



Management measures relating to the introduction of the common Hagfish into the QMS on 1 October 2014

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MPI welcomes written submissions on the proposals contained in the IPP. All written submissions must be received by MPI no later than 5pm on Wednesday 25 June 2014.

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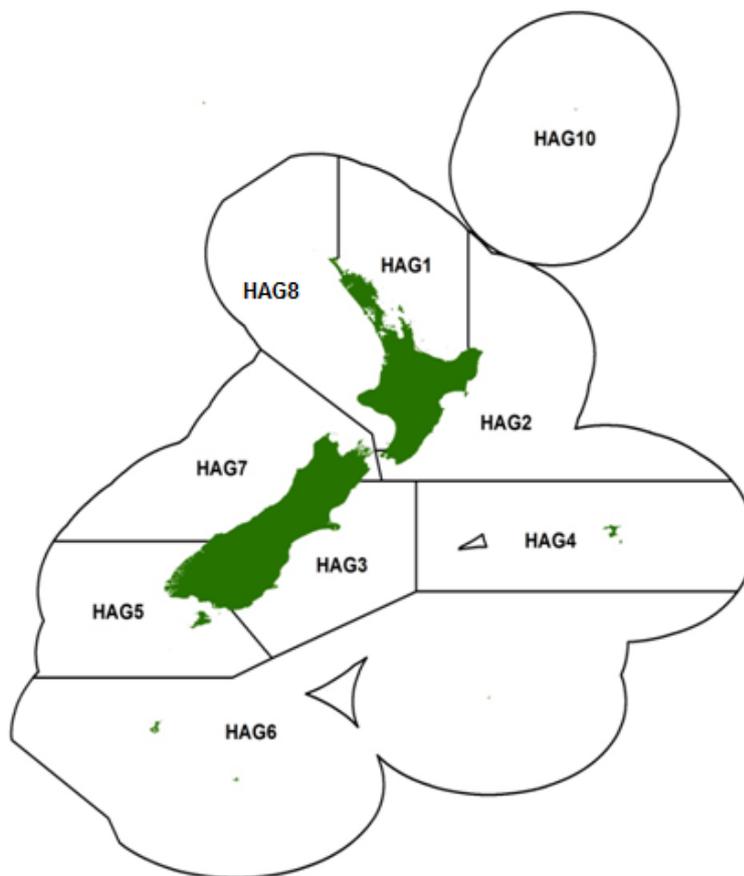
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Contents

Page

1	Executive summary	1
2	Context	4
	Need to Act	4
3	Available Information	5
	Biological Characteristics of the Common Hagfish	5
	The Common Hagfish Fishery	6
	Other Sources of Fishing-Related Mortality	8
4	Management Options	9
	Basis for Setting TACs: Section 13(2A) Management	9
5	Summary of Proposals	10
6	Total Allowable Catch (TAC) Setting	11
7	Allocation of the TAC	14
	Customary Māori and Recreational Allowances	14
	Allowance for Other Sources of Fishing-Related Mortality	14
	Total Allowable Commercial Catch (TACC)	15
	Environmental Impacts	16
8	Other Management Measures	17
	Return of live hagfish to the sea	17
	Deemed value rates and overfishing threshold	17
	Potential Future Development	19
9	Conclusion	20

Figure 1: Quota Management Areas (QMAs) for the common hagfish



1 Executive Summary

1. The common hagfish (*Eptatretus cirrhatus*) will enter the Quota Management System (QMS) on 1 October 2014. The Quota Management Areas (QMAs) for the common hagfish are shown in Figure 1.
2. The purpose of this document is to initiate a consultation process on behalf of the Minister for Primary Industries (the Minister) regarding management measures for common hagfish stocks.
3. The Ministry for Primary Industries (MPI) is proposing the following options for Total Allowable Catches (TACs), Total Allowable Commercial Catches (TACCs), sector allowances, and other sources of fishing-related mortality (Table 1).

Table 1: Proposed TACs, TACCs, sector allowances, and other sources of fishing-related mortality for common hagfish stocks

Option	Stock	Allowances				Other sources of fishing related mortality (t)
		TAC (t)	TACC (t)	Customary Māori (t)	Recreational (t)	
Option 1	HAG1	112	100	1	1	10
	HAG2	112	100	1	1	10
	HAG3	112	100	1	1	10
	HAG4	112	100	1	1	10
	HAG5	112	100	1	1	10
	HAG6	13	10	1	1	1
	HAG7	167	150	1	1	15
	HAG8	112	100	1	1	10
	HAG10	13	10	1	1	1
	Option 2 (MPI preferred option)	HAG1	112	100	1	1
HAG2		57	50	1	1	5
HAG3		57	50	1	1	5
HAG4		57	50	1	1	5
HAG5		57	50	1	1	5
HAG6		13	10	1	1	1
HAG7		112	100	1	1	10
HAG8		57	50	1	1	5
HAG10		13	10	1	1	1

4. Under Option 1, the proposed TACs are based on an average of commercial catches reported over the past seven fishing years (2006/07 – 2012/13), plus assumed recreational and customary take, and the level of other sources of fishing-related mortality. This option reflects that catch records indicate that current levels of utilisation have been sustained at the level of the Fisheries Management Area (FMA) over the past seven years, and allows for the maximum socio-economic benefits and utilisation potential to be derived from these stocks.
5. Under Option 2, the proposed TACs are set lower than reported average annual commercial take from the past seven years. This reflects that current catch per unit effort analyses are inconclusive, and there is uncertainty around what level of take will continue to be sustainable. Option 2 provides a cautious approach to TAC setting, while allowing the opportunity for more information to be collected to inform raising TACs in the future, if that information suggests higher catches are sustainable.
6. Both options allow for development potential in under-utilised areas.
7. Additionally, MPI proposes the following management measures for each stock to support QMS management:
 - a) Consider adding the common hagfish to the Sixth Schedule of the Fisheries Act 1996 (the Act) to allow the live return of hagfish to the water that are likely to survive; and
 - b) Set the interim and annual deemed value rates for common hagfish using one of the three options outlined below:
 - (i) Set annual deemed value rate of \$3.00 per kg, and set interim deemed value rate of \$2.70 per kg; **OR**
 - (ii) Set annual deemed value rate of \$12.00 per kg, and set interim deemed value rate of \$10.80 per kg; **OR**

- (iii) Set annual deemed value rates of \$12.00 per kg for HAG1 and 2, and \$3.00 per kg for HAG3, 4, 5, 6, 7, and 8; and, set interim deemed value rates of \$10.80 per kg for HAG1 and 2, and \$2.70 per kg for HAG3, 4, 5, 6, 7, and 8; **AND**
 - (iv) Regardless of which option is chosen, set standard differential deemed value rates for common hagfish stocks, and do not set overfishing thresholds at this time.
- c) Amend the Fisheries (Reporting) Regulations 2001 to include reporting codes for hagfish stocks.

2 Context

NEED TO ACT

8. The Minister has informed MPI of his decision to introduce the common hagfish into the Quota Management System on 1 October 2014. Concurrently, the Minister made a decision to set nine QMAs for the common hagfish, which will be referred to as HAG1, HAG2, HAG3, HAG4, HAG5, HAG6, HAG7, HAG8, and HAG10.
9. The Minister declared the fishing year will begin on 1 October and end on 30 September in the following year. The TACs, TACCs, and Annual Catch Entitlement (ACE) will be expressed in terms of greenweight (kilograms, kg).
10. In order to support these decisions, the Minister must now set a TAC, a TACC, associated allowances, and deemed value rates for all common hagfish stocks. He must also agree to any other management controls necessary to support the introduction of common hagfish stocks into the QMS on 1 October 2014.
11. MPI considers the following key issues affect the setting of sustainability measures and other management controls for the common hagfish:
 - a) There are no estimates of current biomass, sustainable yield, or of stock status for any common hagfish stock. Stocks were considered to be near virgin biomass prior to the development of a target fishery in 2006. Now some stocks, predominantly HAG1, HAG2, and HAG7, have been subject to a target fishery for the past seven years.
 - b) Hagfish have a moderate to high vulnerability and low resilience to overfishing.¹ Many overseas hagfish fisheries have collapsed or are in decline.
 - c) The common hagfish is considered to be a slow growing, low productivity species. It has no known migration or larval phase, and is therefore vulnerable to serial localised depletion.
 - d) Reported catch data indicates that a high proportion of catch is returned to the water in the target fishery. The survival rate of released hagfish is unknown.

¹ Fishbase.org

3 Available Information

BIOLOGICAL CHARACTERISTICS OF THE COMMON HAGFISH

12. The common hagfish, *Eptatretus cirrhatus*, is a common bottom-dwelling marine fish found throughout New Zealand coastal shelf waters. It is sometimes known as the slime-eel, due to its eel like shape and ability to produce copious amounts of slime as a defence mechanism when stressed. It inhabits a depth range from as shallow as 1 m to up to 900 m, but is most common between 90 m and 700 m. Populations of common hagfish can be highly abundant, but are often highly localised too; therefore, abundance is expected to be patchy.
13. The common hagfish is a low productivity species, and it is thought to be very slow growing. One study showed that females spawned first at a length of between 412 mm and 534 mm, whereas males developed later than females. Many individuals were not considered to be maturing until a size of 585 mm. ² It is not known where or when the common hagfish reproduces, but there is no evidence to suggest that reproduction is seasonal.²
14. Evidence from species overseas indicates that hagfish can take up to 2 or 3 years after maturing to produce between 6 and 80 eggs, depending on the species, but frequency of reproduction is not known. Development of the embryo is also slow, though MPI has no information on embryo development for the common hagfish.
15. Information collected from discussions with stakeholders suggests that the common hagfish may have developed differing tolerances to environmental factors (for example, salinity or temperature) throughout its geographic range. As such, hagfish may respond to fishing pressure differently between the east coast and west coast of the North Island due to these potential differences in environmental tolerances. This has led fishers to suggest that there are multiple species similar to the common hagfish throughout coastal New Zealand; however, MPI currently has no scientific evidence to test this suggestion.

Stock Status

16. The stock structure of hagfish is unknown. There are no estimates of absolute or relative abundance of hagfish, 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.
17. The only available information on stock status for hagfish is trends in catch, limited catch per unit effort (CPUE) analyses, and the performance of hagfish fisheries overseas. Trends in catch are sometimes used as a proxy for biomass in the absence of better information; however, they offer no indication of the amount of effort that was made to achieve those levels of catch, or the level of catch that will be sustainable over the long-term.

² Martini, F. H., Beulig, A. 2013. Morphometrics and gonadal development of the hagfish *Eptatretus cirrhatus* in New Zealand. *PLOS ONE*. Volume 8. Issue 11. E78740

18. CPUE analyses account for fishing effort, but current analyses for the hagfish fishery have been largely inconclusive and highlight that there is high uncertainty as to whether or not past levels of catch are sustainable. These analyses will require further scrutiny as more information becomes available.

THE COMMON HAGFISH FISHERY

19. Common hagfish have been targeted since 2006. Catch records indicate a sharp decrease in landings after 2009/10 (Figure 2); however, MPI is aware that this was primarily due to a company that was responsible for the majority of the fishing effort going out of business.

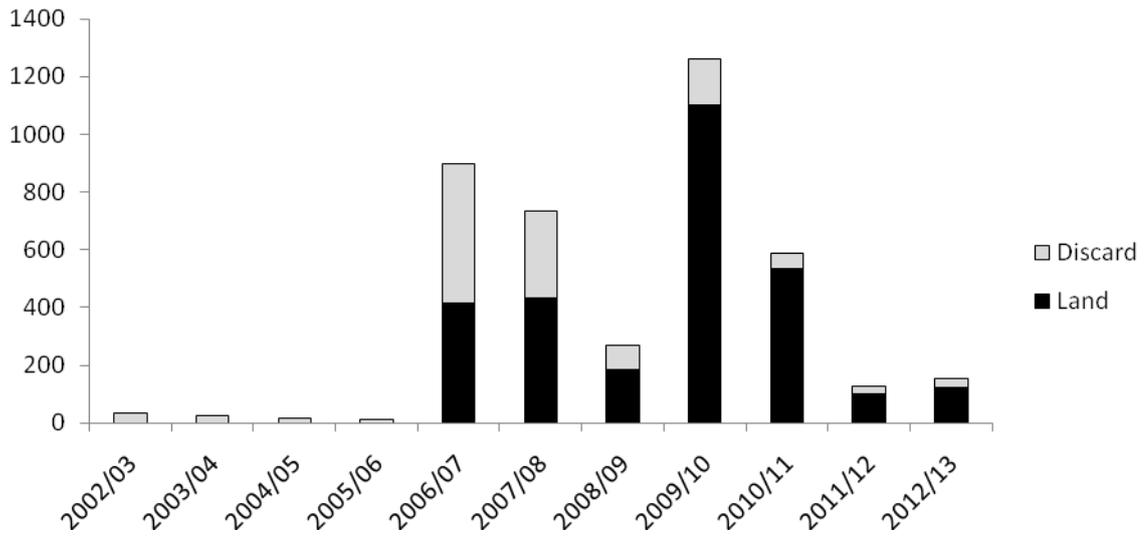


Figure 2: Total reported landed and discarded catch in tonnes greenweight for hagfish from the 2002/03 fishing year up to the 2012/13 fishing year

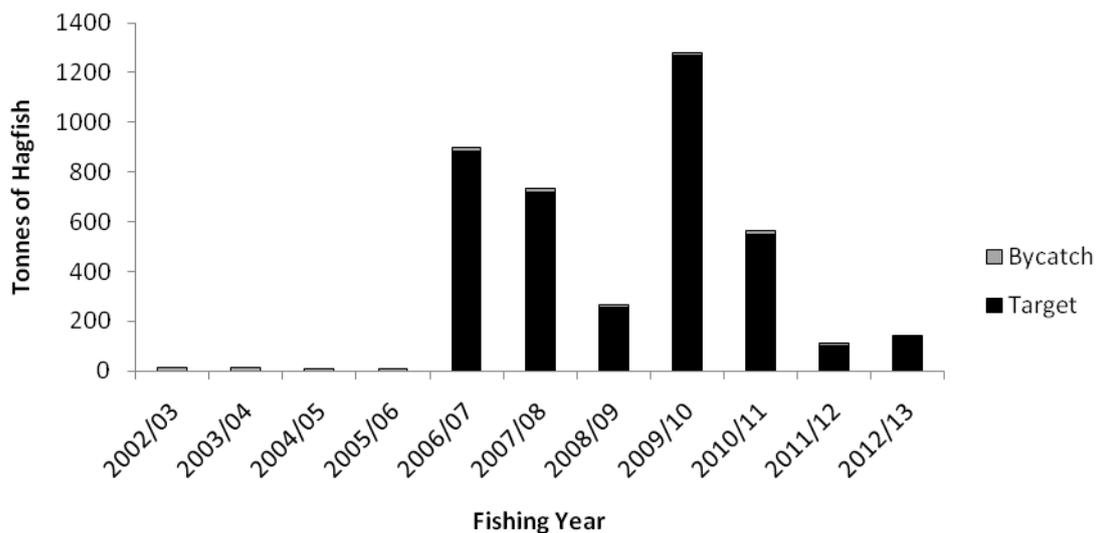


Figure 3: Total reported targeted catch for hagfish and bycatch of hagfish (including landings and discards) from the 2002/03 fishing year to the 2012/13 fishing year

20. The commercial fishery is driven by an export market to Korea. The common hagfish is sold as meat, which is considered a delicacy and believed to hold aphrodisiac properties. Hagfish is exported as either a frozen product with a port price of \$3.00-3.50 per kg or as a live product with a port price of \$12.00 per kg. Anecdotal information collected by an observer suggests that these prices may have reached much higher levels in the past (up to \$30.00 for live and \$12.00 for frozen around 2009). The availability of flights currently restricts live exports of hagfish to those sourced only from the North Island.
21. Hagfish are targeted with pots. Hagfish pots typically have up to 5 entrance holes, and hundreds of “escape” holes, which primarily function to help the pots sink. Reported commercial catches and observer information suggests that there is a high level of hagfish returned to the water from pots (Figures 2 and 3). This is driven by a market preference for fish of over 300 mm, and a high level of catch of smaller individuals. MPI is also aware that some members of industry have a preference for taking fish larger than 400 g, or roughly 550 mm.
22. MPI is aware that at the peak of hagfish fishing in 2009 there were gear conflicts with other fishing methods and hagfish pots were lost with resulting potential for ghost fishing. Ghost fishing occurs when lost fishing gear continues to trap individuals, driving up levels of mortality. This may increase other sources of fishing-related mortality, but could be mitigated by having pots with decomposable panels.
23. Hagfish have primarily been taken in waters off the East Coast North Island and West Coast of the South Island (FMAs 1, 2, and 7). Low levels of catch have been reported for FMAs 3, 4, 5, 6, 8, and 9. However, MPI is also aware that there has been area misreporting in this fishery, with some fishers reporting the FMA that they are landing hagfish in, and not the FMA that the hagfish were caught in. As a result, MPI does not know whether or not the reported landings by FMA are reliable.
24. Hagfish have been fished infrequently in eastern and southern South Island waters to date, but under open access fishing pressure was expected to increase over the next year, potentially substantially. This is because new vessels are planning to enter the fishery to supply a frozen product. MPI is also aware of plans by industry to expand fishing effort in general, once complications with maintaining live hagfish and flight capacity for the live trade have been addressed.
25. Hagfish are also taken as bycatch, primarily by pots in the rock lobster fishery, bottom trawl in the scampi fishery, and bottom long line in the ling fishery. Levels of bycatch are considered to be low, averaging 4.3 tonnes per year in ling and 0.6 tonnes per year in rock lobster since 1990, and 1.7 tonnes per year in scampi since 2001. MPI does not know whether bycatch is predominantly the common hagfish, or *Neomyxine biniplicata*, a more slender hagfish species that is typically found in shallower depths than the common hagfish, and may be misreported under the species code, HAG, for common hagfish. *N. biniplicata* is found in east coast waters from roughly Whangarei to Christchurch.
26. International fisheries for hagfish have typically followed a boom and bust pattern, and hagfish species generally appear vulnerable to overfishing and depletion. Many fisheries of a similar magnitude to the peak of the New Zealand hagfish fishery have collapsed or are in decline.
27. Recreational and Māori Customary Take

28. MPI is aware that there is local customary take around the country for hagfish. Hagfish is not a reported catch in the NZ recreational marine fishing survey 2011-12, but anecdotal information from stakeholders suggests that there may be small levels of recreational take in some parts of the country.

OTHER SOURCES OF FISHING-RELATED MORTALITY

29. Release rates of 50% of the catch were reported for hagfish at the onset of the fishery in 2006. Since then, release rates have trended downwards, and from 2009 have settled at around 20%.
30. Fishers and observers both suggest that hagfish seem likely to survive when returned to the water at the surface, unless they have become stressed in pots and started sliming. MPI does not know what proportion of common hagfish come up stressed or die when released. Studies from overseas are inconclusive as to whether or not hagfish are likely to survive when returned to the water. This indicates that collecting specific information for the New Zealand fishery will be important for informing survival rate.
31. MPI is aware that there have been difficulties during the development of the live trade in keeping hagfish alive. There may be high mortality of hagfish taken for the live trade and kept in holding tanks between capture and landing. This appears to be particularly problematic for west coast North Island fisheries. Hagfish exporters are also experiencing issues with keeping hagfish alive on the flights to market.

4 Management Options

BASIS FOR SETTING TACS: SECTION 13(2A) MANAGEMENT

32. Section 13 of the Act represents the default management approach that applies when setting a TAC for a QMS stock. Section 13(2) requires an understanding of BMSY for the stock. The current statuses of the common hagfish stocks in relation to BMSY are not known and cannot be reliably estimated using best available information. However, Section 13(2A) enables the Minister to set a TAC under section 13 where the current biomass of a stock and the biomass that produce a maximum sustainable yield cannot be estimated reliably. MPI's preferred approach is to set hagfish TACs under section 13(2A) of the Act.
33. In setting a TAC under this section, the Minister must:
- a) Not use the absence of, or any uncertainty in, that information as a reason for postponing or failing to set a total allowable catch for the stock. MPI considers that this has been taken into account in formulating the options in this initial position paper (IPP).
 - b) Have regard to the interdependence of stocks, the biological characteristics of the stock, and any environmental condition affecting the stock. Consideration of these factors has been included throughout this IPP (see *Environmental Impacts*).
 - c) Set a total allowable catch –
 - (i) using the best available information; and
 - (ii) that is not inconsistent with the objective of maintaining the stock at or above, or moving the stock towards or above, a level that can produce the maximum sustainable yield.

MPI considers that best available information regarding biological characteristics of the common hagfish, relevant fishery information, and all other information collected through past consultations has been used to formulate proposals in this paper that are not inconsistent with the aforementioned objective.

34. In considering the way in which and rate at which a stock is moved towards or above a level that can produce maximum sustainably yield, the Minister shall have regard to such social, cultural, and economic factors that he considers are relevant. These factors are discussed throughout this IPP.

5 Summary of Proposals

35. MPI is consulting on the management options for setting TACs, TACCs, and sector allowances for common hagfish stocks set out in Table 1.
36. Additionally, MPI proposes the following management measures for each stock to support QMS management:
 - a) Consider adding the common hagfish to the Sixth Schedule of the Fisheries Act 1996 (the Act) to allow the live return of hagfish to the water that are likely to survive;
 - b) Set the interim and annual deemed value rates for common hagfish using one of the three options outlined below:
 - (i) Annual deemed value rate of \$3.00 per kg; AND
 - (ii) Interim deemed value rate of \$2.70 per kg; OR
 - (iii) Annual deemed value rate of \$12.00 per kg; AND
 - (iv) Interim deemed value rate of \$10.80 per kg; OR
 - (v) Annual deemed value rates of \$12.00 per kg for HAG1 and 2, and \$3.00 per kg for HAG3, 4, 5, 6, 7, and 8; and, set interim deemed value rates of \$10.80 per kg for HAG1 and 2, and \$2.70 per kg for HAG3, 4, 5, 6, 7, and 8; AND
 - (vi) Regardless of which option is chosen, set standard differential deemed value rates for common hagfish stocks, but no overfishing thresholds to be set at this time.

6 Total Allowable Catch (TAC) Setting

37. In the absence of a reliable estimate of sustainable yield, the TAC options outlined in this paper have been based on average landings over the past seven years. Each of the options represents a difference balance in terms of risk to sustainability and benefits from utilisation. MPI understands that average landings do not necessarily indicate a level that will be sustainable over the long-term; however, MPI considers that these levels have been sustainable over the short-term, and continued monitoring will enable us to respond to changes in catch over time to ensure ongoing sustainability.
38. MPI proposes the following TAC options for common hagfish stocks (Table 2):

Table 2: Proposed TACs for common hagfish stocks

Option	Stock	TAC (t)
Option 1	HAG1	112
	HAG2	112
	HAG3	112
	HAG4	112
	HAG5	112
	HAG6	13
	HAG7	167
	HAG8	112
	HAG10	13
	Option 2 (MPI preferred option)	HAG1
HAG2		57
HAG3		57
HAG4		57
HAG5		57
HAG6		13
HAG7		112
HAG8		57
HAG10		13

Option 1

39. Option 1 is to set TACs at around the level of commercial take averaged over the past seven years since the start of the target fishery. This option allows for greater utilisation of common hagfish stocks than Option 2 by proposing higher initial TACs. These higher proposed TACs reflect that catch records indicate that this level of take is possible in areas that have developed a fishery for hagfish so far (FMA 1, 2 and 7).
40. Option 1 also allows for greater development potential than Option 2 in areas that have yet to develop a fishery for hagfish, but are expected in time to do so in time (FMAs 3, 4, 5 and 8). Catch limits proposed may be greater than averaged landings in these areas, but may still be relatively cautious because of the wide distribution of hagfish, historically low levels of fishing and assumed low exploitation rate.

41. Under Option 1, a nominal TAC is set for HAG6 and HAG10, as these areas may support hagfish populations, but MPI does not expect a target fishery to develop in these areas in the near future.
42. MPI considers that sustainability of hagfish stocks can be ensured over the short-term under Option 1. This is because levels of take this high have been sustained by these populations over the past seven years. However, given the biological characteristics of hagfish, and uncertainty resulting from CPUE analyses, it is possible that such high levels are not sustainable over the long-term.
43. There may be sustainability risks over the long-term if populations of hagfish within a stock become serially depleted due to fishing effort. MPI considers these risks are higher under Option 1 than under Option 2. Serial localised depletion can occur if fishers concentrate fishing effort in one area long enough to reduce the local population of the target species before moving to another area. Given the low productivity of hagfish, fished populations may take a considerable time to rebuild, even if there are enough reproductive individuals for a rebuild to occur. In this case, catch records may artificially resemble a sustainable fishery until all populations are fished to a low level.
44. Sustainability risks that may arise over the long-term could be managed proactively by the development of a management strategy (see the Other Management Measures section of this paper). Under Option 1, there is scope for fishers to work with MPI to develop a management strategy, and scope for MPI to collect more information to inform the review of TACs over the short to medium-term.
45. Option 1 may require a review of the TAC over the short-term, if new information suggests that these levels of commercial utilisation are either not sustainable, or are capable of greater levels of utilisation.
46. The effect on the aquatic environment of fishing for hagfish at this level of intensity has not been investigated. Under Option 1, MPI does not expect there to be any major impacts on stocks that are interdependent with common hagfish stocks, and the method of fishing with pots is considered to have low environmental impact. The potential impact on associated or dependent species is expected to be low for species taken as a bycatch, as there is very little bycatch associated with hagfish pots.
47. The effect on associated or dependent species in the benthic ecosystem that hagfish are removed from is not known. Hagfish are scavengers and predators. It is likely that they impact the turnover of organic matter on the seafloor, and populations of species that they actively hunt, such as crustaceans or small benthic fish. Potential impacts will be higher under Option 1 than Option 2; however, MPI considers that by setting a TAC, there will be a framework for actively managing the effects of fishing on the aquatic environment, including on associated or dependent species and biodiversity, and that any adverse effects of fishing will be minimised.
48. There are at least two other species of hagfish known to be present in some of the management areas outlined for common hagfish; however, they are not likely to be taken in association with hagfish as they inhabit different depths to where fishing effort for common hagfish has been targeted (fishing effort is concentrated around 450 m, while other hagfish species are found above 400 m or below 700 m).

49. Overall, Option 1 maximises the socio-economic benefit from the common hagfish resource relative to Option 2, but this is accompanied by higher overall sustainability risk.

Option 2

50. Option 2 is to set TACs calculated at a level lower than the average commercial take over the past seven years. This option restricts utilisation and development potential of hagfish stocks relative to Option 1. Setting lower initial TACs reflects a more cautious approach to TAC setting by placing greater weight on the biological characteristics that make hagfish vulnerable to fishing and on the knowledge that some areas have already been subject to high levels of fishing in the past, which may impact on future sustainability of the stock.
51. Furthermore, this option gives greater weight to uncertainty in information on stock status, including that current CPUE analyses are inconclusive and there is uncertainty around what level of take is sustainable. Under Option 2, initial TACs are cautious until more information becomes available and can be scrutinised more closely. The same level of utilisation is allowed for in HAG1 as under Option 1, but lower catches are allowed for in HAG2 and HAG7.
52. Catches in HAG2 have averaged around 54 tonnes over the last 5 years, and MPI considers that a TAC at around this level will better ensure sustainability of this stock. Similarly, restricting catch in HAG7 is likely to be important considering that harvest has been high in this area relative to other areas, and it is not clear whether this will be sustainable over the long-term.
53. Option 2 allows for development potential in management areas that have not been heavily targeted to date, but at a lower level than Option 1. Average catches for HAG3, 4, 5, and 8 over the past seven years range from as low as .03 tonnes in HAG5 to 10.3 tonnes in HAG3. MPI considers that setting a TAC of 57 tonnes for these areas already greatly exceeds the average catches that have been reported, and as such still provides scope for development potential, with the ability to better ensure the overall sustainability of the stocks relative to Option 1.
54. Option 2 proposes the same nominal TAC for HAG6 and HAG10 as Option 1.
55. Under Option 2, impacts on associated or dependent species will be lower relative to Option 1, as the total level of hagfish able to be removed from the environment will be less. Similarly, impacts on the benthic ecosystem will be lower relative to Option 1. Levels of bycatch are likely to be very low in hagfish pots, and fishing with pots is considered to have low environmental impacts.
56. Overall, MPI considers that Option 2 will better ensure the sustainability of common hagfish stocks than Option 1, but allows for lower initial socio-economic benefits to be obtained over the short-term.

7 Allocation of the TAC

57. When setting any TAC, that TAC must be apportioned between the relevant sectors and interests set out under the provisions of section 21 of the Act. Section 21 prescribes that the Minister shall make allowances for Māori customary non-commercial interests, recreational fishing interests, and for any other sources of fishing-related mortality, before setting the TACC.
58. The Act does not provide an explicit statutory mechanism to apportion available catch between sector groups either in terms of a quantitative measure or prioritisation of allocation. Accordingly, the Minister has the discretion to make allowances for various sectors based on the best available information.

CUSTOMARY MĀORI AND RECREATIONAL ALLOWANCES

59. MPI proposes to set initial customary Māori and recreational allowances at a nominal level of 1 tonne each. There is no reported information; however, anecdotal information from stakeholders suggests that there are small amounts of both customary Māori and recreational take in parts of the country.

ALLOWANCE FOR OTHER SOURCES OF FISHING-RELATED MORTALITY

60. Catch records indicate that common hagfish are returned to the water in high quantities in the target fishery. MPI notes that the current rate of releases reported from the fishery is 20% of reported catches. MPI has little information on the survival rate of hagfish returned to the water, but has based the proposed allowances for other sources of fishing-related mortality on the assumption that at least 50% of hagfish returned to the water will survive (discussed in the section for The Common Hagfish Fishery under *Other Sources of Fishing-Related Mortality*).
61. Furthermore, MPI is aware of complications in the live trade with keeping hagfish alive. There may currently be high mortality of hagfish taken for the live trade and kept in holding tanks after the fish are caught, but before they are landed. Under the QMS, these fish will be required to be reported and balanced with ACE.
62. Given that there is potential for relatively high levels of other sources of fishing-related mortality to occur, an allowance for other sources of fishing-related mortality of 10% of the TACC is appropriate while better information is collected. MPI contends that the proposed allowances reflect a realistic level of other sources of fishing-related mortality, and can be revised if new information becomes available.
63. MPI proposes to set an initial allowance for other sources of fishing-related mortality of 10% of the TACC under both TAC options for common hagfish stocks (Table 1).
64. Hagfish are reported as a bycatch in other target fisheries, predominantly in the rock lobster, ling, and scampi fisheries. However, MPI is not aware if other hagfish species have been misreported under the species code for the common hagfish (HAG). In fisheries targeting depths shallower than 400 m, it is possible that *N. biniplicata*, a skinnier and lighter-coloured species,

is taken as bycatch in some areas, and in addition to the common hagfish. Levels of reported discards are low in fisheries targeting species other than the common hagfish (averaging 4.3 tonnes per year in ling and 0.6 tonnes per year in rock lobster since 1990, and 1.7 tonnes per year in scampi since 2001). MPI understands that many fishers have an aversion to catching hagfish as bycatch due to the copious amounts of slime that they are capable of producing, and return hagfish to the water in the event that they are brought up.

TOTAL ALLOWABLE COMMERCIAL CATCH (TACC)

65. MPI proposes the following TACCs for common hagfish stocks under each option (Table 3).

Table 3: Proposed TACCs for common hagfish stocks

Option	Stock	TACC (t)
Option 1	HAG1	100
	HAG2	100
	HAG3	100
	HAG4	100
	HAG5	100
	HAG6	10
	HAG7	150
	HAG8	100
	HAG10	10
	Option 2 (MPI preferred option)	HAG1
HAG2		50
HAG3		50
HAG4		50
HAG5		50
HAG6		10
HAG7		100
HAG8		50
HAG10		10

66. The TACC options allocate harvest rights to quota owners that create incentives to invest and develop both fisheries to provide economic opportunities.

67. Under both options, quota owners will have the opportunity to work with MPI to develop a management strategy to prevent or mitigate any adverse effects of fishing on the benthic ecosystem associated with hagfish populations.

Option 1

68. Under Option 1, TACCs provide for the current levels of utilisation of hagfish stocks that have existing target fisheries, and corresponding levels of utilisation for stocks that have yet to develop a fishery but have potential to do so. It is possible that this will create larger incentives for quota owners to invest in and develop the fishery than under Option 2.

69. Option 1 places greater weight on the higher potential economic value for the commercial sector than does Option 2. Estimates of nominal quota value suggest that common hagfish is a relatively high value species and could be worth between ~\$27,000 and ~\$93,000 per tonne depending on whether it is exported alive or frozen. Option 1 will maximise the economic value

of quota shares and Annual Catch Entitlement as greater annual returns will be possible with the higher overall levels of catch allowed for relative to Option 2. It is unclear whether or not this would provide the right incentives for quota owners to collaborate on a management strategy that focuses on the long-term management of hagfish stocks and inform future TACC reviews.

Option 2

70. Under Option 2, lower TACCs are proposed than under Option 1. Option 2 places more weight on a lower sustainability risk over the long-term. However, this option restricts the overall economic value that may be achieved from hagfish stocks relative to Option 2. This may result in fishers investing in the means to further develop the hagfish fishery and to focus more on live exports.
71. Despite restricting short-term utilisation opportunities, MPI considers that Option 2 may maximise benefits over the long-term as it is better able to ensure sustainability than Option 1. Furthermore, MPI considers that Option 2 may result in greater incentives for fishers to develop management strategies for common hagfish stocks, including collecting appropriate stock assessment information to inform TACC reviews. Option 2 creates greater certainty for quota owners of a sustainable fishery, and may permit them to invest more in adding value to the fishery than under Option 1.

ENVIRONMENTAL IMPACTS

72. Setting or varying sustainability measures under the Act requires consideration of the potential impacts of increased fishing effort on any stock and the surrounding aquatic environment.
73. MPI does not expect increased fishing effort for common hagfish to impact on the environment or other stocks. This is because fishing with pots is considered to have low environmental impact, and levels of bycatch are expected to be low also.
74. Common hagfish are expected to form highly abundant localised populations, and given their biological characteristics, are vulnerable to localised depletion. This may have knock-on effects on the benthic ecosystems that support them. Hagfish are known to be scavengers and predators, and are likely to play a large role in the turn-over of organic matter on the seafloor. The effect of removing hagfish from the aquatic environment is not known.
75. Setting the initial TACs for both stocks at a relatively low level should mitigate these potential environmental impacts.

8 Other Management Measures

RETURN OF LIVE HAGFISH TO THE SEA

76. MPI is consulting on the possibility of including hagfish on Schedule 6 to the Act under the provision that a commercial fisher may return a common hagfish to the water if it is likely to survive on return, and the return takes place as soon as practicable after the hagfish is taken.
77. Common hagfish are reported as bycatch in a number of other target fisheries. A requirement to land common hagfish and balance catches with ACE (a default requirement under the QMS) will impose an unnecessary cost on these fishers.
78. There is little information to inform the survival rate of hagfish returned to the sea. Limited observer information suggests that hagfish brought up in trawls (for example, in the scampi fishery), may survive when returned to the ocean. Information from fishers and observers suggests that hagfish brought up in pots are likely to survive if they have not become stressed and started sliming. MPI considers that hagfish taken as a bycatch in other target fisheries will be brought up in low numbers, and are less likely to produce amounts of slime that may be more detrimental to them than hagfish brought up in pots in the target fishery.
79. MPI welcomes any information that stakeholders may have regarding the survival of hagfish returned to the water, and any stakeholder views on the possible inclusion of common hagfish on Schedule 6 to the Act.

DEEMED VALUE RATES AND OVERFISHING THRESHOLD

80. Under s 75(1) of the Act, the Minister is required to set interim and annual deemed value rates for each quota management stock. Section 75(2A) requires the Minister, when setting deemed value rates, to take into account the need to provide an incentive for every commercial fisher to acquire and hold sufficient annual catch entitlement (ACE) in respect of each fishing year that is not less than the total catch of that stock taken by the fisher.
81. MPI developed Deemed Value Guidelines to set out a process for managing the setting, reviewing, and amendment of deemed value rates. These guidelines are available to view on the MPI website.³
82. MPI acknowledges that the estimated landed price for hagfish varies considerably based on the state that it is landed in (frozen or live). The options presented in this paper relate to the frozen landed price (Option 1), the live landed price for hagfish (Option 2), and the fact that a live fishery exists predominantly in HAG1 and 2, while a frozen fishery exists predominantly in other stocks (Option 3).
83. Based on this information, MPI proposes three options to set the annual and interim deemed value rates for common hagfish (Table 4).

³ <http://mpi.govt.nz/news-resources/publications.aspx> (search Deemed Value Guidelines)

Table 4: Proposed deemed value rates for common hagfish stocks

Option	Stock	Annual Price (\$/kg)	Interim Price (\$kg)
Option 1	All Stocks	3.00	2.70
Option 2	All Stocks	12.00	10.80
Option 3 (MPI preferred option)	HAG 1, 2	12.00	10.80
	HAG 3, 4, 5, 6, 7, 8	3.00	2.70

Option 1

84. Option 1 is to set a deemed value rate based on the port price for frozen hagfish. In adopting this approach, MPI proposes setting an annual deemed value rate of \$3.00 per kg, and an interim deemed value rate of \$2.70 per kg. The proposed interim deemed value rate is set at 90% of the annual deemed value rate, as outlined in the Deemed Value Guidelines.
85. This options treats all landed hagfish as if it were at the lower end of its value spectrum (that is, landed frozen). This option may provide little incentive for fishers catching for the live trade to avoid overcatching their annual catch entitlement.

Option 2

86. Option 2 is to set a deemed value rate based on the port price for live hagfish. In adopting this approach, MPI proposes setting an annual deemed value rate of \$12.00 per kg, and an interim deemed value at \$10.80 per kg. The proposed interim deemed value rate is set at 90% of the annual deemed value rate, as outlined in the Deemed Value Guidelines.
87. This option treats all landed hagfish as if it were at the higher end of its value spectrum (that is, landed live). This option may provide little incentive for fishers catching for the frozen trade to land individuals that are caught in excess of their annual catch entitlement, and may incentivise illegal discarding practices.

Option 3

88. Option 3 is to set separate deemed value rates for HAG1 and 2, as for the rest of the HAG stocks. This reflects the knowledge that the hagfish fishery in HAG1 and 2 is predominantly for the live trade, while fishing that has occurred and is expected to occur in other locations is primarily for the frozen trade.
89. Option 3 may provide the best incentives for fishers fishing each stock to land and balance all catch with ACE. However, it may not provide the right incentives for fishers developing frozen fisheries in HAG1 and 2, or live fisheries in HAG3, 4, 5, 6, 7, and 8. This may also encourage some area misreporting of catches.

DIFFERENTIAL DEEMED VALUES

90. For Options 1, 2 and 3, MPI proposes to apply standard differential annual deemed value rates to common hagfish stocks for the 2014/15 fishing year.
91. MPI does not propose that an overfishing threshold be set under section 77 of the Act for these stocks, unless monitoring of catches suggests that this is required in the future.
92. MPI invites submitters to provide information on landed prices of common hagfish to provide a basis for future assessments of deemed value rates.
93. MPI notes that deemed value rates for common hagfish stocks will be adjusted as required when information about ACE prices becomes available. Currently, deemed value rates for all species are typically reviewed on an annual basis. When information becomes available on the ACE price for the common hagfish stocks, this will be incorporated into the annual deemed value review process to ensure the correct deemed value rates are set for all common hagfish stocks.

POTENTIAL FUTURE DEVELOPMENT

94. Hagfish are managed under the draft National Finfish Plan for Inshore Finfish (the Finfish Plan).⁴ The Finfish Plan is a policy document that sets out management objectives for all inshore finfish stocks. Because of the sheer number of stocks managed within the Finfish Plan, stocks have been grouped to facilitate multi-stock objective setting and service delivery.
95. Stocks in the Finfish Plan have been grouped according to their biological vulnerability and their desirability to fishers (potential fishing pressure). Hagfish are currently included in Group 7, which includes all non-QMS stocks. However, the common hagfish will now need to be moved to a new group. This will involve risk analysis to determine what group hagfish should be moved into.
96. The development of a management strategy has the potential to mitigate risks of localised depletion considerably. The more robust the management strategy, which relies on the effectiveness of measures and buy-in from fishers, the greater the potential for risk management, and accordingly, the larger the yield that can be provided. With only a small number of quota owners expected in this fishery, it is likely that a Commercial Stakeholder Organisation (CSO) could form to effectively implement a management strategy. Rotational harvest strategies and move on rules may be considered as components of this process.
97. MPI seeks stakeholder feedback on the development of a management strategy.

⁴ The Finfish Plan has not been formally approved under the Act. It is being trialled for two years before being refined and improved. Once this is done, formal approval of the Finfish Plan will be sought from the Minister.

9 Conclusion

98. The common hagfish will enter the QMS on 1 October 2014. The Minister must now set TACs, TACCs, associated allowances, and deemed value rates for all common hagfish stocks. MPI is consulting on two options for setting of TACs, TACCs, and associated allowances (Table 1).
99. MPI's preferred option is Option 2. Under Option 2, greater weight is given to mitigating sustainability risks associated with the common hagfish fishery, while still providing for utilisation and for development of the fishery in under-utilised areas. MPI considers that this provides the greatest balance between sustainability and utilisation, and the greatest opportunity for long-term benefits from the fishery to be realised.
100. MPI proposes three options for setting deemed value rates (Table 4). MPI's preferred option is Option 3. Option 3 allows for higher deemed value rates for stocks that are primarily fished for the live market, and lower deemed values for stocks that are primarily fished for the frozen market, or where fisheries have not yet developed. This provides the best incentives for fishers to land catch and balance catch with ACE for each stock that is fished.
101. MPI is also considering the possibility of including the common hagfish on Schedule 6 to the Act, under the provision that a commercial fisher may return a common hagfish to the water if it is likely to survive on return, and the return takes place as soon as practicable after the hagfish is taken.
102. MPI welcomes stakeholder feedback on the proposals in this paper.