



Proposed Introduction of the Common Hagfish (*Eptatretus cirrhatus*) into the Quota Management System on 1 October 2014

Final Advice Paper

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PROPOSED INTRODUCTION OF THE COMMON HAGFISH (*EPTATRETUS CIRRHATUS*) INTO THE QUOTA MANAGEMENT SYSTEM ON 1 OCTOBER 2014

Executive Summary

1. The Ministry for Primary Industries (MPI) recommends that you make a determination under section 17B of the Fisheries Act 1996 (the Act) to introduce the common hagfish (*Eptatretus cirrhatus*) into the Quota Management System (QMS) on 1 October 2014.
2. MPI also recommends that you set nine separate Quota Management Areas (QMAs) for the management of common hagfish stocks. MPI recommends that the boundaries of these nine QMAs match the boundaries of the fisheries management areas (FMAs) defined in Schedule 1 to the Act, where HAG8 is a combination of FMA8 and 9.
3. Following consultation, the options proposed are:

Table 1: Final options proposed for introduction of the common hagfish into the QMS

Option	Introduction of hagfish species into the QMS	Quota Management Areas
	No hagfish	Not applicable
Option 1 (<i>Status quo</i>)	No hagfish	Not applicable
Option 2 (MPI preferred option)	Common hagfish (<i>Eptatretus cirrhatus</i>)	Nine QMAs *
Other options consulted on in the IPP	Common hagfish, goliath hagfish (<i>E. goliath</i>), and <i>Neomyxine biniplicata</i>	Four QMAs or ten QMAs

*matching the boundaries of the FMAs defined in Schedule 1 to the Act, where FMA8 and 9 are combined to form HAG8

4. If you agree to introduce the common hagfish into the QMS, MPI recommends that you set a 1 October to 30 September fishing year, and use greenweight as the unit of measurement to express the Total Allowable Catch (TAC) and Annual Catch Entitlement (ACE).
5. A total of 8 submissions were received in response to the IPP seeking stakeholders' views. These submissions were received from Te Ohu Kaimoana Trustee Limited, the New Zealand Recreational Fishing Council, and various commercial interests.
6. Submissions on the proposal were mixed. Five supported introduction. Two submissions, from commercial fishers directly involved in the hagfish fishery, did not support introduction. The other submission did not comment directly on the proposals in the IPP.

7. MPI's preferred option is Option 2. MPI considers that the QMS best provides for utilisation of the common hagfish because the allocation of access rights will allow fishers greater security in investing in, and developing the fishery. This will promote the long term utilisation of the fishery.
8. MPI also considers that the QMS will provide the best framework for ensuring sustainability of the common hagfish. Allocation of rights under the QMS will create a pool of rights holders with a long term interest in the fishery that MPI can work with to develop management plans. Additionally, the QMS also provides incentives to fish within sustainable limits through balancing catch with ACE and the potential to incur deemed value fees. MPI does not consider that section 11 sustainability measures alone will better serve the purpose of the Act, to provide for utilisation of fisheries resources while ensuring sustainability. This is primarily because section 11 measures lack the incentive framework for fishing within sustainable limits that is afforded by the QMS, and are unlikely to provide for efficient and sustainable utilisation.
9. If you make a determination to introduce common hagfish into the QMS, MPI's recommendation is to set nine QMAs. MPI considers that the biological information for hagfish suggests that they form discrete populations, and are likely to be most effectively managed within relatively small management units to ensure sustainability.
10. If you agree to introduce common hagfish into the QMS, the next step of the process is for MPI to consult on appropriate TACs, TACCS, sector allowances, deemed value rates, and other management measures.

Key Considerations

NEED TO ACT

11. Section 17B(1) of the Act requires you to make a determination under section 17B(2) to introduce a stock or species into the QMS, if satisfied that the current management of a stock or species is not ensuring the sustainability of the stock or species, or is not providing for the utilisation of the stock or species.
12. "Ensuring sustainability" means maintaining the potential of fisheries resources to meet the reasonably foreseeable needs of future generations; and, avoiding, remedying, or mitigating any adverse effects of fishing on the aquatic environment (section 8).
"Utilisation" means conserving, using, enhancing, and developing fisheries resources to enable people to provide for their social, economic, and cultural well-being (section 8).

13. The common hagfish fishery is currently managed as an open access fishery. There are no management measures in place for this fishery. The available biological information indicates that hagfish are low productivity species and are vulnerable to overfishing. International fisheries for hagfish have historically been unsustainable, and anecdotal information from fishers in New Zealand suggests that localised depletion has occurred as a result of fishing effort under the non-QMS framework. This raises concerns that the current management framework is not able to ensure sustainability of the common hagfish fishery.
14. MPI also considers that there is strong utilisation potential for the common hagfish fishery. Under the current management regime, the only barriers to entry into the fishery are the requirement to obtain a fishing permit, any capital costs associated with fishing, and operational costs of getting the species to market. The target fishery for hagfish has been sporadic since 2006, and MPI considers that development has been hampered by the high costs of fishing and inconsistency getting the species to market alive. As the current management framework does not provide fishers with the security of access rights to the fishery, this may be contributing to inconsistent investment in the fishery. MPI considers that the *status quo* is not providing best for utilisation, in particular for enabling people to provide for their social, cultural, and economic well-being, as there is no allocation of access rights to provide fishers security over their investments.
15. Consequently, MPI considers that the current management framework is not likely to be ensuring sustainability of common hagfish stocks, or providing for utilisation, and recommends that you consider introducing common hagfish into the QMS on 1 October 2014.

BIOLOGICAL CHARACTERISTICS OF HAGFISH

16. Hagfish species are considered to have a moderate to high vulnerability and low resilience to overfishing.¹ There may be as many as seven species of hagfish in New Zealand waters, but currently only five of these are described in literature, two of which are extremely rare and only known from one or two specimens. The IPP on the introduction of hagfish into the QMS consulted on whether or not to introduce the remaining three species: *Eptatretus cirrhatus* (the common hagfish), *E. goliath* (the goliath hagfish), and *Neomyxine biniplicata*.
17. *E. cirrhatus* is the only species currently targeted by fishers. It is common throughout the coastal shelf in New Zealand waters. 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, and is capable of forming highly abundant localised populations.

¹ Fishbase.org

18. The goliath hagfish and *N. biniplicata* can be distinguished from the common hagfish based on the depth they are taken from (the goliath hagfish is found deeper than 700 m, *N. biniplicata* is most common between 50 and 400 m), or morphology (*N. biniplicata* is skinnier and a lighter, pinker colour than the common hagfish). Geographic range for these species is also restricted relative to the common hagfish, with *N. biniplicata* currently thought to be found in coastal shelf waters from Whangarei to Christchurch, and the goliath hagfish in and north of the Bay of Plenty.
19. The common hagfish is a low productivity species, and is thought to be very slow growing. Evidence suggests that females undergo their first spawning event between 412 mm and 534 mm, whereas males may not mature until a size of up to 585 mm. It is not known when or where common hagfish reproduce, but they are not expected to exhibit seasonal reproductive patterns.² Evidence from species overseas indicates that hagfish can take up to 2 or 3 years after maturing to produce only 20 – 30 eggs, and development of the embryo is also slow, with early stages developing at only 7 months in the species *Eptatretus burgeri*.
20. Information collected from fishers and a local hagfish expert 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 lead 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 support this claim.

STOCK STATUS

21. Stock assessments have not been done for the common hagfish. 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.

RELEVANT FISHERY INFORMATION

22. The commercial hagfish fishery is targeting the common hagfish. The majority of fishing pressure is concentrated at around the 450 m depth contour, and therefore it is unlikely that the goliath hagfish and *N. biniplicata* are frequently taken in association with the common hagfish. However, it is possible that any hagfish species caught in the past have been reported under the species code for the common hagfish (HAG). Therefore, MPI is not sure if hagfish taken as bycatch in other fisheries are predominantly common hagfish. It is possible that *N. biniplicata* is caught in shallower depths within its geographic range.

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

23. Hagfish have been targeted since 2006. Catch records indicate a drastic decrease in landings after 2009/10 (Figure 1); 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. Reported commercial catches and observer information suggests that there is a high level of discarding in the target fishery. 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.

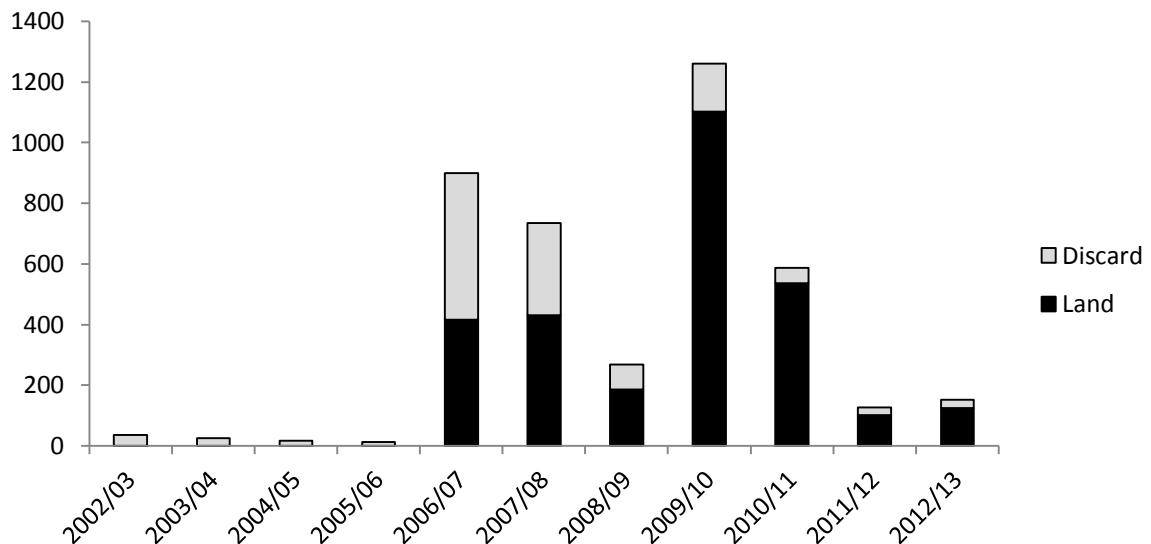


Figure 1: Total reported landed and discarded catch in tonnes greenweight for hagfish from the 2002/03 fishing year up to the 2012/13 fishing year

24. Hagfish have been fished infrequently in South Island waters to date, but fishing pressure is expected to increase there over the next year, potentially dramatically. This is because MPI is aware of new freezer vessels entering the fishery, and plans by industry to expand fishing effort, once complications with maintaining live hagfish for the live trade and a lack of direct flights from the South Island to markets are solved.
25. 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 the time when the fish are caught and when they are landed.
26. 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 \$3-3.5 kg or as a live product with a port price of \$12.0 kg. Anecdotal information collected by an observer suggests that these prices may have reached much higher levels in the past (up to \$30 for live and \$12 for frozen around 2009).

27. 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. 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.
28. Hagfish have primarily been taken in FMAs 1, 2, and 7. Low levels of take have been reported for FMAs 3, 4, 5, 6, 8, and 9. However, MPI is also aware that there has been 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 is reliable information.
29. Hagfish are 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.
30. MPI has little information regarding a recreational or a customary fishery for hagfish. Hagfish is not a reported catch in the NZ recreational marine fishing survey 2011-12.
31. International fisheries for hagfish have typically followed the pattern of a boom and bust fishery. Information from overseas hagfish fisheries indicates that hagfish are 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.

OTHER KEY CONSIDERATIONS

32. If you determine under section 17B to make a stock subject to the QMS, section 18 requires you, by notice in the *Gazette*, to declare the stock subject to the QMS on and from the first day of the fishing year stated in the notice.
33. Section 19 says that the *Gazette* notice under section 18 must:
 - a) Define the QMAs – section 19(2) requires that the Minister shall, as far as practicable, maintain the same QMAs for different species. MPI considers that the QMA options proposed in this paper are consistent with this obligation.³
 - b) State the fishing year in respect of the stock. MPI is proposing that the fishing year for the proposed common hagfish stocks should be 1 October to 30 September.
 - c) State whether the total allowable commercial catch (TACC) and the annual catch entitlements (ACE) are to be expressed in meatweight or greenweight.
 - d) Make provision for other such matters as may be contemplated by the Act.
34. MPI is also providing you concurrently with final advice in a separate paper on a proposal to introduce a minimum number of escape holes each of a minimum diameter for hagfish pots under section 11 of the Act. MPI considers that this measure is necessary to ensure the sustainability of the fishery, whether or not the common

³ Note section 19(3) of the Act, which provides that if the Minister is satisfied that any species in the waters around the Chatham Islands can, for fisheries management purposes, be managed effectively as a unit, a notice under section 18 may create around the Chatham Islands a separate QMA for that species. Both options proposed in this IPP for hagfish QMAs are consistent with section 19(3).

hagfish is introduced into the QMS. This is because the fishery appears to be currently targeting juveniles, and is characterised by a relatively high level of discarding. Given a paucity of information on the survival of hagfish that are discarded at the surface, MPI considers that escape holes are important for promoting juvenile survival.

35. If you make a determination to introduce the common hagfish into the QMS, MPI will need to consider whether or not hagfish should be included on Schedule 6 of the Act. Inclusion on Schedule 6 of the Act would provide for the live return of individuals to the water if they are likely to survive. This analysis will be included in a subsequent consultation paper on setting of the TAC, TACC, associated allowances, deemed value rates, and other management measures.
36. MPI will also consider the development of observer coverage for the hagfish fishery.

Consultation

37. Section 19(7) requires that before you make a declaration that a stock is subject to the QMS, you must consult with those persons or organisations whom you consider are representative of those classes of persons having an interest in the matters discussed in paragraph 34.
38. For this purpose, an IPP was released on 24 January 2014 seeking tangata whenua and stakeholders' views on whether to introduce the common hagfish, the goliath hagfish, and *N. biniplicata* into the QMS on 1 October 2014.
39. MPI received 8 submissions responding to the proposal to introduce hagfish into the QMS. These are attached for your reference.
40. The submissions were from:
 - Sanford Ltd (Sanford)
 - Te Ohu Kaimoana Trustee Limited (TOKM)
 - Brian Deadman
 - Hagfish NZ Limited
 - NZ Rock Lobster Industry Council (NZRLIC)
 - Seafood NZ
 - New Zealand Recreational Fishing Council (NZRFC)
 - Port Nelson Fishermen's Association (Port Nelson FA)

Submissions

INTRODUCTION INTO THE QMS

41. Sanford, the NZRFC and the NZRLIC support the introduction of hagfish into the QMS. Sanford and the NZRFC made no comment with regards to which species should be considered, while the NZRLIC suggested that the introduction of different species should be driven by the needs of those wishing to develop the fishery.
42. TOKM supports introduction, but would like to see an option for introducing all three hagfish species under a mixed species code. Seafood New Zealand also recommended the mixed species approach in their support for introduction of hagfish. The mixed species approach was not an option in the IPP, and is discussed in Appendix One, “Other Issues Raised in Submissions”.
43. Mr Deadman and Hagfish NZ Limited did not support introduction. They suggest that MPI has insufficient information to support introduction at this time, and that introduction of hagfish into the QMS would be premature. While Mr Deadman did not support introduction, he did state that controls should be applied to all species. However, in his submission he suggested that multiple species are frequently taken in the target fishery, and are taken at depths that MPI would not expect *N. biniplicata* or the goliath hagfish to be abundant. MPI considers that these may be sub-populations of the common hagfish that have developed different environmental tolerances in different areas, and discusses this further in Appendix One, “Other Issues Raised in Submissions”.
44. Port Nelson FA suggested in their submission that hagfish was different from carpet shark, which they did not support for introduction. This suggests that they felt hagfish should be considered for introduction. However, given that this submission did not comment on options in the IPP, the submission will not be discussed further in this final advice paper.

Setting of QMAs

45. TOKM supports management of hagfish within four QMAs. They support this approach given the lack of information available about biomass, location, and breeding habits. However, they request that this be coupled with stringent reporting requirements. No other submission supported managing hagfish within four QMAs.
46. Mr Deadman, though he did not support introduction, submitted that management controls should be applied at the level of ten QMAs. Seafood NZ also supported managing within ten QMAs. The NZRLIC noted that setting restrictive TACs for hagfish within ten QMAs could be detrimental to the rock lobster fishery, and proposed considering hagfish for Schedule 6 to overcome this problem.

47. No other submission provided comments on the setting of QMAs for hagfish. However, Sanford suggests that the proposal on setting FMAs was too light in the IPP. MPI assumes this refers to setting of QMAs for hagfish, and considers that the options presented in the paper were thorough. Sanford provided no additional suggestions, and did not comment on the options in the paper for setting of QMAs.

FINAL PROPOSALS

48. The final proposals remain unchanged from the IPP with two exceptions: the IPP contained two options for introducing hagfish species into the QMS, and two options for setting of QMAs. This FAP provides one option for introducing species (the common hagfish only), and one option for setting of QMAs (nine QMAs). The rationale for this is discussed below.

Analysis of Management options

OPTION 1 – STATUS QUO

49. Under the *status quo*, all hagfish species would remain subject to an open access fishery outside the QMS. Section 17B(2) says that you must make a determination to make a stock or species subject to the QMS unless you determine that the purpose of the Act would be better met by setting one or more sustainability measures under section 11. The purpose of the Act is to provide for utilisation of fisheries resources while ensuring sustainability. Utilisation and sustainability are defined, according to section 8 of the Act, in paragraph 12, and are discussed in more detail below.
50. Hagfish NZ Limited and Mr Deadman did not support introduction of hagfish into the QMS, and therefore supported the *status quo*. They maintained that MPI had insufficient information to be able to introduce hagfish.
51. MPI responds that there is sufficient information to suggest that there is both strong utilisation potential and a high sustainability risk for this fishery. Section 10(d) of the Act states that the absence of, or uncertainty in, any information should not be used as a reason for postponing or failing to take any measure to achieve the purpose of the Act. As such, MPI does not agree that waiting for more information before introducing hagfish is prudent, a correct interpretation of the Act, nor necessary, and therefore not a valid reason for maintaining the *status quo*.

Sustainability

52. Under the *status quo*, the hagfish fishery will remain open access, and section 11 sustainability measures must be determined to best meet the purpose of the Act.
53. Sustainability measures may relate to the catch limit (including a commercial catch limit) for any stock; the size, sex, or biological state of any fish, aquatic life, or seaweed of any stock that may be taken; the areas from which any fish, aquatic life, or seaweed of any stock may be taken; the fishing methods by which any fish, aquatic life, or

- seaweed of any stock may be taken or that may be used in any area; and the fishing season for any stock, area, fishing method, or fishing vessels.
54. MPI considers that section 11 sustainability measures are not likely to ensure sustainability of hagfish stocks for a number of reasons discussed here. National catch limits can incentivise a 'race to catch' and result in localised depletion, particularly for species like hagfish that form small discrete populations. Size limits would require the return of live hagfish to the water at the surface, and information is conflicting as to whether or not hagfish are likely to survive when returned to the water. Anecdotal information from fishers and observers suggests they are highly likely to survive, unless they become stressed in pots and start sliming. Some trials overseas indicate that hagfish are sensitive to fluctuations in temperature and salinity, and this may lead to lower survival rates. Given this uncertainty, MPI is not confident that setting a size limit for hagfish will ensure sustainability either. Seasonal controls are impractical as MPI has little information regarding seasonality of reproduction in hagfish, and the information that is available suggests that there are no seasonal trends⁴. Similarly, area controls are unlikely to be effective as MPI has little information regarding population size with respect to geographic location or depth for the common hagfish. While banning particular fishing methods may address sustainability concerns for hagfish, this would go against part of the purpose of the Act, to provide for utilisation, as fishing potting is the only method known to effectively target hagfish.
55. You are also considering final advice on a section 11 sustainability measure to introduce a minimum number of escape holes each of a minimum diameter for pots used to target hagfish. MPI considers that, given the low productivity of hagfish species, this section 11 measure is necessary to promote juvenile survival, whether or not you make a determination to introduce hagfish into the QMS. However, this measure alone is not expected to ensure sustainability of the species
56. Additionally, MPI considers that catch limits set under section 11 lack the incentives available under the QMS for fishers to fish within the limit, such as balancing catch with ACE and the potential to incur deemed value fees.
57. Overall, MPI is not confident that the purpose of the Act would be better met by setting section 11 sustainability measures for the common hagfish.
58. MPI considers that the *status quo* is likely to be ensuring sustainability of the goliath hagfish and *N. biniplicata*, as they do not appear to be part of the target fishery for hagfish. As such, there are unlikely to be sustainability concerns for these species, as was previously considered under the IPP. Currently, there is little information regarding the level of take of either the goliath hagfish or *N. biniplicata* as bycatch species, as they may be misreported under the species code for common hagfish. MPI considers that overall reported bycatch of hagfish for other target fisheries is low enough that it does represent a sustainability concern for *N. biniplicata* or the goliath hagfish, and that the *status quo* is appropriate until better species reporting and observer information can be collected.

⁴ 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

Utilisation

59. Catches of hagfish have been sporadic throughout the development of the fishery. This may reflect a lack of incentives for fishers to invest in the fishery. In particular, current management appears to be hindering investment to achieve greater returns from the fishery from live exports. This is unlikely to change under the *status quo*. Under the *status quo*, the hagfish fishery will continue to be managed as open access. Fishers will not be provided with the security of access rights, and this may dampen interest in investing the development of the fishery. MPI considers that section 11 sustainability measures would not address this concern.
60. While there is market demand for hagfish, there is fishing pressure, and there are no barriers for fishers taking hagfish other than acquiring a fishing permit and any capital costs associated with fishing. As a result, the *status quo* leaves the fishery vulnerable to developing as a boom and bust fishery, as has happened in hagfish fisheries overseas. MPI considers that this option does not provide adequately for utilisation.

OPTION 2 (MPI PREFERRED OPTION) – INTRODUCE THE COMMON HAGFISH INTO THE QMS ON 1 OCTOBER 2014 AND SET NINE QMAS FOR MANAGEMENT OF COMMON HAGFISH STOCKS

61. MPI recommends under Option 2 that you make a determination to introduce the common hagfish into the QMS on 1 October 2014. Overall, MPI considers that the QMS is likely to provide the best framework for managing the common hagfish fishery in terms of both sustainability and utilisation, and that the purpose of the Act, in relation to the common hagfish fishery, would not be better met by setting section 11 measures.
62. As your determination to introduce a new stock or species into the QMS requires consideration of sustainability and utilisation for that stock or species, these factors are outlined in more detail below.

Sustainability

63. Under Option 2, the common hagfish would be managed under the QMS. MPI is aware of strong interest in developing this fishery. Once current issues surrounding keeping hagfish alive for live export are resolved, there will be a heightened risk of an unsustainable fishery developing in the non-QMS environment. MPI considers that the QMS provides the best framework for ensuring that catches are constrained to sustainable levels. The QMS best ensures stock sustainability over section 11 measures alone because quota allocation, balancing catch with ACE, and deemed values provide incentives for fishers to fish within sustainable limits. These measures are not available outside the QMS. Furthermore, under the QMS, section 11 measures can still be implemented if necessary to further support sustainability.
64. While there is no scientific information currently available on the stock status of common hagfish, given susceptibility to overfishing the QMS framework provides a

better management regime to ensure sustainability using the best available information.

65. Additionally, under Option 2, the allocation of access rights will give quota owners an incentive to take a long term view of the fishery and promote sustainable management. MPI will have the ability to work with rights holders to develop a sustainable management plan for this fishery.

Utilisation

66. Under option 2, fishers will be able to secure long term access rights to the common hagfish fishery. MPI considers that, as there is high utilisation potential for this fishery, the best framework for providing for utilisation is through the access rights framework provided for by the QMS. This provides effective tools for the fishery to be managed without going through a boom and bust phase, and therefore for providing for utilisation of the fishery. Furthermore, the allocation of rights will provide incentives for fishers to invest in and develop the hagfish fishery. This includes incentives to invest in developing the value of the fishery and maximising returns on exports.

Setting Quota Management Areas

67. The final proposal put forward for QMAs in this final advice paper differs from those in the IPP. In the IPP that was released for consultation, MPI consulted on two options for QMAs. Option A was to set four QMAs, and Option B was to set ten QMAs. MPI recommends that you set nine QMAs, which falls between these two options. This is because further analysis indicates that there is very little suitable habitat for targeting hagfish in FMA8. Low habitat indicates that it is unlikely that a target fishery comparable to the size of other FMAs will develop in area 8, and therefore setting a commensurately small TAC for in this area will impose unnecessary costs on fishers. Combining areas 8 and 9 into one hagfish QMA will create a management area similar in size and habitat to the other QMAs that are proposed (Figure 1). This also aligns with principles developed by MPI to be used in the setting of TACs (see below).
68. Setting nine QMAs is preferable over setting four QMAs, as hagfish likely form small biological populations, and are likely to be managed most effectively as small units for fisheries management.
69. The Act sets out two statutory obligations that must be considered when defining QMAs for stocks introduced into the QMS:
 - a) As far as practicable, the same QMAs should be maintained for different species (s19(2)); and
 - b) A separate QMA may be set for waters surrounding the Chatham Islands if the species can be managed effectively as a unit.
70. MPI notes that the proposed QMAs for hagfish match those for most other QMS species. MPI considers that setting QMA boundaries that match those of current fisheries management areas will provide the best management areas to support

sustainable utilisation of hagfish stocks. Combining FMA8 and 9 to form HAG8 will still ensure that existing fisheries management area boundaries are used.

71. The proposed QMA 4 aligns with FMA 4. Modest levels of catch of hagfish have been reported in FMA4. Hagfish likely form discrete biological populations, therefore, under section 19(3) of the Act, it is effective to manage the common hagfish as a unit in the waters of the Chatham Rise and surrounding the Chatham Islands.
72. MPI has also developed a set of principles to assist in defining practicable QMAs, as outlined in Table 2.

Table 2: Principles in setting proposed QMAs

Principles	Fisheries management outcomes
1. Management areas should be based principally on the biological characteristics of the stock	<ul style="list-style-type: none"> • Sustainability requirements of the 1996 Act (based around "stock") are met.
2. The stock boundaries should take into account the existing characteristics of the fishery (known fisheries, relevant fisheries management issues)	<ul style="list-style-type: none"> • Sensible stock boundaries • Simplified allocation of quota • Reduced business compliance costs
3. Where practicable, QMAs for species that are taken together in the same fisheries should be aligned	<ul style="list-style-type: none"> • Integrated management of interrelated-stocks • Reduced complexity and business compliance costs
4. QMAs with new boundaries may be appropriate for species with populations whose distributions do not align with existing QMA boundaries	<ul style="list-style-type: none"> • Sensible stock boundaries • Sustainability requirements of the Act are met • Improved control of harvest and reduced risk to the aquatic environment
5. Subject to the principles noted above, QMAs should be as large as possible	<ul style="list-style-type: none"> • Reduced complexity and business compliance costs • Flexibility for exercise of customary rights

73. Concerning principal 1, catch records indicate that hagfish are abundant throughout their range in areas where they have been fished. MPI understands that they are likely to be abundant in other areas also. Given that hagfish likely form small discrete biological populations, MPI considers that the most effective management of this fishing effort will likely be achieved through setting a larger number of smaller QMAs to ensure the long-term sustainable utilisation of the common hagfish.
74. Under Principle 2, a relevant fisheries management issue is the availability of fishable habitat, and likelihood for a target fishery to develop. Given that there is low suitable habitat in FMA8, and low likelihood for a target fishery to develop, MPI considers that Principle 5 applies, and that FMA8 and 9 should be combined to create a management area for HAG8. Additionally, this will create a management area similar in size to the other QMAs that are proposed.
75. Concerning Principal 3, MPI notes that relatively small amounts of hagfish are taken as bycatch primarily in the ling, scampi, and rock lobster fisheries. Each of these species has different management areas that reflect the unique characteristics of these species

and fisheries. As such, it is not practical to set QMAs for hagfish that match each of these species. Basing the QMAs for hagfish on current FMA boundaries matches most other QMS stocks

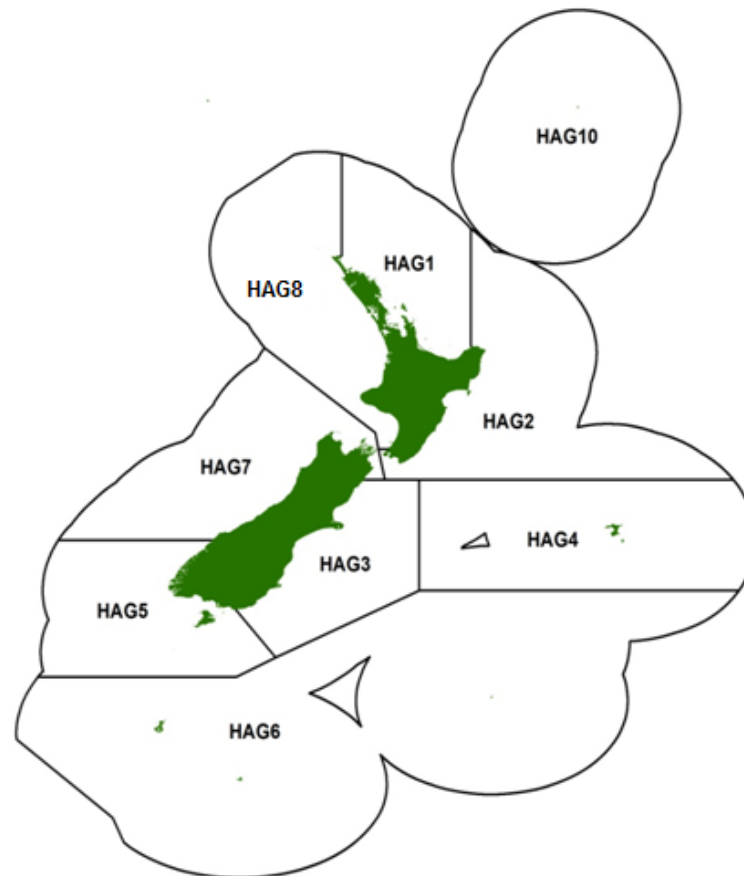


Figure 2: Proposed Quota Management Areas for the common hagfish

76. With regards to the initial proposals, two submitters supported setting ten QMAs. However, TOKM submitted that four QMAs should be set given that MPI has so little information regarding biomass, location, and breeding habits.
77. MPI responds that while fewer QMAs would lead to less costs for fishers, it also holds a higher sustainability risk given the biology of hagfish. Again, section 10(d) of the Act states that the absence of, or any uncertainty in, any information should not be used as a reason for postponing or failing to take any measure to achieve the purpose of the Act. The best available information suggests that the locations inhabited by the common hagfish include all coastal shelf New Zealand waters, and that they are abundant throughout this range. This is reflected by fishing effort so far. Evidence further suggests that hagfish species have no larval duration, are not likely to migrate, and are low productivity species. Overall, MPI believes that setting nine QMAs is important as management at small spatial scales is likely to better ensure the sustainability of this fishery, which aligns with the purpose of the Act as required under section 17B(2) (and proposes nine QMAs in place of ten QMAs for the reasons outlined in paragraph 66).

78. Setting nine QMAs, as opposed to four, may create additional costs for fishers. However, MPI considers that this step is necessary to ensure sustainability of the stocks.
79. Overall, MPI considers that setting nine QMAs for the management of hagfish stocks will provide the most effective framework for ensuring sustainability.

Fishing Year

80. MPI recommends the proposed fishing year for hagfish is from 1 October to 30 September.

Unit of Measure

81. MPI recommends using greenweight as the unit of measure to express TACs and ACE.

OTHER STATUTORY CRITERIA

Purpose of the Act

82. MPI considers that the proposals in this paper meet the purpose of the Act, as discussed in paragraph 49 above. Introducing the common hagfish into the QMS will provide a framework for sustainable management that ensures the long-term utilisation of the species. Determining not to introduce hagfish into the QMS requires that you are confident that managing hagfish as an open access fishery will better achieve the purpose of the Act than management within the QMS. MPI considers that the QMS provides a better framework for ensuring the sustainability of common hagfish. MPI also considers that open access does not provide adequately for utilisation of the species due to the lack of incentives to invest in development of the fishery. While the purpose of the Act is to ensure sustainable utilisation for fisheries resources more generally, MPI does not think that managing hagfish using section 11 measures will impact the sustainable utilisation of fisheries resources more positively than management within the QMS.
83. MPI does not consider that introducing the goliath hagfish and *N. biniplicata* will best serve the purpose of the Act at this point in time. This is because, contrary to previous concerns, these species do not appear to be associated with the target hagfish fishery, and they are unlikely to be caught in numbers that raise sustainability or utilisation concerns. As such, until such time that MPI is confident that these species are targeted or taken in large quantities as bycatch, MPI considers that their introduction may impose unnecessary constraints on industry, and that continuing to manage these species as open access will better achieve the purpose of the Act.

General Obligations

84. In setting or varying sustainability measures, you must also act in a manner consistent with New Zealand's international obligations to fishing and the provisions of the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992.
85. A wide range of international obligations relate to fishing, including use and sustainability of fishstocks, and maintaining biodiversity (s 5(a)). MPI considers that the proposal presented for hagfish is consistent with these international obligations.
86. MPI also considers the proposed management options to be consistent with the provisions of the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992 (s 5 (b)).
87. There is an obligation to provide for input and participation of tangata whenua and have particular regard to kaitiakitanga (under section 12 of the Act). MPI provided the opportunity for tangata whenua to offer input into the options proposed during the consultation period. MPI received a submission from Te Ohu Kai Moana Trustee Ltd, which acts as corporate trustee of Te Ohu Kai Moana Trust. The purpose of Te Ohu Kai Moana Trust is to advance the interests of iwi individually and collectively, primarily in the development of fisheries, fishing, and fisheries-related activities. Their submission points have been taken into account throughout this paper.

Environmental Principles

88. Section 9 of the Act requires you to take into account the following environmental principles:
 - a) associated or dependent species be maintained at or above a level that ensures their long term viability;
 - b) the biological diversity of the aquatic environment should be maintained; and
 - c) habitat of particular significance for fisheries management should be protected.
89. Associated or dependent species are defined as any non-harvested species taken or otherwise affected by the taking of any harvested species. There is very little bycatch associated with hagfish pots, and the impact from hagfish fishing on non-harvested species taken alongside hagfish is thought to be very low whether or not hagfish are introduced into the QMS.
90. MPI has no information to indicate what effect removing hagfish from the benthic environment will have for local ecosystems. Hagfish are thought to act as both scavengers and predators in their natural environments. Reducing their capacity to act in such roles could impact on associated species or local biodiversity. However, MPI expects that through managing within the QMS, hagfish will not be removed in numbers that would threaten the long-term viability of associated or dependent species. For the same reason, MPI considers that the options in this paper will not threaten the ability of biodiversity to be maintained. However, MPI notes that introduction into the QMS provides a better framework for managing these impacts, than does managing as an open access fishery.

91. Hagfish pots have minimal effect on the environment, and are not expected to impact negatively on any potential habitat of particular significance for fisheries management.
92. MPI considers that the proposals in this paper satisfy the environmental principles outlined under section 9 of the Act.

Information Principles

93. Section 10 says you must take into account the following information principles when exercising or performing functions, duties or powers under the Act in relation to the utilisation of fisheries resources or ensuring sustainability:
 - a) decisions should be based on the best available information;
 - b) decision makers should take into account any uncertainty in the available information;
 - c) decision makers should be cautious when information is uncertain, unreliable, or inadequate; and
 - d) the absence of, or any uncertainty in, any information should not be used as a reason for postponing or failing to take any measure to achieve the purpose of the Act.
94. The options and analysis presented in this paper reflect the best available information for hagfish and the hagfish fishery, and outline the uncertainty in the information available where it is relevant to your decision making.

Section 11 Considerations

95. Section 17B(2) of the Act states that you must make a stock or species subject to the QMS unless you determine that the purpose of the Act would be better met by setting one or more sustainability measure under section 11. Consideration of the applicability of section 11 sustainable measures for the management of the common hagfish, as opposed to QMS introduction, has been incorporated throughout the analysis in this final advice paper. If you make a determination to introduce the common hagfish into the QMS, MPI will need to consult on setting of a TAC. This will involve further consideration of other factors under section 11, and this analysis will be included in a subsequent final advice paper.

Recommendations

96. MPI recommends that you:

Note that the prerequisites for introducing the common hagfish into the QMS under section 17B of the Fisheries Act 1996 (including consultation) have been complied with

Noted

And choose either:

Option 1 (*Status quo*):

Yes / No

Agree to retain the *status quo* for the fishery, which is to manage hagfish outside the QMS. The fishery will remain open access, and MPI will consider the use of sustainability measures under section 11 of the Act to ensure sustainability of the fishery.

OR

Yes / No

Option 2 (MPI preferred option):

- i) Approve** the introduction of the common hagfish (*Eptatretus cirrhatus*) into the QMS on 1 October 2014; and
- ii) Approve** the setting of nine separate QMAs for management of common hagfish stocks; and
- iii) Approve** the fishing year for common hagfish as 1 October to 30 September; and
- iv) Approve** the use of greenweight as the unit of measure for the above stocks; and
- v) Agree** not to introduce the goliath hagfish (*E. goliath*) and *N. biniplicata* into the QMS.

Note that if you agree to the introduction of hagfish into the QMS, MPI will instruct the Parliamentary Counsel Office to draft the necessary *Gazette* notice for your signature

Noted

Approved / Not Approved / Approved as Amended

Scott Gallacher
Deputy Director General
Regulation and Assurance
On behalf of Director-General

Hon Nathan Guy
Minister for Primary Industries

/ / 2014

Appendix one: Other issues raised in submissions

97. MPI recognises that multiple submitters supported introducing all three hagfish species under a mixed species code. This option was not provided in the IPP for consultation. MPI disagrees that managing hagfish species under one mixed species reporting code will be effective for providing for utilisation or ensuring sustainability. As TOKM points out, neither the goliath hagfish nor *N. biniplicata* appear to be abundant enough to support a quota-based fishery. Given the sustainability concerns surrounding hagfish species, the most appropriate approach is to manage species with separate species codes and, therefore, separate reporting for each species. Managing under a mixed species code would not provide us with adequate information to analyse stock status for these separate species.
98. Furthermore, despite TOKM's suggestion that MPI offered no way to distinguish the species, MPI points out that Appendix 1 to the IPP described clear differences between *N. biniplicata* and species of the genus *Eptatretus*. Furthermore, MPI is now aware that fishers targeting the common hagfish primarily target depths outside of the goliath hagfish's depth range, and therefore, species may be distinguished by establishing what depth they are taken from.
99. Mr Deadman suggested that there are many species of hagfish that have been caught as part of the target fishery. Expert advice suggests that this is likely to reflect that the common hagfish has developed local environmental tolerances in different locations, and thus is responding differently to fishing pressure and environmental factors in these locations, and may even look different⁵. More information is needed to corroborate this assertion. Currently, MPI expects that management at a small spatial scale will be the best approach for managing sub-populations with different environmental tolerances. This provides further support for managing hagfish within nine QMAs, if the species is introduced into the QMS.
100. Sanford suggested that the IPP was too light on how the TAC/TACC would be set and tendered for, and wishes to discuss this further. MPI notes that the paper stated that a second consultation paper would be released for this purpose, should you make a determination to introduce the common hagfish into the QMS. MPI welcomes Sanford's submission on this second consultation paper. This paper is planned to be released ahead of 1 October 2014, in time for you to make decisions on TACs before the start of the fishing year on 1 October 2014.
101. Some submissions recommended that more stringent reporting requirements were needed immediately for the hagfish fishery. MPI has already considered the need to collect finer scale reporting information for hagfish fisheries, and is investigating how this can be achieved.
102. Seafood NZ submitted that proper QMS introduction procedures, as outlined in the QMS Introduction Standard (the Standard), were not followed by MPI before proposing species for introduction into the QMS. Specifically, they note that risk analyses for each species proposed were not completed or provided to stakeholders.

⁵ Frederic Martini; personal communication

103. The Standard is a document that sets out an annual process for identifying stocks or species to be considered for QMS Introduction. A step outlined as part of this process was to undertake a risk analysis for stocks that were candidates for QMS introduction. These analyses were primarily used as a tool for grouping stocks or species, so as to create a schedule for introducing species over a period of three years based on the risk associated with continuing to manage them outside the QMS. MPI considers that when the Standard was developed, there were many species to be considered for introduction. Given that there were so few candidate species being proposed for introduction in this case, MPI did not consider that a grouping or scheduling step was necessary, and therefore no risk analyses were released.
104. The Standard also states that the groupings (a product of the risk analyses) were to be used to make decisions on which candidate stocks or species would be considered for QMS introduction. In the case of hagfish, MPI considered that the catch characteristics, utilisation potential, and sustainability concerns, were of a level strong enough that no additional risk analysis as explicitly defined in the Standard was necessary before a decision to propose introduction was able to be made. MPI also notes that there is no statutory obligation for you to complete steps in the Standard before determining to make a species subject to the QMS.
105. The NZRLIC expressed concerns in their submission that proper legislative procedure was not followed by MPI in deciding to propose carpet shark (separate paper) and hagfish into the QMS. Specifically, they felt that the statutory tests in 17B of the Act were not properly followed. See “Need to Act” for discussion of 17B.
106. The NZRLIC maintains that many comments in the IPP were misguided because they used the language that is provided in the definitions in section 8 of the Act for utilisation and ensuring sustainability. They believe that this is wrong, given that 17B(1) refers specifically to sustainability and utilisation only of the stock or species under consideration for introduction into the QMS. MPI agrees that the tests in 17B(1) should focus on the stock or species proposed for introduction into the QMS, but disagrees that using the definition of ensuring sustainability and utilisation as outlined in section 8 of the Fisheries Act is inappropriate for this purpose. To this end, MPI is satisfied that the proper statutory considerations were applied when considering independently the species proposed for introduction into the QMS.
107. The NZRLIC was also concerned that section 17B(2) was not properly followed. They suggest that this subsection specifically provides a statutory requirement for you to consider the implications for sustainability and utilisation of fisheries resources more generally, rather than just for those candidate stocks proposed for introduction, when determining whether or not candidate stocks should be managed under the QMS framework. They propose that this is the case as 17B(2) explicitly involves the purpose of the Act (see “Analysis of Management Options – Option 1 *status quo*”), thus requiring consideration of utilisation and sustainability for all fisheries resources. NZRLIC proposes that this reference to the purpose of the Act means that MPI must consider the effect on fisheries resources generally, and provide for their utilisation and sustainability, if a new stock or species is introduced into the QMS.

108. For the reasons set out above, MPI does not agree with this. In MPI's view, the proper approach is to look at the sustainability and utilisation of the stock being considered for introduction into the QMS, and the potential ability of section 11 sustainability measures to deal with any issues found.
109. Inherently, the purpose of the Act requires that the management of hagfish ensures sustainability for the fishery and provides for utilisation of the fishery. It places no hierarchical priority on consideration of other fisheries over these basic requirements. MPI considers that the QMS best ensures stock sustainability because of its useful measures (particularly the balancing regime) and incentives (via quota allocations), neither of which are present in the non-QMS framework.
110. The NZRLIC directed MPI towards a review paper that referenced a separate scientific article as providing evidence that hagfish returned to the sea from crustacean trawls in the UK experienced a 100% survival rate. If you determine to make hagfish subject to the QMS, MPI will consult on possible inclusion on Schedule 6 as part of a second consultation for TACs, TACCs, associated allowances, and other management measures.
111. TOKM suggested that there is customary and recreational take of hagfish. MPI will give this due consideration in the setting of the TAC, TACC, associated allowances, and other management measures, if you make a determination to introduce hagfish into the QMS.