



Review of Management Controls for Hoki 1 (HOK 1) in 2015

Consultation Document

MPI Discussion Paper No: 2015/19

Prepared by the Ministry for Primary Industries

ISBN No: 978-0-908334-45-2 (online)

ISSN No: 2253-3907 (online)

June 2015

Contents	Page
1 Submission Information	ii
1.1 Official Information Act 1982	ii
2 Executive Summary	1
3 Purpose	2
3.1 Issue/Need for Action	2
3.2 Management Approach	3
4 Background Information	4
4.1 Biological Characteristics of hoki	4
4.2 Fishery Description	4
4.3 Previous Review	6
4.4 Stock Assessment/New Information	6
5 Legal Considerations	7
5.1 Setting Management measures	7
5.2 Key Considerations	7
6 Proposed Options	11
6.1 Option 1 (Status Quo)	12
6.2 Option 2	13
6.3 Option 3	13
7 Other Matters	14
8 Conclusion	14

1 Submission Information

MPI welcomes written submissions on the proposals contained in the Consultation Document. All written submissions must be received by MPI no later than 5pm on 17 July 2015.

Written submissions should be sent directly to:

Deepwater Fisheries Management
Ministry for Primary Industries
P O Box 2526
Wellington 6011

or emailed to FMsubmissions@mpi.govt.nz

1.1 OFFICIAL INFORMATION ACT 1982

All submissions are subject to the Official Information Act and can be released (along with personal details of the submitter) under the Act. If you have specific reasons for wanting to have your submission or personal details withheld, please set out your reasons in the submission. MPI will consider those reasons when making any assessment for the release of submissions if requested under the Official Information Act.

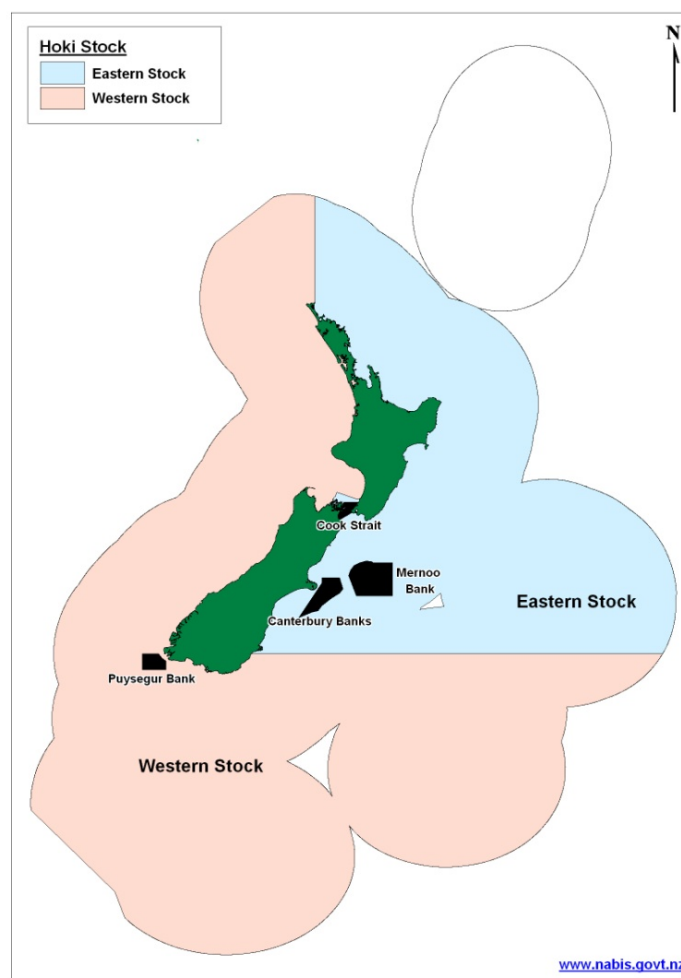


Figure 1: Map of the HOK1 quota management area detailing the boundaries between the eastern and western biological stocks and the hoki management areas (HMAs) in black

2 Executive Summary

The Ministry for Primary Industries (MPI) is seeking tangata whenua and stakeholder input to inform a review of catch limits and other management controls for New Zealand hoki (HOK 1).

New Zealand hoki is managed under section 13 of the Fisheries Act 1996 (the Act) as two separate biological sub-stocks within one quota management area (QMA) – HOK 1 (Figure 1). A single total allowable catch (TAC) and total allowable commercial catch (TACC) is set for HOK 1, which is then divided between the two sub-stocks (east and west)¹ through a non-regulatory catch split arrangement with commercial operators/quota owners.

The results of the 2015 hoki stock assessment base case² estimate the stock status of both the eastern and western stocks to be well above the biomass that will produce the maximum sustainable yield (B_{MSY}) and above the hoki management target range.³ The base case model did not fit the hoki biomass estimate from the most recent (December 2014) Sub-Antarctic

¹ For the remainder of the Consultation Document, the term 'stock' will refer to either the eastern or western sub-stocks.

² The 'base case' model refers to the final stock assessment model run accepted by the Deepwater Fisheries Assessment Working Group to be the most likely scenario for the status of the hoki stocks.

³ Deterministic B_{MSY} for hoki is estimated to be 24-26% of the unfished hoki biomass (B_0), and the management target has been set at 35-50% B_0 .

wide-area trawl survey, treating the low estimate as the result of chance rather than a change in hoki biomass. A sensitivity run that gave more weight to the trawl survey provided a lower estimate of current stock status for the western stock, estimating that the stock was below the management target range and decreasing.

Five year projections, using the 2015 stock assessment base case model show that both stocks are likely to remain above B_{MSY} and within or above the management target range at current catch levels. Similar projections using the sensitivity run indicate that the western stock may decrease further below the management target range at current catch levels.

The base case model is considered by the Deepwater Fisheries Assessment Working Group (DWFAWG) to be the most likely scenario for the status of the hoki stocks, and scientific advice is based on this model. The Options proposed in this paper represent a proactive and conservative approach to management, taking action based on potential signals of a decline in hoki biomass that is not fully represented in the base case model. Any decrease in the TAC or TACC may decrease the likelihood of a larger decrease being required in future.

MPI proposes the following Options for the TAC, TACCs, sub-area catch limits, and associated allowances for the 2015-16 fishing year (Table 1).

Table 1: Proposed TACs, TACCs and allowances for HOK1 in 2015-16

Option	TAC	TACC	Non-regulatory catch split arrangement		Allowances (tonnes)		
			Eastern stock limit	Western stock limit	Customary Māori	Recreational	Other sources of fishing related mortality
Option 1 (status quo)	161,640	160,000	60,000	100,000	20	20	1,600
Option 2	151,540	150,000	60,000	90,000	20	20	1,500
Option 3	156,590	155,000	65,000	90,000	20	20	1,550

MPI is confident that the Options proposed are consistent with the purpose of the Act. All Options will ensure both stocks remain above B_{MSY} .

3 Purpose

3.1 ISSUE/NEED FOR ACTION

The results of the 2015 base case stock assessment estimate the stock status of both the eastern and western hoki stocks to be well above the biomass that will produce the maximum sustainable yield (B_{MSY}) and above the hoki management target range (35-50% B_0) at 59% of unfished biomass (B_0) and 51% B_0 respectively.

The 2015 stock assessment model incorporated all available data sets, including a new data point from the Sub-Antarctic wide-area trawl survey that took place in December 2014. This survey provided the lowest estimated abundance of hoki since 2007.

In the base case stock assessment model, the observation of low biomass in the 2014 Southern Plateau trawl survey was interpreted as observation error (i.e. the survey underestimated hoki biomass by chance and hoki abundance is actually higher than the survey estimated). However it was noted by the DWFAWG that the status of the western stock could be

significantly lower if the low biomass estimate is reflecting a change in hoki abundance and is not the result of chance.

A sensitivity run that gave more weight to the most recent Sub-Antarctic wide-area trawl survey was therefore presented to test the potential impact of this assumption on stock status. This sensitivity assessment didn't fit the other data inputs as well as the base case, but estimated that the western stock status is 30% B_0 , which is below the management target range. Five year projections with the sensitivity run indicated a 77% chance that the western stock could decline below the management target range and a 35% chance that it could decline below the soft limit at current catch levels if the survey point reflects a decrease in abundance.

Hoki stocks are next scheduled to be assessed in 2016, which will provide an update of the model trajectory of the western stock. However, the next Sub-Antarctic trawl survey, which could provide more certainty around the western stock abundance is scheduled for December 2016 and will input to the 2017 hoki stock assessment.

The Options proposed are intended to provide for a cautious and responsive approach to the management of the western hoki stock. Taking a relatively small decrease now may lessen the risk that a larger cut in the western stock catch limit will be needed in 2017 if the next Sub-Antarctic survey confirms the decrease in hoki abundance is real. In the early 2000's, indications that the stocks were declining were not responded to soon enough, and as a result, the western hoki stock declined below the soft limit and significant TACC cuts were required to rebuild the stock. The proposed Options mitigate the risk of repeating this, and potentially provide for a more timely reduction in the western catch limit if the stock status is found in future assessments to have decreased as per the trawl survey indication.

3.2 MANAGEMENT APPROACH

Hoki is managed within the National Fisheries Plan for Deepwater and Middle-Depth Fisheries (National Deepwater Plan) as a Tier 1 stock. A fisheries-specific hoki chapter of the National Deepwater Plan was finalised in 2010. The chapter details the management approach and operational objectives for the fishery.

A comprehensive range of data inputs is used to assess the status of the hoki stocks. Proportion at age data from the commercial fishery and research surveys are combined with estimates of biological parameters and four indices of hoki abundance. Each abundance index is derived from a time series of research surveys across the four key hoki fishing grounds.

The management approach for hoki employs regular fishery-independent trawl and acoustic surveys as a key source of information for estimation of stock status. These surveys enable regular stock assessments and TAC/TACC reviews. Stock assessments incorporate abundance indices from the surveys, estimates of biological parameters, and age data from surveys and the commercial fisheries.

The three fishery-independent surveys that provide abundance indices for the hoki stocks are:

- a) Cook Strait acoustic survey, which provides abundance information about the eastern spawning stock, is scheduled biennially, with the next survey in July 2015

- b) Chatham Rise wide-area trawl survey, which provides estimates of incoming recruitment for both stocks (although the split of year classes between stocks is not able to be measured), is scheduled biennially, with the next survey in January 2016
- c) Sub-Antarctic wide area trawl survey, which provides the main abundance index for the western stock, is scheduled biennially, with the next survey in December 2016.

The TAC and TACC are set based on the status of the stock in relation to the current reference points for hoki as described in Table 2.

Table 2: Harvest Strategy for hoki - reference points and associated management responses

Reference point	Management response
Management target 30-50% B_0	Stock permitted to fluctuate within this management target to an acceptable level
Soft limit of 20% B_0	A formal time constrained rebuilding plan will be implemented if this limit is reached
Hard limit of 10% B_0	The limit below which fisheries will be considered for closure
Rebuild strategy	Catch limit set to deliver half the rate of rebuild that would occur in the absence of fishing
Harvest control rule	Management actions determined by the results of a series of forward projections under a range of catch assumptions, guided by the biological reference points

4 Background Information

4.1 BIOLOGICAL CHARACTERISTICS OF HOKI

Hoki is a relatively fast growing productive species that is widely distributed throughout New Zealand waters at depths of 300 to 800 m. Hoki are thought to mature between the ages of two and four and to reach a maximum age of 20 to 25 years old.

Two biological stocks of hoki exist within New Zealand's Exclusive Economic Zone (EEZ), referred to as the "eastern" and "western" stocks (Figure 1). The un-fished biomass (B_0) of the western stock is estimated to have been significantly larger than the eastern stock.⁴

For the majority of the year, fish from both stocks are found on their feeding grounds: the Chatham Rise for the eastern stock and the Sub-Antarctic for the western stock. Juvenile fish from both stocks mix on the Chatham Rise and are thought to migrate to the eastern or western stock feeding grounds before recruiting to the spawning grounds.

Mature hoki from both stocks migrate to spawn between late June and early September. The west coast of the South Island (WCSI) is the main spawning ground for the western stock, as is the Cook Strait for the eastern stock. Smaller spawning events occur on the east coast of the South Island (eastern stock) and at Puysegur Bank (western stock).

4.2 FISHERY DESCRIPTION

New Zealand's hoki fisheries have been managed within the quota management system (QMS) since 1986. Both stocks are managed within a single QMA, HOK 1, which covers

⁴ Median estimates of B_0 for the western stock = 897,000 tonnes; and for the eastern stock = 540,000 tonnes. These median estimates are taken from the final base case model in the 2015 hoki stock assessment.

fishery management areas (FMAs) 1-9 (Figure 1). The TAC for HOK 1 is set under section 13(2) of the Act.

To manage fishing effort across the two stocks, the HOK 1 TAC is set by the Minister for Primary Industries (the Minister)⁵ and is then divided between the stocks each year via a non-regulatory catch split arrangement that has been agreed between MPI and quota holders. Each catch limit is varied (within the overall TACC) in response to the current estimate of stock status and projected impacts of catch levels on each stock. The catch split arrangement was first implemented by industry in 2001 and is now formally administered through FishServe⁶, reported to MPI, and endorsed by the Minister.

The hoki stocks are predominantly fished across four main fishing grounds. Less than 1% of the total catch in 2013-14 was caught outside these four areas:

- The Cook Strait fishery: the fishery operates at a low level year-round, with a peak in late-June to September. Approximately 13% of the HOK 1 catch was caught here in 2013-14.
- The WCSI fishery: the fishery on the WCSI operates from June-August. Approximately 47% of the HOK 1 catch was caught here during 2013-14.
- The Chatham Rise fishery: the fishery on the Chatham Rise operates year round and during 2013-14 harvested approximately 23% of the total catch.
- The Sub-Antarctic fishery: this fishery also operates year round and during 2013-14 harvested approximately 14% of the total catch.

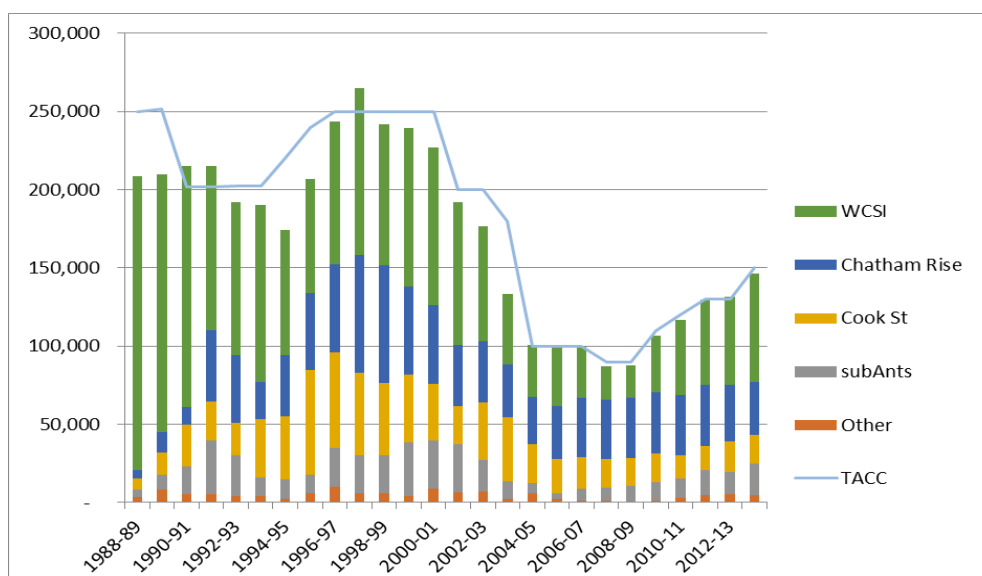


Figure 2: Estimated catch reported from the main hoki fishing grounds, and the HOK 1 TACC (t) from 1988-89 to 2013-14

To protect juvenile hoki, the industry has closed four areas to target hoki fishing where juvenile hoki are known to be most abundant. These hoki management areas (HMAs, Figure 1) aim to ensure that the fishing mortality of juvenile fish does not adversely affect later recruitment to the spawning stock.

⁵ The Minister for Primary Industries now exercises the powers and responsibilities of the Minister of Fisheries under the Fisheries Act 1996.

⁶ FishServe is a wholly-owned subsidiary of Seafood New Zealand and is responsible for the administration of catch reporting requirements.

Recreational and Māori Customary Interests

Recreational and customary fishers do not generally target hoki, as it is predominantly available offshore in deep water. Recent data on the level of customary and recreational hoki catch is negligible, although references to customary catches in the past do exist. Hoki has been identified as a taonga species in several Forum Fisheries Plans. It is also likely that a small amount of hoki is caught by recreational fishers while targeting other species.

An allowance of 20 tonnes each for both the recreational and customary fishers is provided for within the current HOK 1 TAC. MPI considers that these allowances should be retained under all proposed Options.

Other Sources of Fishing Related Mortality

MPI proposes to retain the current allowance for other sources of fishing-related mortality, set at 1% of the TACC. This nominal allowance accounts for unreported hoki mortality, such as loss due to burst nets, or discarding of damaged hoki.

4.3 PREVIOUS REVIEW

The hoki stocks are currently assessed every year, providing updated estimates of stock status. Recent assessments have shown ongoing increases in hoki abundance in both stocks, following a low point in 2006. Management settings were previously reviewed prior to 1 October 2014, when the TAC was increased from 151,540 tonnes to 161,640 tonnes for the 2014-15 fishing year, with the increase allocated to the western stock. Prior to that the TAC was increased from 131,340 tonnes to 151,540 tonnes for the 2013-14 fishing year with the increase also allocated to the western stock. The recent TAC reviews have generally taken a conservative approach to utilising the available biomass with the objective of maintaining the stock within the target range.

4.4 STOCK ASSESSMENT/NEW INFORMATION

In 2015, the DWFAWG agreed that the 2015 hoki stock assessment was of high quality and met New Zealand's Science and Research Information Standard.⁷ In 2014, MPI commissioned an independent review of the hoki assessment model by a panel of international experts who did not recommend any significant changes to the model. Recommendations from the review are being implemented over time, and the highest priority items have been explored and addressed to improve the robustness of the 2015 assessment.

The Sub-Antarctic trawl survey was the only abundance index that had a new data point available for the 2015 stock assessment. The most recent survey, completed in December 2014, produced the lowest estimate of hoki biomass since 2007. The working group considered this low point to be the result of observation error (i.e. the survey underestimated the biomass by chance), although the impacts were explored through a sensitivity model for the possibility that it reflected a change in hoki biomass.

The final 2015 assessment model, as agreed by the DWFAWG, estimates current stock status of both the eastern and western stocks as being above both B_{MSY} for hoki and the management target range (35-50% B_0) (Table 2). The eastern stock is estimated at 59% B_0 , and the western stock is estimated to be at 53% B_0 . The estimate of combined stock status is 55% B_0 .

The four surveys of the Sub-Antarctic between 2004 and 2007 estimated that the western stock biomass had declined significantly since the survey in 2003. The estimate increased by

⁷ Available at: <http://www.fish.govt.nz/en-nz/Publications/Research+and+Science+Information+Standard.htm>

a factor of three in the 2008 survey. That level was maintained for the subsequent five surveys. The 2015 survey however, has the lowest hoki biomass estimate since 2007. The 2015 stock assessment model treats this low point as due to observation error and not an actual change in hoki biomass.

A sensitivity run removed the process error from the Sub-Antarctic trawl survey series, to try to force the model to better fit the index, especially the most recent abundance estimate. This model run did not fit the other data inputs as well as the base case, and resulted in a much lower estimate of current stock status (30% B_0), although it is still above B_{MSY} . This reflects what the current status of the stock might be if the recent Sub-Antarctic trawl survey biomass estimate is the result of a change in hoki abundance rather than observation error.

The main sources of uncertainty associated with the hoki stock assessment model include the assumed stock structure and migration patterns of hoki, and the split of a large year class from 2011 between eastern and western stock with regard to projections of future stock status.

5 Legal Considerations

5.1 SETTING MANAGEMENT MEASURES

Section 13(2) of the Act requires the Minister to set a TAC that maintains the stock at or above a level that can produce the maximum sustainable yield (MSY), or if the stock is above or below that level, to move towards or above the level that can produce MSY. TAC setting for hoki is also guided by the agreed hoki harvest strategy which requires both stocks to fluctuate within the management target range of 35-50% B_0 . This target is set above the estimate of deterministic B_{MSY} for hoki to provide greater certainty that the hoki stocks will remain at or above this point and can sustain the fishery in the long term. The Soft and Hard Limit reference points in the hoki harvest strategy are set at 20% and 10% B_0 respectively.

The TAC must be apportioned between the commercial, Maori customary non-commercial, and recreational interests as set out under the provisions of section 21 of the Act. Section 21 requires the Minister to allow for Maori customary non-commercial fishing interests, recreational fishing interests, and for any other sources of fishing-related mortality, when setting or varying the TACC.

There is limited recreational and Maori customary take of hoki, although hoki has been identified as a taonga species in several Iwi Forum Fisheries Plans. MPI is proposing to retain an allowance of 20 tonnes each for both the recreational and customary fishers within the HOK 1 TAC.

MPI proposes that the current proportional allowance for other sources of fishing-related mortality, set at 1% of the TACC be retained. This nominal allowance accounts for unreported hoki mortality, such as loss due to burst nets or discarding of damaged hoki.

5.2 KEY CONSIDERATIONS

When making a decision concerning the TAC for a stock, the Minister must have regard to the interdependence of stocks and any environmental interactions. Interdependent stocks and key environmental issues associated with the HOK 1 fishery and how they will be affected by the proposal to increase the TAC are discussed below.

5.2.1 Interdependence of stocks

The main commercial bycatch species in the hoki fisheries are hake, ling and silver warehou. Option 2 in this IPP would result in reducing fishing effort in the west and no change in the east and Option 3 would reduce fishing effort in western stock fisheries and result in a small increase in fishing effort in eastern stock fisheries.

All three hake stocks have been assessed in the last three years. All stocks were assessed to be Likely or Very Likely to be above the default management target of 40% B_0 . It is considered that all stocks could probably support higher catch levels, especially as all three TACCs have been under-caught in recent years. None of the Options proposed are likely to impact on the sustainability of any hake stock.

Stock assessments for all ling stocks potentially affected by changes in hoki fishing effort have been completed in the past four years. All stocks were estimated to be above the default management target of 40% B_0 and catch limits were increased in both LIN 5 and LIN 7 in 2013. MPI considers that all Options proposed are unlikely to impact on the sustainability of any ling stock.

The TACC for silver warehou has been overcaught in SWA 3 in three of the past four years, and in one of the last two years in SWA 4. An increase in fishing effort in the eastern hoki fishery may result in the SWA 3 or SWA 4 TACC being overcaught again. The sustainability of current catch levels for these stocks is not known, although there are not currently any specific sustainability concerns for these stocks.

MPI is satisfied that any changes to the hoki TAC or increase in fishing effort in eastern stock fisheries is unlikely to have an unacceptable impact on the sustainability of the key species that are caught in conjunction with hoki. Fish by-catch levels in the fishery will continue to be monitored.

5.2.2 Protected species interactions

Both proposed Options 2 and 3 would result in an overall decrease in hoki fishing effort, although Option 3 would result in increased effort in eastern stock fisheries (Cook Strait and Chatham Rise). This may result in slight increases to the known interactions with protected species in the eastern fisheries, as outlined below. However, MPI considers that current management processes will ensure that the long-term viability of these affected protected species populations is not negatively impacted.

Seabirds

Management of seabird interactions with New Zealand's commercial fisheries is driven through the 2013 National Plan of Action to reduce the incidental catch of seabirds in New Zealand Fisheries (NPOA-Seabirds). The NPOA-Seabirds has established a risk-based approach to managing fishing interactions with seabirds, targeting management actions at the species most at risk.

The level of risk from commercial fishing to individual seabird species has been identified through a comprehensive hierarchical risk assessment and risk screening approach that underpins the NPOA-Seabirds. Hoki fishing effort generally contributes a relatively low proportion of the total risk score for most seabird species.

There are three species captured in hoki fisheries that are estimated to be at very high risk from commercial fishing in New Zealand waters. These are the New Zealand white-capped

albatross, Salvin's albatross, and Southern Buller's albatross. A brief summary of each species is provided below as well as catch rate information for the most recent five years.

New Zealand white-capped albatross is categorised by the New Zealand Department of Conservation⁸ (DOC) as 'At Risk: Declining', and 'Near Threatened' by the International Union for the Conservation of Nature⁹ (IUCN). However, recent population studies show fluctuating numbers of breeding birds at the main colonies and it is not possible to determine population trend with any certainty.¹⁰ Hoki fishing is estimated to contribute roughly 10% of the total risk for NZ white-capped albatross from New Zealand fishing activity and has, on average, comprised around 6% of the total estimated captures. The proportion of risk is higher than the proportion of estimated on-deck captures because the risk assessment incorporates cryptic mortality, including potentially fatal captures with trawl warps that do not lead to an observed capture. From 2008-09 to 2012-13, the average estimated capture rate in hoki fisheries was roughly 0.21 white-capped albatross captures per 100 tows.

Salvin's albatross is categorised by DOC as 'Threatened: Nationally Critical', and 'Vulnerable' by the IUCN. Some populations of Salvin's albatross are monitored by DOC using photographic surveys and field estimates of breeding pairs. The population appears to have declined between 1997 and 2011 based on review of these population estimates, however recent population counts suggest that the population may be stable. Hoki fishing is estimated to contribute just under 10% of the total risk to Salvin's albatross from New Zealand fishing activity, and has, on average, comprised around 11% of the total estimated captures. From 2008-09 to 2012-13, the average estimated capture rate in hoki fisheries was 0.45 Salvin's albatross captures per 100 tows.

Southern Buller's albatross is categorised by DOC as 'At Risk: Naturally Uncommon', and 'Near Threatened' by the IUCN. The current population trend for Southern Buller's albatross is uncertain but the population increased markedly between 1950 and 2005. Hoki fishing is estimated to contribute roughly 25% of the estimated risk to Southern Buller's albatross from New Zealand fishing activity. There is no estimate of the proportion of overall Southern Buller's captures that are attributed to hoki fishing. From 2008-09 to 2012-13, the average estimated capture rate in hoki fisheries was 0.30 Southern Buller's albatross captures per 100 tows.

In 2012-13 (the most recent full year for which data is available), 100 seabird captures were observed from 4,467 observed hoki target tows. Subsequent modelling of the level of effort and the number of observed seabird captures across the different hoki grounds provides an estimate of total seabird captures in hoki fisheries of 265 seabirds in 2012-13 (Table 3).

Table 3: Estimated and observed seabird captures in hoki fisheries 2008-09 to 2012-13

	Observed captures	Estimated captures	% tows observed	Total # of tows	Estimated Capture rate (per 100 tows)
2012-13	100	265	38.7	11,681	2.27
2011-12	59	242	22.8	11,333	2.14
2010-11	50	272	16.6	10,405	2.61
2009-10	53	197	20.7	9,966	1.98
2008-09	37	185	20.3	8,174	2.26

⁸ DOC categorisation information may be found at <http://www.doc.govt.nz/documents/science-and-technical/nztcs4entire.pdf>

⁹ Details on categorisation of the IUCN may be found at <http://www.iucnredlist.org/>

¹⁰ Seabird population and risk information available in the Ministry for Primary Industries Aquatic Environment and Biodiversity Annual Review 2014. Available at <http://mpi.govt.nz/news-resources/publications>

A range of measures are currently in place or are under development. Mandatory seabird mitigation measures¹¹ include the requirement that all trawlers over 28 m in length deploy bird mitigation devices during fishing. Research projects are currently underway that aim to improve the performance of these mitigation devices.¹²

Non-regulatory measures are also used to reduce the risk of seabird interactions with the hoki fleet. Every vessel over 28m in length (the majority of the hoki fleet) has developed a specific vessel management plan (VMP) that sets out the onboard practices vessels must follow to reduce the risk to seabirds, including offal management procedures and good factory cleanliness. MPI monitors each vessel's performance against its VMP and works with the Deepwater Group Ltd (DWG) to rectify any non-adherence and also to assist the fleet to improve their offal management practices. These practices will continue during 2015-16.

The proposed Options, apart from the status quo, will result in an overall reduction in hoki fishing effort, although Option 3 could result in a small amount of additional fishing effort in the eastern fishery. MPI will continue to work with industry stakeholders to reduce the risk to key seabird species.

Marine mammals

The hoki fisheries are also responsible for some fur seal mortalities, particularly the fisheries on the WCSI and in Cook Strait. It is estimated that 242 fur seal incidental captures occurred in the hoki fisheries in 2012-13.

Table 4: Estimated and observed NZ fur seal incidental captures and capture rates in hoki fisheries 2008-09 to 2012-13

Year	Observed captures	Estimated captures	% tows observed	Observed Capture rate (per 100 tows)	Total # of tows
2012-13	58	242	38.6	1.28	11,682
2011-12	33	213	22.8	1.28	11,332
2010-11	24	180	16.6	1.39	10,405
2009-10	30	179	20.7	1.45	9,966
2008-09	37	217	20.3	2.23	8,176

The rate of fur seal captures has declined fairly steadily since 2005. The proposed Options will result in an overall reduction in hoki fishing effort, although Option 3 could result in a small amount of additional fishing effort in the eastern fishery. MPI considers this is unlikely to result in any increase in the number of fur seal captures. MPI notes that the population is believed to be increasing and considers it is unlikely that the current level of mortalities is affecting the long-term viability of the national population.

New Zealand sea lions are rarely captured in hoki fisheries, with two observed captures having been reported in the past 10 years. In 2012-13, one New Zealand sea lion was observed captured and released alive in hoki fisheries. MPI considers that the risk to sea lions from hoki fishing is low, but will continue to work with DWG to monitor and minimise marine mammal captures in deepwater fisheries.

A risk assessment for marine mammals is underway which will provide further information on particular species at risk from fishing and allow management to be targeted based on risk.

¹¹ Seabird mitigation on trawl vessels is regulated by the Fisheries (Commercial Fishing) Regulations 2001, Seabird Scaring Devices Circular 2010 (No. F517).

¹² More information on these projects can be found at the Department of Conservation's Conservation Services Programme website: www.doc.govt.nz/csp

This work will inform future management of the New Zealand fur seal and New Zealand sea lion with respect to the deepwater fisheries, including that for hoki.

5.2.3 Benthic impacts

Although hoki is a mid-water species, it is often caught by bottom trawl or midwater trawl fished on or near the bottom which will have an impact on benthic habitat.

Management measures to address the effects of deepwater trawl activity have focused on ‘avoiding’ these effects. This has been achieved through closing areas to bottom trawling; first with seamount closures in 2001 and then with Benthic Protection Areas (BPAs). The implementation of BPAs in 2007¹³ effectively closed approximately 30% of the New Zealand EEZ to bottom trawling. A monitoring regime to ensure these closures are adhered to was also implemented.

The proposed Options will result in an overall reduction in hoki fishing effort, although Option 3 would result in some additional fishing effort in the eastern fishery. Most of the additional effort from any increase in the catch limit for the eastern stock will likely be in areas that have previously been fished, somewhat limiting further benthic impacts.

MPI will continue to monitor the trawl footprint of the hoki and other deepwater fisheries annually.

6 Proposed Options

Table 5: Proposed TACs, TACCs and allowances for HOK1 in 2015-16

Option	TAC	TACC	Non-regulatory catch split arrangement		Allowances (tonnes)		
			Eastern stock limit	Western stock limit	Customary Māori	Recreational	Other sources of fishing related mortality
Option 1 (status quo)	161,640	160,000	60,000	100,000	20	20	1,600
Option 2	151,540	150,000	60,000	90,000	20	20	1,500
Option 3	156,590	155,000	65,000	90,000	20	20	1,550

The stock assessment model was used to generate a series of projections that provide estimates of future stock status in relation to B_0 and the target and limit reference points. The projections estimate the likely stock status trajectory under different catch scenarios to guide selection of appropriate management settings.

To inform the 2015 review of management settings, projections have been produced for three different catch scenarios:

1. The status quo TACC of 160,000 tonnes, with 60,000 tonnes allocated to the eastern stock and 100,000 tonnes allocated to the western stock
2. A TACC decrease of 10,000 tonnes, all taken from the western stock catch limit resulting in catch limits of 60,000 tonnes for the eastern stock and 90,000 tonnes for the western stock

¹³ Benthic Protection Areas are regulated by the Fisheries (Benthic Protection Areas) Regulations 2007.

3. A TACC decrease of 5,000 tonnes, comprising a 10,000 tonne reduction in the western stock catch limit and a 5,000 tonne increase in the eastern stock catch limit. This would result in catch limits of 65,000 tonnes for the eastern stock and 90,000 tonnes for the western stock.

Projections were also run using the sensitivity model that added weight to the Sub-Antarctic trawl survey abundance index to provide information on the potential trajectory of the stock in the case that the most recent trawl survey abundance estimate reflects a decrease in abundance. These projections were run for the same catch scenarios and were significantly more pessimistic for the western stock than those run using the stock assessment model.

Projections from the base stock assessment model result in both stocks remaining above the management target range through to 2020 for all Options. The projections also provide the probability of each stock declining below management reference points. These probabilities for the western stock are shown in Table 6 for each of the three Options proposed under both assumptions regarding the trawl survey. The probability of the eastern stock declining below any management reference points is <1% for all Options.

Table 6: Western stock status and percentage probability of the western stock declining below management reference points by 2020 from the proposed Options based on the stock assessment model and the sensitivity run

Option	Western stock catch limit (t)	Status in 2020 (% B_0)		Probability >35% B_0		Probability <20% B_0		Probability <10% B_0	
		Base	Sensitivity	Base	Sensitivity	Base	Sensitivity	Base	Sensitivity
1	100,000	53	24	89%	23%	1%	35%	1%	7%
2	90,000	56	28	92%	29%	0	24%	0	4%
3	90,000	56	27	92%	29%	0	25%	0	4%

6.1 OPTION 1 (STATUS QUO)

Under this Option, the TAC would remain at 161,640 tonnes and the TACC would remain at 160,000 tonnes. The current catch split arrangement would also remain unchanged under this Option.

Five year management projections using the base case stock assessment model indicate that under this Option, the status of both stocks is likely to remain at or above the management target range.

However, five year projections were run using the sensitivity model that gave more weight to the recent Sub-Antarctic trawl survey biomass estimate. These projections indicate a 35% chance of the western stock status falling below 20% B_0 in the next five years, if the survey abundance estimate reflects a change in hoki abundance.

If the next Sub-Antarctic survey, scheduled for December 2016, confirms that hoki abundance has decreased and no action has been taken, a larger cut may be required in 2017 to maintain the western stock within the management target range.

This Option would maximise the economic benefit to the fishing industry, but may increase the risk that the western stock may decline below the soft limit in the next five years.

6.2 OPTION 2

Under this Option, the TAC would be decreased to 151,540 tonnes and the TACC would be decreased to 150,000 tonnes. It is proposed that the decrease come from the catch limit for the western stock, decreasing the catch limit from 100,000 tonnes to 90,000 tonnes. The eastern catch limit would remain at 60,000 tonnes.

The five year projections from the base case stock assessment model indicate that the western stock will likely remain above the management target range and increase slightly to 56% B_0 .

The five year projections using the sensitivity model that gave more weight to the trawl survey result in a decrease in probability of the western stock being below the soft limit in 2020 from 35% to 24%. The stock status is projected by the sensitivity model to decline further below the management target range under this Option, but not as far below as it would at current catch (28% B_0 compared to 24% B_0).

This Option is a conservative and responsive approach to the possibility that hoki abundance in the western stock has decreased. The intention of this approach is to avoid a larger reduction in future if it is determined in 2017 that there has been a reduction in hoki biomass in the western stock.

Based on export figures from 2014 of roughly \$1.65/kg greenweight, a 10,000 tonne¹⁴ decrease in the TACC may result in approximately \$16.5 million in immediate export revenue loss. This loss should be considered in the context of the potential for greater losses if a larger cut is required in future.

6.3 OPTION 3

Under this Option, the TAC would be decreased to 156,590 tonnes and the TACC would be decreased to 155,000 tonnes. It is proposed that this be apportioned by decreasing the western catch limit by 10,000 tonnes and allocating a 5,000 tonne increase to the eastern catch limit.

The five year projections based on the stock assessment model indicate that under this Option, both stocks are likely to remain above the management target range, with the western stock increasing slightly to 56% B_0 and the eastern stock to remain at the current stock status of 59% B_0 .

This Option provides the same benefits to the western stock as Option 2. Projections using the sensitivity model that gave more weight to the trawl survey abundance estimate indicate a decrease in the probability of the western stock declining below the soft limit from 35% to 25%. The stock status of the western stock is projected to decline further below the management target range under this Option, to 27% B_0 which is lower than the stock status projected for Option 2, but higher than that under the status quo (Option 1).

This Option provides a middle ground, decreasing the catch limit of the western stock to reduce the probability that it may decline below the soft limit while decreasing the effect on the fishing industry by reallocating 5,000 tonnes of catch to the eastern stock. A projection was run investigating the effects of the 5,000 allocation to the eastern stock being taken only in the spawning fishery. It was determined that there was no significant difference in stock status with the catch taken from different areas of the eastern stock.

¹⁴ ¹⁴ Based export figures for 2014 calendar year of \$1.65 / kg greenweight. This uses frozen headed and gutted (HGU) to estimate the greenweight export price as this form accounted for 32% of export earnings and 46% of export volume for hoki in the 2014 calendar year.

Based on export figures from 2014 of roughly \$1.65/kg greenweight, a 5,000 ton decrease in the TACC may result in approximately \$8.25 million in immediate export revenue loss. This loss should be considered in the context of the potential for greater losses if a larger cut is required in future.

7 Other Matters

MPI is not proposing to make any changes to the deemed value rates for hoki at this time.

8 Conclusion

The 2015 hoki stock assessment estimates the status of both hoki stocks to be above B_{MSY} and the management target range. There is uncertainty, however, in the status of the western stock, with the most recent fishery-independent trawl survey suggesting a potential decline in the stock that is not accounted for in the base case stock assessment model.

MPI considers that care should be taken and a reduction in the TACC be considered to potentially avoid a larger decrease in future if it is determined that hoki abundance in the western stock has declined as suggested by the most recent trawl survey.