Ling (LIN 5)

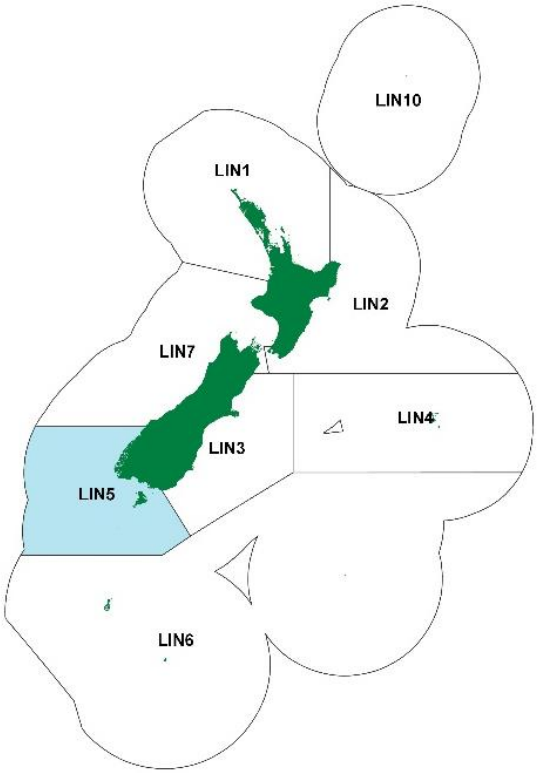

Figure 1: Quota Management Areas (QMAs) for ling (LIN), with LIN 5 highlighted in blue

1. What is proposed?

137. Fisheries New Zealand is reviewing the total allowable catch (TAC), allowance for Māori customary fishing, allowance for recreational fishing, allowance for all other mortality to the stock caused by fishing, and the total allowable commercial catch (TACC) for ling (*Genypterus blacodes*, hoka) in quota management area LIN 5 which is off the southwest coast of the South Island (see Figure 1). Fisheries New Zealand proposes that the following initial options be considered, and seeks information and views from tangata whenua and stakeholders (Table 1):

Table 1: Proposed management settings in tonnes for LIN 5 from 1 October 2018, with the percentage change relative to the *status quo* in brackets.

Option	Total Allowable Catch (TAC)	Total Allowable Commercial Catch (TACC)	Allowances		
			Customary Māori	Recreational	All other mortality to the stock caused by fishing
Option 1 *(Status quo)*	4036	3955	1	1	79
Option 2	4431 ↑ (10%)	4340 ↑ (10%)	1	1	89 ↑ (13%)
Option 3	4834 ↑ (20%)	4735 ↑ (20%)	1	1	97 ↑ (23%)

138. No changes are proposed to the deemed value rates for LIN 5. The interim deemed value rate for LIN 5 is currently set at 50% of the annual deemed value rate. While the Deemed

Value Guidelines[1] suggest that the interim deemed value rate should generally be set at 90% of the annual deemed value rate, given that LIN 5 landings have not exceeded the available ACE (Annual Catch Entitlement) during the last five years, Fisheries New Zealand considers that the current deemed value rates are appropriate. Therefore, to ensure consistency with the deemed value rates of other ling stocks,[2] no changes are proposed to the deemed value rates for LIN 5 (as outlined in Table 2).

Table 2: Deemed value rates ($/kg) for all ling stocks including LIN 5

	Interim deemed value rate ($/kg)	Annual differential rates ($/kg) for excess catch (% of ACE)		
		≤2%	>2% and ≤20%	>20%
Status quo	1.20	2.38	3.40	6.00

2. Why the need for change?

139. Ling is managed within the National Fisheries Plan for Deepwater and Middle-depths Fisheries (National Deepwater Plan) as a Tier 1 stock. A fisheries-specific Ling Fisheries Chapter for the National Deepwater Plan was finalised in 2011. The chapter sets the operational objectives and performance criteria for all ling fisheries. It also addresses the management of environmental effects caused by fishing for ling.

140. Ling found in LIN 5 and LIN 6 (excluding the Bounty platform) is considered to be the same biological stock (refer to section 3.1). The management approach for this stock is supported by a quantitative stock assessment undertaken every three years to estimate stock status. Key abundance indices that inform the assessment include a wide-area trawl survey series and catch per unit effort (CPUE) indices.

141. The TAC and TACC for both stocks are set based on the status of the stock in relation to the reference points for ling. These are described in Table 3 and are based on the default reference points set in the Harvest Strategy Standard[3].

Table 3: Harvest Strategy for ling: reference points and associated management responses

Reference point	Management response
Management target 40% B_0	Stock permitted to fluctuate around this management target. TAC/TACC changes will be employed to keep the stock around the target (with a 50% probability of being at the target)
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	To be determined
Harvest control rule	Management actions focussed on adjusting fishing mortality determined following consideration of the results of stock assessments and in some cases, forward projections under a range of catch assumptions, guided by biological reference points.

142. The stock assessment for LIN 5 and LIN 6 includes consideration of catch histories, biomass indices and catch-at-age data from trawl surveys and commercial fisheries. It was updated in 2018 and the two model runs estimate the stock is at 88-90% of unfished or "virgin" biomass (B_0). The Deepwater Working Group concluded that although estimates of absolute current and virgin stock size are very imprecise, it is most unlikely

[1] Available at www.mpi.govt.nz/document-vault/3663
[2] All ling stocks currently have the same deemed value rates.
[3] Harvest Strategy Standard for New Zealand Fisheries, October 2008, accessible at: http://fs.fish.govt.nz/Page.aspx?pk=113&dk=16543

that B_0 was lower than 200,000 tonnes for this stock, and that it is very likely that current biomass is greater than 70% of B_0.

143. Projections based on the updated stock assessment were undertaken based on four model runs; the reference model from the 2015 assessment, the base model, and two sensitivities to the base model. Each model used two catch scenarios: a low catch scenario based on the mean of recent catch history between 2013 and 2017, and a high catch scenario based on the combined LIN 5 and LIN 6 TACCs being caught. Under all model runs and both catch scenarios, the stock status is unlikely to change over the next five years.

144. The stock assessment, which represents the best available information on the status of the LIN 5 and LIN 6 stocks, indicates that there is a utilisation opportunity. Initial consultation with tangata whenua and industry stakeholders has indicated interest in a TAC increase for LIN 5.

145. The rationale for increasing the TAC for LIN 5 is that catch for this stock is consistently at or above the TACC (refer Figure 2). In contrast, Figure 3 shows that catch of LIN 6 is consistently undercaught (less than 50% of the TACC since 2007/08). Fish are more widely dispersed in LIN 6, which together with factors associated with operating in a remote and challenging environment, means operating costs are higher in LIN 6 than in LIN 5.

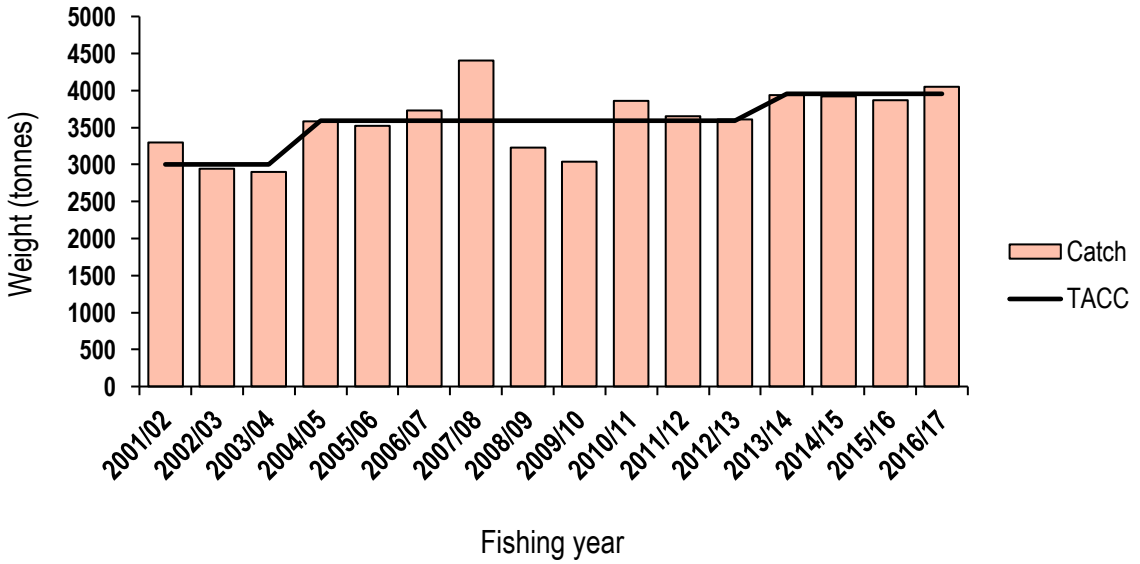

Figure 2: Landings vs Total Allowable Commercial Catch (TACC) in tonnes for LIN 5 from 2001/02 to 2016/17.

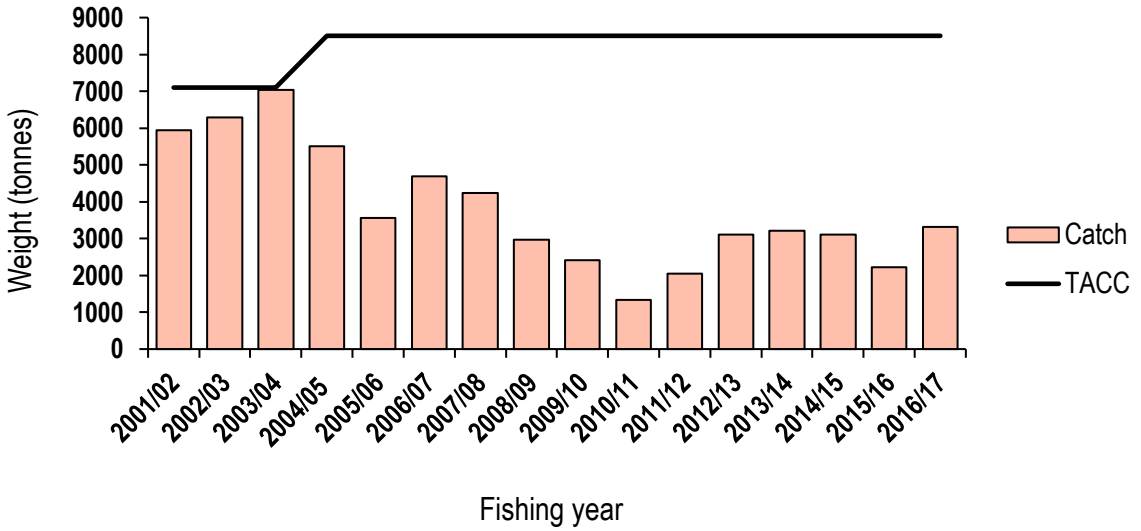

Figure 3: Landings vs TACC in tonnes for LIN 6 from 2001/02 to 2016/17.

3. Why are these options proposed?

3.1 BACKGROUND

146. The south western (LIN 5) and Sub-Antarctic (LIN 6) fisheries are considered to be the same biological stock (see Figure 4). However, these stocks are managed separately and are considered as two different stocks under the definition of 'stock' in section 2 of the Fisheries Act 1996 (the Act).

147. The part of LIN 6 on the Bounty Plateau is considered to be a separate biological stock (Figure 4) and fishing pressure is estimated to have been low, but erratic, since 1980. The proportion of total LIN 6 catch taken from the Bounty Plateau during the last 10 years has ranged between less than 1% and 22%. Changes in the LIN 6 TAC are not thought to impact the Bounty Plateau fishery, and it has not been included in the stock assessment for LIN 5 and LIN 6.

148. There is no rationale or interest from stakeholders for increasing the TAC for LIN 6. For reasons identified earlier, the only practical option available to take advantage of the potential utilisation opportunity that exists for the LIN 5 and LIN 6 biological stock is to increase the TAC for LIN 5.

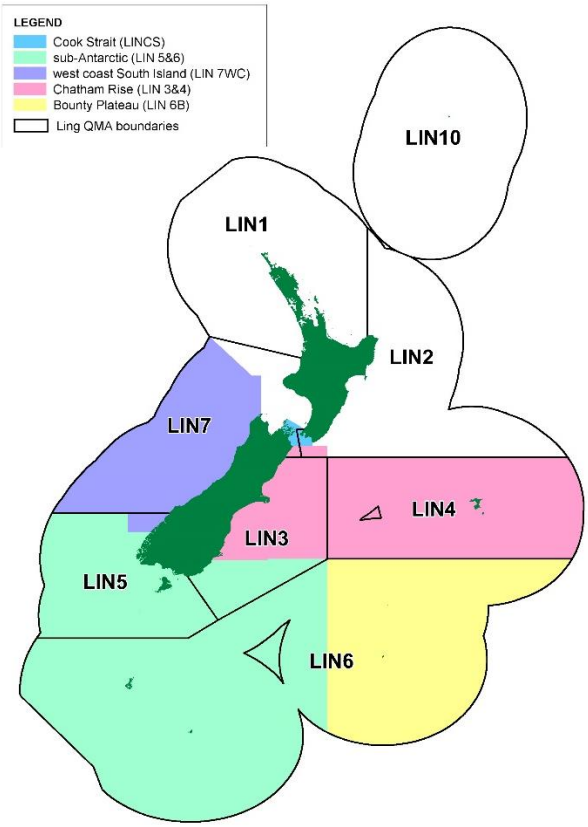

Figure 4: Ling biological stocks (coloured areas) and Quota Management Areas (QMAs)

3.2 SETTING AND VARYING THE TAC

149. The TAC for LIN 5 is currently set under section 13(2)(c) of the Act. This section requires the Minister of Fisheries (the Minister) to set a TAC that enables any stock whose current level is above that which can produce the maximum sustainable yield to be altered in a way and at a rate that will result in the stock moving towards or above a level that can produce the maximum sustainable yield, having regard to the interdependence of stocks. Fisheries New Zealand considers it is appropriate that the TAC continues to be set under this section.

Option 1 (*Status quo*)

150. Option 1 (*status quo*) is to retain the existing catch limits and allowances for 2018/19.

Option 2

151. Option 2 is a proposal to increase to the TAC for the 2018/19 fishing year and beyond by 10%. As the exploitation rate for the biological stock has been low, Fisheries New Zealand considers that an increase of this order is very unlikely to cause any undue risks for stock sustainability.

Option 3

152. Option 3 is a proposal to increase to the TAC for the 2018/19 fishing year and beyond by 20%. As with Option 2, Fisheries New Zealand considers that an increase of this order is unlikely to cause any undue risks for sustainability of the stock as a whole. However, as

fishing effort is not distributed evenly across LIN 5 and LIN 6 stock, this option increases the risk of localised depletion occurring in LIN 5.

153. All options satisfy the requirements of section 13(2)(c) that the level of the stock is altered in a way and at a rate that will result in the stock moving towards or above a level that can produce the maximum sustainable yield, having regard to the interdependence of stocks. They are also consistent with the relevant Management Objectives of the National Fisheries Plan for Deepwater and Middle-depth Fisheries (National Deepwater Plan).

3.3 SETTING ALLOWANCES AND THE TACC

154. Having set the TAC, the Minister must make allowances for Māori customary non-commercial fishing interests, recreational fishing interests, and all other mortality to the stock caused by fishing (s 20 & 21).

Allowance for Māori customary fishing

155. For LIN 5, the current allowance for Māori customary non-commercial fishing interests is 1 tonne. Under all options, this allowance would remain unchanged. Best available information indicates that there is limited customary catch of ling in LIN 5. Consequently, it is proposed that no provision be made for additional customary catch in any of the proposed options.

156. Fisheries New Zealand is aware that not all customary catch is required to be reported. Fisheries New Zealand seeks information from iwi and stakeholders on whether they are aware of any customary fishing that may have occurred in this fishery to enable an accurate estimate of likely customary harvest to be made.

Allowance for recreational fishing

157. For LIN 5, Fisheries New Zealand proposes to retain the current allowance for recreational fishing interests at 1 tonne. Fisheries New Zealand has no new information upon which to base an increase to the allowance for recreational fishing interests but welcomes any information that stakeholders have regarding that allowance.

Allowance for all other sources of mortality caused by fishing

158. Under the current settings, the allowance for other sources of fishing-related mortality is 2% of the TACC. This allowance is to provide for unrecorded mortality of fish that is caused by, for example, fish escaping through trawl net mesh and subsequently dying from injuries, accidental loss from lost or ripped trawl net codends, predation, and loss of fish taken on longlines. In the absence of further information on this subject, Fisheries New Zealand proposes to maintain this allowance at 2% of the TACC all options.

TACC

159. Under Options 2 and 3, the TACC for LIN 5 would increase by 10% (385 tonnes) and 20% (780 tonnes) respectively.

3.4 DEEMED VALUE RATES

160. Deemed value charges for LIN 5 have totalled approximately $4,300 in total over the last five years.

161. There are no proposed changes to the deemed value rates for LIN 5 (refer to Table 2 above).

3.5 EVALUATION OF OPTIONS

162. Increasing the TACC for LIN 5 as proposed would have direct benefits to industry. The predicted economic revenues from the options are outlined in Table 4. On the basis of the export value of frozen ling fillets during the 2017 calendar year, a 10% increase in catch (385 tonnes) could be worth approximately $1.3m in additional export revenue.[4] A 20% increase in catch (780 tonnes) could be worth up to $2.7m in additional export revenue. Retaining the existing TACC would forego any economic benefits.

Table 4: Predicted changes to commercial revenue of the proposed options for LIN 5, based on the export value of frozen ling fillets in 2017/18.

	TACC	Change from *status quo* (t)	Predicted revenue change ($ p.a.)
Option 1 *(Status quo)*	3955		
Option 2	4340	386 ↑ (10%)	$1,300,000 ↑
Option 3	4735	780 ↑ (20%)	$2,700,000 ↑

163. Ling is not known to be taken commonly by non-commercial fishers in the area encompassed by LIN 5, and the proposed TACC increase is unlikely to affect the size and availability of ling for these fishers.

164. As detailed earlier in this paper, the LIN 5 and LIN 6 biological stock is separated into two administrative quota management areas. LIN 6 has the higher TACC (currently more than double that of LIN 5) but catch from LIN 5 has exceeded that from LIN 6 every year since 2007/08. These factors mean that fishing pressure (the proportion of available ling biomass harvested) in LIN 5 is probably greater than in LIN 6 if an even distribution of the stock is assumed.

165. A Sub-Antarctic summer trawl survey has taken place annually or biennially since 2000.[5] Using trawl survey data, analysis of the biomass index of ling in different regions within the Sub-Antarctic area, one of which included most of the fished grounds within LIN 5, was undertaken.[6] The analysis found no evidence for a long-term biomass trend in any region, such as could arise from localised depletion. This suggests the current method for allocating the TACC to LIN 5 and LIN 6 is appropriate but the analysis recommended that future assessments continue to monitor survey biomass estimates in LIN 5.

166. Trawl surveys are carried out every two years. Outputs from the surveys will be monitored for any signs of localised depletion.

[4] This is based on an average unit value for frozen ling fillets of $10.24 during the 2017 calendar year and a conversion factor for skin-off trimmed fillets of 2.95.
[5] Surveys also took place annually between 1991 and 1993.
[6] Roberts, J. (2016). Stock assessment of ling (*Genypterus blacodes*) in the Sub-Antarctic (LIN 5&6) for the 2014-15 fishing year. *New Zealand Fisheries Assessment Report 2016/05.* 39 p. Report available at http://fs.fish.govt.nz/Page.aspx?pk=113&dk=23997

4. Other Relevant Matters

4.1 ENVIRONMENTAL PRINCIPLES AND SUSTAINABILITY MEASURES

167. In LIN 5, ling is taken predominantly as a target species. For that reason, the proposed increases to the LIN 5 TACC under Options 2 and 3 will result in an increase in fishing effort in the LIN 5 stock. When making a decision concerning the TAC of a stock, the Minister must have regard to any environmental conditions affecting the stock.

168. LIN 5 is taken primarily by trawl methods (Figure 5). Most trawl catch is, in turn, taken by larger trawl vessels (vessels greater than 28m in length). In the last five fishing years, large trawl vessels have taken over 70% of annual catch while smaller trawl vessels have taken, on average, around 10%. During the same period less than 20% of catch was taken by bottom longlining while other methods were responsible for less than 1% of catch.

169. During the last five fishing years, around 70% of ling catch in LIN 5 was targeted. The remainder was taken as bycatch while fishers targeted other species such as hoki, white warehou, squid, and silver warehou. The target fishery takes place primarily during September to December, when ling aggregate to spawn on the Stewart-Snares Shelf.

170. The percentage of ling target tows on the Stewart-Snares Shelf that were observed during each of the last five completed fishing years has ranged between 10 and 31%. Data recorded by Fisheries New Zealand observers on trawl vessels during that period indicates than when ling is the target species, it is also the dominant species caught (60% of total catch). Hoki is the main bycatch species, comprising 21% of catch. No other species formed more than 3% of the total catch. Overall, Quota Management System (QMS) species comprised 88% of catch during this period.

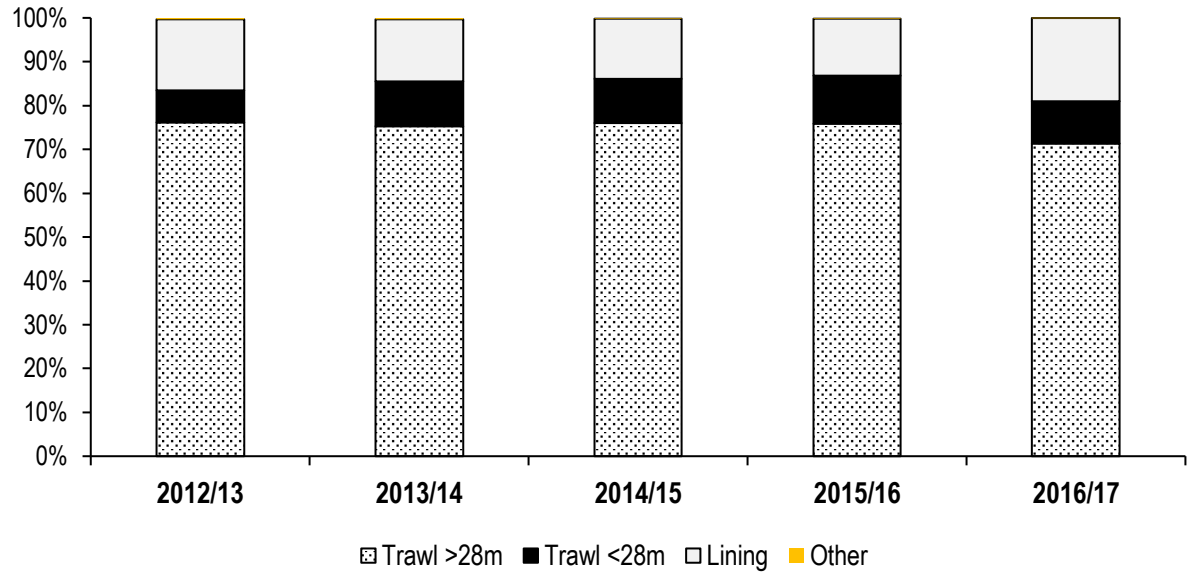

Figure 5: Percentage of LIN 5 catch by method during the 2012/13 to 2016/17 fishing years

171. During the last five completed fishing years, observer coverage on bottom longline vessels targeting ling on the Stewart-Snares Shelf has been low; there was no coverage in

2012/13 while highest percentage of effort observed was 7.2% in 2016/17. The observer data indicates that ling comprises 80% of the catch with no single bycatch species comprising more than 3% of catch. Overall, QMS species comprised 96% of catch on bottom longline vessels targeting ling.

172. As discussed below, there are currently no significant impacts of the ling fishery on protected species. Fisheries New Zealand considers that an increase in fishing effort in LIN 5 through either a 10% or 20% increase to the TAC is unlikely to result in adverse effects on the aquatic environment.

Seabirds

173. Seabird captures in trawl fisheries for ling occur in two main ways. Seabirds either collide with or are struck by the moving trawl warps (usually larger seabirds) or are caught in the net when it is on the surface during deployment and retrieval (usually smaller seabirds). Regulations have been in place since 2005 requiring vessels >28m to deploy bird scaring devices.

174. In addition to the mandatory mitigation measures, Fisheries New Zealand and the fishing industry work have worked collaboratively for over a decade to ensure all trawlers over 28 m in length have, and follow, a Vessel Management Plan (VMP). VMPs specify the measures that must be followed on board each vessel so as to reduce the risk of incidental seabird captures. Fisheries New Zealand observers monitor each vessel's performance against its VMP and if a vessel is not complying with the guidelines in its VMP, the Director-General has the option of imposing vessel-specific regulations to better control management practices.

175. In bottom longline fisheries, birds are mainly captured during setting of the gear, as seabirds try to take the bait off the hook and accidentally get hooked. The risk of capture is also present during hauling when any remaining baits and hooked fish are near the surface. In 2008, seabird sustainability measures for bottom longliners were put in place to minimise and mitigate seabird interactions in longline fisheries.

176. The National Plan of Action – 2013 to reduce the incidental catch of seabirds in New Zealand Fisheries, (NPOA Seabirds) which is currently under review, is the driver for all actions to reduce the incidental mortality of seabirds from fishing.[7] It puts in place a risk-based approach to managing fishing interactions with seabirds, targeting mitigation on those species most at risk but also aiming to reduce captures overall.

177. The most recent seabird risk assessment was published in 2017.[8] It is a primary input to the NPOA Seabirds. The risk assessment calculates a species-level risk broken down by fishery group. Fishery groups were assigned on the basis of target species, vessel size and for trawl vessels targeting middle-depth species, whether or not the vessel was a factory vessel. Vessels in the same fishery group are assumed to attract and capture birds in a similar way.

178. The risk assessment identified the middle-depth trawl fishery, which includes ling, as contributing >10% of the proportion of risk to one seabird species in the very high risk or

[7] Accessible at: https://www.mpi.govt.nz/dmsdocument/3962-national-plan-of-action-2013-to-reduce-the-incidental-catch-of-seabirds-in-new-zealand-fisheries
[8] Accessible at: http://www.mpi.govt.nz/dmsdocument/27531-aebr-191-assessment-of-the-risk-of-commercial-fisheries-to-nz-seabirds-2006-07-to-2014-15

high risk categories. The small-vessel ling bottom longline fishery contributed >50% of the proportion of risk to one species in these two risk categories.

179. It is important to point out that these estimates are for all middle-depth and ling bottom longline fisheries nationwide, of which LIN 5 represents only a small proportion. Based on fishing effort during the 2015/16 fishing year, LIN 5 target tows comprised 4% of all middle depth trawl tows. Effort by small-vessel ling bottom longline vessels in LIN 5 represented 7% of total effort during 2015/16. Any increase in effort resulting from either a 10% or 20% increase to the LIN 5 TACC will likely result in only a marginal increase in total effort by vessels in the respective fishery groups.

Marine Mammals

180. New Zealand fur seals are occasionally captured in ling fisheries with the majority taking place in trawl fisheries. However, observers have not reported any incidences of New Zealand fur seal captures occurring in LIN 5.

181. The New Zealand fur seal is a protected species under the Marine Mammals Protection Act 1978. The species status has been classified by the Department of Conservation as 'Not Threatened' and the population is considered to be increasing.

182. The ling fisheries rarely interact with any other marine mammals, and observers have not reported interactions with any other marine mammal species in LIN 5.

183. Industry has developed Marine Mammal Operational Procedures, which are generic across all trawlers greater than 28m in length. The Operational Procedures describes a range of procedures that a vessel and crew should follow to reduce the risk of marine mammal captures. Fisheries New Zealand monitors and audits vessel performance against the Operational Procedures via the Fisheries New Zealand Observer Programme.

184. As with seabirds, any increase in effort resulting from either a 10% or 20% increase to the LIN 5 TACC will likely result in only a marginal increase to the risk of marine mammal captures occurring in LIN 5.

Interdependence of stocks

185. There is no information to suggest that the interdependence of any stocks would limit the increased levels of the LIN 5 TAC proposed at this time. The fishery primarily targets aggregations of ling and bycatch species are predominantly managed under the QMS. Ling biological characteristics are taken into account in the assessment and management of stock. No specific environmental conditions that would affect the level of the TAC for LIN 5 have been identified.

Benthic impacts

186. Most ling in LIN 5 is taken by bottom trawl. In recent years, management measures to address the effects of deepwater trawl activity have focused on 'avoiding' these effects on a spatial basis. 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 2007 effectively closed over 30% of New Zealand's Exclusive Economic Zone to bottom trawling. Within LIN 5, there are two BPAs and one seamount closure.

187. The trawl footprint of all fisheries taking LIN 5 will continue to be mapped and monitored annually and any undue expansion will give rise to a review of management arrangements.

4.2 INPUT AND PARTICIPATION OF TANGATA WHENUA

188. The proposal to consult on LIN 5 was presented to the Te Waka a Māui me Ōna Toka Iwi Forum in March 2018. This forum represents the nine iwi of the South Island, each holding mana moana and significant interests (both commercial and non-commercial) in South Island fisheries. The forum supported a review of the LIN 5 fishery.

189. Fisheries New Zealand will be taking the proposed options to the Te Waka a Māui me Ōna Toka Iwi Forum again in July to seek further input, and will incorporate the Forum's views into the final advice to the Minister.

Kaitiakitanga

190. Under Section 12(1)(b) the Minister must also have particular regard to kaitiakitanga before setting or varying a TAC. Under the Act, kaitiakitanga is the exercise of guardianship, and in relation to any fisheries resources, includes the ethic of stewardship based on the nature of the resources, as exercised by the appropriate tangata whenua in accordance with tikanga Māori.

191. Relevant Iwi or Forum Fish Plans provide a view of the objectives and outcomes iwi seek from the management of the fishery and can provide an indication of how iwi exercise kaitiakitanga over fisheries resources. Iwi views from Forum meetings and submissions received from iwi can also provide an indication.

192. Ling (hoka) is not listed as a taonga species in the Te Waipounamu Iwi Fisheries Plan, but the Te Waka a Māui me Ōna Toka Iwi Forum consider the species taonga. This plan contains objectives to support and provide for the interests of South Island iwi. That Forum Fisheries Plan contains three objectives which are relevant to the management options proposed for LIN 5:

    a) Management objective 1: to create thriving customary non-commercial fisheries that support the cultural wellbeing of South Island iwi and our whānau;
    b) Management objective 3: to develop environmentally responsible, productive, sustainable and culturally appropriate commercial fisheries that create long-term commercial benefits and economic development opportunities for South Island iwi; and
    c) Management objective 5: to restore, maintain and enhance the mauri and wairua of fisheries throughout the South Island.

193. Fisheries New Zealand considers that the management options presented in this advice paper will contribute towards the achievement of these three management objectives in ensuring that appropriate allowances are made for customary non-commercial fishing, the fishery remains sustainable, and that environmental impacts are minimised.

5. Further Information

Should you require further information, please see:

Fisheries Act (1996)

http://www.legislation.govt.nz/act/public/1996/0088/latest/DLM394192.html

Fisheries New Zealand Plenary document

Fisheries New Zealand (2018). Fisheries Assessment Plenary, May 2018: stock assessments and stock status. Compiled by the Fisheries Science Group, Fisheries New Zealand, Wellington, New Zealand.

Fisheries New Zealand's fisheries species page

http://fs.fish.govt.nz/Page.aspx?pk=5&tk=1&fpid=51

Previous reviews of the stock

LIN 5 and LIN 6 Sustainability Round Review 2013
http://www.mpi.govt.nz/news-and-resources/consultations/2013-review-of-sustainability-measures-and-management-controls-for-fishstocks/

Oreo (OEO 4)

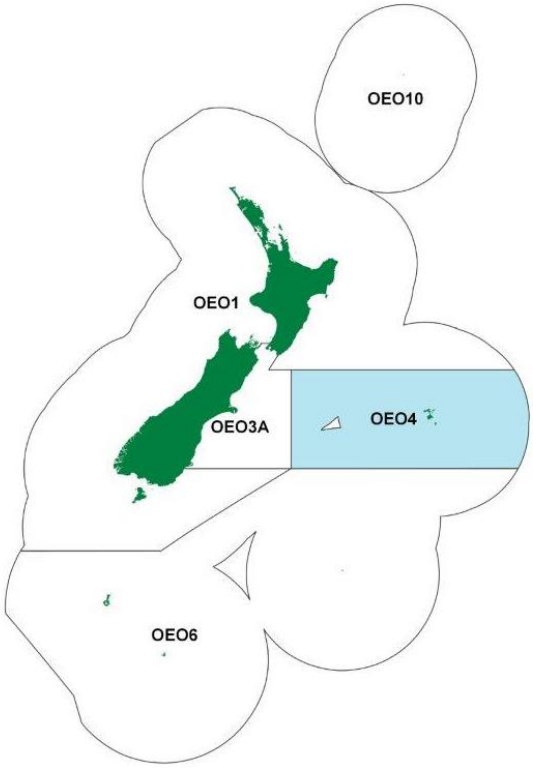

Figure 1: Quota Management Areas (QMAs) for oreo (OEO), with OEO 4 highlighted in blue.

1. What is proposed?

194. Fisheries New Zealand is reviewing the total allowable catch (TAC), allowance for Māori customary fishing, allowance for recreational fishing, allowance for all other mortality to the stock caused by fishing, and the total allowable commercial catch (TACC) for oreos (*Pseudocythus maculatus; Allocyttus niger; Neocyttus rhomboidalis;* and *Allocyttus verucosas*) in quota management area OEO 4, which is off the Chatham Islands (see Figure 1). Fisheries New Zealand proposes that the following initial options be considered, and seeks information and views from tangata whenua and stakeholders (Table 1).

195. It is also proposed that as part of this sustainability review, a voluntary species-specific catch limit for smooth oreo be implemented in OEO 4.

Table 1: Proposed management settings in tonnes for OEO 4 from 1 October 2018

Option	Total Allowable Catch (TAC)	Total Allowable Commercial Catch (TACC)	Smooth oreo voluntary limit (t)	Allowances		
				Customary Māori	Recreational	All other mortality to the stock caused by fishing
Current settings	**3150**	**3000**	**-**	**0**	**0**	**150**
Option 1	3465 ↑ (10%)	3300 ↑ (10%)	2300	0	0	165 ↑ (10%)
Option 2	4095 ↑ (30%)	3900 ↑ (30%)	2900	0	0	195 ↑ (30%)
Option 3	4515 ↑ (43%)	4300 ↑ (43%)	3300	0	0	215 ↑ (43%)

196. No changes are proposed to the deemed value rates for OEO 4. The interim deemed value rate for OEO 4 is currently set at 90% of the annual deemed value rate and as the current interim and annual deemed value rates are consistent with the Deemed Value Guidelines,[9] no change is proposed as outlined in Table 2.

Table 2: Standard deemed value rates for OEO 4

	Interim Rate	Annual Differential Rates ($/kg) for excess catch (% of ACE)					
	($/kg)	100-120%	120-140%	140-160%	160-180%	180-200%	200%+
Status quo	0.81	0.90	1.08	1.26	1.44	1.62	1.80

2. Why the need for change?

197. The best available information suggests that the biomass of smooth oreo in OEO 4 is currently at the management target. Based on projections from the 2018 smooth oreo stock assessment, Fisheries New Zealand considers there is an opportunity to increase utilisation whilst ensuring the sustainability of smooth oreo within OEO 4.

198. Oreo are managed within the draft National Fisheries Plan for Deepwater and Middle-depths Fisheries (draft National Deepwater Plan) as a Tier 1 stock. The draft National Deepwater Plan includes an Oreo Fisheries Chapter that sets the operational objectives and performance criteria for all oreo fisheries. It also addresses the management of environmental effects caused by fishing for oreo.

199. OEO 4 is managed as a species complex comprised of smooth oreo *(Pseudocythus maculatus*, SSO), black oreo *(Allocyttus niger*, BOE), spiky oreo *(Neocyttus rhomboidalis*, SOR) and warty oreo *(Allocyttus verucosas*, WOE).

200. The TAC and TACC are set for all species combined, but fishers are required to report by species on landing returns. The TAC and TACC for OEO 4 are set primarily based on the status of the smooth oreo stock in relation to the default reference points from the Harvest Strategy Standard[10] (Table 3).

Table 3: Harvest Strategy for oreo: reference points and associated management responses

Reference point	Management response
Management target 40% B_0	Stock permitted to fluctuate around this management target. TAC/TACC changes will be employed to keep the stock around the target (with a 50% probability of being at the target)
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
Harvest control rule	Management actions focussed on adjusting fishing mortality determined following consideration of the results of stock assessments and in some cases, forward projections under a range of catch assumptions, guided by biological reference points.

201. The management approach of OEO 4 is supported by a quantitative stock assessment undertaken every four years for smooth oreo with the most recent assessment in 2018. Stock assessments for smooth oreo are underpinned by a combination of acoustic surveys, trawl surveys, catch per unit effort indices and observer sampling.

[9] Available at www.mpi.govt.nz/document-vault/3663
[10] Harvest Strategy Standard for New Zealand Fisheries, October 2008. Accessible at: http://fs.fish.govt.nz/Page.aspx?pk=113&dk=16543

202. The current TACC is generally fully caught (Figure 2), with most of the catch comprised of smooth oreo. The remainder of the catch is predominantly black oreo (average annual catch around 800 tonnes), with a very small amount of spiky and warty oreo (<1% of the TACC).

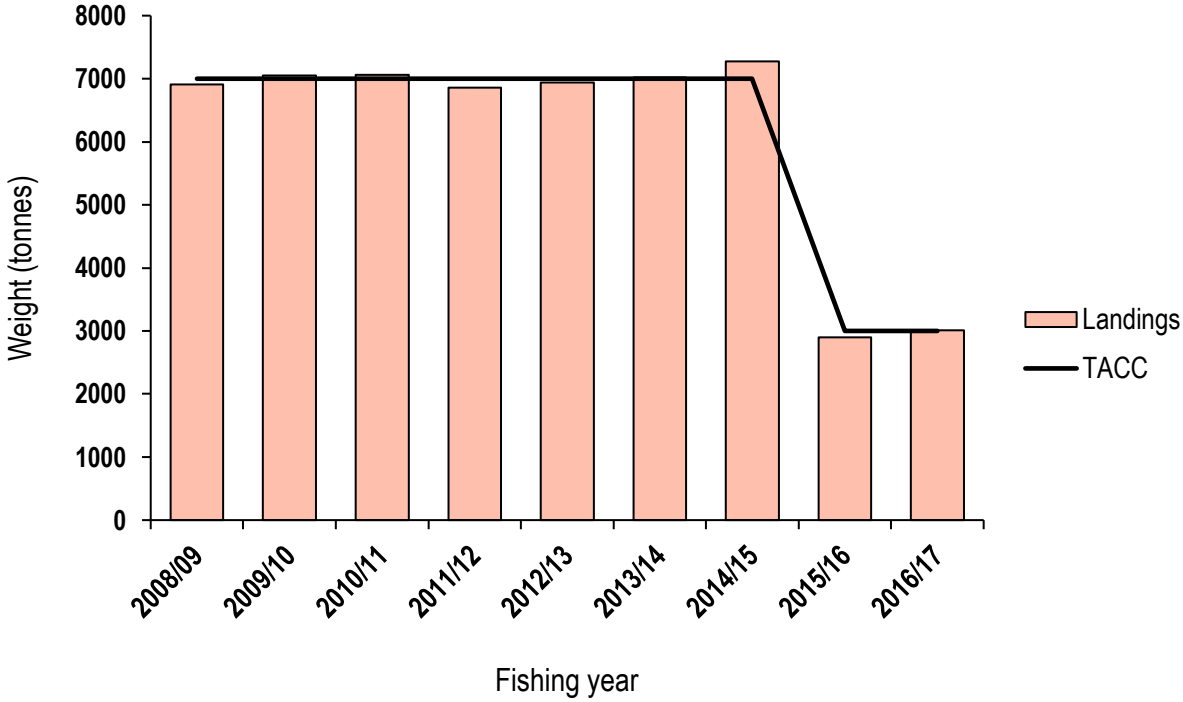

Figure 4: Landings vs Total Allowable Commercial Catch (TACC) in tonnes for OEO 4 from 2008/09 to 2016/17.

203. The most recent change to the OEO 4 TACC was in 2015/16, when the TACC was reduced from 7000 tonnes to 3000 tonnes. The reduction was in response to the 2014 smooth oreo stock assessment, which indicated that the spawning stock biomass was below the management target of 40% B_0 (at 27% B_0) and declining.

204. A new smooth oreo stock assessment base case model was accepted by the 2018 Stock Assessment Plenary. It suggests that the estimate of stock status from the 2014 stock assessment was overly pessimistic. The 2018 stock assessment results indicate that current spawning stock biomass is at 40% B_0 and can support increased utilisation. However, one of the sensitivity model runs indicated that the stock could be as low as 33% B_0 and some uncertainty in stock status therefore remains.

205. The 2018 stock assessment model structure remained similar to 2014, but included some parameter adjustments and incorporated new data including: updated smooth oreo catch history to 2017/18, an acoustic biomass estimate from 2016, and commercial, trawl and acoustic survey age frequency information.

206. Five year projections based on the 2018 smooth oreo stock assessment indicate that the smooth oreo stock in OEO 4 can potentially sustain an increase in catch.

3. Why are these options proposed?

3.1 VARYING THE TAC

207. The TAC for oreo can be varied under section 13 of the Fisheries Act 1996. Section 13(2) of the Act specifies requirements for setting or varying a TAC where a reliable estimate of the current biomass of the stock and the level of biomass that can produce the maximum sustainable yield, is known. It is proposed that the TAC is reviewed under section 13(2)(a) to maintain OEO 4 at or above a level that can produce the maximum sustainable yield. In OEO 4, the management target is 40% unfished or "virgin" biomass (B_0), around which fisheries should be permitted to fluctuate with at least a 50% probability of achieving the target, as outlined in the Harvest Strategy Standard.

208. Fishers have been required to report OEO 4 landings by species since 2007/08. It is proposed that a species-specific catch limit for smooth oreo be implemented for the first time in the OEO 4 fishery to ensure the catch of smooth oreo does not exceed yield estimates.

209. Probabilities of smooth oreo stock status in relation to reference points based upon five-year projections from the 2018 stock assessment base case model and a sensitivity model for various smooth oreo catch scenarios are shown in Table 4. The probability of the stock being at or above the management target of 40% B_0 in 2023 indicate that on average it is likely under all three base model catch options.

Table 4: Probabilities of smooth oreo stock status in relation to reference points based upon five-year projections from the 2018 stock assessment base case model and a sensitivity model [11] for various smooth oreo catch scenarios.

Model	Catch (t)	Smooth oreo stock status in 2023 (% B_0)	Probability of stock being at or above management target in 2023 (40% B_0)	Probability of stock being below the soft limit in 2023 (20% B_0)	Probability of stock being below the hard limit in 2023 (10% B_0)
Base	2300	42	0.56	0.01	0
	2900	40	0.50	0.01	0
	3300	39	0.46	0.02	0
Sensitivity	2300	35	0.28	0.02	0
	3000	34	0.21	0.04	0
	3300	33	0.19	0.05	0

210. Little is known about the current stock status or sustainability within the TACC for catch of all other oreo species in the OEO 4 fishery. Recent average landings of black oreo in OEO 4 have been around 800 tonnes which is taken mostly as bycatch from other target fisheries.

[11] Sensitivity analysis is the study of how the uncertainty in the output of a mathematical model or system (numerical or otherwise) can be apportioned to different sources of uncertainty in its inputs.

Current settings

211. The *status quo* is to retain current catch limits and allowances. There is currently no explicit allowance or catch limit for specific oreo species within the TACC. When the TAC was reviewed in 2015/16, it was assumed that the catch of smooth oreo would average 2000 tonnes. It has since averaged 2,300 tonnes and this level formed the basis of projections for Option 1. No allowances currently apply for customary Māori or recreational catch. However, there is an allowance of 5% of the TACC for all other mortality to the stock caused by fishing.

212. Option 1 is a proposal to increase the TAC by 315 tonnes to 3465 tonnes based on recent average catches of smooth oreo and the outcome of stock status projections. It is further proposed that the catch of smooth oreo is maintained around current levels by implementing a species-specific smooth oreo catch limit of 2300 tonnes.

213. Option 2 is a proposal to increase the TAC by 945 tonnes to 4095 tonnes with a species-specific smooth oreo catch limit of 2900 tonnes.

214. Option 3 is a proposal to increase the TAC by 1365 tonnes to 4515 tonnes with a species-specific smooth oreo catch limit of 3300 tonnes.

3.2 VARYING ALLOWANCES AND THE TACC

215. Having set the TAC, the Minister must set the TACC and in setting or varying the TACC must make allowances for Māori customary non-commercial fishing interests, recreational fishing interests, and all other mortality to the stock caused by fishing (s 20 & 21).

Allowance for Māori customary fishing

216. Best available information indicates that there is currently no customary catch of oreo in OEO 4. Consequently it is proposed that no provision be made for customary catch in any of the proposed options. Fisheries New Zealand is aware that not all customary fishing is required to be reported. Fisheries New Zealand seeks information from iwi and stakeholders on whether they are aware of any customary fishing that may have occurred in this fishery to enable an accurate estimate of likely customary harvest to be made.

Allowance for recreational fishing

217. The current zero allowance for recreational fishing is maintained for all options. There is currently no known recreational catch of oreo in OEO 4 and no allowance is proposed under any option, however this does not preclude recreational take.

Allowance for all other sources of mortality caused by fishing

218. Fisheries New Zealand proposes to retain the current proportional allowance for all other mortality to the stock caused by fishing, at 5% of the TACC. This allowance accounts for unreported oreo mortality, such as loss due to burst nets.

219. While there is no information available to quantify all other mortality to the stock caused by fishing, the available evidence suggests that an allowance of 5% of the TACC is

appropriate given the biological characteristics of the stock and mortality caused by trawling.

3.3 DEEMED VALUE RATES

220. Deemed value charges in OEO 4 have been relatively low over the past five years, with a total of approximately $61,000 in charges, which are entirely from the 2014/15 fishing year.

221. There are no proposed changes to the deemed value rates for OEO 4 for the 2018/19 fishing year (see Table 2 above).

3.4 EVALUATION OF OPTIONS

222. Under section 13(3) of the Act the Minister shall have regard to such social, cultural and economic factors as he considers relevant when determining the way in which and rate at which a stock is moved towards or above a level that can produce the maximum sustainable yield.

223. Increasing the TACC and allowances will allow fishers the opportunity to take advantage of increased abundance of oreo. An additional benefit for commercial fishers is that an increased TACC which would reduce the amount of deemed value payments incurred, provided fishers constrain their catch within the commercial catch limit, and the predicted economic revenues from the options are outlined in Table 5. Retaining the current TACC (Option 1) may result in opportunity loss through unnecessarily constrained catch.

Table 5: **Indicative changes to commercial revenue[12] of the proposed options, based on an estimated FOB[13] Unit Value of $3.26/kg greenweight for smooth oreo**.[14]

	TACC	Proposed SSO Voluntary Catch Limit	Change from *status quo* (t)	Predicted revenue change ($ p.a.)
Current settings	**3000**			
Option 1	3300	2300	300 ↑	$978,000 ↑
Option 2	3900	2900	900 ↑	$2,934,000 ↑
Option 3	4300	3300	1,300 ↑	$4,238,000 ↑

[12] Figures underpinning these indicative revenue changes are reported by Seafood NZ and taken from Statistics New Zealand, and are based on estimated values from the 2017 calendar year. Available here: https://www.seafood.org.nz/fileadmin/documents/Export_data/17.12.10a.pdf

[13] Free On Board: the value of export goods including raw material, processing, packaging, storage and transportation to point of export (exclusive of storage, export transport, or insurance costs).

[14] The indicative revenue change for SSO is based upon the dressed (DRE) product state conversion factor of 2.15 for SSO and an average value across all countries of export of $NZ3.26/kg.

Current settings

224. Maintaining the current settings would result in no change to catch limits or allowances and no implementation of a species-specific catch limit for smooth oreo within the OEO 4 TACC.

225. While recent annual landings of smooth oreo have been around 2,300 tonnes they could potentially decrease if catch of other species of oreo increases. Alternatively, with no species-specific catch limit in place, it is possible that smooth oreo catch will increase. In either event the status quo does not take advantage of a utilisation opportunity and makes no provision for customary fishing.

Option 1

226. Option 1 would increase the TACC by 300 tonnes and implement a voluntary species-specific catch limit for smooth oreo of 2300 tonnes. This limit is based upon current catch levels of smooth oreo and supported by five-year projections of stock status.

227. Projections based on the 2018 stock assessment model indicate that annual smooth oreo catch of 2300 tonnes would result in a 56% probability of the stock being at or above the management target in 2023, with an estimated 2023 spawning stock biomass of 42% B_0. Under this scenario, it is very unlikely that the stock would approach soft or hard limits.

228. Projections using the more pessimistic sensitivity run suggest that annual smooth oreo catch of 2300 tonnes would result in a 28% probability of the stock being at or above the management target in 2023. However, these projections do indicate the stock would continue to increase under these catch levels (from 33% B_0 in 2018 to projected 35% B_0 in 2023), and have a 2% probability of being below the soft limit in 2023.

229. This option is the most conservative and would not maximise utilisation in OEO 4, but does provide for a potential revenue increase of around NZD $978,000 based on the current export value for smooth oreo.

Option 2

230. Option 2 would result in a voluntary species-specific limit of smooth oreo catch of 2900 tonnes. Projections based on the 2018 stock assessment model indicate that annual smooth oreo catch of 2900 tonnes would result in a 50% probability of the stock being at or above the management target in 2023, with an estimated 2023 spawning stock biomass of 40% B_0. Under this scenario, it is very unlikely that stocks would approach soft or hard limits.

231. Projections using the more pessimistic sensitivity run suggest that annual smooth oreo catch of 2900 tonnes would result in a 21% probability of the stock being at or above the management target in 2023. However, these projections do indicate the stock would continue to increase under these catch levels (from 33% B_0 in 2018 to projected 34% B_0 in 2023), and have only a 4% probability of being below the soft limit in 2023.

232. This option provides for additional utilisation, including a potential revenue increase of around NZD $2.9 million.

Option 3

233. Option 3 proposes implementing a voluntary species-specific limit of smooth oreo catch of 3300 tonnes. This option is based on maximising utilisation opportunity, while ensuring the probability of the stock declining below soft and hard limits remains very unlikely.

234. Projections based on the 2018 stock assessment model indicate that annual smooth oreo catch of 3300 tonnes would result in a 46% probability of the stock being at or above the management target in 2023, with an estimated 2023 spawning stock biomass of 39% B_0. Under this scenario, it is very unlikely that stocks would approach soft or hard limits.

235. Projections using the more pessimistic sensitivity run suggest that annual smooth oreo catch of 3300 tonnes would result in a 19% probability of the stock being at or above the management target in 2023. However, these projections do indicate the stock would remain at a similar status as in 2018 at these catch levels and have a projected 5% probability of the stock declining below the soft limit in 2023.

236. This option maximises the opportunity for additional utilisation, including a potential revenue increase of around NZD $4.2 million.

4. Other Relevant Matters

4.1 ENVIRONMENTAL PRINCIPLES AND SUSTAINABILITY MEASURES

237. Section 9 of the Act prescribes three environmental principles that the Minister must take into account when exercising powers in relation to the utilising of fisheries resources or ensuring sustainability. See "Statutory Considerations" Part 1.4 for a full description of these environmental principles.

238. Section 11 of the Act sets out various matters that the Minister must take into account or have regard to when setting or varying any sustainability measure (such as a TAC). See "Statutory Considerations" Part 1.6 for a full description

Non-regulatory management approaches

239. It is proposed that a voluntary mechanism is used to implement a species-specific catch limit arrangement in the OEO 4 fishery to limit the smooth oreo catch within the TACC. This would require the cooperation of industry and OEO 4 quota owners. It would be formally administered through FishServe[15], and audited and reported annually by Fisheries New Zealand. Fisheries New Zealand seeks industry views on this option.

240. Voluntary agreements have been successfully implemented in the past in other fisheries. However, if there is no agreement to apply voluntary catch limits for smooth oreo in OEO 4, Fisheries New Zealand will consider how this would impact on proposals to increase the TAC. If and when implemented, non-adherence to an agreed limit would result in the application of regulatory measures.

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

Protected species

241. The three options will increase fishing effort targeting oreo in OEO 4, however, oreo target fishing is considered to pose low risk to seabirds and marine mammals. Between 2003/03 and 2015/16, 1.2% of observed seabird captures and less than 1% of observed tows where New Zealand fur seals were captured were attributed to orange roughy and oreo trawl fisheries[16].

Interdependence of stocks

242. An increase in the OEO 4 TACC is likely to increase catch of associated fish species. The main bycatch species associated with oreo fishing includes orange roughy, hoki, seal sharks and other deepwater sharks.

243. Management of shark species in New Zealand is driven by the National Plan of Action for Sharks (NPOA Sharks) 2013.[17] Fisheries New Zealand will continue to monitor interactions with deepwater sharks in oreo fisheries and consider management action if impacts are found to pose a sustainability risk to any deepwater shark species.

Benthic impacts

244. Increased fishing effort in OEO 4 could cause increased benthic impact because bottom trawling affects benthic invertebrate communities, however the potential adverse effects are reduced if vessels trawl along previously-trawled towlines.

245. Management measures to address the effects of deepwater trawl activity have focused on avoiding benthic effects. This has been achieved through regulations closing areas to bottom trawling; first with seamount closures in 2001[18] (three of the closures are within the OEO 4 QMA) and then with Benthic Protection Areas[19] (three of the Benthic Protection Areas are within the OEO 4 QMA). The implementation of Benthic Protection Areas in 2007 effectively closed approximately 30% of the New Zealand Exclusive Economic Zone to bottom trawling. A monitoring regime to ensure these closures are adhered to was also implemented.

246. Fisheries New Zealand will continue to annually monitor the bottom trawl footprint of oreo and other deepwater fisheries annually. The environmental impacts of fishing are summarised annually by Fisheries New Zealand.[20]

Fisheries Plans

247. The draft 2018 National Deepwater Plan sets out a series of Management Objectives, the most relevant to the proposals for OEO 4 being:

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[16] Aquatic Environment and Biodiversity Annual Review 2017, Table 8.19, accessible at: https://www.mpi.govt.nz/news-and-resources/open-data-and-forecasting/fisheries/

[17] Accessible at http://fs.fish.govt.nz/Page.aspx?pk=165

[18] Through section 73 of Fisheries (Commercial Fishing) Regulations 2001, accessible at: http://legislation.govt.nz/regulation/public/2001/0253/46.0/DLM76407.html#DLM78041

[19] Accessible at http://legislation.govt.nz/regulation/public/2007/0308/latest/DLM973968.html?src=qs

[20] Aquatic Environment and Biodiversity Annual Review 2017, accessible at: https://www.mpi.govt.nz/news-and-resources/open-data-and-forecasting/fisheries

a) Management Objective 2: Ensure the deepwater and middle-depths fisheries resources are managed so as to provide for the needs of future generations

b) Management Objective 4: Ensure excellence in the management of New Zealand's deepwater and middle-depth fisheries, so they are consistent with, or exceed, international best practice

c) Management Objective 7: Ensure deepwater and middle-depth fish stocks and key bycatch fish stocks are managed to an agreed harvest strategy or reference points

d) Management Objective 10: Identify and avoid or minimise adverse effects of deepwater and middle-depth fisheries on incidental bycatch species, and on the benthic habitat

248. The proposed options are considered to adequately take into account the Management Objectives and considerations in section 11 of the Act in respect of sustainability measures, and address the requirements of section 9 of the Act. There is the possibility that a higher TAC may increase adverse effects on the associated or dependent species, the biological diversity of the aquatic environment or any habitat of particular significance.

4.2 INPUT AND PARTICIPATION OF TANGATA WHENUA

249. Any relevant Iwi or Forum Fishplans must be taken into account when setting or varying the TAC for a stock. In respect to OEO 4, the input and participation of tangata whenua is effected through Fisheries New Zealand's relationship with Te Waka a Māui me Ōna Toka Iwi Forum and the CIFF@44 (Chatham Islands) Forum. Oreo is identified as a taonga species in both Forums' Fisheries Plans.

250. Fisheries New Zealand will be taking the proposed options to the Te Waka a Māui me Ōna Toka Iwi Forum again in July to seek further input, and will incorporate the Forum's views into the final advice to the Minister.

Further Information

Should you require further information, please see:

Fisheries Act (1996)

http://www.legislation.govt.nz/act/public/1996/0088/latest/DLM394192.html

Fisheries New Zealand Plenary document

Fisheries New Zealand (2018). Fisheries Assessment Plenary, May 2018: Stock Assessments and Stock Status. Compiled by the Fisheries Science Group, Fisheries New Zealand, Wellington, New Zealand.

OEO 4 Sustainability Round Review 2015

http://mpi.govt.nz/news-and-resources/consultations/review-of-fisheries-sustainability-measures-for-1-october-2015/

Orange roughy (ORH 3B)

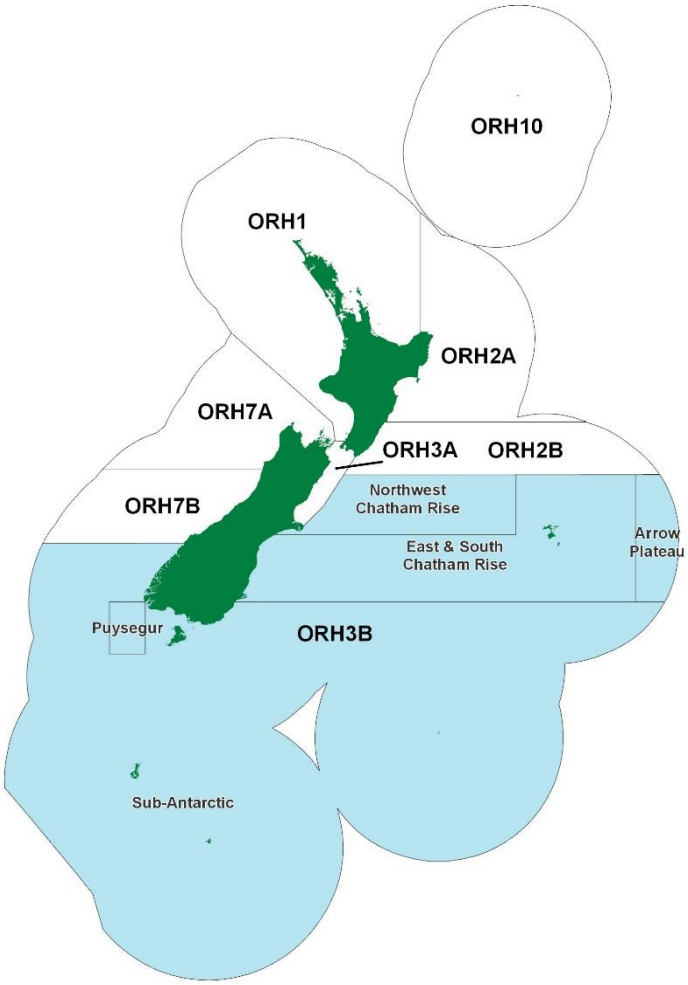

Figure 1: Quota Management Areas (QMAs) for orange roughy (ORH), with ORH 3B and its sub-areas highlighted in blue.

1. What is proposed?

251. Fisheries New Zealand is reviewing the total allowable catch (TAC), allowance for Māori customary fishing, allowance for recreational fishing, allowance for all other mortality to the stock caused by fishing, and the total allowable commercial catch (TACC) for orange roughy (*Hoplostethus atlanticus;* nihorota) in the quota management area ORH 3B, which covers the Chatham Rise, the west coast of the South Island, and the Sub-Antarctic (see Figure 1). Fisheries New Zealand proposes that the following initial options be considered, and seeks information and views from tangata whenua and stakeholders (Table 1 and 2):

Table 1: Proposed management settings in tonnes for ORH 3B from 1 October 2018, with the percentage change relative to the *status quo* in brackets.

Option	Total Allowable Catch (TAC)	Total Allowable Commercial Catch (TACC)	Allowances		
			Customary Māori	Recreational	All other mortality to the stock caused by fishing
Option 1 *(Status quo)*	5470	5197	5	0	268
Option 2	8055 ↑ (47%)	7667 ↑ (47%)	5	0	383 ↑ (43%)
Option 3 (year 1)	6413 ↑ (17%)	6091 ↑ (17%)	5	0	317 ↑ (18%)
(year 2)	7116 ↑ (30%)	6772 ↑ (30%)	5	0	339 ↑ (26%)
(year 3)	8055 ↑ (47%)	7667 ↑ (47%)	5	0	383 ↑ (43%)

Table 2: Proposed ORH 3B Sub-QMA catch limits, TACCs, TACs and allowances under each option in tonnes for ORH 3B from 1 October 2018.

	Option1 *(Status quo)*	Option 2	Option 3		
			Year 1	Year 2	Year 3
Northwest Chatham Rise	1250*	1150 ↓	1150 ↓	1150	1150
East & South Chatham Rise	3100	5670 ↑	4095 ↑	4775 ↑	5670 ↑
Puysegur	347	347	347	347	347
Arrow Plateau	0	0	0	0	0
Sub-Antarctic	500	500	500	500	500
TACC	5197	7667 ↑	6091 ↑	6772 ↑	7667 ↑
Allowance for other mortality to the stock caused by fishing	268	383 ↑	317 ↑	339 ↑	383 ↑
Customary Māori allowance	5	5	5	5	5
TAC	5470	8055 ↑	6413 ↑	7116 ↑	8055 ↑

* Note: the current catch limit is 1250 tonnes; 207 tonnes is voluntarily shelved, giving an effective catch limit of 1043 tonnes.

252. The interim deemed value rate for ORH 3B is set at 50% of the annual deemed value rate (Table 3). As the current interim and annual deemed value rates are consistent with the Deemed Value Guidelines,[21] and for consistency with the deemed value rates of other orange roughy stocks, no changes are proposed to the deemed value rates for ORH 3B for the 2018/19 fishing year.

Table 3: Special deemed value rates ($/kg) for ORH 3B

	Interim Rate ($/kg)	Annual Differential Rates ($/kg) for excess catch (% of ACE)	
		100-110%	>110%
Status quo	2.50	5.00	6.25

[21] Available at www.mpi.govt.nz/document-vault/3663

2. Why the need for change?

253. The application of the agreed Harvest Control Rule (HCR) for ORH 3B to outputs from 2017 stock assessments for two sub-stocks (Northwest Chatham Rise and East & South Chatham Rise) suggests that sub-area catch limits should be changed. This includes a small decrease to the Northwest Chatham Rise (NWCR) sub-area catch limit and an increase to the East & South Chatham Rise (ESCR) sub-area catch limit.

254. Orange roughy are managed within the National Fisheries Plan for Deepwater and Middle-depths Fisheries (National Deepwater Plan) as a Tier 1 stock. The Orange Roughy Fisheries Chapter for the National Deepwater Plan sets the operational objectives and performance criteria for all orange roughy fisheries. It also addresses the management of environmental effects caused by fishing for orange roughy.

255. ORH 3B is a large and spatially complex area that comprises at least four individual sub-stocks (Figure 1). The Minister of Fisheries (the Minister) sets the total allowable catch (TAC) for the ORH 3B stock as a whole. The Deepwater Group Ltd (DWG), which represents approximately 98% of the ORH 3B quota owners, agrees each year to adhere to catch limits at a sub-Quota Management Area (QMA) level for the individual sub-stocks (catch limits).

256. Orange roughy stocks are generally monitored using acoustic surveys and stock assessments completed every four years, as recommended by a Management Strategy Evaluation (MSE) for orange roughy[22].

257. The harvest strategy for ORH 3B is based on the MSE which has been reviewed and accepted by the Fisheries New Zealand stock assessment working group as a basis for setting the TAC and TACC for ORH 3B. The MSE recommends a management target range of 30-50% B_0 to ensure the stock is resilient to periodic recruitment pulses and long-term fluctuations in biomass (Table 4), and to provide a high level of confidence that the stock will remain above the soft limit of 20% B_0. The management target range is set above the deterministic estimate of B_{MSY} of 26% B_0 (assuming Beverton-Holt stock-recruitment relationship).

Table 4: Harvest Strategy for ORH 3B, with reference points and associated management responses

Reference point	Management response
Management target 30-50% B_0	Stock permitted to fluctuate around this management target. TAC/TACC changes will be employed to keep the stock around the target (with a 50% probability of being at the target)
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

258. The MSE underpinned the development of a HCR. This involved testing the performance of a number of potential harvest control rules against simulated stock trajectories over long periods of time to allow for uncertainty in the inputs into the HCR. The agreed HCR is estimated to have a greater than 97% probability of maintaining the stock above the lower bound of the management target range under a range of assumptions about stock-recruit relationships and estimates of natural mortality. Because the management target

[22] Accessible at: http://deepwatergroup.org//wp-content/uploads/2014/08/Cordue-2014-A-Management-Strategy-Evaluation-for-Orange-Roughy.-ISL-Re....pdf

range is set above the deterministic estimate of B_{MSY} (26% B_0 assuming Beverton-Holt stock recruitment relationship), using the HCR to recommend catch limits results in a higher than 97% probability of the stock remaining above B_{MSY}. This means that the recommendations of the HCR can be lower than that required only to maintain the stock above B_{MSY} (i.e. more conservative).

259. The HCR is used to suggest catch limits dependent on the estimated stock status in relation to the management target range (Figure 2). Where a stock is estimated to be below the midpoint of the target range, recommended catch limits are lower than for a stock near the top of the target range. Likewise, the HCR allows for a higher catch limit for stocks that are above the mid-point of the target range.

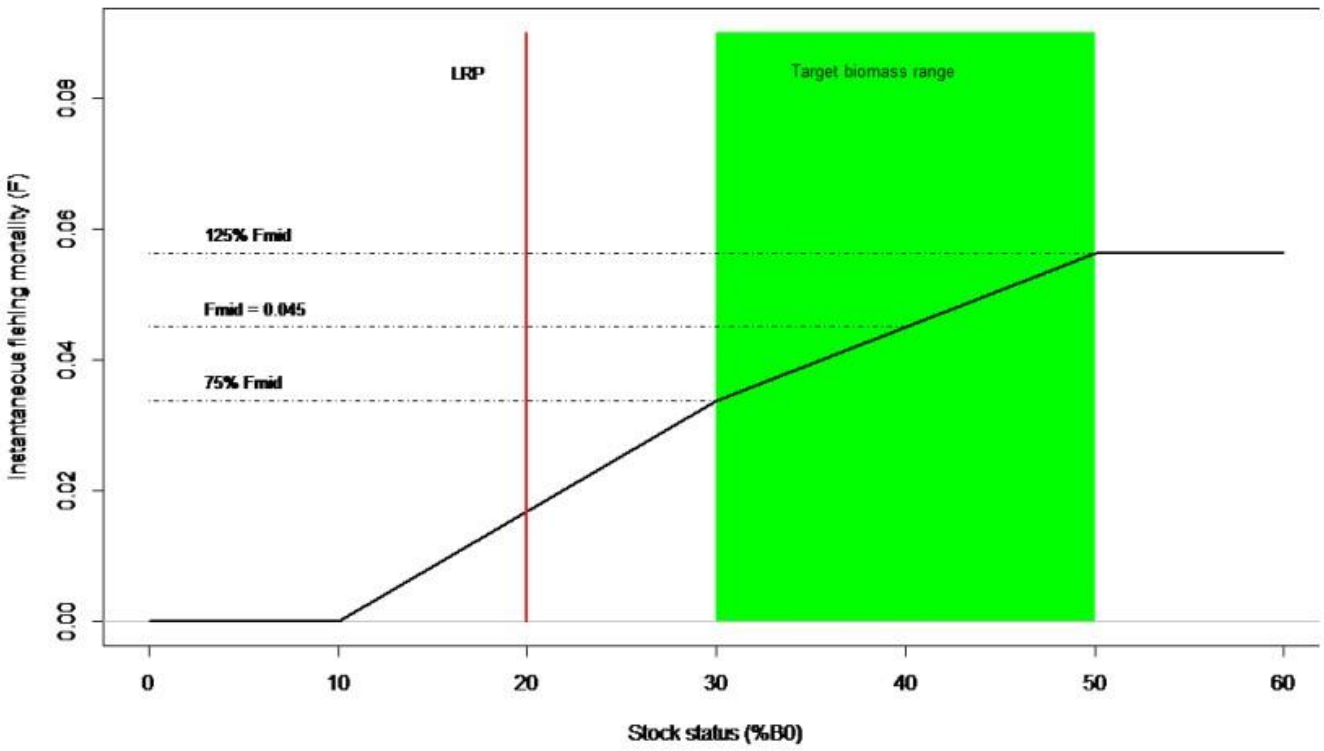

Figure 2: Harvest control rule (HCR) for ORH 3B

260. The HCR was applied to three orange roughy stocks in 2014 (Northwest Chatham Rise, East & South Chatham Rise, and ORH 7A), but was not explicitly agreed to for implementation in any other orange roughy stock.

261. Acoustic surveys in 2016 underpinned stock assessments in 2017 for key sub-stocks in ORH 3B: Northwest Chatham Rise (NWCR), and East & South Chatham Rise (ESCR) which were accepted by the working group. The new assessment used revised acoustic biomass estimates for 2013 (both NWCR and ESCR), new acoustic biomass estimates for 2014 (ESCR), and 2016 (both NWCR and ESCR), and a new age composition for 2016 (both NWCR and ESCR).

262. Orange roughy abundance in both NWCR and ESCR was estimated to be increasing. The NWCR stock assessment estimated that the stock was at 38% B_0 and there was a 98% probability that the stock was above the lower bound of the management target range of 30% of B_0 in 2017 (Figure 3).

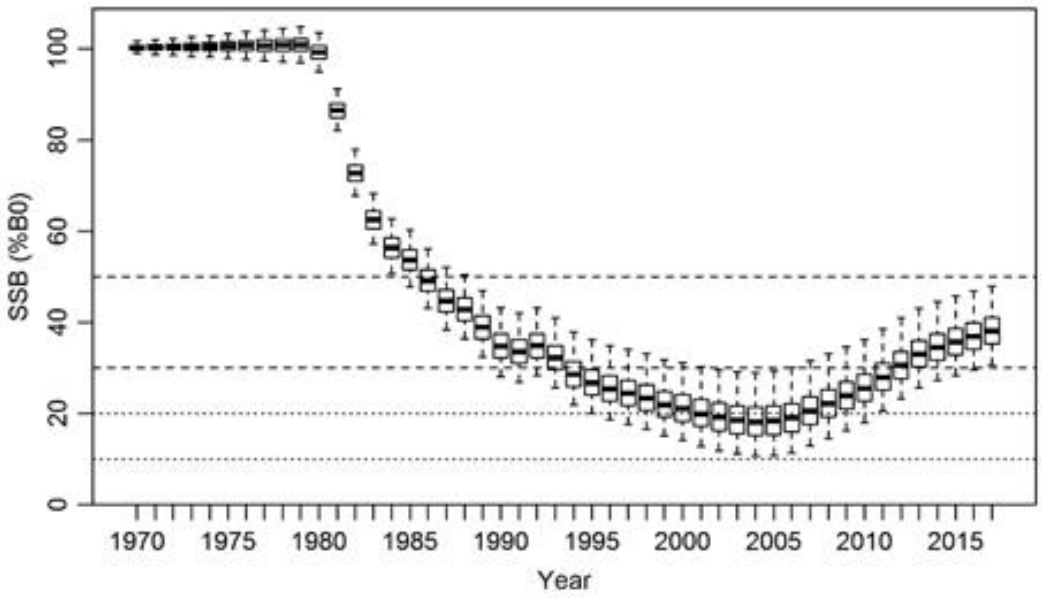

Figure 3. Northwest Chatham Rise estimated spawning stock biomass trajectory.
The box in each year covers 50% of the distribution, and the whiskers extend to 95% of the distribution. Dotted lines indicate the hard limit (10% B_0) and the soft limit (20% B_0) and the dashed lines the biomass target range (30-50% B_0).

263. For ESCR, the stock assessment estimated that the stock was at 33% B_0 and there was an 86% probability that the stock was above the lower bound of the management target range of 30% of B_0 in 2017 (Figure 4).

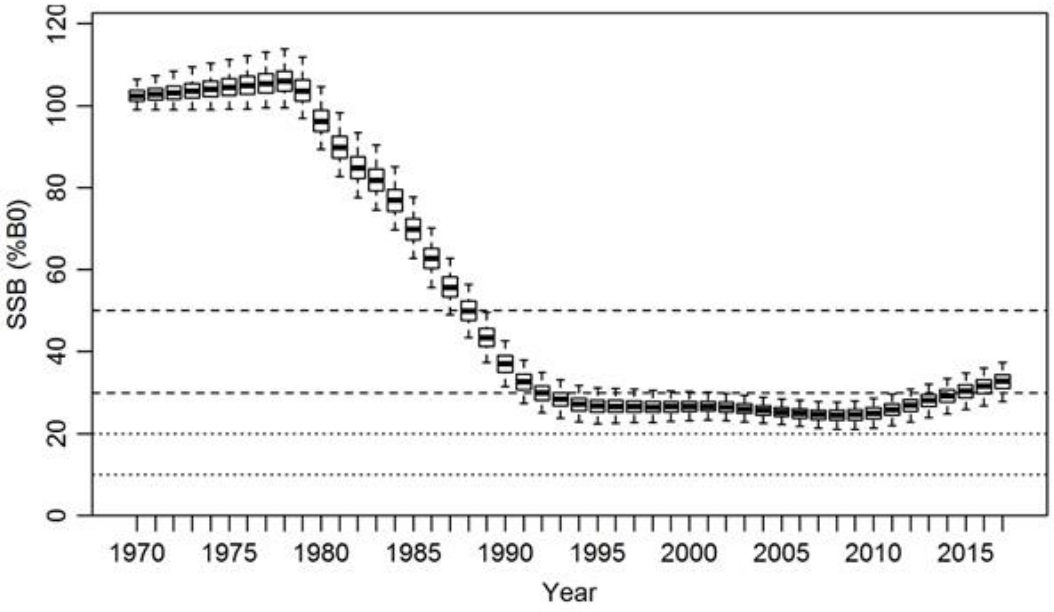

Figure 4: East & South Chatham Rise estimated spawning stock biomass trajectory. The box in each year covers 50% of the distribution, and the whiskers extend to 95% of the distribution. Dotted lines indicate the hard limit (10% B_0) and the soft limit (20% B_0) and the dashed lines the biomass target range (30-50% B_0).

264. As shown in Table 2, the current catch limit for NWCR is 1250 tonnes; this limit was established before a HCR was developed for this fishery, so industry voluntarily shelved 207 tonnes to achieve an appropriate catch limit of 1043 tonnes that would have been set

had the HCR been applied. Applying the HCR to the new stock assessment outputs results in a suggested catch limit of 1150 tonnes - this new catch limit is 107 tonnes more than the previous catch limit with the shelving that was applied.

265. The application of the HCR to stock assessment outputs for ESCR, suggested the catch limit could be increased from 3100 tonnes to 5970 tonnes.

266. As shown in Table 2, the current catch limit for ESCR is 3100 tonnes, however the catch limit was set before the HCR-recommended yield estimate was calculated in 2014/15. The HCR indicates that the catch limit could have been set 672 tonnes higher at 3772 tonnes for the 2014/15 fishing year. When the 2014/15 TAC and TACC were set, the industry elected to support a faster rebuild by maintaining the catch limit at the lower level of 3100 tonnes instead of increasing the catch limit to the level of the yield estimate in subsequent years. Therefore, applying the HCR to the new stock assessment output exaggerates the apparent magnitude of the TACC increase. Had the catch limit been set based on the 2014/15 HCR recommended yield, the proposed TACC change would be a 2198 tonne increase, rather than the 2870 tonnes as it is from the current, lower TACC.

3. Why are these options proposed?

3.1 SETTING THE TAC

267. It is proposed that the TAC is varied under section 13 of the Act to maintain ORH 3B at or above a level that can produce the maximum sustainable yield, having regard to the interdependence of stocks.

Option 1 (*Status quo*)

268. Under the status quo there would be no change to the ORH 3B TAC, TACC or allowances, and within the QMA, no changes to sub-area catch limits.

Option 2

269. Option 2 is a proposal to increase the ORH 3B TAC to 8,055 tonnes (an increase of 2,585 tonnes), the fishing related mortality to 383 tonnes (an increase of 115 tonnes), and increase the TACC to 7,667 tonnes (an increase of 2,470 tonnes).

270. The change in the TAC is the result of a 2,570 tonne increase in the sub-area catch limit for ESCR, a 100 tonne decrease in the sub-area catch limit for Northwest Chatham Rise, and the 115 tonne increase in fishing related mortality.

Option 3

271. Option 3 is a proposal for the same increase in the ORH 3B TAC/TACC as Option 2, but staged over three years as shown in Table 1. This option proposes incremental increases in the TAC, TACC and fishing related mortality over the next three fishing years.

3.2 SETTING ALLOWANCES AND THE TACC

272. Having set the TAC, the Minister must make allowances for Māori customary non-commercial fishing interests, recreational fishing interests, and all other mortality to the stock caused by fishing (ss 20 & 21).

273. There is currently no known customary catch of orange roughy in ORH 3B, however there is an existing allowance of five tonnes for customary catch in recognition that customary catch can be taken by commercial fisheries e.g. under a Pataka arrangement. There are currently no known Pataka arrangements in this fishery. No increase in the customary allowance is proposed at this time.

274. There is currently no known recreational catch of orange roughy in ORH 3B. No recreational allowance is proposed, however this does not preclude any recreational take.

275. Fisheries New Zealand proposes to retain the current allowance for other sources of fishing-related mortality, set at 5% of the TACC, since there is no new information available to suggest that the allowance should be changed. This allowance accounts for unreported orange roughy mortality, such as losses due to fish passing through the trawl mesh that are not landed.

3.3 DEEMED VALUE RATES

276. There has been no over-catch of the TACC in the last five years and no deemed value payments have been required for this fishery. No change is proposed to deemed value rates for ORH 3B.

3.4 EVALUATION OF OPTIONS

277. Under section 13(3) of the Act, the Minister shall have regard to such social, cultural and economic factors as he or she considers relevant when determining the way in which and rate at which a stock is moved towards or above a level that can produce the maximum sustainable yield.

Option 1 (*Status quo*)

278. Maintaining the status quo would result in no changes to the sustainability of the stock, and fishing-related impacts on the environment would remain the same. However, retaining the status quo would result in foregoing utilisation opportunities. Therefore two options other than the status quo are proposed, each of which would increase the TAC and TACC.

Option 2

279. Application of the HCR indicated that the NWCR catch limit should be decreased by 100 tonnes to 1,150 tonnes. Industry has voluntarily shelved 207 tonnes of the 1,250 tonne catch limit since 2014 to maintain catches within the HCR, so this will result in a small,

107 tonne increase in actual catch. Increasing the catch limit for NWCR by this amount allows the objectives of the HCR to be met without the need to shelve ACE.

280. Application of the HCR indicates there is a clear opportunity to increase utilisation on ESCR, whilst maintaining the stock within target biomass levels. Both the proposed options would achieve this outcome.

281. The proposed increase in the TAC/TACC is large - near 50% - and are likely to have a significant impact on the orange roughy stock should biomass estimates be too optimistic. However the outputs of the 2017 stock assessment and the use of the agreed HCR to calculate a proposed catch limit for East & South Chatham Rise provides confidence that the stock can sustain an increase as proposed while remaining within the management target range.

282. Based upon export data for the 2017 calendar year, the estimated economic impact of Option 2 is an increase in FOB exports of $NZ 16.2 million per annum.

Option 3

283. Option 3 is also based upon application of the agreed HCR that Option 2 is based upon, but takes a more cautious approach to the increase than Option 2. Like Option 2, Option 3 proposes an increase in the ORH 3B TAC, but staged over three years as shown in Table 1. This option proposes incremental increases in the TAC, TACC and fishing related mortality over the next three fishing years, noting that after the first year, there would be new consultations for each subsequent increase.

284. Like Option 2, under Option 3 Industry would agree that all of the TACC increase would apply to the ESCR and NWCR, that is, no increase to the voluntary catch limit for Puysegur, Arrow Plateau or Sub-Antarctic sub-areas.

285. By year three (2020/21) the TAC, TACC and fishing related mortality allowance would all be the same as for Option 1, that is, a TAC of 8,055 tonnes (an increase of 2,585 tonnes), an increase in the TACC to 7,667 tonnes (an increase of 2,470 tonnes), and an allowance for fishing related mortality to 383 tonnes (an increase of 115 tonnes).

286. Staging the TAC/TACC increase over three years as proposed in Option 3 provides the opportunity to analyse CPUE (catch per unit of effort) data and delay or cancel further catch limit increases (or even reduce the catch limit) in either the 2019/20 or 2020/21 fishing years. This is a prudent approach in light of the large proposed increase in the TACC, and allows Fisheries New Zealand to make subsequent adjustments should biomass estimates be too optimistic and there are signs that the orange roughy stock is being adversely impacted. Option 3 would require the Minister to make a decision on TAC/TACC changes every year for the next three years.

287. For Option 3 the estimated economic impact is an increase in FOB exports of $NZ 5.4 million in the first year, $NZ 10.8 million in the second year and $NZ 16.2 million in the third year and each year thereafter, therefore Option 3 results in $NZ 16.2 million in foregone export revenue over the three year period, compared with Option 2.

4. Other Relevant Matters

4.1 NON-REGULATORY MANAGEMENT APPROACHES

288. In cooperation with the fishing industry, Fisheries New Zealand is proposing that the Minister requests agreement of ORH 3B quota owners to continue the current non-regulatory regime of sub-area catch limits with the adjustments as proposed. This will continue to be formally administered through FishServe[23], and audited and reported on annually by Fisheries New Zealand.

4.2 PROTECTED SPECIES

289. Options 2 and 3 will increase fishing effort targeting orange roughy in ORH 3B. Orange roughy target fishing is considered to pose low risk to seabirds and marine mammals. Between 2003/03 and 2015/16, 1.2% of observed seabird captures and less than 1% of observed tows where New Zealand fur seals were captured were attributed to orange roughy and oreo trawl fisheries[24]. There are 200 observer days planned for the Chatham Rise deepwater fishery for orange roughy, oreo and alfonsino (ORH 3B, OEO 3A, OEO 6 and BYX 3) for the 2018/19 fishing year.

290. FNZ will continue to monitor the capture rates of seabirds and marine mammals in the ORH 3B fishery throughout the year to ensure that ORH 3B fishing effort is not having an adverse effect on protected species populations.

291. The capture rate of marine mammals in ORH 3B target tows is very low: no marine mammals were caught by observed vessels targeting ORH 3B in 2015/16[25], and only one observed fur seal capture in the last five fishing years. Given the low capture rate it is not thought that an increase in ORH 3B fishing effort will adversely affect the population of marine mammal species.

4.3 INTERDEPENDENCE OF STOCKS

292. The increase in fishing as proposed by Options 2 and 3 is likely to increase catch of associated species. The main bycatch species associated with orange roughy fishing include oreo, hoki, seal sharks and other deepwater sharks.

293. Management of shark species in New Zealand is driven by the National Plan of Action for Sharks (NPOA-Sharks) 2013[26]. The changes proposed to the ORH 3B TAC/TACC would result in a large increase in fishing effort for orange roughy. Fisheries New Zealand will continue to monitor interactions with deepwater sharks in orange roughy fisheries and consider management action if impacts are found to pose a sustainability risk to any deepwater shark species.

[23] FishServe is a wholly-owned subsidiary of Seafood New Zealand and is responsible for the administration of catch reporting requirements.
[24] Aquatic Environment and Biodiversity Annual Review 2017, Table 8.19, available at: https://www.mpi.govt.nz/news-and-resources/open-data-and-forecasting/fisheries/
[25] https://psc.dragonfly.co.nz/2017v1/released/new-zealand-fur-seal/scampi-trawl/all-vessels/eez/2015-16/
[26] Accessible at http://fs.fish.govt.nz/Page.aspx?pk=165

294. The proposed increase to the TACC of ORH 3B will likely result in increased catch of smooth oreo and black oreo on the Chatham Rise (OEO 4). Based on the average annual smooth and black oreo catch from FMA 4 when targeting orange roughy over the last nine fishing years, it is estimated that the proposed TACC increase would lead to an increase of approximately 75 tonnes in black oreo caught, and approximately 284 tonnes of smooth oreo. The TAC and TACC for OEO 4 are being concurrently reviewed as part of this sustainability round, it is not considered that the potential increase in oreo catch from increased ORH 3B fishing is likely to pose a sustainability risk.

4.4 BENTHIC IMPACTS

295. Bottom trawling can affect benthic invertebrate communities, so increased fishing effort in ORH 3B could cause increased benthic impact. However potential adverse effects are reduced if vessels trawl along previously-trawled towlines in a fishery. The increases represented by the options in this paper are likely to increase effort, but likely within previously fished areas.

296. Management measures to address the effects of deepwater trawl activity have focused on avoiding these benthic effects. This has been achieved through regulations closing areas to bottom trawling; first with seamount closures in 2001[27] (four of these closures are within the ESCR and NWCR ORH 3B subareas – Pinnie, the Morgue and Pyre/Gothic group, Diamond Head and Seamount 328) and with Benthic Protection Areas[28] (three of these are within the ESCR and NWCR ORH 3B subareas – Mid Chatham Rise, East Chatham Rise and Blink). A monitoring regime to ensure these closures are adhered to is in place.

297. Fisheries New Zealand will continue to monitor the bottom trawl footprint of orange roughy fisheries annually. The environmental impacts of fishing are summarised annually by Fisheries New Zealand[29].

4.5 FISHERIES PLANS

298. The draft 2018 National Deepwater Plan sets out a series of Management Objectives, the most relevant of those being:

    e) Management Objective 2: Ensure the deepwater and middle-depths fisheries resources are managed so as to provide for the needs of future generations

    f) Management Objective 4: Ensure excellence in the management of New Zealand's deepwater and middle-depth fisheries, so they are consistent with, or exceed, international best practice

    g) Management Objective 7: Ensure deepwater and middle-depth fish stocks and key bycatch fish stocks are managed to an agreed harvest strategy or reference points

[27] Through section 73 of Fisheries (Commercial Fishing) Regulations 2001, accessible at http://legislation.govt.nz/regulation/public/2001/0253/46.0/DLM76407.html#DLM78041
[28] Accessible at http://legislation.govt.nz/regulation/public/2007/0308/latest/DLM973968.html?src=qs
[29] Aquatic Environment and Biodiversity Annual Review 2017, available at: https://www.mpi.govt.nz/news-and-resources/open-data-and-forecasting/fisheries/

299. Options 2 and 3 are consistent with the objectives of the draft 2018 National Deepwater Plan.

4.6 INPUT AND PARTICIPATION OF TANGATA WHENUA

300. The proposal to consult on ORH 3B was presented to the Te Waka a Māui me Ōna Toka Iwi Forum. This forum represents the nine iwi of the South Island, each holding mana moana and significant interests (both commercial and non-commercial) in South Island fisheries. The forum supported a review of the ORH 3B fishery. The proposal to consult on ORH 3B was also discussed with Chatham Islands iwi and imi as part of a general engagement process, but no views were expressed.

301. Fisheries New Zealand will be taking the proposed options to the Te Waka a Māui me Ōna Toka Iwi Forum again in July to seek further input, and will incorporate the Forum's views into the final advice to the Minister.

Kaitiakitanga

302. Under Section 12(1)(b) the Minister must also have particular regard to kaitiakitanga before setting or varying a TAC. Under the Act, kaitiakitanga is the exercise of guardianship, and in relation to any fisheries resources, includes the ethic of stewardship based on the nature of the resources, as exercised by the appropriate tangata whenua in accordance with tikanga Māori.

303. Relevant Iwi or Forum Fish Plans provide a view of the objectives and outcomes iwi seek from the management of the fishery and can provide an indication of how iwi exercise kaitiakitanga over fisheries resources. Iwi views from Forum meetings and submissions received from iwi can also provide an indication.

304. Orange roughy (nihorota) is listed as a taonga species in the Te Waipounamu Iwi Fisheries Plan; in addition, the Te Waka a Māui me Ōna Toka Iwi Forum consider all fish species taonga. This plan contains objectives to support and provide for the interests of South Island iwi. That Forum Fisheries Plan contains three objectives which are relevant to the management options proposed for ORH 3B:

    d) Management objective 1: to create thriving customary non-commercial fisheries that support the cultural wellbeing of South Island iwi and our whānau;

    e) Management objective 3: to develop environmentally responsible, productive, sustainable and culturally appropriate commercial fisheries that create long-term commercial benefits and economic development opportunities for South Island iwi; and

    f) Management objective 5: to restore, maintain and enhance the mauri and wairua of fisheries throughout the South Island.

305. Fisheries New Zealand considers that the management options presented in this advice paper will contribute towards the achievement of these three management objectives in ensuring that appropriate allowances are made for customary non-commercial fishing, the fishery remains sustainable, and that environmental impacts are minimised.

5. Further Information

Should you require further information, please see:

Fisheries Act (1996)
http://www.legislation.govt.nz/act/public/1996/0088/latest/DLM394192.html

Fisheries New Zealand Plenary document

Fisheries New Zealand (2018). Fisheries Assessment Plenary, May 2018: stock assessments and stock status. Compiled by the Fisheries Science Group, Fisheries New Zealand, Wellington, New Zealand.

Scampi (SCI 3)

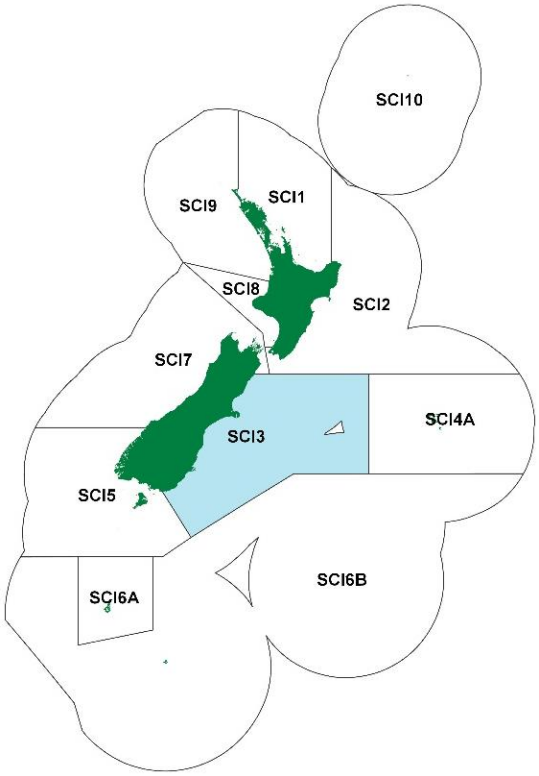

Figure 1: Quota Management Areas (QMAs) for scampi (SCI), with SCI 3 highlighted in blue.

1. What is proposed?

306. Fisheries New Zealand is reviewing the total allowable catch (TAC), allowance for Māori customary fishing, allowance for recreational fishing, allowance for all other mortality to the stock caused by fishing, and the total allowable commercial catch (TACC) for scampi (*Metanephrops challengeri*) in quota management area SCI 3, off the east coast of the South Island (see Figure 1). Fisheries New Zealand proposes that the following initial options be considered, and seeks information and views from tangata whenua and stakeholders (Table 1):

Table 1: Proposed management settings in tonnes for SCI 3 from 1 October 2018, with the percentage change relative to the *status quo* in brackets.

Option	Total Allowable Catch (TAC)	Total Allowable Commercial Catch (TACC)	Allowances		
			Customary Māori	Recreational	All other mortality to the stock caused by fishing
Option 1 (*Status quo*)	357	340	0	0	17
Option 2	394 ↑ (10%)	375 ↑ (10%)	0	0	19 ↑ (10%)
Option 3	428 ↑ (20%)	408 ↑ (20%)	0	0	20 ↑ (20%)

307. No changes are proposed to the deemed value rates for SCI 3. The interim deemed value rate for SCI 3 is currently set at 50% of the annual deemed value rate. Whilst the Deemed Value Guidelines[30] recommend that the interim deemed value rate should generally be

[30] Available at www.mpi.govt.nz/document-vault/3663

set at 90% of the annual deemed value rate, given that SCI 3 landings have not exceeded the available ACE (Annual Catch Entitlement) during the last five years, Fisheries New Zealand considers that the current deemed value rates are appropriate. Therefore, to ensure consistency with the deemed value rates of other scampi stocks[31], no changes are proposed to the deemed value rates for SCI 3 (as outlined in Table 2).

Table 2: Standard deemed value rates ($/kg) for SCI 3

	Interim Rate ($/kg)	Annual Differential Rates ($/kg) for excess catch (% of ACE)					
		100-120%	120-140%	140-160%	160-180%	180-200%	200%+
Status quo	25.65	51.30	61.56	71.82	82.08	92.34	102.60

2. Why the need for change?

308. The 2018 SCI 3 stock assessment (discussed below) estimates that the biomass of scampi in SCI 3 is very likely above target levels. Therefore, Fisheries New Zealand considers there is an opportunity to increase utilisation of SCI 3 whilst maintaining the status of the stock above management targets.

309. Scampi are managed within the National Fisheries Plan for Deepwater and Middle-depth Fisheries 2018 – Part 1A[32] (National Deepwater Plan) as a Tier 1 stock. As part of the National Deepwater Plan, a specific chapter for the scampi fishery is under development and the necessity for a species-specific harvest strategy will be assessed.

310. In the absence of species-specific harvest strategy measures, the TAC and TACC for scampi stocks are set based upon the status of the stock in relation to the default reference points set out in the Harvest Strategy Standard[33] (Table 3).

Table 3: Scampi default reference points, and the associated management response.

Reference point	Management response
Management target 40% B_0[34]	Stock permitted to fluctuate around this management target. TAC/TACC changes will be employed to keep the stock around the target (with a 50% probability of being at the target)
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	To be determined
Harvest control rule	Management actions focussed on adjusting fishing mortality determined following consideration of the results of stock assessments and in some cases, forward projections under a range of catch assumptions, guided by biological reference points.

311. The management of scampi in SCI 3 is supported by a fully quantitative stock assessment to be undertaken every three years. Each stock assessment is preceded by a dedicated trawl and photographic research survey. The latest SCI 3 trawl survey was conducted in September and October 2016.

[31] All scampi stocks currently have the same deemed value rates
[32] The National Fisheries Plan for Deepwater and Middle-depth Fisheries 2018 is expected to be made available in mid-2018, however an iteration was released for consultation in 2017.
[33] Accessible at: http://fs.fish.govt.nz/Page.aspx?pk=104
[34] The term B_0 refers to unfished or "virgin" biomass

312. An update of the SCI 3 stock assessment was presented to the Shellfish Working Group (SFWG) and Stock Assessment Plenary in 2018. The model structure remained similar to that used in 2015[35] (the first stock assessment to be accepted for SCI 3) which estimated B_{2014} to be 54-60% B_0. The 2018 model incorporated photographic and trawl survey indices from the 2016 trawl survey alongside updated catch history and standardised catch per unit effort (CPUE) indices.

313. The base case model accepted in 2018 by both the SFWG group and Stock Assessment Plenary was a three area[36], two time series model with natural mortality (M) fixed at 0.25 and CPUE process error fixed at 0.2. The 2018 base case model estimated the 2017 spawning stock biomass (*SSB*) of scampi in SCI 3 to be very likely (> 90%) at or above management targets, with SSB_{2017} estimated to be 76% of SSB_0 (95% confidence intervals: 69-83%). Three additional model runs were considered as sensitivities with M and CPUE process error fixed at 0.2 & 0.2, 0.2 & 0.25 and 0.25 & 0.25 respectively. The results from the sensitivity model runs were consistent with that of the base case (sensitivity model estimates of SSB_{2017} varied between 75% and 81% SSB_0).

314. The major uncertainty associated with the 2018 SCI 3 model concerns the strong influence catchability assumptions have on the estimate of absolute biomass. As projection outputs (discussed below) are dependent upon the proportion of absolute biomass taken under a range of future catch scenarios, such uncertainty suggests that projection estimates should be interpreted with some caution. However uncertainty regarding the estimate of absolute biomass has little impact on estimates of current stock status (i.e. SSB_{2017}/SSB_0).

315. The results of the 2018 stock assessment (as discussed above) estimate that the abundance of scampi in SCI 3 is well above management targets and that there is the opportunity for increased utilisation. The proposed options address this opportunity.

3. Why are these options proposed?

3.1 SETTING THE TAC

316. It is proposed that the TAC is increased under section 13 of the Fisheries Act 1996 (the Act) to provide for increased utilisation of available SCI 3 biomass, whilst maintaining the stock at or above the level required to produce B_{MSY}.

317. To inform the current review of management settings, both the base case and three sensitivity models were projected forward three years[37] based upon a range of annual catch scenarios (status quo, ~10% TACC increase, 20% TACC increase and a 20% TACC increase with the entirety of the increased allocation taken from the Mernoo Original sub-area).

[35] https://fs.fish.govt.nz/Doc/24200/FAR-2016-55-SCI 3-characterisation-and-assessment.pdf.ashx
[36] The SCI 3 fishery is spatially concentrated in three sub-areas, Mernoo Original (MO), Mernoo West (MW) and Mernoo North (MN) with 97% of SCI 3 target tows since 1990 conducted in either MO, MW or MN. Historically, sub-area MO was heavily fished however since 2004 the majority of the SCI 3 catch has been taken from MW or MN.
[37] SCI 3 is assessed every three years with the next stock assessment scheduled to be completed in 2021. Therefore, to inform the current review of management settings, the current models were projected forward until the date of the next scheduled stock assessment (i.e. three years).

318. Base case model projections estimate that, under all catch scenarios, the 2021 biomass of scampi in SCI 3 (B_{2021}) will very likely (> 90%) be above the management target of 40% B_0. On the basis of projection outputs for the base case model, estimates of B_{2021} show little variation across the range of annual catches examined. (Table 4).

Table 4: Base case model projection outputs showing the probability of spawning stock biomass being above reference points and management targets under a range of projected catch scenarios. Also shown are median estimates of B_{2021} (in relation to B_0) and the probability of B_{2021} being greater than B_{2017} under projected catch scenarios.

2021	Current catch (~340 t)	~10% TACC increase (375 t)	20% TACC increase (408 t)	20% TACC increase with the increase taken from Mernoo Original sub-area
Prob > Hard Limit (10% B_0)	100%	100%	100%	100%
Prob > Soft Limit (20% B_0)	100%	100%	100%	100%
Prob > Target (40% B_0)	100%	100%	100%	100%
B_{2021} stock status	81%	80%	79%	79%
Prob B_{2021} > B_{2017}	82%	78%	74%	74%

319. On the basis of base case model projection outputs, B_{2021} will likely be above B_{2017} under all proposed catch scenarios.

320. Given the results of the forward projections (described above), the following options for increasing utilisation of available scampi biomass in SCI 3 are proposed.

Option 1 (*Status quo*)

321. Option 1 contains no change to the catch limits or allowances of SCI 3. On the basis of base case model projection outputs, if the TACC remains at 340 tonnes and current catches are maintained, B_{2021} is very unlikely to fall below management targets.

Option 2

322. Option 2 is that the TAC be increased by 37 tonnes to 394 tonnes, with the TACC increased by 35 tonnes to 375 tonnes (an increase of approximately 10% based on the current TACC). Option 2 also includes the retention of a fishing-related mortality allowance of 5% of the TACC (19 tonnes).

323. On the basis of base case model projection outputs, if the TACC is increased to 375 tonnes, B_{2021} is very unlikely to fall below management targets.

Option 3

324. Option 3 is that the TAC be increased by 71 tonnes to 428 tonnes, with the TACC increased by 68 tonnes to 408 tonnes (an increase of 20% based on the current TACC). Option 3 also includes the retention of a fishing-related mortality allowance of 5% of the TACC (29 tonnes).

325. On the basis of base case model projection outputs, if the TACC is increased to 408 tonnes, B_{2021} is very unlikely to fall below management targets.

3.5 SETTING ALLOWANCES AND THE TACC

326. In setting or varying any TACC, under section 21 of the Act, the Minister must take account of the TAC and make allowances for Māori customary non-commercial fishing interests, recreational fishing interests, and all other mortality to that stock caused by fishing.

Allowance for Māori customary fishing

327. Best available information indicates that there is currently no customary catch of scampi in SCI 3. Consequently it is proposed that no provision be made for customary catch in any of the proposed options. Fisheries New Zealand is aware that not all customary fishing is required to be reported. Fisheries New Zealand seeks information from iwi and stakeholders on whether they are aware of any customary fishing that may have occurred in this fishery to enable an accurate estimate of likely customary harvest to be made.

Allowance for recreational fishing

328. There is no known recreational take of scampi in SCI 3 and the retention of a zero allowance for this sector is included in all options proposed.

Allowance for all other sources of mortality caused by fishing

329. Fisheries New Zealand proposes to maintain the allocation for all other mortalities to scampi in SCI 3 caused by fishing at 5% of the TACC. This allowance accounts for unreported scampi mortality (such as loss due to ripped nets or the incidental effects of trawl gear on scampi burrows).

330. While there is no information available to quantify all other mortality to the stock caused by fishing, the available evidence suggests that an allowance of 5% of the TACC is appropriate given the biological characteristics of the stock and mortality caused by trawling.

TACC

331. As landings of scampi from SCI 3 have approached or been above the TACC in recent years (Figure 2), it can be anticipated that an increase to the TACC of SCI 3 (as proposed by Options 2 and 3) will be fully or near-fully utilised.

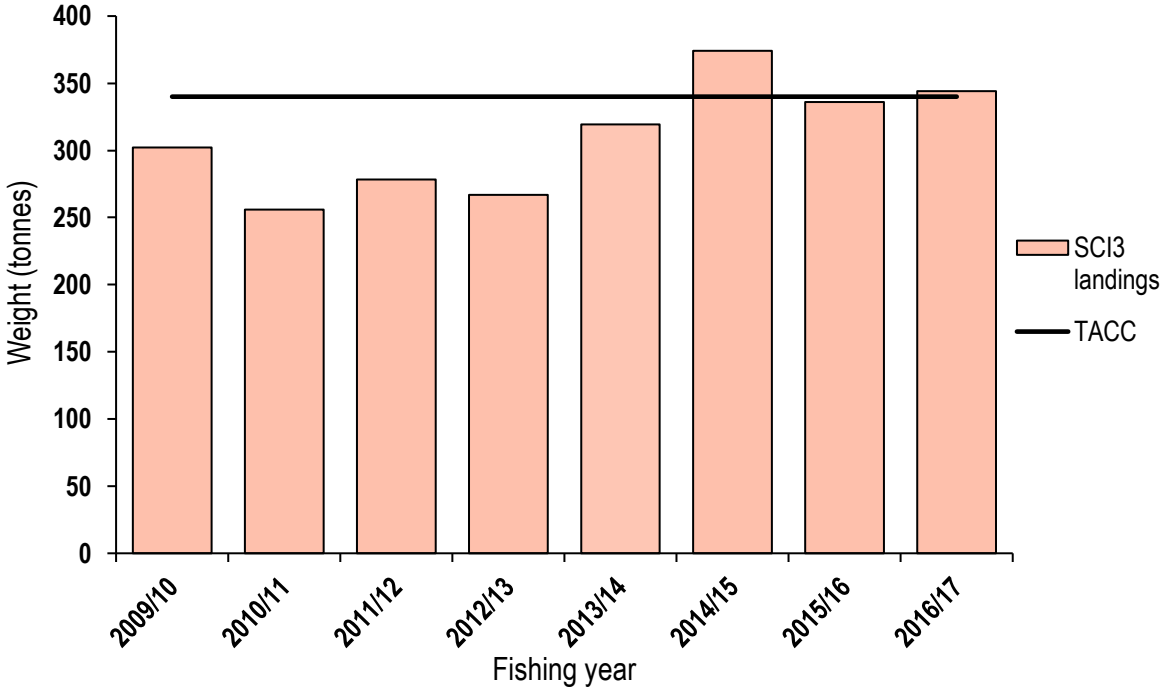

Figure 2. Landings vs Total Allowable Commercial Catch (TACC) in tonnes for SCI 3 from 2009/10 to 2016/17.

3.6 DEEMED VALUE RATES

332. Landings of scampi from SCI 3 have not exceeded the available annual catch entitlement (ACE) during the last five years, with landings in excess of the TACC during the 2014/15 and 2016/17 fishing years balanced by under caught ACE from the previous year. Fisheries New Zealand is not proposing any changes to the deemed value rates of SCI 3 (see Table 2 above).

3.7 EVALUATION OF OPTIONS

333. Under section 13(3) of the Act, the Minister shall have regard to such social, cultural and economic factors as he or she considers relevant when determining the way in which and rate at which a stock is moved towards or above a level that can produce the maximum sustainable yield.

334. Estimating the precise value of scampi taken from SCI 3 is problematic given that scampi export figures (provided by Seafood New Zealand) are not reported under a unique Harmonised System (HS) code. Using an export price of $40.60/kg[38], it is estimated that scampi taken from SCI 3 was worth approximately $14 million in export revenue for the 2017 calendar year. The economic considerations related to the three options proposed in Table 1 are outlined below, including the expected effect on revenue of the proposed options (Table 5).

[38] Calculated using figures provided for the 'Shrimps & Prawns cold-water" and 'Norway Lobster' categories. Precise revenue is difficult to estimate and will be influenced by factors such as commodity prices, exchange rate, catching costs and export state.

Table 5: Predicted changes to commercial revenue of the proposed options, based on an estimated export price of $40.60 FOB[39] for SCI 3 in 2017

	TACC	Change from status quo (t)	Predicted revenue change ($ p.a.)
Option 1 *(Status quo)*	340		
Option 2	375	35 ↑ (10%)	$1,420,000 ↑
Option 3	408	68 ↑ (20%)	$2,760,000 ↑

Option 1 (*Status quo*)

335. No changes to the catch limits or allowances of SCI 3 are proposed under Option 1. On the basis of projection outputs for the base case model, it is estimated that the likelihood of B_{2021} falling below management targets is very low if the TAC remains at 357 tonnes, and current catches are maintained.

336. Given that the biomass of scampi in SCI 3 is currently estimated to be above management targets and B_{2021} estimates are similar under all proposed options (Table 4), Option 1 would not maximise utilisation of scampi in SCI 3.

Options 2 & 3

337. Both Options 2 and 3 would increase the TAC, TACC, Māori customary non-commercial fishing and fishing related mortality allowances for SCI 3.

338. On the basis of projection outputs for the base case model, it is estimated that the likelihood of B_{2021} falling below management targets is very low under both options 2 and 3. Therefore, both options 2 and 3 would allow for increased SCI 3 utilisation whilst maintaining scampi biomass in SCI 3 above management targets with a high degree of likelihood.

339. Scampi in SCI 3 are almost entirely caught as part of a target bottom trawl fishery with less than 1% of scampi in SCI 3 taken during tows targeting species other than scampi. Vessels operating within the scampi target fishery are typically dedicated scampi vessels, between 20 and 33 m in length that deploy light, low headline gear with a double or triple net configuration. Eleven vessels have been used to target scampi in SCI 3 during the last five years.

340. An increase in the TACC of SCI 3, as proposed by Options 2 and 3, will result in an increase in fishing effort targeting scampi in SCI 3. The predicted increase in fishing effort targeting scampi in SCI 3 could potentially result in changes to the current dynamics of the scampi fleet, i.e. additional vessels reconfiguring to target scampi or existing scampi vessels preferentially targeting scampi in SCI 3 over more distant fishing grounds such as SCI 6A (Auckland Islands).

341. An increase in fishing effort targeting scampi in SCI 3 will result in increased catches of non-target bycatch species and may result in increased interactions with protected species (particularly seabirds). Such issues are considered below, however Fisheries New

[39] FOB - Free on board. The value of export goods, including raw material, processing, packaging, storage and transportation up to the point where the goods are about to leave the country as exports. FOB does not include storage, export transport or insurance cost to get the goods to the export market

Zealand has processes in place to monitor both non-target bycatch and protected species interaction rates to determine whether increased fishing effort is having an undue negative impact on fish or protected species populations.

4. Other Relevant Matters

4.1 PROTECTED SPECIES INTERACTIONS

342. Seabird interactions with New Zealand's commercial fisheries is co-ordinated under the 2013 National Plan of Action to Reduce the Incidental Captures of Seabirds in New Zealand Fisheries (NPOA-Seabirds)[40]. The NPOA-Seabirds reflects New Zealand's obligations under international law to take into account the effects of fishing on associated species such as seabirds. The NPOA-Seabirds is supported by a risk-based approach to managing fishing interactions with seabirds, targeting management actions at the species most at risk as a priority but also with the aim of minimising captures of all species to the extent practicable.

343. The most recent update to the risk assessment[41] that underpins the NPOA-Seabirds identified that scampi trawl fisheries contribute 10% of the total risk score for Salvin's albatross and 5% of the total risk score for flesh-footed shearwaters. Both species have been identified as being at a 'high' risk from fishing. However, the proportion of the total risk to both species attributed to scampi fisheries is small as scampi fishing is not the most significant risk for these birds.

344. Fisheries New Zealand acknowledges that with increased fishing effort more seabirds may be incidentally captured by the scampi fleet operating within SCI 3.

345. Non-regulatory management measures are used to reduce the risk of seabird interactions with the scampi fleet. Operators of vessels targeting scampi have developed vessel-specific management plans (VMPs) that set out the on board practices followed to reduce the risk to seabirds. Such practices include offal management measures, the deployment of bird scaring devices for vessels under 28 m and the use of specialist devices (i.e. net restrictors) during times of high risk. Through observer coverage, Fisheries New Zealand monitors each vessels performance against its VMP and works with Deepwater Group Ltd (DWG) to encourage adherence to non-regulatory measures. These practices will continue in 2018-19.

346. The capture rate of marine mammals in tows targeting scampi in SCI 3 is low with New Zealand fur seals the only marine mammal to have been observed caught within the SCI 3 target fishery. Four (95% confidence intervals: 0-16) New Zealand fur seals were estimated to have been caught by vessels used to target all scampi stocks in 2015/16[42] (tows conducted within SCI 3 are responsible for approximately 36% of total scampi effort). Given the low capture rate and the large population of New Zealand fur seals[43] it

[40] Accessible at: https://www.mpi.govt.nz/dmsdocument/3962-national-plan-of-action-2013-to-reduce-the-incidental-catch-of-seabirds-in-new-zealand-fisheries

[41] Richard, Y.; Abraham, E.R. (2017). Assessment of the risk of commercial fisheries to New Zealand seabirds, 2006-07 to 2014-15. *New Zealand Aquatic Environment and Biodiversity Report 191*.

[42] https://psc.dragonfly.co.nz/2017v1/released/new-zealand-fur-seal/scampi-trawl/all-vessels/eez/2015-16/

[43] http://www.doc.govt.nz/nature/native-animals/marine-mammals/seals/nz-fur-seal/

is not thought that an increase in fishing effort targeting scampi in SCI 3 will adversely affect the population of this species.

347. Fisheries New Zealand will continue to monitor the capture rates of seabirds and marine mammals in the SCI 3 target fishery throughout the year to determine whether fishing effort targeting scampi in SCI 3 is having an undue negative impact on protected species populations.

4.2 INTERDEPENDENCE OF STOCKS

348. As a proportion of the total catch, levels of non-target bycatch within the SCI 3 fishery are high compared to other scampi target and deepwater/middle-depth fisheries. Scampi comprised approximately 17% of the total catch of all observed tows targeting scampi in SCI 3 between the 2012/13 and 2016/17 fishing years (551 tows were observed during this time, which equates to approximately 7% of effort). The major bycatch species recorded by Fisheries New Zealand observers were javelinfish (18% of total catch), other rattails (15%), sea perch (14%), ghost shark (8%) and hoki (4%).

349. Although the quantity of non-target bycatch remains variable, data recorded by fisheries observers indicates that both total bycatch and QMS species bycatch rates within the SCI 3 fishery have remained relatively constant since the 2000/01 fishing year (Figure 3).

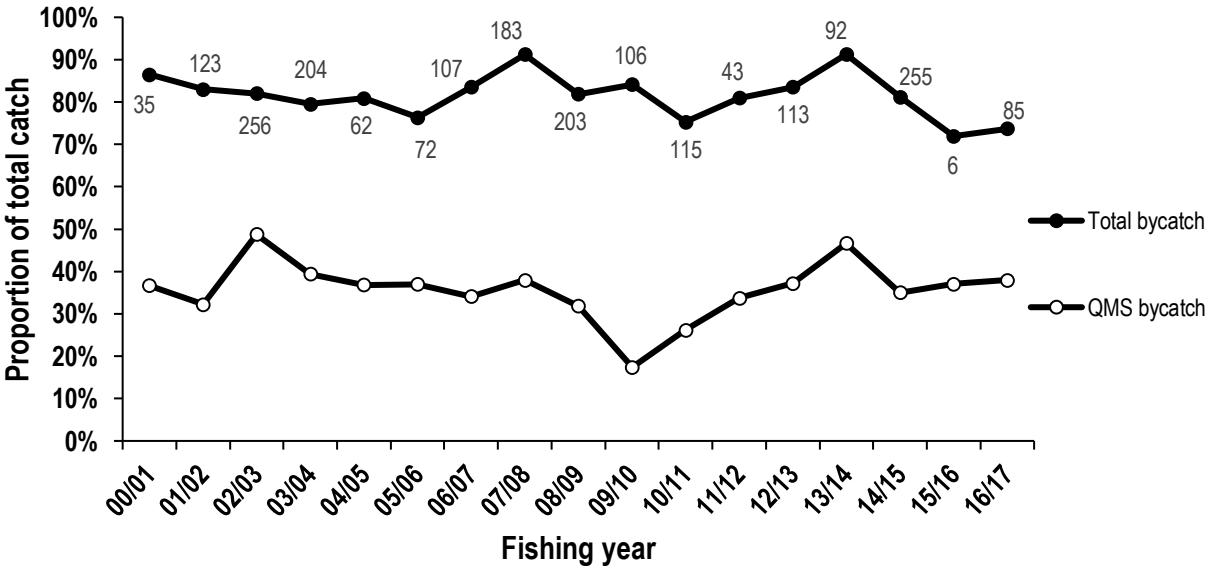

Figure 3 – Proportion total non-target bycatch and QMS species bycatch comprise of the total catch in observed tows targeting scampi in SCI 3 between the 2000/01 and 2016/17 fishing years. Data labels indicate the number of tows observed during each year.

350. Although bycatch rates within the SCI3 fishery remain high, given the size of the vessels and the gear used, the volume of non-target bycatch caught per fishing event targeting scampi in SCI 3 is low compared to other trawl fisheries within the same area (Figure 4).

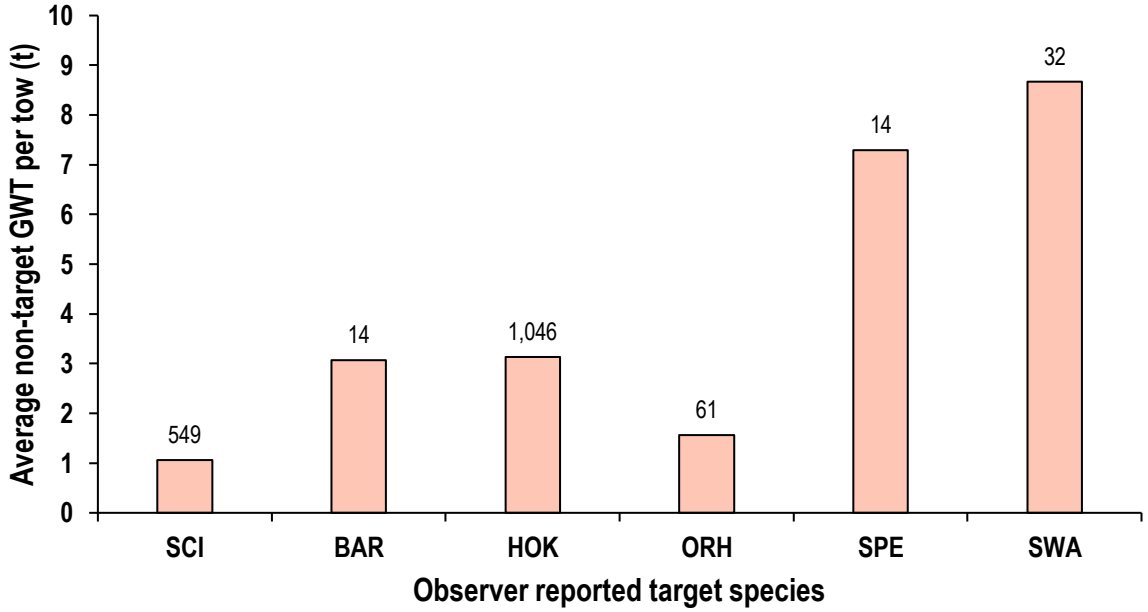

Figure 4 - Mean greenweight (in tonnes) of non-target bycatch species caught per observed tow for target trawl fisheries recorded as starting inside statistical areas 401 or 402[44] between the 2012/13 and 2016/17 fishing years. Data labels indicate the number of tows observed.

351. Sea perch is the QMS species most frequently caught as non-target bycatch within the SCI 3 target fishery. All sea perch catch is balanced against available ACE from quota management areas SPE 3 or SPE 4 (depending on catch location). Given that the average catch of scampi per scampi target tow in SCI 3 is 221.6 kg[45], options 2 and 3 would result in an estimated increase in annual fishing effort of approximately 158 and 307 tows respectively (if the TACC were fully caught). The average sea perch catch per tow targeting scampi in SCI 3 is 189.5 kg[46], therefore options 2 and 3 would likely result in an increase in annual sea perch catches of approximately 30 tonnes and 58 tonnes respectively. Between the 2012/13 and 2016/17 fishing years, SPE 3 and SPE 4 were undercaught by an average of 382 tonnes (38%) and 484 tonnes (53%) respectively. Therefore, an increase in fishing effort targeting scampi in SCI 3 is unlikely to impact upon the sustainability of, or availability of ACE for, SPE 3 or SPE 4 fish stocks.

352. Ghost shark is the second most frequent QMS species caught as non-target bycatch within the SCI 3 target fishery. All ghost shark catch is balanced against available ACE from quota management areas GSH 3 or GSH 4 (depending on catch location). The average ghost shark catch per tow targeting scampi in SCI 3 is 102.6 kg[47], therefore options 2 and 3 would likely result in an increase in annual ghost shark catches of 16 tonnes and 31 tonnes respectively (if the TACC were fully caught). Between the 2012/13 and 2016/17 fishing years, GSH 3 and GSH 4 were undercaught by an average of 678 tonnes (57%) and 156 tonnes (42%) respectively. Therefore, an increase in fishing effort targeting

[44] The SCI 3 target fishery is spatially concentrated within statistical areas 401 and 402 with greater than 99.5% of all commercially reported SCI 3 target tows between the 2012/13 and 2016/17 fishing years conducted within these statistical areas.
[45] The average greenweight of scampi caught per observed SCI 3 target tow between the 2012/13 and 2016/17 fishing years.
[46] The average greenweight of sea perch caught per observed SCI 3 target tow between the 2012/13 and 2016/17 fishing years.
[47] The average greenweight of ghost shark caught per observed SCI 3 target tow between the 2012/13 and 2016/17 fishing years.

scampi in SCI 3 is unlikely to impact upon the sustainability of, or availability of ACE for, GSH 3 or GSH 4 fish stocks.

353. Fisheries New Zealand acknowledges that the quantity of non-target bycatch is likely to increase under the proposed options to increase the TAC. However, there are processes in place to monitor and manage any risks associated with this increase in bycatch. Planned research for 2018/19 will continue the monitoring and quantification time series of bycatch in scampi fisheries[48]. If any non-QMS bycatch species are identified through the regular monitoring process as requiring additional management, the species may be considered for QMS introduction or managed through alternative sustainability measures under section 11 of the Act.

4.3 BENTHIC IMPACTS

354. With an estimated annual trawl footprint of approximately 1% of the 'fishable area'[49] of New Zealand's Exclusive Economic Zone (EEZ)[50], bottom trawling for scampi is known to have an impact upon the benthic environment[51]. However, the impact scampi target tows have on the benthic environment is mitigated by the light bottom gear utilised by vessels targeting scampi. Additionally, as the SCI 3 fishery is concentrated in areas where soft sediment/mud substrate predominates, tows targeting scampi in SCI 3 are unlikely to impact upon fragile benthic invertebrate communities which are found primarily in areas of hard benthic substrate.

355. The SCI 3 fishery has low rates of sessile benthic invertebrate bycatch. The average quantity of sessile benthic invertebrate bycatch caught per observed tow targeting scampi in SCI 3 between the 2012/13 and 2016/17 fishing years is shown in Figure 5 (551 tows were observed during this time, which equates to approximately 7% of effort).

[48] Anderson, O.F. (2012). Fish and invertebrate bycatch and discards in New Zealand scampi fisheries from 1990–91 until 2009–10.
[49] Waters down to 1600 m that are open to fishing.
[50] The total area of New Zealand's Exclusive Economic Zone is estimated to be 4.1 million km^2. The annual trawl footprint of scampi is estimated to be 4,000 – 5000 km^2.
[51] Baird, S.J.; Wood, B.A. (2018). Extent of bottom contact by New Zealand commercial trawl fishing for deepwater Tier 1 and Tier 2 target fishstocks, 1989-90 to 2015-16. *New Zealand Aquatic Environment and Biodiversity Report No. 193.* 102 p

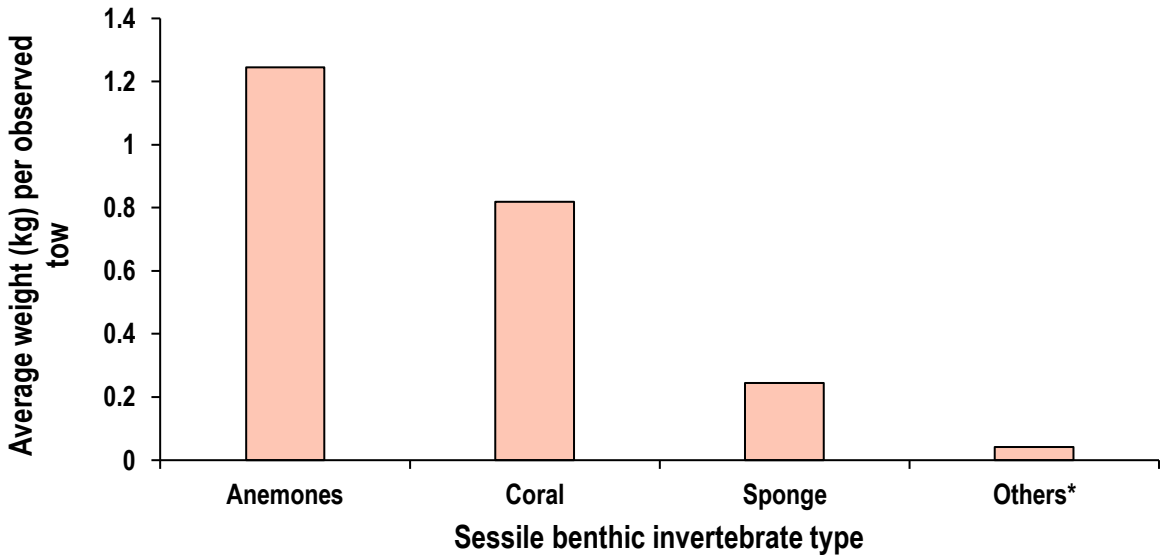

Figure 5 – Average greenweight per tow (kg) of sessile benthic invertebrate bycatch from the 551 observed tows targeting scampi in SCI 3 between the 2012/13 and 2016/17 fishing years. Benthic invertebrate category 'Others' includes sea pens, sea squirts, sessile crustaceans and unidentified benthic specimens.

356. Given a predicted increase in effort of 158 tows per annum, Option 2 will likely result in a 197 kg increase in annual anemone bycatch, a 129 kg increase in annual coral bycatch and a 39 kg increase in annual sponge bycatch (if the TACC were to be fully caught). Given a predicted increase in effort of 307 tows per annum, Option 3 will likely result in a 382 kg increase in annual anemone bycatch, a 251 kg increase in annual coral bycatch and a 75 kg increase in annual sponge bycatch (if the TACC were to be fully caught).

357. Given that the SCI 3 fishery is constrained to a specific depth band and substrate, an increase in fishing effort targeting scampi in SCI 3 will likely result in an increase in the density of fishing effort within currently or historically fished areas rather than the spreading of scampi fishing into other benthic habitats

358. Whilst Fisheries New Zealand acknowledges that the options to increase the TAC (as proposed) will result in increased fishing effort and therefore increased contact with the benthos, Fisheries New Zealand is satisfied that the additional risk to the benthic habitat is low. Fisheries New Zealand will continue to monitor the trawl footprint of scampi (and other deepwater fisheries) annually.

4.4 NATIONAL DEEPWATER PLAN

359. The National Deepwater Plan sets out a series of Management Objectives for deepwater fisheries, the most relevant to the proposals for SCI 3 being:

    a. Management Objective 1: Ensure the deepwater and middle-depth fisheries resources are managed so as to provide for the needs of future generations
    b. Management Objective 4: Ensure deepwater and middle-depth fish stocks and key bycatch fish stocks are managed to an agreed harvest strategy or reference points

c. Management Objective 6: Manage deepwater and middle-depth fisheries to avoid, remedy or mitigate the adverse effects of these fisheries on associated or dependent and incidentally caught fish species

360. Both options proposed for TAC increases are considered to be consistent with these management objectives.

4.5 INPUT AND PARTICIPATION OF TANGATA WHENUA

361. The proposal to consult on SCI 3 was presented to the Te Waka a Māui me Ōna Toka Iwi Forum. This forum represents the nine iwi of the South Island, each holding mana moana and significant interests (both commercial and non-commercial) in South Island fisheries. The forum supported a review of the SCI 3 fishery.

362. Fisheries New Zealand will be taking the proposed options to the Te Waka a Māui me Ōna Toka Iwi Forum again in July to seek further input, and will incorporate the Forum's views into the final advice to the Minister.

Kaitiakitanga

363. Under Section 12(1) (b) the Minister must also have particular regard to kaitiakitanga before setting or varying a TAC. Under the Act, kaitiakitanga is the exercise of guardianship, and in relation to any fisheries resources, includes the ethic of stewardship based on the nature of the resources, as exercised by the appropriate tangata whenua in accordance with tikanga Māori.

364. Relevant Iwi or Forum Fish Plans provide a view of the objectives and outcomes iwi seek from the management of the fishery and can provide an indication of how iwi exercise kaitiakitanga over fisheries resources. Iwi views from Forum meetings and submissions received from iwi can also provide an indication.

365. Scampi is not listed as a taonga species in the Te Waipounamu Iwi Fisheries Plan, however the Te Waka a Māui me Ōna Toka Iwi Forum consider the species taonga. This plan contains objectives to support and provide for the interests of South Island iwi. That Forum Fisheries Plan contains three objectives which are relevant to the management options proposed for SCI 3:

g) Management objective 1: to create thriving customary non-commercial fisheries that support the cultural wellbeing of South Island iwi and our whānau;
h) Management objective 3: to develop environmentally responsible, productive, sustainable and culturally appropriate commercial fisheries that create long-term commercial benefits and economic development opportunities for South Island iwi; and
i) Management objective 5: to restore, maintain and enhance the mauri and wairua of fisheries throughout the South Island.

366. Fisheries New Zealand considers that the management options presented in this advice paper will contribute towards the achievement of these three management objectives in ensuring that appropriate allowances are made for customary non-commercial fishing, the fishery remains sustainable, and that environmental impacts are minimised.

4.6 FUTURE ASSESSMENTS

367. The SCI 3 fishery is assessed every three years. The next dedicated SCI 3 trawl survey is scheduled for 2020 with a full, quantitative stock assessment due to be completed in 2021.

5. Further Information

Should you require further information, please see:

Fisheries Act (1996)

http://www.legislation.govt.nz/act/public/1996/0088/latest/DLM394192.html

Fisheries New Zealand Plenary document

Fisheries New Zealand (2018). Fisheries Assessment Plenary, May 2018: stock assessments and stock status. Compiled by the Fisheries Science Group, Fisheries New Zealand, Wellington, New Zealand.

Fisheries New Zealand recreational fisheries species page

http://fs.fish.govt.nz/Page.aspx?pk=8&stock=SCI 3