

**Species under consideration for introduction into the
Quota Management System on 1 October 2009**

Information briefs and risk analyses

10 June 2008

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OCTOPUS

Common name: Octopus
Species code: OCT, OPI, DWO and all other octopus species
Stock area: 1-10



Introduction

- 1 There are forty-one octopus species known in New Zealand waters representing eleven families. These families are listed in Table 1 on the following page.
- 2 The coastal octopus *Pinnoctopus cordiformis* (also known as *Octopus cordiformis* or *Octopus maorum*) is considered to be the most common near-shore species caught. It is found in shallow coastal areas, often around reefs or harbour entrances. Another species, albeit not as commonly caught, is *Octopus kaharoa*, which is found off the east coast between Kaikoura and North Cape in depths of between 70-550m on sandy bottoms.
- 3 Of the deep-water species, the most commonly caught are the umbrella octopuses (family *Opisthoteuthis*) that are found in depths of 400-900m, and the giant deep-water octopus (*Enteroctopus zealandicus*) that is thought to have a distribution from the east coast of the South Island to the sub-Antarctic islands at a depth range of 400-800m. Other octopus species are known to occur but there is extremely little or no information regarding these. Their abundance, distribution patterns and ecological significance is unknown.
- 4 In New Zealand, octopuses are caught almost exclusively as bycatch across a large number of fisheries including rock lobster and blue cod pot, bottom trawl, and bottom long line fisheries. The largest reported catches are in the rock lobster pot fishery. *Pinnoctopus cordiformis* is the main bycatch of the rock lobster fishery.
- 5 Catches of octopuses are recorded in catch effort returns as OCT (*Pinnoctopus cordiformis*), DWO (deep water octopus spp.) and OPI (umbrella octopus spp.) OCT accounts for the majority of catches. Over the previous five years there has been very few catches recorded as DWO (55kg) or OPI (3,828kg). Consequently there is no information to determine how many species of octopus are caught and whether separate biological stocks of these octopuses occur in New Zealand. It is assumed most of the catch is *Pinnoctopus cordiformis*, but a number of other octopus species are probably included. It is possible that the species' catch is determined to some extent by species' distribution and by target fishery.

Table 1: Octopus in New Zealand

Order	Family	Endemic species	Total species	
Octopoda	Amphitretidae	0	2	
	Argonautidae	0	2	
	Bolitaenidae	0	3	
	Cirrotheuthididae	2	2	
	Grimpoteuthididae	1	1	
	Luteuthididae	1	1	
	Octopodidae	15	22	
	Ocythoidae	0	1	
	Opisthoteuthididae	4	5	
	Tremoctopodidae	1	1	
	Vitreledonellidae	0	1	
			24	41

Biology

Overview

- 6 Octopus refers to the Genus Octopi, which are members of the Phylum Mollusca, of the class Cephalopoda, order and family Octopoda. The majority of octopuses are characterised by soft bodies, eight arms, well-developed eyes, and complex life cycles and behaviours.
- 7 Most octopuses have a globe-shaped ‘head’ that contains all the vital organs and mouth. The mouth has a sharp beak that is used to kill prey. Octopus skin is relatively smooth and many species are able to change colours by contracting skin cells filled with pigments to allow them to hide when hunting for prey. Some octopuses can even mimic other fish and objects, and their defensive arsenal includes the ability to squirt an ink-like substance at an attacker to mask their getaway.

Growth, Reproduction and Recruitment

- 8 The life cycle of many octopuses involves a short lifespan (typically 12-24 months), fast growth, and semelparous reproduction (i.e. spawns once and dies). Species fecundity varies widely with some producing tens of eggs (the rare deep-sea octopus, *Thaumeledone zeiss*) and others hundreds of thousands of eggs (*Pinnoctopus cordiformis* 56,000-232,000 eggs). A number of octopuses are known to brood young (less than a year old).

Spatial and temporal distribution and key areas (feeding, spawning, migration)

- 9 The lack of quantitative information on the life history, growth, and distribution of octopus makes it extremely hard to estimate distribution patterns.
- 10 Work done by NIWA has produced some charts showing the annual distribution of certain umbrella octopus species. However, the information used to generate these

charts is limited and therefore the charts' accuracy must be questioned. As a result, these charts have not been included in this report.

Habitat Interactions

- 11 Octopuses are a key group of predators in both pelagic and benthic habitats. They usually live in dens (small caves and fractures in underwater rock and coral formations) and will either venture out in search of prey or will wait by the entrance and ambush any unwary fish, crustacean or other edible invertebrate that passes within reach. They will leap on their potential prey, enveloping it within their arms and paralysing it with their salivary toxin. This may be accompanied by biting and tearing from their parrot-like beak (the only rigid part of an octopus' body) in order to break the animal into digestible pieces.

Associated Species

- 12 Little is known about associations between octopuses and other species. It is known that octopuses are predatory: feeding primarily on crustaceans and molluscs such as crabs and scallops. This diet is supplemented by other bivalves, snails, fish and even other octopuses. They gain access to shelled prey either by pulling it apart, biting it with their beak to break it apart, or by drilling through the shell and secreting a toxin to dissolve the connective tissues.
- 13 Two known relationships exist where there is some information available. These are rock lobster and blue cod. Octopuses (*Pinnoctopus cordiformis*) are a main predator of rock lobster and are the main bycatch of the rock lobster fishery. Octopus predation causes incidental mortality of rock lobsters caught in pots. The average pot mortality rate of rock lobsters from octopus predation in the Hokianga area during the spring of 1970 was reported to be 20%. Mean mortality rate increased to 35% when pots were not lifted for 3-5 days. Research conducted on the relationship between rock lobster in Australia and *Pinnoctopus cordiformis* noted this predatory role.
- 14 Octopus is also a bycatch of the blue cod pot fishery. Blue cod are known to predate on octopus. Octopuses enter the pot to eat the bait and are then subsequently pulled up with the pot. However, if blue cod are also present, it is most likely that the octopus will be eaten before the pot is lifted.

Environmental Conditions

- 15 No information is available on the environmental conditions that support octopus.

Protected Species Interactions:

- 16 Octopus is a food source for whales, seals and possibly dolphins and sharks.

Stock Assessment:

- 17 There are no estimates of current or reference biomass, or sustainable yield.

Social, Economic, Cultural Information

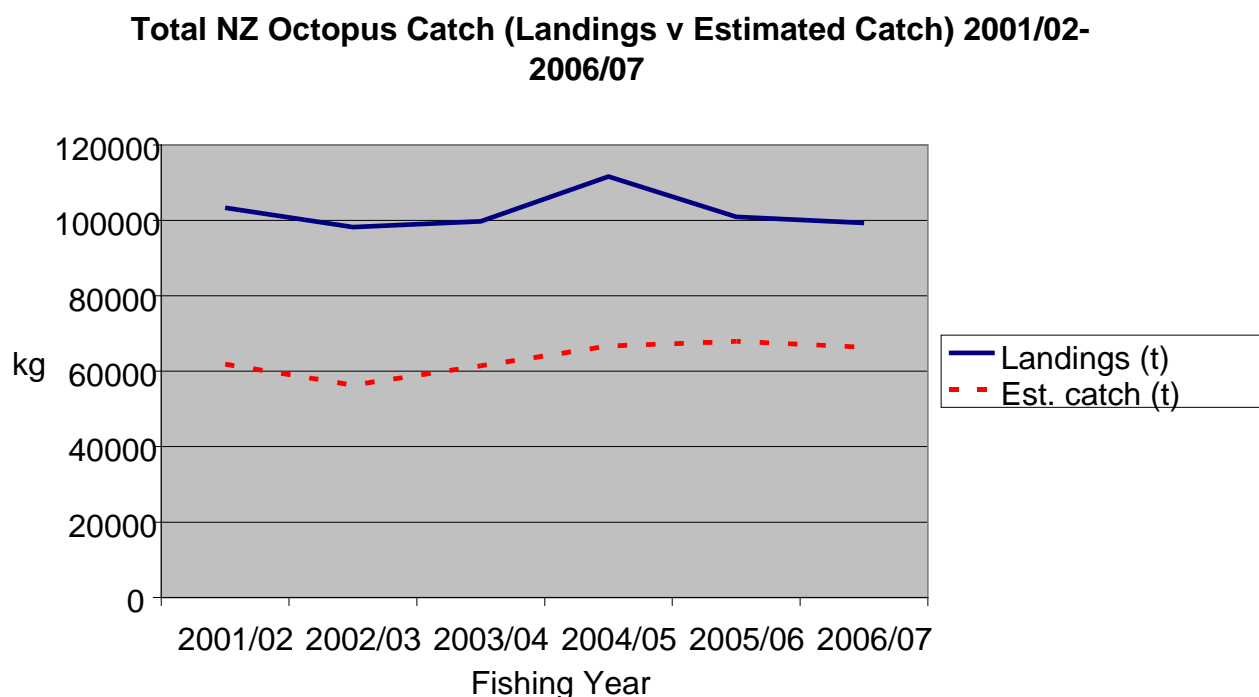
Customary fishery characteristics

- 18 There is little information of the significance of octopus (wheke) to Maori. They occur in some Maori legends and there is reference to some species of octopus being caught by hand and used as bait.
- 19 The most well-known legend concerning wheke concerns the great explorer Kupe. While fishing in his homeland, Hawaiki, he was distracted by a giant octopus belonging to the chief Muturangi. He pursued it and eventually caught it at the entrance to Cook Strait from Totaranui, in the same journey discovering and naming New Zealand (Aotearoa).

Commercial fishery characteristics

- 20 There are over 41 species of octopus in New Zealand however there are only three generic reporting classifications used to report catch (OCT, DWO and OPI). As the majority of octopus species are recorded under only one classification, OCT, the distribution of various species of octopus in the catch effort and/or landing returns is unknown. It is therefore extremely difficult to assess the commercial fishery characteristics of individual species.
- 21 In New Zealand, octopuses have historically been landed mainly as a bycatch of rock lobster and blue cod potting. Due to increases in bottom trawling in some parts of New Zealand over the last twenty years, the amount of octopus taken as trawl bycatch has increased. Some octopuses are also taken in the bottom long lining fisheries.
- 22 Anecdotal information from fishers and fishery managers suggests that *Pinnoctopus cordiformis* is the main contribution to the total catch. This would seem to be validated by the amount of bycatch of octopus being taken in the rock lobster fisheries throughout New Zealand (84% of total estimated catch from the past 6 fishing year) and research conducted that shows *Pinnoctopus cordiformis* as the main predator of rock lobster. Of the other species of octopus very little is known.
- 23 The validity of the information concerning octopus must be questioned due to the high likelihood of non-reporting of octopus. Anecdotal information suggests that much octopus is discarded and not reported by rock lobster fishermen as it is considered a 'pest' species. Such catch is most likely returned to sea without being recorded. The survival rate of returned octopus (their 'pest status' in the rock lobster fishery means some are deliberately killed before being returned) is unknown. Thus, the actual catch of octopus may be much greater than recorded catch levels.
- 24 Over the last 6 years, total landings of octopus in New Zealand (from catch landing returns) have fluctuated within a range of 98-112 t with a mean of 102 t. Figure one below shows the comparison of catch landings and estimated catch data. As can be seen from the graph there is a reasonable level of correlation between the two, however there is a significant difference between landings and estimated catch. This difference can most likely to be attributed to bottom trawling and bottom long lining as octopus caught may not be recorded on the estimated catch section of catch effort returns where only the top five species caught are required to be reported.

Figure 1: Comparison of reported landed catch of octopus with estimated catch (both from catch effort returns).



25 Estimated catches by principle fishing method are given in Table 2 below. Octopus landed as bycatch of rock lobster potting represented 84% of all estimated catch of octopus over the past six fishing years. As previously mentioned the octopus most likely to be caught in rock lobster potting is *Pinnoctopus cordiformis* however this information is based on assumption rather than fact.

26 Bottom trawling accounted for 8.9% of all estimated catch of octopuses although, as mentioned in paragraph 24 above, this may under-represent the actual take of octopus by this method.

Table 2: Total landings (from LFR returns) and estimated catch by method* (from catch effort returns) for the past six fishing years.

Fishing Year	TOTAL Landings (t)	Catch Effort (est.) - tonnes								TOTAL Catch Effort (t)
		RLP	BT	CP	BLL	FP	SN	D	Other	
2001/02	103.348	46.835	7.417	3.276	1.530	26	681	1.597	537	61.899
2002/03	98.244	47.909	3.532	2.664	1.025	79	274	433	427	56.343
2003/04	99.773	50.607	6.272	1.520	1.269	456	442	444	461	61.471
2004/05	111.646	56.945	5.742	1.699	1.385	228	262	249	201	66.711
2005/06	100.943	51.933	4.263	9.627	354	196	277	1.216	64	67.930
2006/07	99.325	53.446	4.511	6.951	342	151	629	192	183	66.405
TOTAL	613.279	320.200	34.045	2.6128	6.217	1.199	2.733	4.171	1.873	380.759

* RLP – rock lobster pot

* BT – bottom trawl

* CP - Cod pot

* FP - Fish traps

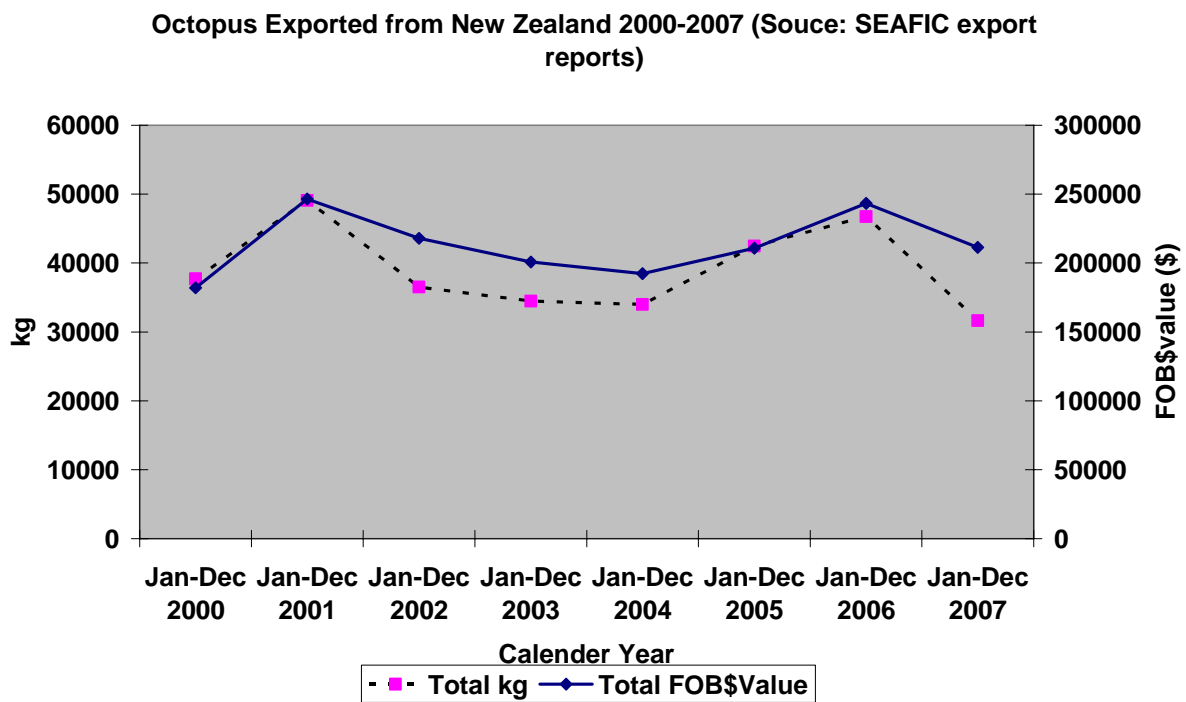
* SN – Set Nets

* D- Dredge

* BLL - Bottom long line

27 The New Zealand Seafood Industry Council Ltd (SeaFIC) currently has 29 companies noted as exporters of octopus. Exports of octopus have been relatively constant over the last 7 years. Figure two below shows the amount of octopus exported and its value. Of note is the most recent year's data, which has shown a sharp decline in the amount of octopus exported but a much slighter decline in the value. This indicates a rise in the export value of octopus. Octopus is generally exported 'frozen, whole' with a small amount exported live. The main market is Australia with other markets including French Polynesia, Korea, New Caledonia, Tonga, and Fiji.

Figure 2: Volume (kg) and value (\$FOB) of octopus exports over the last 7 years (Source: SeaFIC export reports).



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.*

Recreational fishery characteristics

- 28 There is anecdotal evidence of some recreational take of octopus. Octopus is occasionally used as bait for finfish fisheries. Anecdotal information suggests the gathering of octopuses for bait has decreased as squid has become much more readily available from bait suppliers.

Management

Existing Management Information

- 29 Octopus is currently managed as an open access non-QMS fishery.

Provisional catch history implications

- 30 Octopus (*Pinnoctopus cordiformis*) is on Schedule 4D. Schedule 4D provides for quota to be allocated on the basis of provision catch history if bought into the Quota Management System (QMS) on or before 1 October 2009.
- 31 If *Pinnoctopus cordiformis* is introduced into the QMS this will have implications for all fishers, rock lobster fishers in particular. MFish notes that participation in the rock lobster fishery has changed since the provisional catch history years and that, consequently, a number of current fishers do not have catch history for *Pinnoctopus cordiformis* and therefore would not be eligible for quota.

International Obligations

- 32 No international obligations concerning octopus are known.

Treaty Settlement Obligations

- 33 If octopus is bought into the QMS at any time in the future, 20% of the quota will be allocated to Maori under the treaty settlement obligations.
- 34 Additionally, MFish is undertaking research to provide information on the traditional and customary factors that may need to be considered in the management decision-making process. Currently there is no information specific to octopus.

Other

- 35 In 2005 the Department of Conservation (DoC) placed 3 species of octopus under level one threat classification – Nationally Critical. These species are *Cirroctopus hochbergi*, *Opisthoteuthis chathamensis* (roughy umbrella octopus) and *Opisthoteuthis mero* (umbrella octopus). DoC has also placed *Octopus kaharoa* under level four threat classification (serious decline). It must be noted that these classifications are also qualified, being either “data poor” in the case of *Octopus kaharoa*, or “data poor, human-induced” for the other three species (data poor is defined as: “Confidence in listing is low due to there being only poor data available for assessment”). More information of the process used by DoC to classify species can be found at:

<http://www.doc.govt.nz/templates/MultiPageDocumentTOC.aspx?id=45785>.

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1. Department of Conservation(2002) New Zealand Threat Classification System lists – 2002 - Marine invertebrate
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3. Grubert, M.A & Wadley, V,A. (2000) Sexual maturity and fecundity of *Octopus maorum* in southeast Tasmania Bulletin of Marine Science, Volume 66, Number 1, January 2000 , pp. 131-142(12), University of Miami
4. Harrington, J.J., Semmens, J., Gardner, C., and Frusher, S. (2005) Predation of trap-caught southern rock lobsters, *Jasus edwardsii* (Hutton, 1875), in Tasmania waters by the Maori octopus, *Octopus maorum* (Hutton, 1880): Spatial and temporal trends Fisheries Research Issue 77 (2006) 10-16, Elsevier B.V.
5. Ministry of Fisheries (2004) Review of Sustainability Measures and Other Management Controls for the 2004-2005 (01 October) Fishing Year – Final Advice Paper
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Websites

1. www.nabis.govt.nz/resources/documents/ID/Lineage%20Mero's%20umbrella%20octopus.pdf
2. www.niwa.cri.nz/_data/assets/pdf_file/0012/30522/northland-aquaculture.pdf
3. www.tolweb.org
4. www.tonmo.com
5. www.treasuresofthesea.org.nz/octopus-and-squid

Risk analysis and evaluation

STOCK: Octopus (various species)

Severity/likelihood risk analysis:

Generic objective 1: Risk to maintaining the potential of the stock to meet the reasonably foreseeable needs of future generations.
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<p>Analysis: Octopus is taken as bycatch of crayfish potting, cod potting, and the bottom trawl and bottom long-lining fisheries. As all octopus species are usually recorded under one generic reporting classification, OCT, the distribution of various species of octopus in the catch effort and/or landing returns is unknown. It is therefore extremely difficult to assess both the stock structures and biomass of single octopus species.</p>
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<p>Anecdotal information from fishers and fishery managers and analysts suggests that <i>Pinnoctopus cordiformis</i> is the main contribution to the total catch. This would seem to be validated by the amount of bycatch of octopus being taken in the rock lobster fisheries throughout New Zealand (84% of all OCT estimated catch over the past 6 fishing years) and research conducted that shows <i>Pinnoctopus cordiformis</i> as the main predator of rock lobster.</p>
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<p>Additional problems occur in assessing stocks as further anecdotal evidence suggests that significant amounts of the species may be returned to sea without being reported. This would suggest that there might be some risk to maintaining the potential of the stock to meet the reasonably foreseeable needs of future generations. However, the fecundity and short lifespan of the species alleviates some of this risk, as does the lack of a significant market and/or demand (both export and national) for <i>Pinnoctopus cordiformis</i>.</p>
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<p>Of the other species of octopus very little is known. As there currently negligible targeting of octopus, risk to maintaining the potential of the stock to meet the reasonably foreseeable needs of future generations is low for these species.</p>
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Severity of impact (low, medium or high) : Low/Medium

Likelihood of impact (low, medium or high): Low

Risk score (1-9) : 2

Generic objective 2: Risk to avoiding, remedying or mitigating any adverse effects of fishing on the aquatic environment.

Analysis: The risk of adverse effects on the aquatic environment from catch of octopus under an open access regime is low due to the fact that there is almost no target fishery for the species. Some catches of octopus are taken by bottom trawl but only as a consequence of a target fishery for QMS species.

Very little is known of the general habitat interactions or the marine ecosystem role of octopus.

Severity of impact (low, medium or high) : 1

Likelihood of impact (low, medium or high): 1

Risk score (1-9) : 1

Generic objective 3: Risk to providing for utilisation of the stock or species that enables social, cultural and economic well-being.

Analysis: Octopus is generally not targeted by commercial fishers but has some commercial value. The present port price of \$1.53 may indicate there is a market for octopus, and this may be increasing as New Zealand's population becomes more multicultural. Analysis of export data over recent years also indicates a rise in the export value of octopus.

There is thought to be only a very small take of octopus by the customary and recreational sectors.

Octopuses do have intrinsic value and contribute to biodiversity and sustainability of marine ecosystems.

Severity of impact (low, medium or high) : Low

Likelihood of impact (low, medium or high): Low

Risk score (1-9) : 2

Objective(s) returning highest score: **1**

Risk based on severity/likelihood (low, medium, high): **Low**

Immediacy and uncertainty risk analysis:

Not applicable to this species

Draft Risk Evaluation

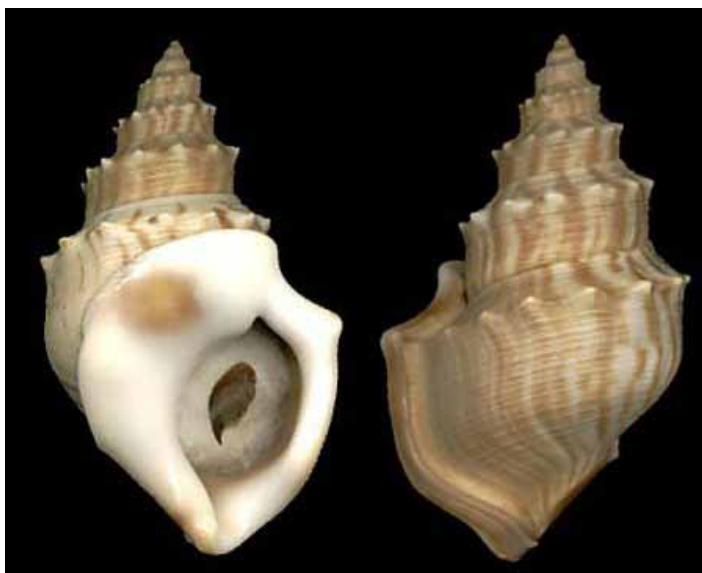
Is risk after severity/likelihood analysis HIGH? **No**

Is risk after severity/likelihood analysis MEDIUM; **and**
immediacy and/or uncertainty is MEDIUM or HIGH? **No**

Is risk after severity/likelihood analysis LOW; **or**
is risk after severity/likelihood analysis MEDIUM and
immediacy and uncertainty are LOW? **Yes - stock is in GROUP 3**

LARGE OSTRICH FOOT WHELK

Species:	<i>Struthiolaria papulosa</i>
Common name:	Large ostrich foot
Species code:	LOF
Stock area:	1-10



Introduction

- 1 The large ostrich foot (*Struthiolaria papulosa*) is in the Struthiolariidae whelk family that is endemic to New Zealand. The family includes the small ostrich foot (*Struthiolaria vermis*) and the Stewart Island sub-species *Struthiolaria papulosa gigas*.
- 2 There is no recorded catch under the large ostrich foot species code (LOF); instead, the generic whelk code (WHE) has been used.

Biological information

Morphology, growth, reproduction and recruitment

- 3 The large ostrich foot has a heavy light reddish brown shell, with prominent knobs along the edge, a white or yellow lip and a small operculum. The large ostrich foot shell reaches a maximum height of 83mm and width up to 48mm.
- 4 No studies have been published on the growth, reproduction or recruitment of this species.

Distribution and habitat

- 5 The large ostrich foot is found widely throughout New Zealand including around the Kermadec Islands. It is common on sandy and muddy tidal flats, in estuaries and on the open coast, in shallow water. The large ostrich foot is found buried to a depth of 2-3cm below the surface, near the low tide mark.

Environmental effects and protected species interactions

- 6 There is no specific information available on the environmental effects of fishing or protected species interactions for the large ostrich foot. However, any information related to the large ostrich foot or the fishing methods used to catch it could be useful in determining potential environmental effects and protected species interactions.

Associated species

- 7 Little is known of the habitat interactions or the ecosystem role of the large ostrich foot. The large ostrich foot feeds on detritus and micro organisms including diatoms and foraminifera. Whelks are known to be preyed upon by fish, sharks and sea-stars.

Social, economic and cultural information

Commercial fishery characteristics

- 8 There is no recorded catch under the large ostrich foot species code (LOF); instead, the generic whelk code (WHE) has been used. MFish considers that in fishery management areas (FMAs) 3, 4, 5, and 6, about two thirds of reported whelk landings are of the large ostrich foot, and about one third are the knobbed whelk. In FMAs 1, 2, 7, and 8, MFish considers most reported landings will be of the knobbed whelk.
- 9 The permit moratorium* prohibited new participants from entering the whelk fishery between 1992 and 2004. The permit moratorium was revoked in 2004 however several species of whelk, including large ostrich foot, were listed on Schedule 4C of the Fisheries Act 1996. Schedule 4C prohibits the issue of fishing permits that allow targeting of listed species and was created to ensure species that were considered to have a sustainability risk in an open access environment were adequately managed prior to consideration for QMS introduction.

Commercially landed catch

- 10 Because of the relatively low value of whelk as a commercial species it is likely that there is a high level of discarded catch that has not been reported. The port price for knobbed whelk for 2006/07 for all QMAs was \$0.60/kg.
- 11 Whelk was targeted by fish potting in FMA 7 during the 1990s (Table 1), but MFish considers that the large ostrich foot is likely to have constituted a small proportion of the catch in FMA 7.
- 12 Table 1 shows that catch of whelk across FMAs 1 to 9 has been sporadic with the majority of catch taken from FMAs 3 and 7. While relatively large catches of 2 to 17 tonnes were taken within FMAs 4, 5, and 6 from 1998/99 to 2001/02, little or no catch has been taken from these areas since 2001/02. This catch was primarily as bycatch from bottom trawl fishing for hoki.

* Between 30 September 1992 and 30 September 2004 there was a moratorium on the issuance of new non-QMS permits to commercially harvest species managed outside the QMS (with the exception of tuna). The permit moratorium was intended to (1) prevent expansion of non-QMS fisheries prior to QMS introduction, (2) avoid the creation of incentives to 'race for catch history', and (3) mitigate risks to stock sustainability. However, the prolonged presence of the permit moratorium caused some management issues, such as inhibiting the development of new and underdeveloped fisheries.

Table 1: Total landings (kg) of whelk by Fisheries Management Area (FMA) 1988/89 – 2006/07

Fishing Year	FMA1	FMA2	FMA3	FMA4	FMA5	FMA6	FMA7	FMA8	FMA9
1988/89							825		
1989/90							21,683		
1990/91							44,976		
1991/92							26,935		
1992/93	21		18				1,762		
1993/94		135					49,278		
1994/95		707	545				21,458	593	
1995/96		89	178				*27,832		
1996/97	2	174	144	150	3		8,959		
1997/98			102				884		
1998/99			223	2,205	2,470	150	570		
1999/00			2,286	7,953	3,250	790	80		
2000/01			10,467	17,497	3,538	4,765	141		
2001/02			1,474	3,995	515	1,755	2		
2002/03			212	20	4	780	77		
2003/04	35		491			335	4,217		
2004/05	8		58			335	228		47
2005/06			212				32		
2006/07	405		425						
Total	471	1105	16,835	31,820	9780	8910	182,107	593	47

* Data has been corrected by removing a suspected data entry error.

- 13 Data on target species and fishing methods is derived from estimated catch data reported on catch-effort returns, which is generally less reliable than landings data. From 1988/89 to 1997/98 the majority of whelk catch was targeted (Table 2). Since 1998/99 the majority of estimated catch of whelk has been taken as bycatch in fisheries targeting oyster or finfish such as hoki, flounder and red cod (Table 2).

Table 2: Estimated catch of whelk (kg) while targeting different species 1988/89 to 2006/07

Fishing Year	Oyster	Scallop	Whelk	Finfish*	Rock Lobster	Paddle crab	Total
1988/89			825				825
1989/90	105	725	20,696				21,526
1990/91	915	1,358	47,105				49,378
1991/92	107	2,745	24,551				27,403
1992/93	717	1,576	155	20		321	2,789
1993/94	1,395	540	56,944	44			58,923
1994/95	767		22,770	248			23,785
1995/96	20	180		81	40		321
1996/97		50	9,472	67	15		9,604
1997/98			960	292			1,252
1998/99	580			3,260			3,840
1999/00	118			3,855			3,973
2000/01	6	20		17,547			17,573
2001/02		2		5,872			5,874
2002/03	49			290			339
2003/04	3,820		2	300			4,122
2004/05	154		50	30			234
2005/06		25		55			80
2006/07				134		518	652
Total	8,753	7,221	183,530	32,095	55	839	232,493

*Hoki was the main finfish target species from 1998/99 to 2001/02 (96%) while flatfish was the main target species all other years (84%).

Commercial fishing method

14 Estimated catch data for the 1988/89 to 2006/07 fishing years shows that 79% of whelk caught was taken by fish pot, 14% was taken by bottom trawl, 7% was taken by dredge, and a small amount (<1%) of catch was taken by rock lobster pot and hand gathering (Table 3). Several fishers undertook investigative research work on whelk, which was authorised by special permit and resulted in the large amount of targeted whelk catch by baited fish pots from 1989/90 to 1997/98. Following the expiry of all of the special permits by the end of 1997/98, the majority of reported whelk catch has been taken by bottom trawling and dredging.

Table 3: Total estimated catch of whelk (kg) by fishing method 1988/89-2006/07

Fishing Method	Dredge	Fish Pot	Bottom Trawl	Rock Lobster Pot	Hand Gather	Crab Pot
1988/89		825				
1989/90	830	20,232	464			
1990/91	2,273	47,105				
1991/92	2,852	24,551				
1992/93	2,323	446	20			
1993/94	1,935	56,944	44			
1994/95	767	22,770	248			
1995/96	200		81	40		
1996/97	50	9,472	67	15		
1997/98		960	292			
1998/99	580		3,260			
1999/00	118		3,705			
2000/01	26		17,547			
2001/02	2		5,872			
2002/03	49		290			
2003/04	3,820		300			
2004/05	154		30		50	
2005/06	25		55			
2006/07			134			518
Total	16,004	182,305	32,409	55	50	518
% of Total	7	79	14	0	0	0

Customary and recreational fishery characteristics

- 15 Large ostrich foot shells have been found in middens around the North Island, indicating that it was a food source for Māori. Though there is no data detailing levels of current customary or recreational catch of this species, it is not known to be an important species to either customary or recreational fishers.

Management information

- 16 Large ostrich foot is managed as a Schedule 4C species; the Act prohibits the issuing of fishing permits to target this species.

International obligations

- 17 There are no international obligations specific to large ostrich foot.

Treaty settlement obligations

- 18 Currently, there are no settlements that specifically identify the large ostrich foot as a species of interest.
- 19 MFish is undertaking research to provide information on the traditional and customary factors that may need to be considered in the management decision-making process.

Recommendation

- 20 Regardless of whether or not the large ostrich foot is introduced into the QMS or is taken off Schedule 4C, MFish should encourage the correct identification and reporting of whelk species and monitor whelk and large ostrich foot catch. Such administrative steps would provide a better basis for an assessment of future management interventions, and such action in itself would better meet the purpose of the Fisheries Act. Should reported catches vary significantly from historical catches and/or if TACCs of associated target QMS species are adjusted to higher levels in the following one or two fishing years, MFish should reconsider management interventions.

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Risk analysis and evaluation

STOCK: Large ostrich foot (*Struthiolaria papulosa*)

Severity/likelihood risk analysis:

Generic objective 1: Risk to maintaining the potential of the stock to meet the reasonably foreseeable needs of future generations.

Analysis:

The large ostrich foot code has never been used to report commercial catch; therefore any catch of this species would be recorded under the generic whelk code. Whelk has been largely taken as bycatch of established trawl and dredge (oyster and scallop) fisheries in recent years. Whelk was targeted in FMA 7 from 1988/89 to 1997/98, but only a small proportion of this whelk catch was likely to be large ostrich foot. In addition, due to the nature of catch-reporting obligations for non-QMS species, unless the bycatch species is estimated to be among the 5 most abundant species taken in a given dredge or bottom trawl, estimated catches do not have to be reported. The whelk data and consequently any ostrich foot data therefore are, at best, only indicative of annual catch and of year-to-year catch variability. Conclusions regarding risk drawn from such data are therefore likely to be highly uncertain.

Table 4: Reported landings (kg) for the fishing years 2002/03 – 2006/07

	2002/03	2003/04	2004/05	2005/06	2006/07
Whelk	1,092	5,078	676	243	829
Scallop	185,006	99,965	146,949	171,419	132,118
Oyster	451,335	270,100	267,711	386,014	237,221

Landed catches vary markedly over the five fishing years from as high as 5,078 kg in 2003/04 to as low as 243 kg in 2005/06 (Table 4). It is uncertain what led to these fluctuations in catch. Catch of whelk has not followed the same trends as scallop or oyster catch.

Given the variable catch and lack of species-specific reporting, the level of risk to the large ostrich foot is difficult to assess. MFish should encourage the correct identification and reporting of whelk species and monitor whelk and large ostrich foot catch. Such administrative steps would provide a better basis for an assessment of future management interventions, and such action in itself would better meet the purpose of the Fisheries Act. Should reported catches continue to decline and/or if TACCs of associated target QMS species are adjusted to higher levels in the following one or two fishing years, MFish should reconsider management interventions.

Severity of impact (low, medium or high): Low

Likelihood of impact (low, medium or high): Low

Risk score (1-9): 1

Generic objective 2: Risk to avoiding, remedying or mitigating any adverse effects of fishing on the aquatic environment.

Analysis:

The risk of adverse effects on the aquatic environment from catch of large ostrich foot is low due to the fact that there is no target fishery for the species. While there has been a targeted whelk catch in previous years, this has been by potting, which has a relatively low impact on the environment.

Little is known of the habitat interactions or the ecosystem role of the large ostrich foot. The large ostrich foot feeds on detritus and micro organisms including diatoms and foraminifera. Whelks are known to be preyed upon by fish, sharks and seastars.

Severity of impact (low, medium or high): Low

Likelihood of impact (low, medium or high): Low

Risk score (1-9): 1

Generic objective 3: Risk to providing for utilisation of the stock or species that enables social, cultural and economic well-being.

Analysis:

The Act prevents large ostrich foot from being targeted by commercial fisheries, though whelks have been targeted in the past. Whelks currently have little commercial value to fishers.

The amount of targeted recreational or customary catch of the large ostrich foot is unknown.

There are no known international obligations.

Severity of impact (low, medium or high) :Low

Likelihood of impact (low, medium or high) : Low

Risk score (1-9) :1

Objective(s) returning highest score: All three

Risk based on severity/likelihood (low, medium, high): Low

Immediacy and uncertainty risk analysis (for medium risk stocks or species only):

Not applicable for this species

Draft Risk Evaluation

Is risk after severity/likelihood analysis HIGH? **No**

Is risk after severity/likelihood analysis MEDIUM; **and** immediacy and/or uncertainty is MEDIUM or HIGH? **No**

Is risk after severity/likelihood analysis LOW; **or** is risk after severity/likelihood analysis MEDIUM and immediacy and uncertainty are LOW? **Yes - stock is in GROUP 3**

CARPET SHARK

Class:	Chondrichthyes
Subclass:	Elasmobranchii (sharks and rays)
Order:	Carcharhiniformes (ground sharks)
Family:	Scyliorhinidae (cat sharks)
Genus:	<i>Cephaloscyllium</i>
Species:	<i>isabellum</i>



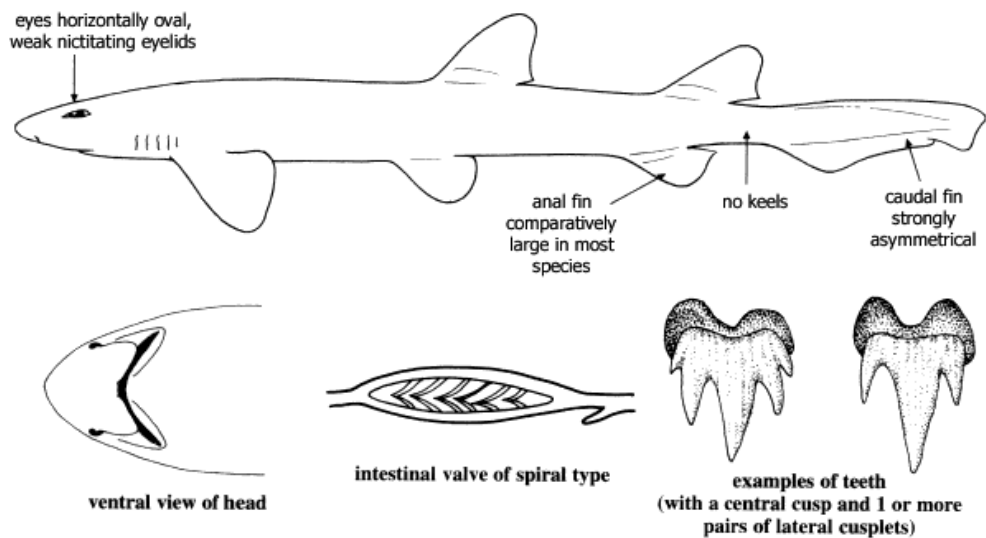
Biological Information

- 1 *Cephaloscyllium isabellum* can be known by a number of different names including: carpet shark, draughtsboard shark, swell shark, pekapeka (Māori), holbiche damier (French), pejegato ajedrezado (Spanish), *Scyllium isabella*, *S. lima*, *C. umbratile*, or *C. formosanum*. For the purposes of this document, *C. isabellum* will be referred to as the carpet shark. The Ministry of Fisheries (MFish) species code for carpet shark is CAR.

Description

- 2 The carpet shark is a small, benthic-dwelling species. The average length of a carpet shark is 70 – 100cm. Adult specimens rarely exceed 150cm. The body of the carpet shark is stocky and striking in colouration - variegated brown with irregular dark brown patterning. The ventral surface of the shark is light and uniform in colour.
- 3 Two small, spineless dorsal fins are present and the second dorsal fin is smaller than the first (Figure 1). There are five gill openings, no labial furrows, and the anterior nasal flaps do not reach the mouth. Scyliorhinidae (cat sharks) is one of the most diverse shark families, comprising 15 genera and around 90 species. Similar to other species of cat shark, the carpet shark has characteristically elongated cat-like eyes with nictating eyelids and a longitudinal fold in the lower eyelid.

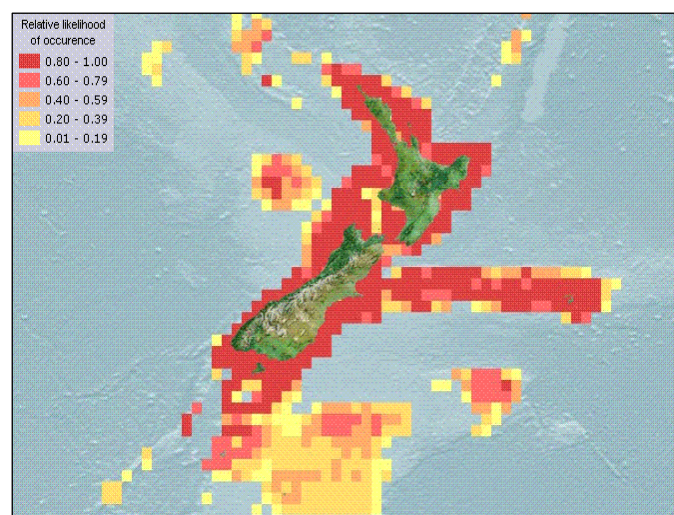
Figure 1: Identification key for species of the Scyliorhinidae (cat sharks).



Distribution, habitat and behaviour

- 4 Carpet shark is distributed around mainland New Zealand, including the Chatham and Stewart Islands (Figure 2). The species can also be found in other regions of the southwest Pacific Ocean, including the southern regions of Australia. Carpet shark is found in waters from 0 – 690m deep, and is generally found at around 85m depth. It is considered to be primarily a shelf or coastal species.

Figure 2: Distribution of carpet shark in the New Zealand Exclusive Economic Zone.



- 5 Like many Chondrichthyans (cartilaginous fishes), carpet sharks are nocturnal. During the day, they rest in caves or under overhangs within rocky/reef habitats, where their external colours allow them to camouflage with their surroundings. At night, carpet sharks will venture widely around sandy and rocky regions to prey upon small fish, cephalopods and a range of other invertebrates (crabs, worms and shellfish).

Growth, reproduction and recruitment

- 6 Growth rates and age at maturity are unknown. However most shark species tend to have relatively slow growth rates and a relatively late onset of maturity. Mature adult male carpet sharks (> 69cm) tend to be smaller than mature adult females (> 86cm).
- 7 Fecundity estimates and the seasonality of spawning are unknown for carpet sharks. Carpet sharks are oviparous (egg-layers). Most shark species are known to have very low fecundity when compared to teleost (bony) fishes. Juvenile carpet sharks hatch at around 16cm body length, and are much larger and more energetic than juvenile teleosts. As such, the survivorship of juvenile carpet sharks is relatively improved, although estimates of recruitment are unknown.

Associated and protected species

- 8 There is no target fishery for carpet shark. It is taken as a bycatch in several QMS target fisheries (including school shark, rig, tarakihi, red cod and rock lobster). Any protected species interactions are associated with these target fisheries.
- 9 There is no information available regarding the importance of carpet shark within local and broader marine ecosystems (e.g. food webs, indicator and dependent species, trophic cascades etc).

Stock assessment

- 10 Stock assessment for carpet shark has not been done. There are no estimates of absolute or relative abundance of carpet shark, and the level of natural mortality is unknown. There is insufficient scientific information available to calculate estimates of current biomass, maximum sustainable yield or the biomass that can support the maximum sustainable yield (B_{MSY}).
- 11 A significant amount of international scientific concern has been raised about the sustainability of harvesting levels for a number of shark species. Sharks tend to be vulnerable to overfishing because they have low growth rates, moderate to high ages at maturity, and low fecundity. The International Union for the Conservation of Nature and Natural Resources (IUCN) has evaluated the population status of carpet shark as a species of Least Concern (LC) on the Red List of Threatened Species.

Environmental effects of fishing

- 12 Carpet shark is not targeted by commercial fishers. Should carpet shark become a commercially-targeted species, it would likely be taken by bottom trawl or set net methods. The environmental effects associated with these methods would apply.

Social, Economic and Cultural Information

Commercial fishery characteristics

- 13 New Zealand's shark catch has increased steadily since 1975. There are approximately 70 species of sharks within the New Zealand Exclusive Economic Zone (EEZ), and eleven of these are currently managed within the Quota Management System (QMS). Approximately 85% of the total commercial landings for sharks and rays are comprised of spiny dogfish, school shark, skates, ghost shark, rig and elephantfish.

- 14 Carpet shark is not a commercially targeted species – its capture is generally a result of incidental bycatch. Carpet shark is currently managed as an open access non-QMS species. There does not appear to be any commercial demand specifically for carpet shark although carpet shark caught is often utilised for its fins. To some extent, the combined total allowable catch (TAC) limits of the target species may be limiting the total catch of carpet sharks.
- 15 Carpet shark landed catch includes both the catch that is utilised and fishers' estimates of discarded catch.

Commercial fishing method

- 16 Carpet shark is an incidental bycatch from the commercial fishing methods of bottom trawling and set netting. There is also a small amount of bycatch from bottom longline and rock lobster potting methods.

Commercially landed catch

- 17 Estimated catch data from catch effort returns, together with corresponding landing information, provides the catch data set for carpet sharks.
- 18 A number of factors have resulted in some uncertainty within the data set for carpet shark. As there are many shark species within the New Zealand EEZ, and some of these are encountered relatively infrequently, there are sometimes instances where species are mis-identified and consequently mis-reported. Approximately 4-5% of the annual commercial shark catch is reported against generic stock codes such as 'other sharks and dogs' (OSD). In addition, there has been at least one occasion where estimated catch of cardinal fish (CDL) has been inaccurately recorded as carpet shark (CAR). The following analyses should be interpreted with these data uncertainties in mind.
- 19 Reported landings of carpet shark increased to 68 tonnes in the late 1980s, dropped to 2 tonnes in the early to mid 90s, and have since increased to record highs of more than 200 tonnes (Figure 3). The increased landings of carpet shark between 1988-91 were probably due to the operation of a shark liver oil fishery during this time period, which ceased around 1994 (Figure 3).
- 20 Since 2002, landings of carpet shark steadily increased from below 50 tonnes to over 245 tonnes in the 2006/07 fishing year (Figure 3). Landings by carpet shark fishstock code[†] show a corresponding catch increase from three fishery management areas (FMAs 3, 4 and 5) over the same time period (Figure 4). However, there has not been a corresponding increase in catch in the target fisheries that take carpet shark as bycatch within these FMAs. Other than changes in catch reporting trends, it is unclear why the catch of carpet shark has significantly increased in recent years.

[†] Carpet shark fishstock codes relate to standard fisheries management areas e.g. CAR 1 = FMA 1)

Figure 3: Commercially landed catch of carpet shark from 1988-2007 (includes catch reported as discarded). Data taken from the landing portion of catch effort returns.

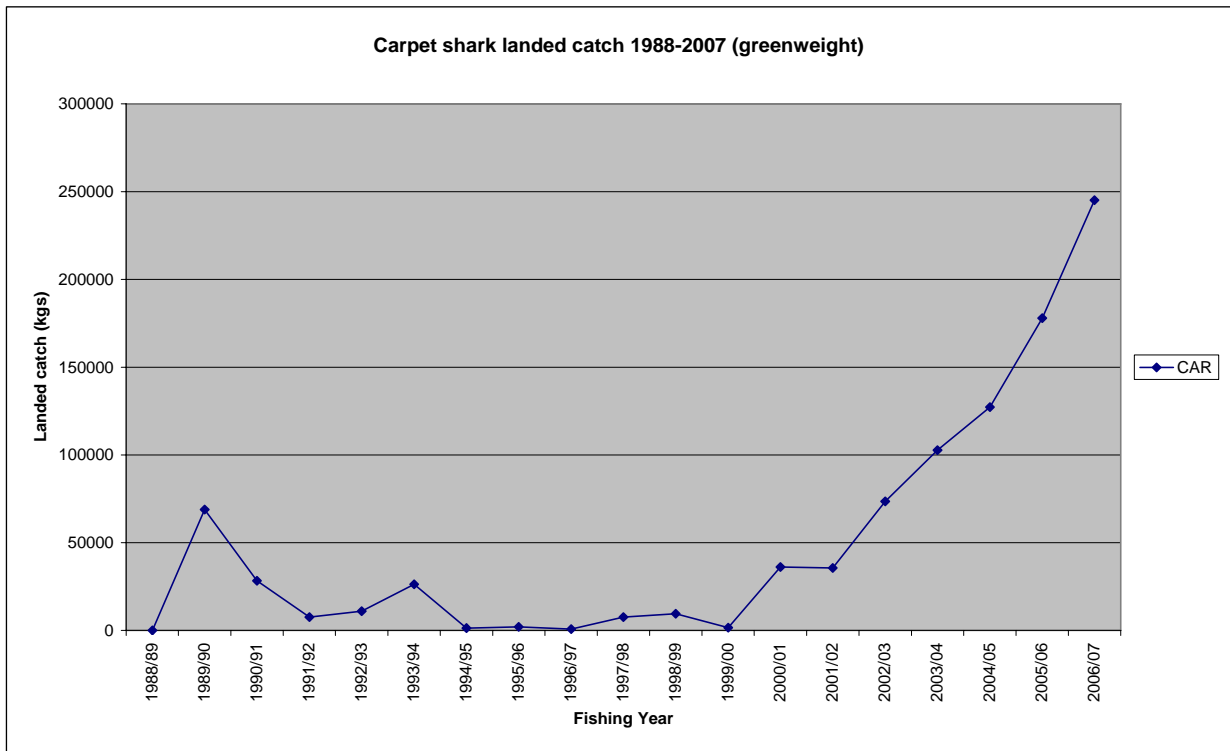
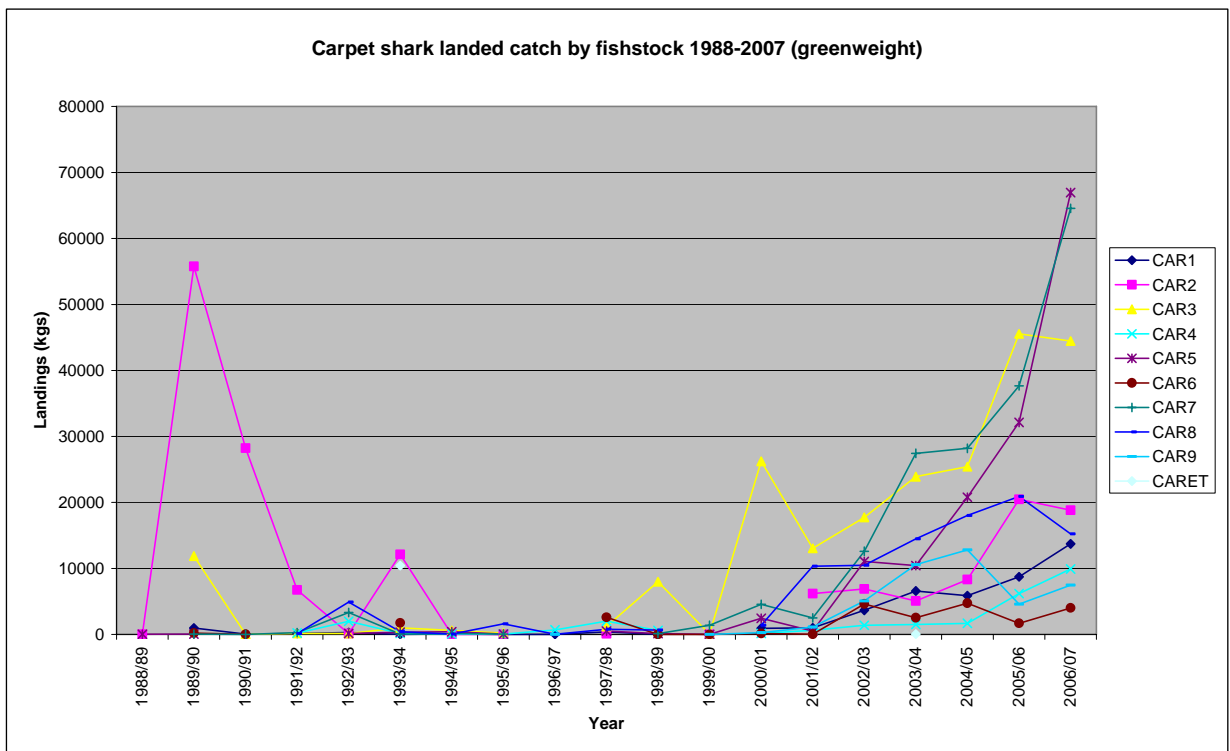


Figure 4: Commercially landed catch of carpet shark by FMA 1988-2007 (includes discarded catch). Data taken from the landing portion of catch effort returns.



Intended use of commercial catch

- 21 Prior to 2001, the majority of carpet shark taken was reported as landed – destination code L (see Table 1). Since 2001, the majority of the catch has been reported as discarded (destination code D). Landed catch (destination code L) includes whole carpet shark, it also includes a fisher’s estimate of greenweight for carpet shark which are finned and the trunks of the sharks returned to the sea. The increase in reported discarded catch may be due to several factors, including: changes to the requirements of catch landing returns, and improved data validation systems, both of which came into effect in 2001.
- 22 Given the lack of reliable data, it is difficult to ascertain whether reporting improvements fully explain the apparent recent increases of both carpet shark catch and the proportion of catch that is discarded.

Table 1: Annual discarded and landed carpet shark catches (1988-2007)

Fishing Year	Percentage of reported landed catch		
	Discarded (destination code D)	Landed (destination code L)	Other destination type codes *
1988/89	0.00%	100.00%	0.00%
1989/90	0.01%	99.99%	0.00%
1990/91	0.00%	100.00%	0.00%
1991/92	4.42%	95.58%	0.00%
1992/93	47.14%	52.86%	0.00%
1993/94	0.00%	100.00%	0.00%
1994/95	5.00%	95.00%	0.00%
1995/96	0.10%	99.65%	0.25%
1996/97	17.16%	82.84%	0.00%
1997/98	27.85%	72.15%	0.00%
1998/99	10.27%	89.52%	0.21%
1999/00	9.34%	90.66%	0.00%
2000/01	82.41%	12.89%	4.70%
2001/02	78.38%	15.90%	5.72%
2002/03	81.78%	18.21%	0.01%
2003/04	65.81%	34.16%	0.03%
2004/05	63.86%	36.08%	0.06%
2005/06	70.39%	29.04%	0.57%
2006/07	76.16%	22.33%	1.50%

* Includes other destination codes A, B, E, F, O, P, S, T, U W

Utilisation of catch

- 23 For carpet shark landed with the destination code L, Table 2 shows the main processed states. Until 1998/99, the majority of the carpet shark not discarded was landed green (unprocessed). In recent years, however, most landed catch is finned (only the fins are retained, the trunk of the shark is returned to the sea).
- 24 The finning of sharks has increased in popularity internationally over recent years to satisfy demand from Asian markets. Since 2001/02 there has been an increasing trend for carpet shark to be processed as fins only (90% or more of reported landed catch since 2003/04).

Table 2: Processed state percentages for non-discarded carpet shark, 1988 – 2007 (dest. code L).

Destination Type- Landed	Processed State			
	Finned	Green	Dressed	Other*
1988/89	0.00%	100.00%	0.00%	0.00%
1989/90	0.00%	99.81%	0.00%	0.19%
1990/91	0.00%	99.97%	0.00%	0.03%
1991/92	0.00%	100.00%	0.00%	0.00%
1992/93	0.00%	65.63%	34.37%	0.00%
1993/94	0.00%	99.31%	0.00%	0.69%
1994/95	0.00%	85.04%	0.00%	14.96%
1995/96	0.00%	100.00%	0.00%	0.00%
1996/97	0.00%	100.00%	0.00%	0.00%
1997/98	0.00%	99.99%	0.01%	0.00%
1998/99	0.00%	100.00%	0.00%	0.00%
1999/00	16.10%	6.52%	75.66%	1.72%
2000/01	8.08%	30.93%	58.70%	2.28%
2001/02	49.80%	36.50%	12.74%	0.95%
2002/03	45.50%	12.71%	41.76%	0.03%
2003/04	89.44%	3.19%	7.33%	0.04%
2004/05	95.81%	4.19%	0.00%	0.00%
2005/06	95.62%	4.05%	0.32%	0.00%
2006/07	91.37%	4.61%	3.16%	0.85%

* Includes other processed states (HGU, FIW, TRU, FIL, GUT, SHF and MEA)

Recreational fishery characteristics

- 25 There is no information available to calculate estimates of recreational catches. However, recreationally-caught carpet sharks are probably unintended catch when targeting other species. There is no daily bag limit or size restriction placed on recreational catches of carpet shark.
- 26 It is probably reasonable to assume that any recreationally-caught carpet sharks will be returned to the sea. This species is very hardy and able to survive removal from the water for long periods, so their survival rate when returned to the sea is probably high.

Customary fishery characteristics

- 27 Sharks are well known to be ‘taonga’ (treasures) to Māori. Traditionally, Māori people night-fished for a range of shark species, and shark products provided an important source of food and trade items. Many species of sharks are well defined within Māori myths and legends, and sharks commonly feature in the carvings of marae around New Zealand. The strength of sharks is often called upon in ritualised ceremonies, or by warriors heading into battle, or by people in distress at sea.
- 28 Customary shark fisheries no longer exist on the scale of the 19th century, although some North Island harbours still provide for some customary shark fishing. There is no information available on the quantities of carpet shark catch taken by customary fishers, either now, or in the past.

Management Information

Existing management information

- 29 The draft NPOA-Sharks has been developed to address conservation and fisheries management issues for New Zealand sharks, and to ensure their long-term sustainable use. The draft NPOA-Sharks addresses a number of management issues, including improvements to the accuracy of catch data sets, improved accuracy of species identification, initiating research and monitoring programmes, reducing the use of generic shark stock codes, and better management of shark finning practices. Consultation on the draft NPOA-Sharks has been completed, and the document is currently being finalised and is expected to be provided to the Minister in June 2008.

International obligations

- 30 An International Plan of Action for the Conservation and Management of Sharks (IPOA-Sharks) was developed by the Food and Agriculture Organisation of the United Nations (FAO). As New Zealand is a member state of the FAO, the draft NPOA-Sharks was developed to encompass the international management principles defined by the IPOA-Sharks. As noted in the previous paragraph the draft NPOA-Sharks is now in the final stages of development, and includes a range of conservation and management measures for New Zealand shark species, including carpet shark.

Treaty settlement obligations

- 31 The Crown and several Iwi around regional New Zealand have formally signed Deeds of Settlement regarding the original terms of the Treaty of Waitangi. From the Deeds of Settlement, MFish has a range of obligations to Iwi regarding fisheries management decisions, as set out within individual Iwi Settlement Protocols.
- 32 The Crown recognises that sharks are a taonga species to Māori people, and that individual Iwi have a customary non-commercial interest in the management of shark species. MFish is obligated to consult with Iwi Governance Entities and to recognise and provide for their customary interests when making decisions on the sustainable utilisation or setting of sustainability measures for shark species, including carpet shark.

Sources of Information

- Data Sources: Landings and catch taken from the Fisheries Information System (FIS).
- MFish Document: Draft National Plan of Action for the Conservation and Management of Sharks.
- International Report: FAO species catalogue Volume 4; Part 2: Sharks of the world
- Book: Sharks and rays of New Zealand, G Cox and M Francis, 1997, Canterbury University Press, Christchurch.
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- International Report: Ed. RD Cavanagh et al, 2003, The conservation status of Australasian Chondrichthyans, Report of the IUCN Shark Specialist Group, Australia and Oceania Regional Red List Workshop, 7-9 March 2003 Queensland, Australia.
- Journal: Cheung, WWL, Pitcher TJ, and Pauly, D. 2005. A fuzzy logic expert system to estimate intrinsic extinction vulnerabilities of marine fishes to fishing. Biological Conservation vol. 124, pp. 97-111.
- Internet Resources: www.fishbase.com
www.marinenz.org.nz
www.octopus.org.nz
www.fish.govt.nz
www.iucnredlist.org

Risk analysis and evaluation

STOCK: Carpet Shark - *Cephaloscyllium isabellum*

Severity/likelihood risk analysis:

Generic objective 1: Risk to maintaining the potential of the stock to meet the reasonably foreseeable needs of future generations.

Analysis:

Carpet shark is probably a low productivity species and is probably susceptible to over fishing. The Ministry has no stock assessment for carpet shark. The Ministry has no estimate of B_{MSY} and has no proxies.

Carpet shark is taken as a bycatch from target bottom trawl and more recently set net fisheries, for school shark, rig, and tarakihi and from the rock lobster fishery. Reported landings of carpet shark have increased markedly since 2000/01, and in 2006/07 were 245 tonnes. Since 2000/01 the majority of carpet shark catch has been reported as discarded. The target species for which carpet shark is taken as bycatch are all managed within the QMS, hence mitigating the risk of overfishing.

There is no information to assess whether the current level of harvest comprises a risk to the sustainability of the stock.

Severity of impact (low, medium or high): Low

Likelihood of impact (low, medium or high): Low

Risk score (1-9): 1

Generic objective 2: Risk to avoiding, remedying or mitigating any adverse effects of fishing on the aquatic environment.

Analysis:

The risk of adverse effects on the aquatic environment directly attributed to fishing for carpet shark is nil. Carpet shark is a bycatch species and is caught as a consequence of other fishing activities.

There is no information regarding habitat interactions, the role of carpet shark within marine ecosystems, or any dependent species or indicator species relationships.

There is no indication that the introduction of carpet shark to the QMS, or the retention of the species outside the QMS, would alter existing fishing activity.

Severity of impact (low, medium or high): Low

Likelihood of impact (low, medium or high): Low

Risk score (1-9): 1

Generic objective 3: Risk to providing for utilisation of the stock or species that enables social, cultural and economic well-being.

Analysis:

Carpet shark is not targeted by commercial fishers. There is no known targeted recreational or customary catch of carpet shark, however, there are Maori fisheries settlement protocols that apply to sharks in general. There are no known international obligations although the NPOA-Sharks is based on an international agreement.

Should carpet shark be introduced into the QMS, consideration should be given to its inclusion on Schedule 6.

Severity of impact (low, medium or high): Low

Likelihood of impact (low, medium or high): Low

Risk score (1-9): 1

Immediacy and uncertainty risk analysis (for medium risk stocks or species only):

Not applicable for this species

Draft Risk Evaluation

Is risk after severity/likelihood analysis HIGH? **No**

Is risk after severity/likelihood analysis MEDIUM; **and** immediacy and/or uncertainty is MEDIUM or HIGH? **No**

Is risk after severity/likelihood analysis LOW; **or** is risk after severity/likelihood analysis MEDIUM and immediacy and uncertainty are LOW? **Yes - stock is in GROUP 3**

HAMMERHEAD SHARK

Species:	<i>Sphyrna zygaena</i>
Common name:	Smooth hammerhead shark
Species code:	HHS
Stock area:	1-10



Introduction

- 1 This paper seeks to identify whether smooth hammerhead shark should be considered for introduction into the QMS. The assessment concludes there is little risk to maintaining the existing regime in the short term. Further, the species should be evaluated against some sort of prohibited utilisation standard before being re-considered for introduction into the QMS.

Biological information

Morphology, growth, reproduction and recruitment

- 2 The smooth hammerhead shark (hereafter hammerhead shark) has an elongate lateral body shape with the distinctive feature of a wide flattened head. Colouration is olive-grey or dark grey above and white below. Fins are plain, dusky or blackish tipped. The maximum size attained in New Zealand waters is 3.5m. Hammerheads become sexually mature when 2.5 to 3m long and pregnant females may give birth to up to 40 live young.

Spatial and temporal distribution and key areas (feeding, spawning, migration)

- 3 Hammerhead shark is a highly migratory species (HMS) as defined by the United Nations Convention on the Law of the Sea (UNCLOS).
- 4 The species inhabits inshore and offshore waters over the continental shelf. It occupies both a pelagic and benthic habitat, and may be semi-oceanic. Hammerhead shark is a northern species, and probably occurs very rarely in South Island waters. The young are often found on the sea surface with such aggregations common in the Hauraki Gulf.
- 5 Hammerhead shark prefer to feed on skates, stingrays and other small sharks, but also predate bony fishes, shrimps, crabs, barnacles and cephalopods.

Habitat interactions

- 6 As mentioned, juveniles are known to aggregate on the surface of shallow coastal waters such as the Hauraki Gulf where they may be vulnerable to a wide range of human impacts (e.g. sedimentation, pollution, dredging and interactions with moving vessels) that degrade their habitat and possibly their health. No other information is available.

Associated species (bycatch and target)

- 7 Hammerhead shark is taken as bycatch primarily in inshore commercial fisheries targeting snapper, John Dory, red gurnard, spotted dogfish, flatfish and school shark.

Protected species interactions

- 8 None known

Stock Assessment

- 9 There are no estimates of current or reference biomass, or sustainable yield for this species.
- 10 The World Conservation Union (IUCN) regional classification for smooth hammerhead shark in the south west Pacific is Least Concern (LC) on its Red List. Globally, however, the species is near threatened (NT). The global IUCN assessment is justified as follows: *Sphyrna zygaena occurs around New Zealand, where it is a prohibited target species, and the most abundant shark species recorded in aerial surveys along the north western coast. It also occurs along the southern coast of Australia where it is found in reasonably high numbers. It is a large, viviparous, fecund species. Although taken in commercial fisheries, it does not appear to be negatively impacted by this fishing pressure, and is classified least concern for this region.*
- 11 However contrary to the IUCN regional classification of Least Concern, NIWA are on record that hammerhead shark, and others, may warrant full protection because of their low productivity and the extreme difficulty of assessing sustainable yields and monitoring their abundance.¹
- 12 The reliability of reported catch data is not known, but there is some catch information to use as a basis for preliminary management considerations.

Social, Economic and Cultural Information

- 13 Large hammerhead sharks are regarded as dangerous to people, though in New Zealand waters the species is shy and relatively harmless.

Commercial fishery characteristics

Current management

- 14 The non-QMS moratorium on the issuing of fishing permits to new entrants restricted commercial access to hammerhead shark between 1992 and 2004. To coincide with the revocation of the moratorium in October 2004, hammerhead shark was listed on Schedule 4C of the Fisheries Act 1996 to continue to prohibit the issuing of fishing permits to allow targeting of this species.
- 15 Although no commercial fishing for hammerhead shark has ever been permitted, it is taken and utilised as bycatch of other fisheries.

¹ Draft National Plan of Action for the Conservation and Management of Sharks: Submission by National Institute of Water and Atmospheric Research Ltd (NIWA) 1 February 2008

Fishing methods and areas

- 16 The commercial fishing effort data used to evaluate the catch of hammerhead shark by fishing method is substantially underreported because most information comes from returns that only require the estimated catch of the top five species caught (by weight) to be reported (catch, effort and landing returns (CELRs) and trawl catch effort and processing returns (TCEPRs)). Records from the past three fishing years suggest that trawling and Danish seining account for 50% of the reported catch, setnetting 35%, and lining methods 15%.
- 17 Most commercial landings (95%) are reported for HHS1 and the rest of landings shared between HHS2, HHS9 and HHS 8.

Catch information and utilisation

- 18 As most catch is reported only from northern waters landings are reported below on a national basis.

Table 1: Hammerhead shark reported landings and means of utilisation (kilograms) by fishing year reported from 1999-00 to 2006-07. Source: MFish catch effort database

Fishing Year	Catch greenweight (kg)	Discarded	Landed green	Processed	Records	Vessels
1999/00	10,608	50	490	10,014	241	36
2000/01	13,453	25	102	13,317	278	38
2001/02	8,457	290	704	7,463	295	36
2002/03	12,535	486	1,037	11,012	353	45
2003/04	11,482	257	988	10,237	250	37
2004/05	8,302	1,407	909	5,985	255	34
2005/06	9,082	42	490	8,550	304	36
2006/07	6,847	65	1,193	5,589	229	42

Current utilisation.

- 19 The IUCN shark specialist group report states that neonates and small juveniles are a common bycatch in commercial setnet fisheries for flatfish, and are also commonly taken by trawlers and Danish seine vessels. They are usually discarded, although juveniles discarded from setnets are usually dead.²
- 20 Reported catches vary between 7-13.5 tonnes per fishing year. The number of records and vessels is relatively consistent suggesting that a relatively large number of vessels are each reporting a small amount of bycatch.
- 21 Most of the reported landing data for hammerhead shark indicates that it is utilised (Table 1). Typically those that are processed at sea are dressed or trunked and it is assumed that the fins are retained. Negligible amounts of finning of hammerhead shark are reported and this practice was reported only in earlier years.

Recreational fishery characteristics

- 22 Hammerhead shark is recognised as a gamefish and regularly taken by game fishers off the north-east of the North Island. While targeted less actively than mako or blue sharks, their habit of swimming on the surface makes them vulnerable to suitably presented dead or live bait. National catch tallies kept by the New Zealand Big Game

² The Conservation Status of Australasian Chondrichthyans - Report of the IUCN Shark Specialist Group Australia and Oceania Regional Red List Workshop 7-9 March 2003

Fishing Council record an average of 33 hammerhead sharks caught each fishing year for the past 14 seasons (not including catch and release). Reported landings have been much reduced from this average over recent years, although this might be due to increasing numbers of hammerheads being released.

Customary fishery characteristics

- 23 An estimate of current customary catch is not available for this species.
- 24 Maori traditionally ate a wide variety of seafood. To date no specific records have been found of fishing for this species, but they were nonetheless potentially a small part of customary catches, given the distance offshore that Maori fished and the quality of their fishing materials.

Management

Existing management

- 25 Hammerhead shark has been listed on Schedule 4C because of potential sustainability risks under an open access management regime. Accordingly, no new fishing permits can be issued for commercial targeting of the species.

Provisional catch history implications

- 26 Hammerhead shark is listed on Schedule 4C. Accordingly for the 26 clients reporting landings of 7.643 tonnes during the fishing year commencing 1 October 1990 and the 24 clients reporting landings of 8.372 tonnes for the fishing year commencing October 1991 allocations of provisional catch history may be lost if the QMS introduction of hammerhead shark is deferred beyond 1 October 2009.

International obligations

- 27 Hammerhead shark is listed as a highly migratory species on Annex 1 of the United Nations Convention on the Law of the Sea (UNCLOS). UNCLOS requires regional cooperation for ensuring conservation and optimal utilisation of listed species both within and beyond exclusive economic zones. No specific measures relate to hammerhead shark.
- 28 The Convention on the Conservation of Migratory Species of Wild Animals (CMS) does not list hammerhead shark on Appendix 1 of its convention (basking, white, and whale shark are the only HMS shark species so listed). Accordingly there is no current international obligation for New Zealand to consider prohibiting the taking of hammerhead shark.

Treaty settlement obligations

- 29 MFish is undertaking research to provide information on the traditional and customary factors that may need to be considered in the management decision-making process. Currently there is no information specific to hammerhead shark.

Risk analysis and evaluation

STOCK: Hammerhead shark (*Sphyrna zygaena*)

Severity/likelihood risk analysis:

Generic objective 1: Risk to maintaining the potential of the stock to meet the reasonably foreseeable needs of future generations.

Analysis: There is uncertainty associated with the reporting of species such as hammerhead shark. The available information suggests very small amounts of catch. However as most of the catch reported is utilised and therefore has unit value to fishers it is unlikely that substantial misreporting is occurring. It is of concern that recreational catches appear to have declined.

In the South West Pacific the species is listed on the IUCN Red List as having least concern. Nevertheless NIWA suggests hammerhead shark may warrant full protection because of its particular biological characteristics.

The impact of maintaining the existing regime in the short term is likely to be minor. Accordingly no management intervention is currently necessary and the species should retain its Schedule 4C listing. Prior to re-considering hammerhead shark for introduction into the QMS an assessment to consider protecting the species as recommended by NIWA should be undertaken. This might be achieved by evaluating the species against the proposed prohibited utilisation standard as discussed in the draft NPOA Sharks.

Severity of impact (low, medium or high) : Low

Likelihood of impact (low, medium or high) Low:

Risk score (1-9) :1

Generic objective 2: Risk to avoiding, remedying or mitigating any adverse effects of fishing on the aquatic environment.

Analysis: The risk of adverse effects on the aquatic environment is unknown. Most catch of hammerhead shark is taken by bottom trawling but only as a consequence of fishing for QMS species.

Little is known of habitat interaction apart from potential impacts on aggregations of juveniles in areas such as the Hauraki Gulf.

Severity of impact (low, medium or high) : Low

Likelihood of impact (low, medium or high) : Low

Risk score (1-9) :1

Generic objective 3: Risk to providing for utilisation of the stock or species that enables social, cultural and economic well-being.

Analysis: Hammerhead shark is not targeted by commercial fishers and the reported bycatch associated with other target fisheries is very small. The species has little commercial value although those caught are utilised. Wastage is not an issue. Only small amounts of provisional catch history are involved.

The species is sought by gamefishers and although reported landings have declined in recent years this may be due to greater numbers of releases.

Severity of impact (low, medium or high) : Low

Likelihood of impact (low, medium or high) Low

Risk score (1-9) : 2 (on the basis of value to recreational fishing)

Objective(s) returning highest score: Objective 3

Risk based on severity/likelihood (low, medium, high): Low

Immediacy and uncertainty risk analysis (for medium risk stocks or species only):

Not applicable for this species

Draft Risk Evaluation

Is risk after severity/likelihood analysis HIGH? **No**

Is risk after severity/likelihood analysis MEDIUM; **and** immediacy and/or uncertainty is MEDIUM or HIGH? **No**

Is risk after severity/likelihood analysis LOW; **or** is risk after severity/likelihood analysis MEDIUM and immediacy and uncertainty are LOW? **Yes - stock is in GROUP 3**

JAVELINFISH

Species:	<i>Lepidorhynchus denticulatus</i>
Common Name:	Javelinfish
Species code:	JAV
Stock area:	1-10

Biological information

Morphology, growth, reproduction and recruitment

- 1 Javelinfish is a rattail species that grows to a maximum total length of 55cm. Very little is known about the growth, reproduction or recruitment of javelin fish.



Image provided by NIWA

Spatial and temporal distribution and key areas (feeding, spawning, migration)

- 2 Javelinfish is a bathypelagic, non-migratory species found in depths ranging from 180 – 1000m in the eastern Indian Ocean and Southwest Pacific – primarily southern Australia and New Zealand. It is very widely distributed within the EEZ with areas of local abundance (e.g. Chatham Rise).

Habitat interactions

- 3 No information is available.

Associated species (bycatch and target)

- 4 Javelinfish is taken as bycatch in a large number of fisheries targeting QMS species but primarily in the hoki and scampi fisheries. Analysis of observer data from 1999-2003 showed that javelinfish contributed nearly 2% to the total catch weight in the hoki fishery and was the fourth most common bycatch species by weight.¹ Javelinfish

¹ Anderson, O.F.; Smith, M.H. (2004). Fish discards and non-target fish catch in the New Zealand hoki trawl fishery, 1999-2000 to 2002-03. *New Zealand Fisheries Assessment Report 2005/03*. 37 p.

also contributed nearly 9% to the total catch weight and was the fourth most common bycatch species by weight in the scampi fishery from 1990 to 2001.²

Environmental conditions

5 No information is available.

Protected species interactions

6 None known.

Stock Assessment

7 There are no estimates of stock structure, current or reference biomass, or sustainable yield.

Social, Economic, Cultural Information

Commercial fishery characteristics³

8 Due to its widespread geographic distribution, javelinfish has been reported as bycatch in 32 target fisheries over the last five fishing years. For the fishing years 2002/03 – 2006/07 total EEZ reported catch of javelinfish was 29,781 tonnes, most of which was taken by bottom trawl. The following table summarises the total catch distribution by Fisheries Management Area (FMA) for the fishing years 2002/03 – 2006/07

FMA1	FMA2	FMA3	FMA4	FMA5	FMA6	FMA7	FMA8	FMA9	FMA10
100 t	399 t	11,258 t	10,870 t	1,535 t	4,076 t	1,539 t	0 t	2 t	0 t

9 The total reported catch for each of the cited fishing years is shown in the following table.

2002/03	2003/04	2004/05	2005/06	2006/07
6,909 t	7,300 t	4,837 t	5,408 t	5,326 t

10 The percentage of total reported catch for each fishing year discarded or landed is shown in the following table.

	2002/03	2003/04	2004/05	2005/06	2006/07
Discarded	20%	13%	18%	20%	27%
Landed	80%	87%	82%	80%	73%

² Anderson, O.F. (2004). Fish discards and non-target fish catch in the trawl fisheries for arrow squid, jack mackerel, and scampi in New Zealand waters. *New Zealand Fisheries Assessment Report 2004/10*. 61 p.

³ Tables showing figures as percentages may not sum to 100% as percentages are rounded to the nearest whole number.

- 11 The percentage of reported landed catch for each fishing year landed as dressed, green, or meal is shown in the following table (assuming discarded catch is reported as green).

	2002/03	2003/04	2004/05	2005/06	2006/07
Dressed	0%	0%	1%	2%	2%
Green	0%	0%	0%	0%	0%
Meal	100%	100%	99%	98%	98%

- 12 Although over 30 target fisheries report javelinfish as bycatch, the hoki fishery reports by far the most javelinfish bycatch with 85% of the estimated javelinfish catch over the last 5 years reported as a bycatch of the hoki fishery. The only other fishery reporting significant quantities of javelinfish bycatch is scampi, which accounts for 10% of the javelinfish catch over the same time period. The smaller mesh size used in the scampi fishery may explain the relatively high javelinfish catch in this fishery.
- 13 Analysis of fish discards from observer data in the hoki and scampi trawl fisheries showed that the percentage of javelinfish catch discarded was 34%⁴ and 100%⁵ respectively. These figures suggest that discards of this species may be under-reported.
- 14 Anecdotal information suggests that javelin fish has limited potential commercially, other than as a source of meal, as its tough skin makes it difficult to process.

Recreational fishery characteristics

- 15 MFish has no information on recreational catch of javelinfish. Due to the offshore location and depth distribution of this species, recreational catch is unlikely.

Customary fishery characteristics

- 16 MFish has no information on customary catch of javelinfish. Due to the offshore location and depth distribution of this species, customary catch is unlikely.

Management

Existing management information

- 17 Javelinfish is currently managed as an open access, non-QMS fishery.

Provisional catch history implications

- 18 Javelinfish is a Schedule 4D species. If introduced into the QMS before 1 October 2009 quota allocation will be by way of provisional catch history.

International obligations

- 19 There are no international obligations specific to javelinfish.

⁴ Anderson, O.F.; Smith, M.H. (2004). Fish discards and non-target fish catch in the New Zealand hoki trawl fishery, 1999-2000 to 2002-03. *New Zealand Fisheries Assessment Report 2005/03*. 37 p.

⁵ Anderson, O.F. (2004). Fish discards and non-target fish catch in the trawl fisheries for arrow squid, jack mackerel, and scampi in New Zealand waters. *New Zealand Fisheries Assessment Report 2004/10*. 61 p.

Treaty settlement obligations

- 20 MFish is undertaking research to provide information on the traditional and customary factors that may need to be considered in the management decision-making process. Currently there is no information specific to javelinfish.

Risk analysis and evaluation

STOCK: Javelinfinh (*Lepidorhynchus denticulatus*)

Severity/likelihood risk analysis:

Generic objective 1: Risk to maintaining the potential of the stock to meet the reasonably foreseeable needs of future generations.

Analysis:

Significant quantities of javelinfinh are taken annually with over 5,000 tonnes taken in 2006/07. There is no obvious trend in the annual catch of this species although there may be a decrease since 2003/04.

There is no target fishery for javelinfinh and most of the catch is taken as a bycatch of the hoki fishery. The apparent decrease in catch of javelinfinh since 2003/04 may be due to a decrease in the TAC of hoki.

While the level of risk to javelinfinh stocks is difficult to assess it is clearly a widely distributed and locally abundant species.

Severity of impact (low, medium or high): Low

Likelihood of impact (low, medium or high): Low

Risk score (1-9) : 1

Generic objective 2: Risk to avoiding, remedying or mitigating any adverse effects of fishing on the aquatic environment.

Analysis:

Although most catches of javelinfinh are taken by bottom trawl this catch is incidental to the targeted take of QMS species – predominantly hoki and scampi. As there is no target fishery for this species the risk of adverse effects on the aquatic environment from catch of javelinfinh under an open access management regime is low.

Nothing is known of the habitat interactions or of the ecosystem role of javelinfinh. Its widespread distribution and abundance suggests it has some function in the marine ecosystem.

Severity of impact (low, medium or high) : Low
Likelihood of impact (low, medium or high) : Low

Risk score (1-9) : 1

Generic objective 3: Risk to providing access that enables social, cultural and economic wellbeing.

Analysis:

Javelinfish is not targeted by commercial fishers. It is reportedly difficult to process owing to its tough skin and is a low value species that is either discarded or mealed. Consequently there appears to be little likelihood of a target fishery developing.

There is no information available to suggest a recreational or customary fishery for javelinfish and there are no specific international obligations or Treaty settlement obligations known.

Javelinfish was considered for introduction into the QMS on 1 October 2004, however the Minister declined to introduce the species. At that time he considered it appropriate to continue to manage the species outside the QMS until such time as more explicit sustainability or utilisation issues were identified that warranted active management. No further information is available that would change that assessment.

Severity of impact (low, medium or high) : Low
Likelihood of impact (low, medium or high) : Low

Risk score (1-9) : 1

Objective(s) returning highest score: None

Risk based on severity/likelihood (low, medium, high): Low

Additional risk analysis not applicable as risk based on severity likelihood is low.

Draft Risk Evaluation

Is risk after severity/likelihood analysis HIGH? **No**

Is risk after severity/likelihood analysis MEDIUM; **and** immediacy and/or uncertainty is MEDIUM or HIGH? **No**

Is risk after severity/likelihood analysis LOW; **or** is risk after severity/likelihood analysis MEDIUM and immediacy and uncertainty are LOW? **Yes - stock is in GROUP 3**

ORANGE PERCH

Species:	<i>Lepidoperca aurantia</i>
Common Name:	Orange perch
Species code:	OPE
Stock area:	1-10

Biological information

Morphology, growth, reproduction and recruitment

- 1 Orange perch is easily identified. It is orange in colour fading to silver below with colour on the sides tending to form horizontal lines. Orange perch have large eyes and attain an average of 20 to 30cm in length reaching a maximum of 45cm. There is no information on the reproduction or recruitment of this species.



Image provided by NIWA

Spatial and temporal distribution and key areas (feeding, spawning, migration)

- 2 Orange perch is found on the continental shelf and slope of New Zealand and southern Australian waters at depths of 200-400m. It is widely distributed within New Zealand's EEZ and is taken as bycatch in all fisheries management areas (FMAs). There are areas of local abundance with higher catches evident in FMAs 4 and 5.
- 3 There is no information available regarding feeding, spawning or migratory behaviour.

Habitat interactions

- 4 No information is available.

Associated species (bycatch and target)

- 5 Orange perch is taken as bycatch in a large number of fisheries targeting QMS species; particularly the sea perch, squid, and silver warehou fisheries. Reported catch of orange perch in these fisheries is low however and analysis of fish discards

from observer data in the squid trawl fishery did not identify orange perch as being within the top 50 bycatch species by weight¹.

Environmental conditions

6 No information is available.

Protected species interactions

7 None known.

Stock Assessment

8 There are no estimates of current or reference biomass, or sustainable yield.

Social, Economic, Cultural Information

Commercial fishery characteristics, methods²

9 Over the last five fishing years orange perch has been taken as a bycatch in 26 target fisheries, predominantly those taken by bottom trawl. The amount of orange perch taken in each fishery varies significantly by year. The sea perch, squid and silver warehou target fisheries are responsible for most of the orange perch catch over the last five years with small amounts also taken in ling, barracouta, jack mackerel and white warehou fisheries. In the most recent fishing year 18% of the estimated catch of orange perch was targeted.

10 Catch of orange perch has a widespread geographic distribution. For the fishing years 2002/03 – 2006/07 total reported landings of orange perch from the EEZ was 485 t. The following table summarises the total reported catch by FMA for these fishing years.

FMA1	FMA2	FMA3	FMA4	FMA5	FMA6	FMA7	FMA8	FMA9	FMA10
0 t	1 t	27 t	303 t	118 t	0 t	26 t	1 t	0 t	11 t

11 Total reported landings (t) for each of the cited fishing years is shown in the following table.

2002/03	2003/04	2004/05	2005/06	2006/07
115 t	19 t	29 t	105 t	217 t

12 The percentage of total reported catch for each fishing year discarded or landed is shown in the following table.

	2002/03	2003/04	2004/05	2005/06	2006/07
Discarded	0%	39%	12%	0%	0%
Landed	100%	61%	87%	100%	100%

¹ Anderson, O.F. (2004) Fish discards and non-target fish catch in the trawl fisheries for arrow squid, jack mackerel, and scampi in New Zealand waters. *New Zealand Fisheries Assessment Report 2004/10*. 61 p.

² Tables showing figures as percentages may not sum to 100% as percentages are rounded to the nearest whole number.

- 13 The percentage of reported landed catch for each fishing year landed as dressed, green, or meal is shown in the following table (assuming discarded catch is reported as green).

	2002/03	2003/04	2004/05	2005/06	2006/07
Dressed	9%	1%	0%	19%	0%
Green	90%	93%	61%	79%	98%
Meal	1%	6%	39%	2%	2%

Recreational fishery characteristics

- 14 MFish has no information on recreational catch of orange perch. Due to the offshore location and depth distribution of this species, recreational catch is likely to be negligible or non-existent.

Customary fishery characteristics

- 15 Due to the offshore location and depth distribution of this species, customary catch is likely to be negligible or non-existent.

Management

Existing management information

- 16 Orange perch is currently managed as an open access, non-QMS fishery.

Provisional catch history implications

- 17 Orange perch is a Schedule 4D species. If introduced into the QMS before 1 October 2009 quota allocation will be by way of provisional catch history.

International obligations

- 18 There are no international obligations specific to orange perch.

Treaty settlement obligations

- 19 MFish is undertaking research to provide information on the traditional and customary factors that may need to be considered in the management decision-making process. Currently there is no information specific to orange perch.

Risk analysis and evaluation

STOCK: Orange perch (*Lepidoperca aurantia*)

Severity/likelihood risk analysis:

Generic objective 1: Risk to maintaining the potential of the stock to meet the reasonably foreseeable needs of future generations.

Analysis:

Total reported landings of orange perch are low and although there appears to be a small target fishery, the majority of orange perch is taken as a bycatch in bottom trawl fisheries in QMAs 4 and 5. Over the last five years catches have fluctuated between 19 and 217 tonnes. Over the same period the percentage of reported catch discarded has varied between 0% and 39%, with the high discarding percentages occurring in years with low catch. This may suggest that not all catch that is discarded is reported. However analysis of observer data from the squid trawl fishery, one of the main target fisheries taking orange perch as a bycatch, showed that orange perch did not feature in the top 50 bycatch species by weight, suggesting that catch of orange perch is likely to be low.

While there is no information available on the productivity of orange perch, given its wide distribution and low catch there is unlikely to be a sustainability concern for this species.

Severity of impact (low, medium or high): Low

Likelihood of impact (low, medium or high): Low

Risk score (1-9) : 1

Generic objective 2: Risk to avoiding, remedying or mitigating any adverse effects of fishing on the aquatic environment.

Analysis:

Although taken by bottom trawl, the risk of adverse effects on the aquatic environment from catch of orange perch is low as there is only a small target fishery for the species and total catch is low.

Nothing is known of the habitat interactions or of the ecosystem role of orange perch.

Severity of impact (low, medium or high) : Low

Likelihood of impact (low, medium or high) : Low

Risk score (1-9) : 1

Generic objective 3: Risk to providing access that enables social, cultural and economic wellbeing.

Analysis:

Although most orange perch caught is landed green it is considered a low value species with only a limited target fishery.

There is no information available to suggest a recreational or customary fishery for orange perch and there are no specific international obligations or Treaty settlement obligations known.

Severity of impact (low, medium or high) : Low

Likelihood of impact (low, medium or high) : Low

Risk score (1-9) : 1

Objective(s) returning highest score: all return score of 1

Risk based on severity/likelihood (low, medium, high): Low

Additional risk analysis not applicable as risk based on severity likelihood is low.

Draft Risk Evaluation

Is risk after severity/likelihood analysis HIGH? **No**

Is risk after severity/likelihood analysis MEDIUM; **and** immediacy and/or uncertainty is MEDIUM or HIGH? **No**

Is risk after severity/likelihood analysis LOW; **or** is risk after severity/likelihood analysis MEDIUM and immediacy and uncertainty are LOW? **Yes - stock is in GROUP 3**

RATTAILS

Introduction

- 1 Rattails (or grenadiers) are among the most abundant bottom-living species in depths greater than 200m. There are about 60 species present in New Zealand waters and many of these species are also present off southern Australia. Due to their abundance, rattails are a substantial bycatch in New Zealand middle depth fisheries, and form up to 25% of the biomass during trawl surveys. Most species have limited commercial value.
- 2 Four rattail species are discussed in greater detail due to their abundance, ecological importance, and commercial value. Rattails may be reported against the generic code RAT across all stock areas, or as individual species codes.
- 3 Note that javelinfish (JAV), one of the most abundant rattail species, is being considered separately.

Species:	<i>Trachyrincus aphyodes</i>
Common Name:	White grenadier
Species code:	WHX
Stock area:	1-10



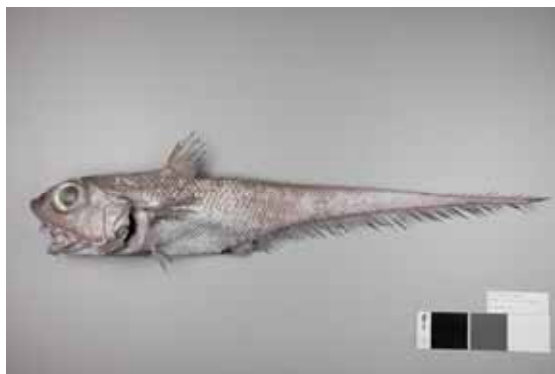
Species: *Coelorinchus bollonsi*
Common Name: Big-eye (Bollins') grenadier
Species code: CBO
Stock area: 1-10



Species: *Coelorinchus biclinozonalsis*
Common Name: Two saddle grenadier
Species code: CBI
Stock area: 1-10



Species: *Macrourus carinatus*
Common Name: Ridge-scaled grenadier
Species code: MCA
Stock area: 1-10



All images provided by NIWA

Biological information

Morphology, growth, reproduction and recruitment

- 4 Almost nothing is known of rattail age, growth rates and age at maturity or recruitment. Preliminary studies have found, however, that some species may be long-lived (70 years).
- 5 Big-eye grenadier is a brownish grey species, averaging about 40cm and reaching at least 60cm.
- 6 White grenadier is a pale brownish-white species with an elongated pointed snout. It averages 50-60cm reaching a maximum length of at least 80 cm. It can provide edible fillets.
- 7 Two saddle grenadier is one of the most common species of rattail and averages 35-45cm in length.
- 8 Ridge-scaled grenadier is a large fish with a maximum reported size of 100cm and a maximum age of 19 years. It is medium brown to straw coloured.

Spatial and temporal distribution and key areas (feeding, spawning, migration)

- 9 Big-eye grenadier is endemic to New Zealand and is caught at depths of 350-800m, but particularly between 400 – 600m.
- 10 White grenadier is found at depths of 600 – 1200m around New Zealand and southern Australia.
- 11 Two saddle grenadier is caught in coastal waters at depths of 50 – 350m.
- 12 Ridge-scaled grenadier is found at depths of 200 – 1200m. It is widely distributed in sub-Antarctic and temperate waters off South Africa, South America and New Zealand.

Habitat interactions

- 13 No specific information is available.

Associated species (bycatch and target)

- 14 Rattails are taken as bycatch in a large number of middle-depth and deepwater fisheries targeting QMS species.

Environmental conditions

- 15 No information is available.

Protected species interactions

- 16 None known.

Stock Assessment

- 17 There are no estimates of current or reference biomass, or sustainable yield for any rattail species or stock.

Social, Economic, Cultural Information

Commercial fishery characteristics³

- 18 Due to their widespread geographic distribution, rattails have been reported as bycatch in over 30 target fisheries over the last five fishing years.
- 19 The following table summarises the total reported catch distribution by FMA for the fishing years 2002/03 – 2006/07. Note that no information is available for two saddle grenadier and ridge-scaled grenadier.

Species code	FMA1	FMA2	FMA3	FMA4	FMA5
RAT	132.02 t	417.67 t	10,742.99 t	5,844.67 t	1,104.75 t
WHX	25.02 t	0.32 t	0.00 t	0.03 t	0.00 t
CBO	0.34 t	0.00 t	0.00 t	0.00 t	0.02 t

Species code	FMA6	FMA7	FMA8	FMA9	FMA10
RAT	2,136.79 t	1,343.70 t	114.30 t	40.15 t	0.83 t
WHX	0.00 t	0.87 t	0.00 t	5.93 t	0.00 t
CBO	0.00 t	0.00 t	0.00 t	0.00 t	0.00 t

- 20 The total reported catch for each of the cited fishing years is shown in the following table. Note that no information is available for two saddle grenadier and ridge-scaled grenadier.

Species code	2002/03	2003/04	2004/05	2005/06	2006/07
RAT	5,872.45 t	4,766.71 t	3,801.30 t	4,056.26 t	3,381.15 t
WHX	7.65 t	6.89 t	1.89 t	12.70 t	3.04 t
CBO	0.0 t	0.0 t	0.36 t	0.0 t	0.0 t

- 21 The percentage of total reported catch for each fishing year discarded or landed is shown in the following table. Note that no information is available for two saddle grenadier and ridge-scaled grenadier.

RAT (rattails generic)

Landed state	2002/03	2003/04	2004/05	2005/06	2006/07
Discarded	27%	24%	29%	29%	42%
Landed	73%	76%	71%	71%	57%

³ Tables showing figures as percentages may not sum to 100% as percentages are rounded to the nearest whole number.

WHX (white grenadier)

Landed state	2002/03	2003/04	2004/05	2005/06	2006/07
Discarded	0%	0%	0%	0%	29%
Landed	100%	100%	100%	100%	71%

CBO (big-eye grenadier)

Landed state	2002/03	2003/04	2004/05	2005/06	2006/07
Discarded	-	-	5%	-	-
Landed	-	-	95%	-	-

- 22 The percentage of reported landed catch for each fishing year landed as dressed, green, or meal is shown in the following table. Note that no information is available for two saddle grenadier and ridge-scaled grenadier.

RAT (rattails generic)

	2002/03	2003/04	2004/05	2005/06	2006/07
Dressed	1%	1%	2%	1%	2%
Green	28%	25%	30%	30%	44%
Meal	71%	73%	68%	68%	54%

WHX (white grenadier)

	2002/03	2003/04	2004/05	2005/06	2006/07
Green	100%	100%	100%	100%	100%

CBO (big-eye grenadier)

	2002/03	2003/04	2004/05	2005/06	2006/07
Green	-	-	100%	-	-

- 23 Although many target fisheries report rattails as bycatch, the hoki target fishery dominates the estimated catch of rattails with over 70% of all reported estimated catch. Other fisheries catching reasonable quantities of rattails include scampi, orange roughy, squid and red cod. There does not appear to be any targeted fishing for rattail species.

Recreational fishery characteristics

- 24 MFish has no information on recreational catch of rattails. Due to the offshore location and depth distribution of this species, recreational catch is likely to be negligible.

Customary fishery characteristics

- 25 MFish has no information on recreational catch of rattails. Due to the offshore location and depth distribution of this species, customary catch is likely to be negligible.

Management

Existing management information

26 Rattail species are currently managed as an open access, non-QMS fishery.

Provisional catch history implications

27 Rattails – family Macrouridae are listed on schedule 4D. If introduced into the QMS before 1 October 2009, quota allocation will be by way of provisional catch history.

International obligations

28 There are no international obligations specific to rattails.

Treaty settlement obligations

29 MFish is undertaking research to provide information on the traditional and customary factors that may need to be considered in the management decision-making process. Currently there is no information specific to rattails.

Risk analysis and evaluation

STOCK: Rattails – family Macrouridae

Severity/likelihood risk analysis:

Generic objective 1: Risk to maintaining the potential of the stock to meet the reasonably foreseeable needs of future generations.

Analysis:

Reported catch data for the last five fishing years shows that large catches of rattails are taken annually. Catch is dominated by FMA 3 with large catch also taken in FMAs 4 – 7. There appears to be a decreasing trend in rattail catches with catch reported against the RAT code declining by 42 % over the last 5 years. At least some of the decrease in rattail catch is attributable to decreases in the TACC of hoki and orange roughy stocks over this period.

From 2002/03 to 2005/06 about three quarters of the rattail catch was landed with the remainder discarded. The percentage discarded increased to close to 50% in the most recent fishing year. Of the rattail landed the amount landed green has been steadily increasing and now accounts for close to 50%. There is some evidence that the larger rattails may be processed as they reportedly provide good edible fillets. However it is unclear what fraction of the catch of these species is reported against the species code rather than the generic RAT code.

There is no evidence that a target fishery is operating for any of the rattail species.

Little is known about the biology and life history characteristics of rattails and, given the predominant use of the generic RAT code, it is difficult to determine whether catches of individual species are sustainable. It is known that some rattail species are long-lived, which raises some concern. However, this is balanced against the widespread and locally abundant distribution typical of rattail species. Rattails have been a consistent component in the bycatch of New Zealand's middle-depth and deepwater trawl fisheries since their inception and remain well represented in catches across a broad range of fisheries.

Severity of impact (low, medium or high) : Low

Likelihood of impact (low, medium or high) : Low

Risk score (1-9) : 2

Generic objective 2: Risk to avoiding, remedying or mitigating any adverse effects of fishing on the aquatic environment.

Analysis:

There are no targeted rattail fisheries and the risk of adverse effects on the aquatic environment from the catch of these species under an open access management regime is low. While some catches of rattails are taken by bottom trawl this is only as a consequence of a target fishery for QMS species.

Nothing is known of the habitat interactions or of the marine ecosystem role of rattails, but as they are widespread and locally abundant they have some function in the marine ecosystem.

Severity of impact (low, medium or high) : Low

Likelihood of impact (low, medium or high) : Low

Risk score (1-9) : 1

Generic objective 3: Risk to providing access that enables social, cultural and economic wellbeing.

Analysis:

Rattails generally have low commercial value and close to half of the total rattail catch in the last fishing year was discarded. About half of what is landed is mealed with the remainder landed green. While there may be commercial possibilities for some of the larger rattails no targeting appears to be taking place at present.

There is no known recreational or customary take of rattails. There are no specific international obligations or Treaty settlement obligations known for rattails.

Severity of impact (low, medium or high) : Low

Likelihood of impact (low, medium or high) : Low

Risk score (1-9) : 1

Objective(s) returning highest score: 1

Risk based on severity/likelihood (low, medium, high): Low

Additional risk analysis not applicable as risk based on severity likelihood is low.

Draft Risk Evaluation

Is risk after severity/likelihood analysis HIGH? **No**

Is risk after severity/likelihood analysis MEDIUM; **and** immediacy and/or uncertainty is MEDIUM or HIGH? **No**

Is risk after severity/likelihood analysis LOW; **or** is risk after severity/likelihood analysis MEDIUM and immediacy and uncertainty are LOW? **Yes - stock is in GROUP 3**

REDBAIT

Species:	<i>Emmelichthys nitidus</i>
Common Name:	Redbait
Species code:	RBT
Stock area:	1-10

Biological information

Morphology, growth, reproduction and recruitment

- 1 Redbait feed mainly on larger zooplankton and grow to a maximum total length of 50cm. The species is reddish in colour, darker (bluish grey) dorsally and silvery white below. Redbait is reported to be an excellent food fish. There is no information available on the reproduction or recruitment of this species.



Image provided by NIWA

Spatial and temporal distribution and key areas (feeding, spawning, migration)

- 2 Redbait is a schooling, bathypelagic species (near-bottom to midwater) found over favoured feeding sites – typically submarine rises and seamounts. It has been reported from depths of between 86m to 500m.
- 3 Juveniles occur near the surface with adults found near the bottom in deeper water.

Habitat interactions

- 4 No information is available.

Associated species (bycatch and target)

- 5 Redbait is taken as bycatch in a large number of fisheries targeting QMS species, particularly the jack mackerel, squid, and barracouta fisheries. Analysis of observer data from 1998-2001 showed that redbait contributed 4% to the total catch weight and was the third most common bycatch species by weight in the jack mackerel fishery.

Redbait contributed 1% to the total catch weight and was the sixth most common bycatch species by weight in the squid trawl fishery.¹

Environmental conditions

6 No information is available.

Protected species interactions

7 None known although target fisheries taking redbait as bycatch are known to interact with seabirds, fur seals and sealions.

Stock Assessment

8 There are no estimates of current or reference biomass, or sustainable yield.

Social, Economic, Cultural Information

Commercial fishery characteristics²

9 Due to its widespread geographic distribution, redbait has been reported as bycatch in 23 target fisheries over the last five fishing years. For the fishing years 2002/03 – 2006/07 total EEZ reported catch of redbait was 16,742 tonnes, most of which was taken by the method of mid-water trawl. The following table summarises the total catch distribution by FMA for the fishing years 2002/03 – 2006/07.

FMA1	FMA2	FMA3	FMA4	FMA5	FMA6	FMA7	FMA8	FMA9	FMA10
50 t	3 t	1,064 t	133 t	5,544 t	9 t	5,003 t	3,600 t	1,334 t	0 t

10 The total reported catch for each of the cited fishing years is shown in the following table.

2002/03	2003/04	2004/05	2005/06	2006/07
3,311 t	4,419 t	2,532 t	4,031 t	2,449 t

11 The percentage of total reported catch for each fishing year discarded or landed is shown in the following table.

	2002/03	2003/04	2004/05	2005/06	2006/07
Discarded	6%	5%	11%	3%	5%
Landed	94%	95%	89%	97%	95%

12 The percentage of reported landed catch for each fishing year landed as dressed, green, or meal is shown in the following table (assuming discarded catch is reported as green).

¹ Anderson, O.F. (2004) Fish discards and non-target fish catch in the trawl fisheries for arrow squid, jack mackerel, and scampi in New Zealand waters. *New Zealand Fisheries Assessment Report 2004/10*. 61 p.

² Tables showing figures as percentages may not sum to 100% as percentages are rounded to the nearest whole number.

	2002/03	2003/04	2004/05	2005/06	2006/07
Dressed	0%	0%	6%	6%	10%
Green	0%	1%	19%	40%	34%
Meal	100%	99%	75%	54%	56%

- 13 Although over 20 target fisheries report redbait as bycatch, the jack mackerel fishery reports by far the most redbait bycatch (65% of estimated catch is reported as a bycatch of jack mackerel over the last 5 years). Other fisheries reporting significant quantities of redbait bycatch are squid (17%) and barracouta (14%). There may be a small targeted fishery with 2% of estimated redbait catch reported as targeted in the 2004/05, 5% in 2005/06 and 3% in 2006/07.
- 14 Analysis of fish discards from 1998-2001 observer data in the jack mackerel and squid trawl fisheries showed that the percentage of redbait catch discarded was 19 and 27% respectively.³ These figures suggest that discards of this species may be under-reported.

Recreational fishery characteristics

- 15 MFish has no information on recreational catch of redbait. Due to the offshore location and depth distribution of this species, recreational catch is likely to be negligible.

Customary fishery characteristics

- 16 MFish has no information on customary catch of redbait. Due to the offshore location and depth distribution of this species, customary catch is unlikely.

Existing management information

- 17 Redbait is currently managed as an open access, non-QMS fishery.

Provisional catch history implications

- 18 Redbait is a Schedule 4D species. If introduced into the QMS before 1 October 2009 quota allocation will be by way of provisional catch history.

International obligations

- 19 There are no international obligations specific to redbait.

Treaty settlement obligations

- 20 MFish is undertaking research to provide information on the traditional and customary factors that may need to be considered in the management decision-making process. Currently there is no information specific to redbait.

³ Anderson, O.F. (2004) Fish discards and non-target fish catch in the trawl fisheries for arrow squid, jack mackerel, and scampi in New Zealand waters. *New Zealand Fisheries Assessment Report 2004/10*. 61 p

Risk analysis and evaluation

STOCK: Redbait (*Emmelichthys nitidus*)

Severity/likelihood risk analysis:

Generic objective 1: Risk to maintaining the potential of the stock to meet the reasonably foreseeable needs of future generations.

Analysis:

Redbait is primarily taken as bycatch of established jack mackerel, squid and barracouta mid-water trawl fisheries. Over the last 5 years catch has fluctuated between approximately 2,000 to 4,000 tonnes annually with no clear increasing or decreasing trend. There is no evidence of a sustainability concern from available catch data.

This may change however if catches increase through development of a target fishery. There appears to be a market for redbait as the amount dressed or landed green has steadily increased over the last three years and now amounts to close to 50%.

Severity of impact (low, medium or high) : Low

Likelihood of impact (low, medium or high) : Low

Risk score (1-9) : 2

Generic objective 2: Risk to avoiding, remedying or mitigating any adverse effects of fishing on the aquatic environment.

Analysis:

The risk of adverse effects on the aquatic environment from catch of redbait under an open access management regime is low as there is only a limited target fishery for the species.

There are however environmental effects related to the principal target fisheries that take redbait – primarily relating to seabird and marine mammal interactions. There may therefore be environmental effects associated with a redbait target fishery should one develop in the future.

Nothing is known of the ecosystem role of redbait.

Severity of impact (low, medium or high) : Low

Likelihood of impact (low, medium or high) : Low

Risk score (1-9) : 1

Generic objective 3: Risk to providing access that enables social, cultural and economic wellbeing.

Analysis:

There is no evidence that a target fishery is developing as the amount targeted has remained low and stable in recent years, and there is no increasing trend in total catch. However the increasing amount of product landed dressed or green rather than mealed suggests that a market for redbait is developing. There may be potential for development of a target fishery.

As an open access fishery there are no barriers to utilisation of this species but security of ownership of the resource may enhance fishery development and the economic wellbeing of those investing in fishery development.

There is no information available to suggest a recreational or customary fishery for redbait.

Redbait was considered for introduction into the QMS on 1 October 2004, however the Minister declined to introduce the species. At that time he considered it appropriate to continue to manage the species outside the QMS until such time as more explicit sustainability or utilisation issues were identified that warranted active management.

Severity of impact (low, medium or high) : Medium

Likelihood of impact (low, medium or high) : Low

Risk score (1-9) : 3

Objective(s) returning highest score: 3

Risk based on severity/likelihood (low, medium, high): Low

Additional risk analysis not applicable as risk based on severity likelihood is low.

Draft Risk Evaluation

Is risk after severity/likelihood analysis HIGH? **No**

Is risk after severity/likelihood analysis MEDIUM; **and** immediacy and/or uncertainty is MEDIUM or HIGH? **No**

Is risk after severity/likelihood analysis LOW; **or** is risk after severity/likelihood analysis MEDIUM and immediacy and uncertainty are LOW? **Yes - stock is in GROUP 3**

SEAL SHARK

Species:	<i>Dalatias licha</i>
Common Name:	Seal shark
Species code:	BSH
Stock area:	1-10

Biological information

Morphology, growth, reproduction and recruitment

- 1 Of the published data on the biology of sharks in New Zealand waters, little has focused on seal shark. Seal shark is a large shark (maximum recorded length 182cm), with males becoming sexually mature at 100cm and females at 120cm. Like other deepwater shark and dogfish species productivity is likely to be low. These are ovoviviparous sharks (internal hatching with live births) with an average litter size of 12 pups ranging from 40-42cm at birth.

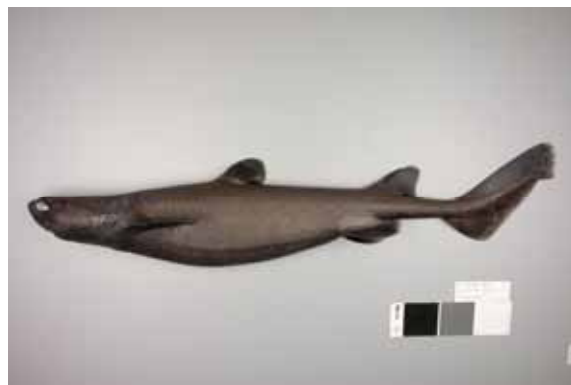


Image provided by NIWA

Spatial and temporal distribution and key areas (feeding, spawning, migration)

- 2 Seal shark is one of six deepwater shark species that are widely distributed over the New Zealand continental shelf. It commonly occurs on the middle and lower New Zealand continental shelf, mainly in depths greater than 600m. It is reported in catches from the north, east, and west of the North Island, from the Kaikoura coast and from the north and east Chatham Rise, but is less common on the south Chatham Rise and Snares shelf. It also occurs on Puysegur Bank and the South Island west coast, and on the Challenger Plateau. The majority of catches are taken from the Chatham Rise and Puysegur Bank.
- 3 Seal shark is believed to be a mobile species, possibly undergoing seasonal or long-term migrations.
- 4 Distribution of juveniles is unknown.
- 5 Seal shark feed primarily on bony fish (94% of their diet) and also on elasmobranches and cephalopods.

Habitat interactions

6 No information is available.

Associated species (bycatch and target)

7 Seal shark is taken as bycatch in a large number of fisheries targeting QMS species. A limited amount of target fishing also occurs.

Environmental conditions

8 No information is available.

Protected species interactions

9 None known.

Stock Assessment

10 There are no estimates of current or reference biomass, or sustainable yield. However, like other deepwater shark and dogfish species it may not be able to withstand high exploitation rates due to low productivity and fecundity.

11 In a review of the distribution and abundance of deepwater sharks in New Zealand¹, the only relative biomass estimates for seal shark were derived from two trawl surveys on the Chatham Rise in 2001, resulting in estimates from 103 to 289 tonnes. Analysis of trawl survey and catch per unit effort (CPUE) data from 1989-90 through 1998-99 indicated an increase in seal shark relative abundance in depths greater than 800m on the Chatham Rise, although the changes may represent better catch reporting rather than changes in abundance. Other regions in New Zealand waters were not reviewed.

Social, Economic, Cultural Information

Commercial fishery characteristics²

12 Due to its widespread geographic distribution, seal shark has been reported as bycatch in 37 target fisheries over the last five fishing years. For the fishing years 2002/03 – 2006/07 total EEZ reported catch of seal shark was 3,125 tonnes. Note that this figure and those in the following tables only relate to catch or landings reported against the BSH code. Seal shark may also be reported against generic codes (e.g. OSD – other sharks and dogfish or DWD – deepwater dogfish). Seal shark may also be confused with Lucifer dogfish and reported against the code ETL. There may be further confusion between the code for seal shark (BSH) and the code for basking shark (BSK) leading to under-reporting of seal shark.

13 The following table summarises the total reported catch distribution by FMA for the fishing years 2002/03 – 2006/07.

FMA1	FMA2	FMA3	FMA4	FMA5	FMA6	FMA7	FMA8	FMA9	FMA10
61 t	278 t	1,254 t	708 t	238 t	282 t	295 t	1 t	9 t	0 t

¹ Blackwell, R.G.; Stevenson, M.L. (2003) Review of the distribution and abundance of deepwater sharks in New Zealand waters. *New Zealand Fisheries Assessment Report 2003/40*. 48 p.

² Tables showing figures as percentages may not sum to 100% as percentages are rounded to the nearest whole number.

- 14 The total reported catch for each of the cited fishing years is shown in the following table.

2002/03	2003/04	2004/05	2005/06	2006/07
656 t	695 t	684 t	606 t	485 t

- 15 The percentage of total reported catch for each fishing year discarded or landed is shown in the following table.

	2002/03	2003/04	2004/05	2005/06	2006/07
Discarded	46%	48%	30%	33%	27%
Landed	54%	51%	69%	67%	73%

- 16 The percentage of reported landed catch for each fishing year landed as dressed, green, or meal is shown in the following table (assuming discarded catch is reported as green).

	2002/03	2003/04	2004/05	2005/06	2006/07
Dressed	41%	32%	37%	30%	31%
Headed and gutted	6%	3%	3%	3%	3%
Green	46%	49%	31%	33%	27%
Meal	0%	13%	19%	28%	26%
Livers	7%	2%	10%	6%	13%

- 17 Although almost 40 target fisheries report seal shark as bycatch, the ling, hoki and orange roughy target fisheries dominate the estimated catch of seal shark (35%, 27% and 17% respectively over the last 5 years). Targeted fishing accounted for 10% of the estimated seal shark catch in 2004/05 but averages less than 2.5% over the last five fishing years and in 2006/07 accounted for only 0.25%.

- 18 Seal shark is taken by several methods. The percentage of estimated catch of seal shark taken by the various methods is shown in the table below. The majority is taken by bottom trawl and set net.

Method	2002/03	2003/04	2004/05	2005/06	2006/07
Bottom longline	6.8%	9.0%	10.2%	15.1%	15.6%
Bottom trawl	52.0%	56.2%	39.7%	49.5%	53.8%
Crab potting	-	-	-	-	0.2%
Drop / dahn lines	0.4%	0.3%	0.3%	0.5%	0.2%
Midwater trawl	0.3%	1.3%	1.1%	1.1%	2.3%
Set net	39.4%	33.1%	48.6%	33.8%	28.0%
Trot line	1.2%	0.1%	-	-	-

- 19 In the last decade, seal shark has become an important bycatch species, more recently marketed for its flesh. The estimated commercial catch of seal shark increased from 1989-90 through 2004-05 and has decreased in the last two years. This may reflect changes in stock abundance, or alternatively, changes in reporting of seal shark

catches. The reported discards have decreased as a percentage of reported catch and approximately 75% is now landed, indicating some level of market interest.

Recreational fishery characteristics

- 20 MFish has no information on recreational catch of seal shark. Due to the offshore location and depth distribution of this species, recreational catch is likely to be negligible.

Customary fishery characteristics

- 21 MFish has no information on customary catch of seal shark. Due to the offshore location and depth distribution of this species, customary catch is likely to be negligible.

Management

Existing management information

- 22 Seal shark is currently managed as an open access, non-QMS fishery

Provisional catch history implications

- 23 Seal shark is a Schedule 4D stock. If introduced into the QMS before 1 October 2009 quota allocation will be by way of provisional catch history.

International obligations

- 24 There are no international obligations specific to seal shark.

Treaty settlement obligations

- 25 MFish is undertaking research to provide information on the traditional and customary factors that may need to be considered in the management decision-making process. Currently there is no information specific to seal shark.

Risk analysis and evaluation

STOCK: Seal shark (*Dalatias licha*)

Severity/likelihood risk analysis:

Generic objective 1: Risk to maintaining the potential of the stock to meet the reasonably foreseeable needs of future generations.

Analysis:

The estimated commercial catch of seal shark increased from 1989-90 through 2004-05 and has decreased in the last two years. This may reflect changes in stock abundance, or alternatively, changes in reporting of seal shark catches. The reported discards have decreased as a percentage of reported catch and approximately 75% is now landed.

Changes in fishing patterns in the target fisheries will determine seal shark catches. If seal shark continues to be taken primarily as bycatch, it is likely that current catch levels will remain the same. However, under open access, catch might increase if market demand for seal shark increases.

It is not known whether or not recent catch levels of seal shark are sustainable. There is very limited stock assessment information for this species and no estimates of current or reference biomass or sustainable yield. There are risks associated with the unchecked harvest of seal shark as, like other deepwater shark and dogfish species, it may not be able to withstand high exploitation rates due to low productivity and fecundity.

Severity of impact (low, medium or high) : Medium

Likelihood of impact (low, medium or high) : Medium

Risk score (1-9) : 4

Generic objective 2: Risk to avoiding, remedying or mitigating any adverse effects of fishing on the aquatic environment.

Analysis:

Seal shark is principally caught as bycatch by the methods of bottom trawling and set netting when targeting other species. Any existing effects arise principally from those target fisheries. It is unlikely that there will be additional adverse effects on the aquatic environment under current seal shark catch levels unless there is an increase in target fishing effort beyond current levels.

Severity of impact (low, medium or high) : Low
Likelihood of impact (low, medium or high) : Low

Risk score (1-9) : 1

Generic objective 3: Risk to providing access that enables social, cultural and economic wellbeing.

Analysis:

In the last decade, seal shark has become an important bycatch species, more recently marketed for its flesh. Estimated catch appears to have declined in recent years. The percentage of discards continues to fall. Of the seal shark landed, 61% is dressed, headed and gutted or landed green and 13% is processed for its liver, which shows some level of market interest. The target fishery shows highly variable catch, with few consistent harvesters.

MFish considers that the key issue for the Crown in managing seal shark is creating a management framework that enables the utilisation of fisheries resources while ensuring deepwater shark sustainability. Currently, seal shark is managed using an open access management regime. The only barriers to entry are the requirement to obtain a fishing permit and any capital costs associated with fishing. Seal shark was considered for introduction into the QMS on 1 October 2007 and 1 October 2004 but was not introduced at either time. Nothing has occurred to alter this position and consequently MFish considers that the current framework is enabling people to provide for their wellbeing to the current extent of interest in the seal shark resource.

Seal shark is of little or no value to customary or recreational fishers.

Severity of impact (low, medium or high) : Low
Likelihood of impact (low, medium or high) : Low

Risk score (1-9) : 1

Objective(s) returning highest score: 1

Risk based on severity/likelihood (low, medium, high): Medium

Immediacy and uncertainty risk analysis (for medium risk stocks or species only):

Immediacy of impact on objective returning highest score:

Analysis:

Although the low productivity of seal shark means there is a risk to the sustainability of the stock under an open access management regime, catch rates do not appear to be increasing and there is unlikely to be a dramatic increase in market potential for this species.

Immediacy value (low, medium or high) : low

Uncertainty of information used in analysis of objective returning highest score:

Analysis:

There is some uncertainty relating to reported catches due to the use of generic codes, possible confusion in differentiating this species from Lucifer dogfish and confusion with the basking shark reporting code.

There are no estimates of current or reference biomass, or sustainable yield although there is some information from a review of the distribution and abundance of deepwater sharks in New Zealand. Like other deepwater shark and dogfish species seal shark is understood to exhibit low productivity and fecundity.

Uncertainty value (low, medium or high) : medium

Collation of additional management information (for stocks or species remaining in group 2 only):

Ease of implementation

Analysis:

Seal shark was twice considered recently for QMS introduction so existing summaries of information are reasonable.

Conclusion: Relative ease

Relationship with other QMS stocks or species

Analysis:

No seal shark stocks have been introduced to the QMS and there are no relevant relationships with other QMS stocks or species.

Conclusion: Nothing relevant

Deployment of MFish resources:

Analysis:

No information available at this time.

Conclusion: Nothing relevant

Provisional catch history implications:

Analysis:

Seal shark is listed on Schedule 4D and provisional catch history exists for this species.

Conclusion: There are likely to be PCH implications should seal shark be introduced to the QMS before 1 October 2009.

Draft Risk Evaluation

Is risk after severity/likelihood analysis HIGH? **No**

Is risk after severity/likelihood analysis MEDIUM; **and** immediacy and/or uncertainty is MEDIUM or HIGH? **Yes - stock is in GROUP 2**

Is risk after severity/likelihood analysis LOW; **or** is risk after severity/likelihood analysis MEDIUM and immediacy and uncertainty are LOW? **No**

SILVER DORY

Species:	<i>Cyttus novaezealandiae</i>
Common Name:	Silver dory
Species code:	SDO
Stock area:	1-10

Biological information

Morphology, growth, reproduction and recruitment

- 1 Silver dory has the thin, deep body typical of the dories. The body is a uniform silver colour, the fins are pink, and the spiny dorsal and pelvic fin tips are black. Individuals attain an average of 20 to 30cm in length, but can reach a maximum of 40cm. There is no information available on the reproduction or recruitment of this species.



Image provided by NIWA

Spatial and temporal distribution and key areas (feeding, spawning, migration)

- 2 Silver dory inhabits the New Zealand shelf and slope and is reported from water depths between 20 - 450m. Silver dory is taken as bycatch in all fishery management areas (FMAs) and thus appears to be a widespread species.
- 3 There is no information available regarding feeding, spawning or migratory behaviour.

Habitat interactions

- 4 No information is available.

Associated species (bycatch and target)

- 5 Silver dory is taken as bycatch in a large number of fisheries targeting QMS species, particularly the middle depths trawl fisheries.

Environmental conditions

- 6 No information is available.

Protected species interactions

7 None known.

Stock Assessment

8 There are no estimates of current or reference biomass, or sustainable yield.

Social, Economic, Cultural Information

Commercial fishery characteristics¹

9 Due to its widespread geographic distribution, silver dory is taken as bycatch in at least 30 target fisheries. For the fishing years 2002/03 – 2006/07 total EEZ reported catch of silver dory was 3,859 tonnes. The following table summarises the total reported catch distribution by FMA for the fishing years 2002/03 – 2006/07.

FMA1	FMA2	FMA3	FMA4	FMA5	FMA6	FMA7	FMA8	FMA9	FMA10
103 t	23 t	354 t	56 t	1,114 t	6 t	772 t	806 t	624 t	0 t

10 The total reported catch for each of the cited fishing years is shown in the following table.

2002/03	2003/04	2004/05	2005/06	2006/07
937 t	844 t	1,035 t	559 t	484 t

11 The percentage of total reported catch for each fishing year discarded or landed is shown in the following table.

	2002/03	2003/04	2004/05	2005/06	2006/07
Discarded	35%	36%	35%	32%	34%
Landed	65%	64%	65%	68%	66%

12 The percentage of reported landed catch for each fishing year landed as dressed, green, or meal is shown in the following table (assuming discarded catch is reported as green).

	2002/03	2003/04	2004/05	2005/06	2006/07
Dressed	0%	0%	0%	0%	0%
Green	6%	8%	3%	3%	4%
Meal	94%	92%	97%	96%	95%

13 Although over 30 target fisheries report silver dory as bycatch, the mid-water jack mackerel fishery reports the most bycatch of this species. Other fisheries reporting significant quantities of silver dory bycatch are squid, barracouta and hoki. The gemfish, silver warehou, tarakihi, and white warehou fisheries report moderate bycatch amounts.

¹ Tables showing figures as percentages may not sum to 100% as percentages are rounded to the nearest whole number.

Recreational fishery characteristics

- 14 MFish has no information on recreational catch of silver dory. Due to the offshore location and depth distribution of this species, recreational catch is likely to be negligible.

Customary fishery characteristics

- 15 MFish has no information on customary catch of silver dory. Due to the offshore location and depth distribution of this species, customary catch is likely to be negligible.

Management

Existing management information

- 16 Silver dory is currently managed as an open access, non-QMS fishery.

Provisional catch history implications (Schedule 4C and 4D stocks or species)

- 17 Silver dory is a Schedule 4D stock. If introduced into the QMS before 1 October 2009 quota allocation will be by way of provisional catch history.

International obligations

- 18 There are no international obligations specific to silver dory.

Treaty settlement obligations

- 19 MFish is undertaking research to provide information on the traditional and customary factors that may need to be considered in the management decision-making process. Currently there is no information specific to silver dory.

Risk analysis and evaluation

STOCK: Silver Dory (*Cyttus novaezealandiae*)

Severity/likelihood risk analysis:

Generic objective 1: Risk to maintaining the potential of the stock to meet the reasonably foreseeable needs of future generations.

Analysis:

Reported catch data for the fishing years 2002/03 – 2006/07 indicates that catch varied between approximately 1,034 tonnes in 2004-05 and 484 tonnes in the most recent fishing year. It is uncertain what led to the large decrease in catch over the last two fishing years. Silver dory is taken as bycatch in at least 30 fisheries that target QMS species and the decline might reflect overall decreased effort in associated target fisheries. The catch of jack mackerel (the principle target fishery in which silver dory is taken) has also decreased over the last two fishing years although whether this is due to reduced effort is unclear. The decline in silver dory take may also be due to natural annual variation in silver dory stocks, changes to the spatial distribution of effort in target fisheries taking silver dory as bycatch, or a fishing-related cause that affects silver dory stock abundance.

Nothing is known regarding reproduction, recruitment, or habitat interactions of silver dory. Given the highly variable reported catch, the level of risk to silver dory stocks is difficult to assess although decreases in catch over the last two years provide some cause for concern.

Severity of impact (low, medium or high) : Medium

Likelihood of impact (low, medium or high) : Low

Risk score (1-9) : 3

Generic objective 2: Risk to avoiding, remedying or mitigating any adverse effects of fishing on the aquatic environment.

Analysis:

The risk of adverse effects on the aquatic environment from catch of silver dory under an open access management regime is low due to the fact that there is no target fishery for the species. Some catches of silver dory are taken by bottom trawl, but only as a consequence of a target fishery for QMS species.

Nothing is known of the habitat interactions or of the marine ecosystem role of silver dory but due to its widespread habitat, it has some function in the marine ecosystem.

Severity of impact (low, medium or high) : Low
Likelihood of impact (low, medium or high) : Low

Risk score (1-9) : 1

Generic objective 3: Risk to providing access that enables social, cultural and economic wellbeing.

Analysis:

Silver dory is not targeted by commercial fisheries and has low commercial value to fishers (approximately one third of the catch is discarded with the remainder mealed).

There is no information available to suggest a recreational or customary fishery for silver dory and there are no specific international obligations or Treaty settlement obligations known.

Severity of impact (low, medium or high) : Low
Likelihood of impact (low, medium or high) : Low

Risk score (1-9) : 1

Objective(s) returning highest score: 1

Risk based on severity/likelihood (low, medium, high): Low

Additional risk analysis not applicable as risk based on severity likelihood is low.

Draft Risk Evaluation

Is risk after severity/likelihood analysis HIGH? **No**

Is risk after severity/likelihood analysis MEDIUM; **and** immediacy and/or uncertainty is MEDIUM or HIGH? **No**

Is risk after severity/likelihood analysis LOW; **or** is risk after severity/likelihood analysis MEDIUM and immediacy and uncertainty are LOW? **Yes - stock is in GROUP 3**