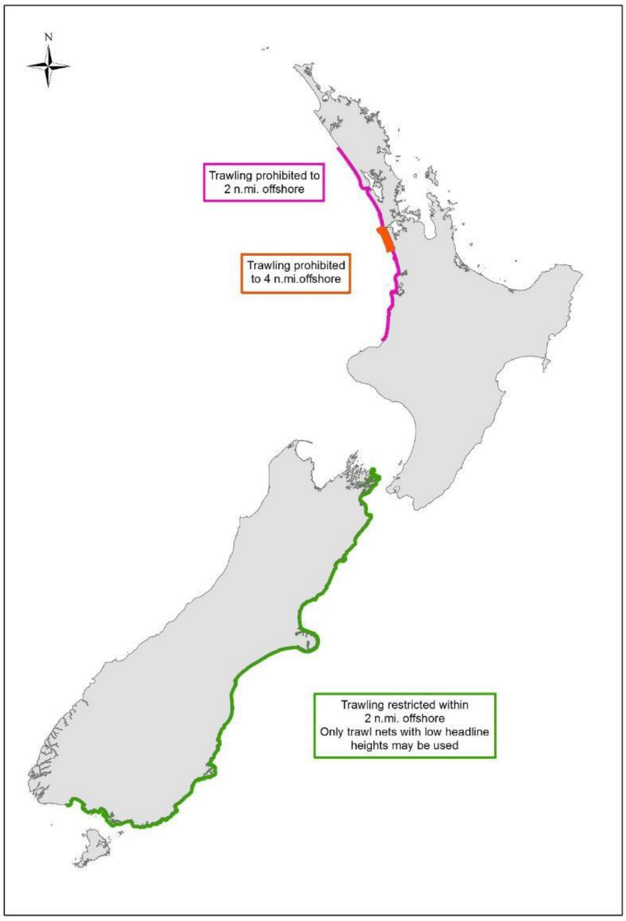


Figure 4: Restrictions on trawling introduced to mitigate impacts on Hector's and Maui dolphin. (MPI, 2016a)

The Maui's Dolphin Threat Management Plan was reviewed in 2013. The existing measures for trawling were retained, as well as extending monitoring coverage between two and seven nautical miles offshore from Maunganui Bluff to Pariokariwa Point. The intent of extending monitoring coverage was to:

- reduce the uncertainty in the risk trawling poses to Māui dolphins while enabling trawling to continue, and
- provide robust information to inform assessment of the level of interaction between trawl activity and the Māui dolphin population.

MPI/DOC (2016) report that in the 14 month period ending March 31, 2016, observer coverage in the West Coast North Island trawl fleet was 24%, and around 31.6% between November 2015 and March 2016. Within that period, there were no observer-reported or fisher-reported captures of Māui dolphins.

On the South Island, trawling is restricted within 2nm of the coast on the east and south coasts.

Given the absence on reported interactions and the updated risk assessment results for both Hector's and Maui dolphin (Abraham et al in prep; in MPI, 2016a), these measures appear to form a strategy that is expected to ensure the UoA does not hinder recovery.

Common dolphins

Apart from the general legal protection of common dolphin, spatial closures and the requirement to report interactions, few specific measures are targeted at mitigating interactions between inshore trawl vessels and common dolphins. Preliminary results from the NZMMRA indicate common dolphin are the marine mammal species most at risk from commercial fishing and inshore trawl vessels may be an important contributor to total mortalities (Abraham et al in prep, in MPI, 2016a). To that end, there is some uncertainty as to whether existing measures are expected to ensure the inshore trawl fisheries do not hinder recovery. The installation of electronic monitoring on some sectors of the fleet will likely assist in better estimating the extent of interactions with trawl vessels.

TRE1 – Purse seine **LOW RISK**

Given the absence of observed interactions with ETP species, the measures in place appear sufficient to ensure the UoA does not hinder recovery.

(b) Management strategy implementation

Trawl Units of Assessment **PRECAUTIONARY HIGH RISK**

For seabirds, periodic risk assessments (e.g. Richard and Abraham, in prep; in MPI, 2016a) provide an objective basis for confidence that the strategy will work, and modelling suggests progress has been made on reducing risk for key species (e.g. black petrel) since the introduction of the 2013 NPOA-Seabirds. To that end, there is at least some evidence that the strategy is being implemented successfully.

For Hector's and Maui dolphin, the most recent risk assessment results (Abraham et al, in prep; in MPI, 2016a) suggest that estimated mortality rates in trawling are low and provide an objective basis for confidence that the strategy will work. The absence of reported captures of Maui dolphin in the inshore trawl fishery on the west coast of the North Island despite higher rates of observer coverage provides some evidence the strategy is being implemented successfully.

The main uncertainty is the extent to which management measures serve to mitigate interactions between inshore trawl vessels and common dolphin given the preliminary outcomes of the NZMMRA (Abraham et al in prep, in MPI, 2016a). Future scoring of this SI should take into account the final outcomes of the risk assessment.

TRE1 – Purse seine **LOW RISK**

The existing observer coverage, albeit limited in many years, provides some objective basis for confidence that the existing measures will work.

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 **LOW RISK**

Notwithstanding the absence of high levels of onboard observer coverage in the inshore fisheries, sufficient information appears to exist to undertake sophisticated assessments of the risk to ETP from the main sectors in the SNA fishery (e.g. Rowe, 2013; Richard and Abraham, 2013; 2015; in prep; Abraham et al, in prep). This information is sufficient to meet low risk, although confidence in the information base for assessments may improve with additional independent monitoring. Implementation of electronic monitoring across some sectors of the fleet may strengthen performance against this indicator.

PI SCORE	**LOW RISK – TRE1 – Purse seine**
	PRECAUTIONARY HIGH RISK – Trawl UoAs

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

Trawl UoAs **MEDIUM RISK**

In the context of habitats, MSC defines "serious or irreversible harm to structure and function" as the "*reduction in habitat structure, biological diversity, abundance and function such that the habitat would be unable to recover to at least 80% of its unimpacted structure, biological diversity and function within 5-20 years, if fishing were to cease entirely*" (MSC, 2014). 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).

It is recognised that when demersal trawl gear touches the bottom, damage may be done to the benthic environment and the communities that dwell there. Depending on the type of habitat, type of interaction, its duration and frequency; some areas may receive permanent damage while other areas will be able to recover in relatively short time periods. Damage to some habitats occurs with minimal trawling and will be long lasting due to the nature of the benthic organisms and the depth (e.g. biogenic habitat with vertical relief). Damage will, however, be restricted to areas trawled so that, the extent of any damage will be in proportion to the trawl footprint of the fishery (MRAG Americas, 2016).

MPI (2016a) report that the widespread nature of bottom trawling suggests that fishing is the main anthropogenic disturbance agent to the seabed throughout most of New Zealand's EEZ. In an in situ study in the Hauraki Gulf, Thrush et al (1998) were able to attribute broad-scale changes in macrobenthic communities to fishing disturbance. Along a gradient of decreasing fishing pressure these authors observed: increases in the density of echinoderms and long-lived surface dwellers; increases in the total number of species and the Shannon-Weiner diversity index; and decreases in the density of deposit feeders and small opportunists. They concluded that: "*the removal of organisms that add three-dimensional complexity to benthic habitats is potentially extremely destructive, as is the homogenization of sediment characteristics by the physical action of dredges and trawls.*" In another study in Tasman and Golden Bays, Tuck et al (2011[3]; in MPI, 2016a) found that "*fishing was consistently identified as an important factor in explaining variance in community structure, with recent trawl and scallop effort being more important than other fishing terms.*"

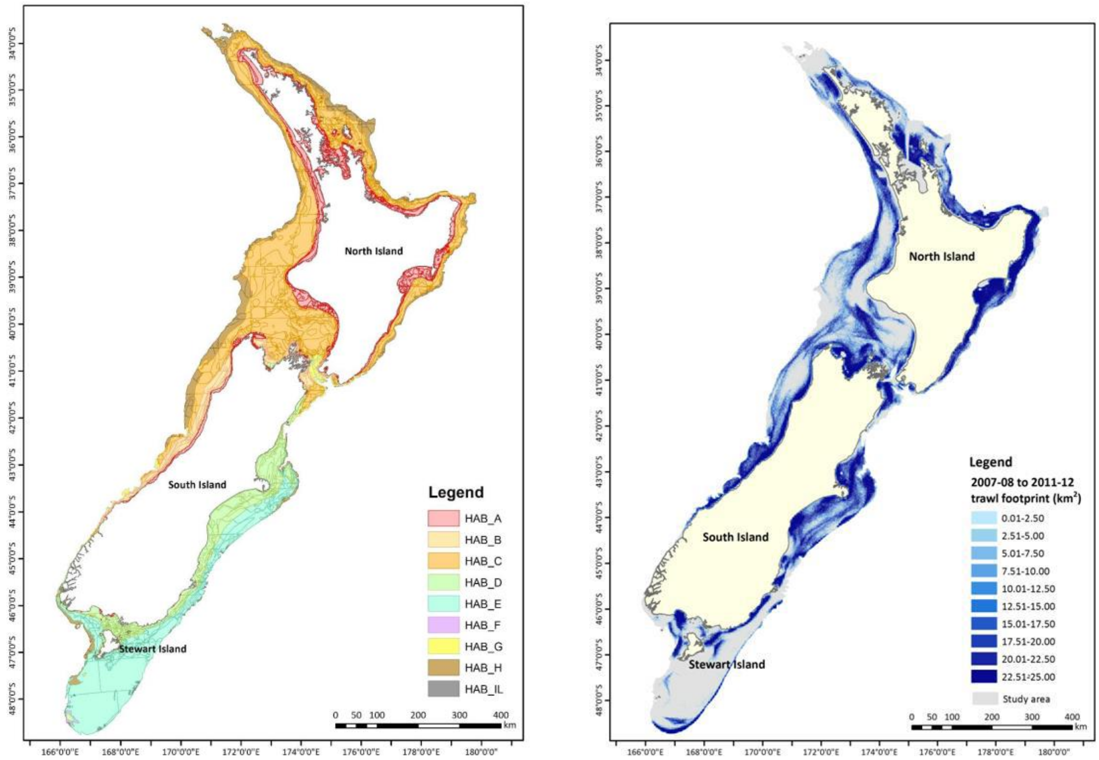
More recently, Tuck et al (2017) examined the impact of trawling on soft sediment habitats in New Zealand's EEZ based on existing and new research. They found that:

- "*The magnitude of the effects of fishing (% variability explained) varied between studies, and as would be expected, greater effects were detected over stronger effort gradients*";

[3] This summary was based on an unpublished progress report to MPI. A publicly copy of the final report has not been located.

- *“When effects were detected, fishing was associated with reductions in the number of taxa, diversity and evenness of both epifaunal and infaunal communities, but more consistently for epifauna. Fishing appears to have reduced epifaunal biomass and productivity (whole community and fish prey) by up to 50% in some of the study sites, but effects on infauna were less consistent (increasing by up to 20% in the one area an effect was detected). The species that were most consistently identified as being negatively correlated with fishing pressure were those that either stand erect out of the seabed (e.g., horse mussels, sponges, bryozoans, hydroids, sea pens, tube building polychaetes), or live on the sediment surface, and thus are particularly sensitive to physical disturbance through either direct physical impact (e.g., Echinocardium), smothering (e.g., small bivalves) or increased vulnerability to predation following disturbance (e.g., brittle stars)”;* and
- *“Where examined, even relatively modest levels of fishing effort (i.e., fishing an area between once and twice per year, estimated at the 5 km × 5 km scale) reduced the density of the combined group of long lived sedentary habitat forming species and individual species group densities of holothurians, crinoids, cnidarians and bryozoans by at least 50%.”*

Assessing the risk of trawling to benthic habitats at the scale of individual habitats in practice requires information on the vulnerability of individual habitats types, the spatial extent of disturbance in the context of the full habitat area and the capacity of the habitat to recover. To examine the spatial footprint of trawling in the context of New Zealand’s inshore benthic habitats, Baird et al (2015) overlaid the combined TCER and TCEPR 2007–08 to 2011–12 fishing years trawl footprint on Benthic-Optimised Marine Environment Classification (BOMEC) (Leathwick et al, 2012) classes shallower than 250 m (Figure 5). The size of the footprint and proportion of each class trawled varied between habitat classes, and ranged from 21% (class F) to 76% (class B). Over the 2007–08 to 2011–12 period, the trawl footprint overlaid 48% of the area shallower than 250m.



(a) *(b)*

Figure 5: (a) New Zealand’s EEZ and TS showing the inshore BOMEC classification zones and (b) total trawl cell based for footprint for the area shallower than 250 m for 2007–08 to 2011–12 combined (from Baird et al, 2015).

Nevertheless, while the footprint calculations were precise, Baird et al (2015) concluded that the data used to represent benthic habitats “were ill-suited for the task” and relied heavily on use of biological data from research surveys beyond the 250m contour. The authors also suggested that “*attempting to define ‘habitats’ for this area of the continental shelf over a relatively large latitudinal gradient is also problematic, particularly with respect to identifying communities that may exist in different benthic habitat classes.*” Attempts by these authors to test how the benthic habitat classes might be affected by the physical contact from bottom trawling, through measures of sensitivity of benthic organisms, also provided inconsistent results.

Moreover, while a number of studies have examined the vulnerability of different habitat types to trawling, MPI (2016a) note that fewer have assessed changes in ecological process or estimated rates of recovery. As a result, the understanding of the consequences of fishing (or of ceasing to fish) for sustainability, biodiversity, ecological integrity and resilience, and fish stock productivity in the wide variety of New Zealand’s benthic habitats remains incomplete.

In the absence of precise information on habitat distribution and recovery, available information on the extent of intense fishing effort and habitat vulnerability may be used to inform a judgement about the probability of serious or irreversible harm occurring. Tuck et al (2017) report that ‘modest’ or higher levels of fishing effort (i.e. fishing an area between once and twice per year, estimated at the 5 km × 5 km scale) occur in less than 10% of the area shallower than 100m. Of the 0-100m depth band, 8.8% is untrawled and 76.26% receives 0.5 or fewer trawls per year (Table 6). Of the 100-200m depth band, 26.94% is untrawled and 93.27% receives fewer than 0.5 trawls per year. While information on recovery is incomplete, the relatively limited spatial footprint of intense trawl effort provides a plausible argument that it is at least unlikely that the fisheries assessed here will reduce habitat structure and function to the point of irreversible harm at the scale of full habitats. Accordingly, we have scored this SI medium risk.

Table 6: Fishing intensity (number of times fished, averaged over most recent 5 years available) by depth band within the New Zealand EEZ. The years for which the data are presented vary depending on the data source, and are 2007/8 – 2011/12 for the coastal data, 2006/7 – 2010/11 for the TCEPR data. (from Tuck et al, 2017).

	Fishing intensity							
Depth range (m)	Not fished	<0.1	0.1–0.5	0.5–1	1–2	2–3.5	3.5–7.5	> 1
0–100	8.84%	38.23%	29.19%	14.51%	6.91%	2.11%	0.21%	9.23%
100–200	26.94%	43.50%	22.83%	4.86%	1.27%	0.43%	0.18%	1.87%
200–500	42.37%	42.32%	8.64%	3.22%	2.17%	0.93%	0.36%	3.46%
500–1000	74.06%	19.62%	3.17%	1.56%	1.15%	0.36%	0.08%	1.59%
1000–1600	90.26%	8.94%	0.75%	0.05%	0.01%			0.01%
1600–5000	99.41%	0.59%						
5000–10000	100.00%							

Nevertheless, the fisheries would be better placed against this SI with better information on inshore habitat distribution and the capacity for habitats to recover from trawling disturbance. We acknowledge that work in this area is ongoing and any advances in our understanding of benthic impacts should be considered in future assessments. For example, we note the outcomes of a 2015 expert workshop convened to address the question "what is the best scientific approach to assessing trawl and dredge impacts on benthic fauna and habitats in New Zealand in the short, medium and long-term?" (Ford et al, 2016). The workshop agreed that a fishing impact/productivity modelling approach to benthic risk evaluation was a useful starting point and would address the management need to ensure sustainability of benthic impacts by taking a risk-based approach. The approach relies on a number of model and prior development steps which are likely to take some years. Progress towards implementing this approach should be considered in future assessments.

TRE1 – Purse seine **LOW RISK**

Purse seine gear is fished at the surface of the water column and typically has negligible impact on habitats.

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

Ackroyd and Pilling (2014) note that "*the Marine Reserves Act (1971) provides the basis for enacting protected areas within New Zealand, while the Conservation Act (1987), Wildlife Act (1953), and Fisheries Act (1996) also provide a framework for implementation. The New Zealand Biodiversity Strategy (2000) identified the need to develop a Marine Protected Areas Policy to protect a full range of natural marine habitats and ecosystems to effectively conserve marine biodiversity, using a variety of appropriate mechanisms, including legal protection. The MPI Strategy for Management of the Environmental Effects of Fishing provides a further framework for managing impacts, aiming to implement an Ecosystem Approach to Fisheries, make significant improvements in managing the environmental effects of fishing, and to ensure the Ministry for Primary Industries meets its environmental obligations under the Fisheries Act 1996 and other legislation in an efficient and consistent manner.*"

Trawl UoAs **MEDIUM RISK**

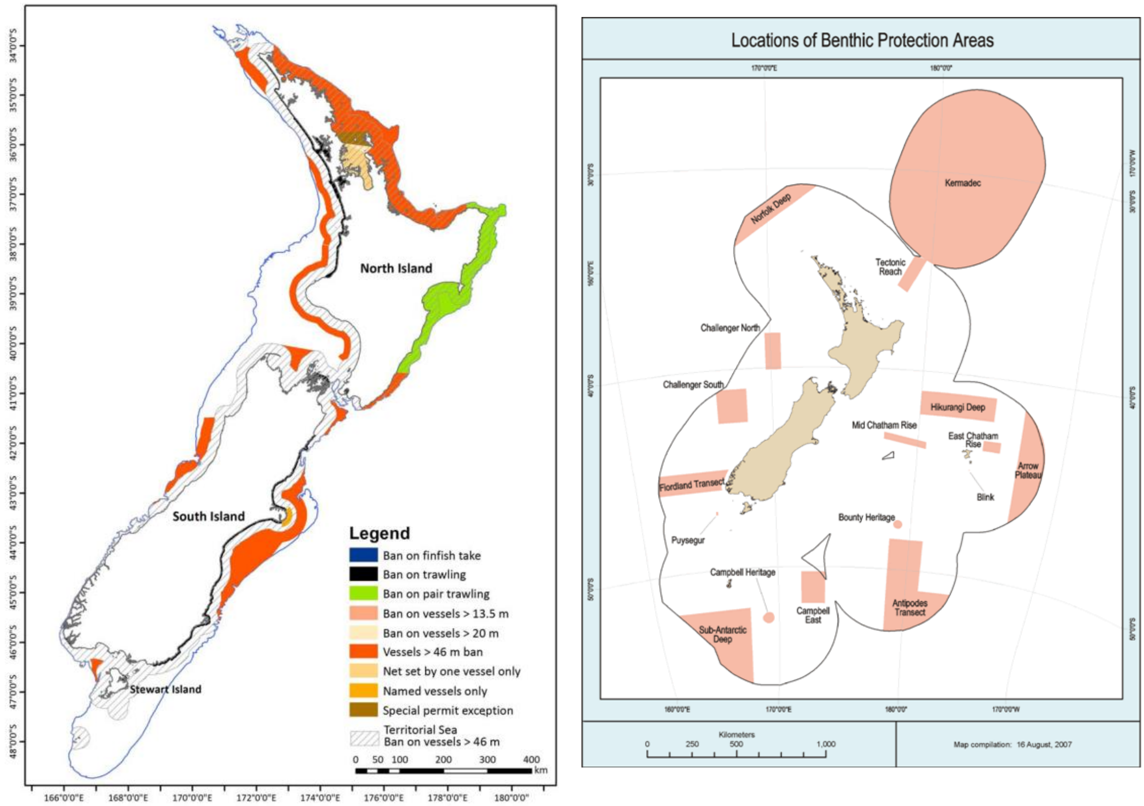
The main measures to manage fisheries impacts on habitat under a range of different legislative tools include:

(i) the closing of about one third of the New Zealand EEZ to bottom fishing though the designation of Benthic Protection areas (BPAs);
(ii) the designation of Marine Protected Areas (MPAs);
(iii) the designation of Marine Reserves;
(iv) closures to some forms of fishing (e.g. large trawl vessel closures) (Figure 6a); and
(v) monitoring vessel position.

Other closures may also serve to limit benthic impacts - e.g. Mataitai Reserves established under the Fisheries Act and cable and pipeline protection areas established under the Submarine Cables and Pipelines Protection Act 1996.

In addition, a substantial (and growing) body of research has been undertaken on the impacts of inshore trawling (e.g. see summarised in Tuck et al, 2017) and the footprint in relation to the main habitats types has been mapped (Baird et al, 2015). The limited observer coverage that has occurred in inshore trawl fisheries may also assist in benthic impact monitoring.

While very few of New Zealand's Benthic Protection Areas are located in inshore areas (Figure 6b), and the proportion of New Zealand's territorial waters (i.e. <12nm) covered by MPAs or other fisheries related closures is relatively small (when the sub-Antarctic Islands and Kermedec Islands marine reserves are excluded, less than 3% of NZ's territorial waters are included in areas where trawl, Danish seine and dredging are prohibited, and less than 5% is covered by MPAs. proportion of area is closed to trawl effort; DOC/MPI, 2011), the outcomes of Tuck et al (2017) showing intense trawling occurs in only a relatively small proportion of the area shallower than 200m and the commitment to ongoing research and management consistent with legislative and policy objectives (e.g. Fisheries Act, New Zealand Biodiversity Strategy, MPI Strategy for Management of the Environmental Effects of Fishing) provides a plausible argument that the current measures in place could be expected to achieve the outcome stated in criteria 2C(i). Accordingly, we have scored this SI medium risk.



(a) *(b)*

Figure 6: (a) Areas showing where trawling is prohibited and other relevant restrictions apply. Note the area shown as "Ban on pair trawling" also is closed to vessels > 46 m; and (b) location of Benthic Protected Area closures.

Nevertheless, as with criteria 2C(i)(a) above, the UoAs would be better placed with better placed with improved information inshore habitat distribution and the capacity for habitats to recover from trawling disturbance, as well as some form of evaluation demonstrating the management measures in place are sufficient to ensure the fisheries are highly likely to not result in serious or irreversible harm to habitat structure and function at the scale of full habitats.

TRE1 – Purse seine **LOW RISK**

The strategy to limit impacts on habitats is largely operational and is sufficient to ensure negligible impact.

(b) Management strategy implementation

Trawl UoAs **MEDIUM RISK**

The outcomes of Tuck et al (2017) provide some objective basis for confidence that intense trawl effort is occurring in a relatively small proportion of habitats shallower than 200m. The main uncertainties are the extent to which more intense trawl effort occurs over habitats with limited capacity to recover, in the context of the full range of those habitats. Existing trawl closures appear to offer only limited protection to benthic habitats. Accordingly, we have scored this SI medium risk.

We note that the questions about the extent to which existing management measures protect benthic habitats at the species level may be informed by the type analysis recommended by the 2015 expert workshop (Ford et al, 2016) (i.e. rather than simply the extent to which habitat classes may be impacted by trawling, what is the impact of trawling at the species/population level, taking into the account the likely vulnerability of each species to trawling and the likely capacity to recover). The outcomes of any follow up research from this workshop should be factored into future assessments.

TRE1 – Purse seine **LOW RISK**

Limited observer data is likely to provide an objective basis for confidence that the gear is fished at the surface of the water column.

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

Trawl UoAs **MEDIUM RISK**

Much of the information known about the impact of trawl fisheries on inshore benthic habitats in NZ is summarised in MPI (2016a) and Tuck et al (2017). Benthic surveys have been performed of seabed types around the New Zealand continental shelf and seamounts. There have been several attempts to use this information to develop a Territorial Sea and EEZ marine environment classification (e.g. MEC, BOMEC). There is ongoing collection of relevant data from vessel monitoring and research programs providing robust information on trawl footprint. Various research programs and projects are current and planned to address gaps in benthic and habitat knowledge.

The existing information is sufficient to broadly understand the types and distribution of main habitats, but less information appears to be available on the vulnerability and recoverability of impacts at a level of detail relevant to the scale and intensity of the fishery.

TRE1 – Purse seine **LOW RISK**

Inshore habitats within New Zealand's EEZ are relatively well mapped (e.g. DoC/MFish, 2011; DOC Maps[4]) and some more vulnerable habitats (e.g. protected corals) have been subject to intensive study (e.g. Baird et al., 2013). The existing information is sufficient to broadly understand the types and distribution of main habitats in a level of detail relevant to the nature and scale of the fishery.

(b) Information and monitoring adequacy

Trawl UoAs **MEDIUM RISK**

Information on the impacts of benthic trawls on structured and unstructured habitats is relatively well-studied elsewhere and there have been dedicated studies in New Zealand inshore fisheries (e.g. see summarised in Tuck et al, 2017). The likely impacts on the main habitats can be inferred from this information and there is very good information through catch records on the spatial extent of the fishery. The current information is at least sufficient to broadly understand the nature of the main impacts of gear use on the main habitats.

TRE1 – Purse seine **LOW RISK**

Information is adequate to allow the identification of the main impacts and there is reliable information on the spatial extent of the fishery.

PI SCORE	**LOW RISK – TRE1 – Purse seine**
	MEDIUM RISK – Trawl UoAs

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

Trawl UoAs **MEDIUM 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.

Apart from impacts to ETP species, the main ecosystem level impacts from the UoAs are likely to come from removal of the target and bycatch species from the ecosystem, as well as through habitat modification. While considerable work has been undertaken to establish indicators to monitor the ecosystem impacts of fishing on New Zealand's ecosystem (e.g. Tuck et al, 2009; Pinkerton, undated), we have found few studies arriving at any form of conclusion about whether the existing ecosystem level impacts of New Zealand's inshore fisheries is likely to disrupt the key elements of ecosystem structure and function to a point where there would be serious or irreversible harm.

MPI (2016a) report that "*multi-species fishing at close to B_{MSY} using predominantly bottom-trawling is likely to make New Zealand's marine ecosystems less silient (compared to fishing more conservatively compared to B_{MSY} and not using predominantly bottom-trawling) to other anthropogenic disturbance and to environmental variability, including climate change, through trophic and ecosystem-level effects*."

At a generic level, Ackroyd and Pilling (2014) note that "*at an EEZ level, New Zealand fisheries have been preliminarily assessed to be sustainable in an energetic context. However, Knight et al. (2011) note that this energetic-based sustainability assessment is not a replacement for a food web based analysis, and that their frameworks are appropriately deployed as a high level guide for monitoring cumulative effects of multiple fisheries, rather than considering removals at a species-specific level.*"

Tuck et al (2017) reported that trawling on soft sediments has implications for ecosystem functioning through at least four processes:

- reducing habitat complexity – habitat complexity is often positively correlated with species richness and can provide refugia from predation and higher densities of fish in some habitats. Reducing habitat complexity through the physical impact of trawling may result in reduced biodiversity and other changes in the composition of benthic community assemblages;
- decreasing bioturbation (surface sediment reworking and destabilisation) – changes in abundance of bioturbators (e.g. *Echinocardium*) can affect nutrient fluxes and primary productivity;
- decreasing suspension feeding – suspension feeding is an important connector between seafloor sediment and the water column increasing removal of both sediment and phytoplankton from the water column; and

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

- decreasing seafloor stability - increased density of habitat structure protects the seafloor from disturbance by waves and currents, sediment stabilisation.

While there are uncertainties around stock sizes for some target and byproduct species, the impact of discards and the extent to which fishing has already altered the underlying ecosystem structure (for example through habitat modification), given the existence of a productive fishery with relatively stable harvest levels for several decades across multiple inshore stocks, there is some intuitive basis to conclude that it is unlikely that the UoAs are disrupting the key elements of the ecosystem to the point where there would be serious or irreversible harm. The fact that trawling of moderate or high intensity occurs over only a small fraction of the area shallower than 200m provides further intuitive support. Accordingly, we have scored this SI medium risk. Nevertheless, given the potential for fishing for multiple species at MSY using demersal trawl gear to influence ecosystem function and resilience, the fishery would be better positioned against this indicator with additional evidence to demonstrate that it was not disrupting the key elements underlying ecosystem structure and function to the point of serious or irreversible harm. We note that ecosystem modelling work is in process in some areas that may assist scoring against this SI in future assessments (e.g. NIWA marine food web modelling[5]).

TRE1 – Purse seine **LOW RISK**

Given the limited impacts of the UoA on ETP species and habitats, the main ecosystem impacts are likely to come from the removal of target and bycatch species. While there is uncertainty about the status of the target stock and some bycatch (e.g. JMA), the volumes involved are small in the context of New Zealand's overall fisheries production and probably highly unlikely to disrupt the key elements underlying ecosystem structure and function to the point of serious or irreversible harm.

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). Good quality monitoring and management of all retained fisheries removals (e.g. through TACCs), together with measures to limit impacts on ETP species, legislated protection of areas from some sea bottom fishing activities (albeit relatively small) and research into habitat and ecosystem level impacts from the fishery represent a partial strategy. Data from the fishery, including (limited) observer data together with fishery independent surveys and other research projects are taken into account in the management of the fishery. The main uncertainties are the effectiveness of the strategy on some ecosystem components – e.g. the impact of potentially reduced target species stock sizes on ecosystem function; uncertainties associated with discard volume and composition and the ecosystem impacts of habitat modification - although MPI and industry have active research programs to resolve many of these issues. Overall, these measures constitute at least a partial strategy which could be expected to restrain impacts from each of the UoAs so as to achieve criteria 2D(i).

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

The types of measures applied in the partial strategy – e.g. maintaining target stock sizes at or above B_{MSY}, limiting impacts on ETP species – are likely to work based on plausible argument. Current ecosystem modelling may provide an objective basis for confidence in future assessments.

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

(a) Information quality **LOW RISK**

Sufficient information is available on New Zealand's EEZ to broadly understand the key elements of the ecosystem (see, for example, MPI, 2016a) and information received through catch and effort monitoring, inshore trawl surveys, and monitoring of ecosystem indicators is likely to be adequate to detect any increased risk. Dietary analyses (e.g. Stevens et al 2011) provide information on the position of inshore trawl species in the food web.

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

The main impacts of the fishery on the ecosystem elements such as structure and function can probably be inferred from the stock assessments, QMS catch trends, limited observer data, and surveys that cover the target species, related species, as well as specific research related to trawl impacts on habitat structure and function. Some of these impacts have been investigated in detail (e.g. Baird et al, 2015; Richard and Abraham, in prep; Tuck et al, 2017), and there is ongoing research and data collection aimed at continuing to inform management with the aim of fulfilling the ecosystem objectives stated in the Fisheries Act.

PI SCORE	LOW RISK – Trawl UoAs, TRE1 – Purse seine

COMPONENT 3: Management system

3A: Governance and Policy

[5] https://www.niwa.co.nz/coasts-and-oceans/research-projects/marine-food-webs

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 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 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

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 inshore trawl fisheries are 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, 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 inshore trawl or purse seine sectors, 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 7). 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 7: 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 inshore trawl 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 is subject to regular internal review through the fisheries 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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