



Initial Position Paper on the proposed introduction of hagfish into the Quota Management System on 1 October 2014

MPI Discussion Paper No: 2014/04

ISBN No: 978-0-478-42343-3 (online)
ISSN No: 2253-3907 (online)

January 2014

Disclaimer

Every effort has been made to ensure the information in this document is accurate.

The Ministry for Primary Industries (MPI) does not accept any responsibility or liability whatsoever for any error of fact, omission, interpretation or opinion that may be present, however it may have occurred.

Requests for further copies should be directed to:

Publications Logistics Officer
Ministry for Primary Industries
PO Box 2526
WELLINGTON 6140

Email: brand@mpi.govt.nz
Telephone: 0800 00 83 33
Facsimile: 04-894 0300

This publication is also available on the Ministry for Primary Industries website at <http://www.mpi.govt.nz/news-resources/publications.aspx>

OFFICIAL INFORMATION ACT 1982

All submissions are subject to the Official Information Act 1982 (OIA) and can be released (along with the personal details of the submitter) under the OIA. If you have specific reasons for wanting to have (any part of) your submission or personal details withheld, please set out your reasons in the submission. MPI will consider those reasons when making any assessment under the OIA.

© Crown Copyright, January 2014 - Ministry for Primary Industries

Contents	Page
Summary	1
Overview	1
Background	4
Statutory Considerations	4
Fisheries Plan Objectives	6
QMS Introduction Guidelines	6
Problem Definition	7
Summary of Options	8
Option 1	8
Option 2 – Introduce the common hagfish (<i>E. cirrhatus</i>) into the QMS on 1 October 2014	8
Option 3 – Introduce the common hagfish (<i>E. cirrhatus</i>), the goliath hagfish (<i>E. goliath</i>), and <i>N. binniplicata</i> into the QMS on 1 October 2014 as three species-specific stocks	9
Analysis of Management Options	10
Option 1	10
Option 2	11
Option 3	14
Other Management Controls Concurrent with Entry into QMS	17
Other Management Issues	22
Appendix 1 – Biological and fishery information	24
Biological and Species Information	24
Social, Economic, Cultural Information	27

Summary

1. This paper seeks tangata whenua and stakeholder views on whether hagfish (*Eptatretus cirrhatus*, *E. goliath*, and *Neomyxine binniplicata*) should be introduced into the Quota Management System (QMS).
2. The hagfish fishery is currently managed as an open access fishery. MPI considers that this management framework is no longer providing adequately for sustainable utilisation of the fishery.
3. This paper presents three options for introducing hagfish into the QMS. Under Option 1, hagfish would remain outside the QMS but be subject to consideration of sustainability measures under section 11 of the Fisheries Act 1996 (the Act). Under Option 2, only the common hagfish (*E. cirrhatus*) would be introduced into the QMS. Under Option 3, three species (*E. cirrhatus*, *E. goliath*, and *N. binniplicata*) would be introduced into the QMS.
4. Two options are also presented for defining Quota Management Areas (QMAs) for hagfish, should they be introduced into the QMS. Option A suggests four large QMAs, whereas Option B recommends managing hagfish in ten smaller QMAs.
5. This paper recommends that hagfish be managed under the 1 October – 30 September fishing year, should they be introduced into the QMS, and that the unit of measurement be expressed in greenweight.

Overview

6. This paper seeks tangata whenua and stakeholder views on whether hagfish (*E. cirrhatus*, *E. goliath*, and *Neomyxine binniplicata*) should be introduced into the QMS on 1 October 2014 by way of determination by the Minister for Primary Industries (the Minister) under section 17B of the Act.
7. The Minister's key decision, whether to make a determination to make hagfish subject to the QMS, is made under section 17B(1) and (2) of the Act. If satisfied that the current management is a) not ensuring the sustainability of the stock or species or b) not providing for the utilisation of hagfish, the Minister must determine to make hagfish subject to the QMS unless he determines that the purposes of the Act would be better met by setting one or more sustainability measures under section 11.

8. The hagfish fishery is currently managed as an open access fishery. Hagfish are targeted with fish pots by commercial fishers for export and are also taken as bycatch in several fisheries targeting QMS species (primarily by bottom longline and bottom trawl). Hagfish have largely been taken in Fisheries Management Areas (FMA) 1, 2, and 7 in recent years. Hagfish were considered for introduction into the QMS in 2008 but were not introduced as the costs at the time outweighed the benefits considering that interest in the fishery appeared to be waning at that point in time. However, the following fishing year, 2009/10, yielded a reported catch of approximately 1300 tonnes. There were at least five fishing vessels targeting hagfish, with one vessel taking close to half of the reported catch that year.
9. Hagfish catches have declined since 2009. However, the Ministry for Primary Industries (MPI) recognises that interest in developing the hagfish fishery is currently increasing, driven by the export market to Korea. MPI is aware that some commercial operators are currently gearing up five vessels to pot hagfish, and that some of these vessels have already started experimental fishing.
10. Hagfish have been identified through MPI's annual fish planning cycle as species for consideration under section 17B(1)(b) of the Act, due to changes in the level of catch in recent years. With interest in the hagfish fishery rising, open access may lead to a race to catch and is likely to require input controls, such as catch limits or fishing restrictions, under section 11 of the Act. Furthermore, managing under an open access regime does not provide a suitable opportunity for gathering information about the fishery that will be used to inform management decisions and input controls in the event they are needed.
11. MPI also considers that open access to hagfish may not be continuing to provide a suitable framework to enable stakeholders to provide for their economic well-being. Although open access does provide for utilisation of hagfish species, MPI believes that utilisation of the species would be optimised under the QMS. The security of rights and access provided by the QMS would enable rights holders to invest in developing the fishery and lead to incentives to better utilise hagfish.
12. The Minister has an option to choose to impose measures under section 11 of the Act rather than introducing hagfish into the QMS. MPI does not feel that section 11 measures will sufficiently address the management issues that the hagfish fishery faces, but welcomes submissions on this option. MPI notes that fishers will face additional costs

such as those associated with acquiring ACE or paying deemed values, for any hagfish species introduced into the QMS.

13. MPI proposes three options in this paper. Under Option 1, hagfish species would remain outside the QMS but be subject to consideration of section 11 measures. Option 2 proposes to introduce only the common hagfish, *E. cirrhatus*, into the QMS on 1 October 2014. Option 3 proposes to introduce *E. cirrhatus*, *E. goliath*, and *Neomyxine binniplicata* into the QMS as separate species on 1 October 2014.
14. MPI proposes two separate options, A and B, for setting QMAs should *E. cirrhatus*, or *E. cirrhatus*, *E. goliath*, and *N. binniplicata*, be introduced into the QMS.
15. Under QMA Option A, the relevant species would be managed in four separate QMAs (1, 3, 4, and 10). QMA 1 would encompass current FMAs 1, 2, 7, 8, and 9. The majority of targeted fishing occurs in these areas. QMA 3 would encompass FMAs 3, 5, and 6. MPI believes that hagfish are primarily bycatch species in these areas. QMA 4 would encompass the waters around the Chatham Islands in FMA 4. MPI believes that hagfish can be effectively managed as a unit in the waters of the Chatham Rise and surrounding the Chatham Islands. It is of economic benefit for a separate QMA to be established for the Chatham Islands under section 19(3) of the Act. QMA 10 would encompass FMA 10 around the Kermadec Islands. Any further division of QMAs would pose additional costs for fishers.
16. Under QMA Option B, hagfish species that are introduced into the QMS would be managed in ten separate QMAs. These proposed QMAs would match current FMAs 1 – 10 as defined in Schedule 1 to the Act. This proposal reflects that hagfish, having no larval phase¹ or migratory behaviour², likely form discrete biological stocks across small spatial scales, and will be most effectively managed in small QMAs.
17. Should the Minister make a determination to introduce hagfish into the QMS, MPI proposes that hagfish be managed within the 1 October to 30 September fishing year and that the unit of measurement be expressed in greenweight.
18. MPI will require species-specific reporting to closely monitor catch of hagfish species that remain outside the QMS. This will improve current information on the levels that are

¹ Worthington, Julia. 1905. Contribution to our knowledge of the Myxinoids. *The American Naturalist* 39:625-663

² Only one species, *E. burgeri* in Japanese waters, is known to exhibit migratory behaviour, moving between deep and shallow waters during spawning.

taken of each hagfish species. MPI will consider proposing changes to the management framework for species outside the QMS if we become aware that these species of hagfish become a target of commercial fishing effort.

Background

19. Hagfish have been identified through MPI's annual fish planning cycle as meeting the QMS introduction standard. That is, there is evidence of significant change in reported catch over time, which calls into question whether or not existing management remains appropriate for these species.
20. The existing management framework is no longer appropriate if it is not meeting the purpose of the Act – to provide for the utilisation of fisheries resources whilst ensuring sustainability. In this case, the Minister may choose to implement measures under section 11 of the Act, or introduce hagfish into the QMS. MPI considers that the QMS framework generally provides the best means of meeting the purpose of the Act, but that other methods of active management may be more appropriate in some cases.

Statutory Considerations

21. The Minister's key decision, whether to make a determination to make hagfish stocks subject to the QMS is made under section 17B(1) and (2) of the Act. If satisfied that current management is a) not ensuring sustainability or b) is not providing for the utilisation of hagfish the Minister must determine to make hagfish subject to the QMS unless he determines that the purpose of the Act would be better met by setting one or more sustainability measures under section 11.
22. Generically, MPI considers the QMS is the best framework available within the Act to provide for the utilisation of fisheries resources while ensuring sustainability (purpose of the Act) regardless of the section 11 measure chosen. MPI believes that open access to the hagfish fishery does not provide a suitable framework to enable stakeholders to provide for their economic well-being. Although open access does not prevent utilisation, without the security provided by the QMS, the potential of the fishery is unlikely to be fully realised. MPI believes that the 17B(1)(b) test is therefore met.
23. MPI has no information indicating that there are current sustainability concerns for hagfish; however, hagfish species have a moderate to high vulnerability, and low

resilience, to overfishing. Anecdotal evidence suggests that some areas remain depleted since the peak of fishing effort in the hagfish fishery in 2009/10. MPI is aware that an increase in fishing pressure could lead to sustainability concerns. In other parts of the world, most hagfish fisheries at a similar level to the peak of the New Zealand fishery have collapsed. MPI considers that open access to the hagfish fishery may not provide for the sustainable long-term utilisation of these species.

24. Section 17B(3) requires that before any determination under section 17B is made, the Minister must consult with those persons or organisations whom he considers to be representative of the classes of persons who have an interest in the relevant determination.
25. If the Minister determines under section 17B to make a stock subject to the QMS, the Minister must by notice in the *Gazette* declare the stock to be subject to the QMS on and from the first day of the fishing year stated in the notice.
26. Should the Minister agree to introduce hagfish stocks into the QMS under section 17B, he must then in the section 18 *Gazette* notice:
 - 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 both the QMA Option A and B proposed in this paper are consistent with this obligation. MPI also considers that hagfish on the Chatham Rise and around the Chatham Islands can be managed effectively as a unit, and therefore, that a separate QMA should be established (in accordance with section 19(3)).
 - State the fishing year in respect of the stock. MPI is proposing that the fishing year for the proposed hagfish stocks should be 1 October to 30 September.
 - State whether the total allowable commercial catch (TACC) and annual catch entitlements (ACE) are to be expressed in meatweight or greenweight. MPI is proposing that the unit of measurement for hagfish be expressed in greenweight.
 - Make provisions for other such matters as may be contemplated by the Act.
27. Additionally, section 19(7) of the Act requires that before the Minister makes a declaration that a stock is subject to the QMS, he must consult with those persons or organisations whom he considers are representative of those classes of persons having an interest in the matters set out in section 19(1) – set out above in paragraph 26.

28. This paper seeks submissions on both the proposed introduction of hagfish into the QMS and on the other matters referred to in paragraph 26 of this paper.

Fisheries Plans Objectives

29. The Government's long-term goal for fisheries is "New Zealanders maximising benefits from the use of fisheries within environmental limits". To support this goal, MPI has developed a draft National Fisheries Plan for Inshore Finfish (the Finfish Plan)³, which is a policy document that sets out management objectives for all inshore finfish fisheries. However, because of the sheer number of fish stocks, it is not practical to set stock-specific management objectives (or harvest strategies) for every stock. Therefore, stocks in the Finfish Plan have been grouped to facilitate multi-stock objective setting and service delivery.
30. Stocks in the Finfish Plan have been grouped according to their biological vulnerability and their desirability to fishers (potential fishing pressure). Non-QMS stocks were assigned into their own category (Group 7), reflecting the current low desirability and hence lower risk in general associated with these stocks.
31. Group 7 species are generally managed as open access fisheries, which MPI considers will enable utilisation in most cases. In addition, the stock sustainability objective for Group 7 is to ensure catch is at a level that is sustainable. If the non-QMS framework is not adequately providing for utilisation whilst ensuring sustainability, MPI will take appropriate action. This management approach minimises constraints so that opportunities for developing these fisheries can be realised where appropriate and sustainable. It also minimises management costs.

QMS Introduction Guidelines

32. MPI is committed to ensuring that there are appropriate development opportunities for non-QMS finfish species in Group 7. The statutory considerations as to whether a stock or species may be introduced into the QMS are addressed throughout this paper.
33. Stocks or species are assessed based on evidence of a significant change in reported catch over time. Changes in commercial catch are assessed over the three years preceding each

³ 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.

annual review. This analysis is undertaken on all catches for all non-QMS stocks or species, totalled for each 6 month period within this timeframe.

34. Two values will be used to define a significant change for a given stock or species:
 - catch exceeding 20 tonnes for any of the 6 month periods and the difference in catch between the minimum and maximum 6 month totals exceeding fifty percent of the minimum monthly 6 month total; and
 - catch exceeding 100 tonnes for any of the 6 month periods.
35. Catch history of hagfish has met both values that define a significant change in reported catch in recent years.

Problem Definition

36. Hagfish were considered for QMS introduction in 2008, but were not introduced. Since 2008, MPI has become aware of plans by some commercial operators to further develop a target fishery for hagfish, with a goal to begin fishing as soon as possible. This is because hagfish are highly valuable export species. They are valued for their meat marketed as champagne eel, which is a delicacy in Asia, and for their skin, which is used as leather and often marketed as 'eelskin'.
37. Levels of catch in recent years have ranged within the hundreds of tonnes, with a maximum reported catch of 1,275 tonnes in the 2009/10 fishing year. This suggests that there is an opportunity for development of the hagfish fishery (Appendix 1 provides additional information on recent catch history). MPI is aware that at the peak of fishing for hagfish, 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 'fish' and trap individuals, driving up levels of mortality.
38. Hagfish are easily identified into two subfamilies. MPI believes that hagfish of the subfamily Eptatretinae are the primary target of commercial fishers, due to their larger size and girth over individuals of the subfamily Myxininae. Within the subfamily Eptatretinae, two species (the common and the goliath hagfish) are likely to be the most common within their ranges, and therefore targeted by fishers. *N. binniplicata* is in the subfamily Myxininae. Species from the subfamily Myxininae have been heavily targeted in international fisheries, which indicates that there is potential for a target fishery for *N. binniplicata* to develop in New Zealand.

39. While MPI expects that common hagfish have made up the majority of reported hagfish landings in recent years, there is no information available to indicate the level of any other species that have been taken. Both *E. goliath* and *N. binniplicata* can be abundant in their geographic ranges, and may be taken in addition to the common hagfish.
40. To facilitate interest from stakeholders in investing in hagfish fisheries for these species, MPI believes long-term fishing rights to hagfish are now required. Continuing to manage hagfish as an open access fishery may not provide sufficiently for sustainable utilisation of these species. MPI does not feel that these management issues would be better addressed by section 11 measures over the long term.

Summary of Options

OPTION 1

41. Under Option 1, hagfish would remain an open access species outside the QMS and MPI will consider proposing sustainability measures under section 11 of the Act.

OPTION 2 – INTRODUCE THE COMMON HAGFISH (*E. CIRRHATUS*) INTO THE QMS ON 1 OCTOBER 2014

42. Option 2 recommends that the Minister make a determination to introduce the common hagfish into the QMS on 1 October 2014 and within that option:
- define the QMAs for common hagfish as set out below in paragraph 43;
 - state the fishing year for common hagfish to be 1 October to 30 September; and
 - state the unit of measure for common hagfish to be kilograms greenweight.
43. Within Option 2, there are two options available to the Minister regarding the setting of QMAs:
- QMA Option 2A recommends that the QMAs for common hagfish be QMA 1, 3, 4, and 10; and
 - QMA Option 2B recommends that the QMAs for common hagfish be QMA 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10.
44. MPI recognises that hagfish, having no larval phase or known migratory behaviour, likely form small biological stocks and will be most effectively managed in ten small QMAs. However, MPI welcomes stakeholder opinion on the possibility of setting four larger QMAs.

45. Should the Minister make a determination to introduce the common hagfish into the QMS, MPI will commence a separate process for recommending the setting of total allowable catches (TAC), TACCs, and allowances. Tangata whenua and stakeholders will again be consulted during that process. If the Minister makes a determination to introduce the common hagfish into the QMS, 20% of hagfish quota will be allocated to Maori (via Te Ohu Kai Moana Trustee Limited) and 80% to the Crown. The Crown-held quota would be tendered at the earliest opportunity.

OPTION 3 – INTRODUCE THE COMMON HAGFISH (*E. CIRRHATUS*), THE GOLIATH HAGFISH (*E. GOLIATH*), AND *N. BINNIPPLICATA* INTO THE QMS ON 1 OCTOBER 2014 AS THREE SPECIES-SPECIFIC STOCKS

46. Option 3 recommends that the Minister make a determination to introduce the common hagfish, *E. goliath*, and *N. binniplicata* into the QMS on 1 October 2014 under separate species codes, and within that option for each of the species of hagfish:
- define the QMAs as set out below in paragraph 47;
 - state the fishing year to be 1 October to 30 September; and
 - state the unit of measure to be kilograms greenweight.
47. Within option 3, there are two options available to the Minister regarding the setting of QMAs:
- Option 3A recommends that *E. cirrhatus*, *E. goliath*, and *N. binniplicata* be managed as species-specific stocks each within four QMAs (QMA 1, 3, 4, and 10); and
 - Option 3B recommends that *E. cirrhatus*, *E. goliath*, and *N. binniplicata* be managed as species-specific stocks each within ten QMAs (QMA 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10).
48. MPI recognises that hagfish, having no larval phase or known migratory behaviour, likely form small biological stocks and will be most effectively managed in ten small QMAs. However, MPI welcomes stakeholder opinion on the possibility of setting four larger QMAs.
49. As for Option 2, and explained in paragraph 45, should the Minister agree to introduce these hagfish species into the QMS, MPI will recommend the setting of TACs, TACCs, and allowances. Tangata whenua and stakeholders will again be consulted during that process. The hagfish quota would be split in the same way as in Option 2.

Analysis of Management Options

OPTION 1

50. Under Option 1, hagfish would remain an open access species outside the QMS and MPI will consider proposing sustainability measures under section 11 of the Act.
51. Continuing to manage hagfish outside the QMS is an option available for the Minister's consideration. In assessing the appropriateness of this option the Minister must look at sustainability and utilisation considerations and whether they are best provided for by retaining hagfish outside the QMS and possibly implementing section 11 measures. These factors are described in more detail below.

Sustainability

52. MPI has no information indicating concerns over the current sustainability of hagfish; however, they have moderate to high vulnerability, and low resilience, to overfishing.⁴ Anecdotal evidence suggests that areas targeted during the peak of fishing in 2009/10 remain depleted today. Furthermore, overseas fisheries of a similar magnitude to the peak of the New Zealand hagfish fishery have collapsed or declined. Continuing to manage under an open access regime may impart sustainability concerns if fishing pressure increases as expected.
53. MPI does not feel that section 11 measures alone can effectively address sustainability issues that hagfish fisheries are expected to face if fishing pressure increases.
54. Section 11 measures offer input controls, such as catch limits and method, area, and seasonal controls, as means for addressing sustainability concerns. These measures lack enforcement tools, such as deemed values and balancing of ACE, that provide incentive to fishers to remain within a set catch limit. National catch limits can provoke a 'race to catch' and result in localised depletion, particularly for species like hagfish that form small discrete populations. Seasonal controls are impractical as MPI currently has no information regarding seasonality of reproduction in hagfish and it is unknown how seasonal controls would impact these populations. Similarly, area controls are unlikely to be effective as MPI has no information regarding population size, and limited information regarding distribution, for hagfish species. While banning particular fishing methods may address sustainability concerns for hagfish, this would go against another purpose of the

⁴ fishbase.org

Act, to allow for utilisation, as fish potting is the only method known to be used to target hagfish.

Utilisation

55. Any companies wishing to target hagfish will continue to be able to do so under an open access regime and despite section 11 measures. However, long-term fishing rights would not be secured as fishers would have no entitlement to a share of the hagfish fishery if hagfish were introduced into the QMS in the future. Continuing to manage under an open access regime may prevent the hagfish fishery from reaching its full utilisation potential.
56. Additionally, setting catch limits can result in a ‘race to fish’ as mentioned above, which can cause the fishery to become over-capitalised and inefficient, and impact on people’s ability to provide for their well-being.
57. As long as hagfish remain outside the QMS, they will be subject to the annual assessment process undertaken by MPI to determine whether non-QMS stocks or species should be considered for introduction into the QMS.

Costs

58. Continuing to manage outside the QMS will incur no additional costs; however, it may incur a cost in the form of lost potential revenue if fishers are discouraged from investing in the fishery.

Benefits

59. There may be short-term benefits to utilisation for fishers as there are no administrative barriers to entry into the hagfish fishery for non-QMS species. This means that anyone can fish for hagfish, provided they have a fishing permit. They will also have the option of discarding any unwanted hagfish catch, which would be illegal if hagfish entered the QMS. These potential short-term benefits to utilisation may be offset in the long-term by risks to sustainability and a lack of certainty for investment by fishers who desire long-term fishing rights in the hagfish fishery.

OPTION 2

60. Under Option 2, the common hagfish (*E. cirrhatus*) would be introduced into the QMS on 1 October 2014.

61. MPI has a policy preference for management under the QMS where sustainability or utilisation of a species is not being adequately provided for. As the Minister's decision to introduce a species into the QMS is based on sustainability and utilisation considerations, these two factors are described in more detail below.

Sustainability

62. MPI understands there is growing interest (driven by the Korean market) in developing the hagfish fishery and expects fishing pressure to increase in the immediate future. Introducing *E. cirrhatus* into the QMS will provide an appropriate framework for ensuring that catches are constrained to a sustainable level for this species, which MPI expects to be targeted primarily over other species of hagfish. MPI notes that the QMS best ensures stock sustainability over section 11 measures alone because quota allocation, balancing catch with ACE, and deemed values, provide incentives to fishers to fish within the limit. These measures are not available outside the QMS. Under the QMS, section 11 measures can still be implemented if necessary to further support sustainability.
63. Option 2 does not provide a framework for ensuring that catch of other hagfish species is constrained to a sustainable level.

Utilisation

64. MPI believes that QMS introduction and acquisition of quota shares by the fishing industry will provide the most effective framework for maximising utilisation of the common hagfish fishery. This is because long-term fishing rights, which are secured under the QMS, provide security to fishers investing in the hagfish fishery. Furthermore, the allocation of rights will provide better incentives than exist currently for rights holders to collectively manage the hagfish fishery. These factors indicate that the allocation of transferable rights provides the best opportunity to enable social, cultural and economic well-being to be derived from the fishery.
65. Section 11 measures (such as catch limits) cannot effectively address the management issues identified above. MPI considers that introduction into the QMS will provide better opportunity to manage environmental effects and enable utilisation through the allocation of rights than the use of measures under section 11 on their own. Accordingly, MPI does not consider that the purpose of the Act would be better met by setting one or more sustainability measures under section 11, when compared to the benefits of introduction into the QMS.

66. Option 2 does not provide a framework for ensuring long-term fishing rights for hagfish species other than the common hagfish.

Costs

67. There are additional costs to fishers associated with a species being entered into the QMS. These include the cost of acquiring ACE and paying deemed values.
68. Under the QMS, it would be illegal for fishers to dump unwanted hagfish catch and it is possible that restrictive TACCs for common hagfish QMAs could constrain other target fisheries such as ling, rock lobster, and scampi. However, the best available information suggests that levels of hagfish bycatch are 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.
69. It is likely that MPI will propose research projects to investigate biological characteristics of hagfish species, such as growth, productivity, and distribution. MPI expects that these costs will be borne by the Industry.

Benefits

70. The primary benefit of QMS introduction (and consequent allocation or tendering of quota) is that those parties who purchase quota will have greater certainty to invest in the fishery and will be able to take a long-term view of the resource. This approach is likely to provide the best opportunity for maximising utilisation of the fishery as the security provided by quota ownership will allow owners to invest in catching and developing markets for the common hagfish.
71. Introduction into the QMS will provide a further opportunity for better quality information to be obtained. Currently, there is no available information on population size for the common hagfish, and little is known about its distribution. Furthermore, fishers may currently be reporting multiple hagfish species under the species code HAG. As part of obtaining better quality information, MPI will develop and make available material for fishers that will help to distinguish hagfish species.
72. Adopting Option 2 does not preclude other species or assemblages of species of hagfish from entering the QMS should this be required in the future. Option 2 is conservative in this regard until further information is obtained.

OPTION 3

73. Under Option 3, the common hagfish, *E. goliath*, and *N. binniplicata* would be introduced into the QMS on 1 October 2014 as species-specific stocks. Under Option 3, MPI is assuming *E. goliath* and *N. binniplicata* form a substantial component of the catch and may be vulnerable to overfishing. MPI will be seeking additional information on the distribution and productivity of *E. goliath* and *N. binniplicata* to test this assumption. This additional information will inform the need to manage as species-specific stocks.
74. MPI has a policy preference for management under the QMS where sustainability or utilisation of a species is not being adequately provided for. As the Minister's decision to introduce stocks into the QMS is based on sustainability and utilisation considerations, these two factors are described in more detail below.

Sustainability

75. As noted above, MPI understands there is growing interest in developing the hagfish fishery and expects fishing pressure to increase in the immediate future. MPI expects that common hagfish make up the majority of catch, but it is likely that *E. goliath* and *N. binniplicata* are also taken, particularly as MPI understands there may be a preference on the export market for hagfish taken from deeper depths, such as *E. goliath*. Both *E. goliath* and *N. binniplicata* may have more restricted ranges than the common hagfish and may be more vulnerable to overfishing. Under these assumptions, introducing *E. goliath* and *N. binniplicata* into the QMS alongside the common hagfish will provide an appropriate framework for ensuring sustainable utilisation of these species also.
76. MPI notes that the QMS best ensures stock sustainability over section 11 measures alone because quota allocation, balancing catch with ACE, and deemed values, provide incentives to fishers to fish within the limit. These measures are not available outside the QMS. Under the QMS, section 11 measures can still be implemented if necessary to further support sustainability.

Utilisation

77. QMS introduction and acquisition of quota shares by the fishing industry for *E. goliath* and *N. binniplicata*, in addition to the common hagfish, will provide the most effective framework for maximising utilisation of these fisheries. This is because long-term fishing

rights, which are secured under the QMS, provide security to fishers investing in these fisheries.

78. MPI has no information to indicate the proportion of catch made up by each species of hagfish, but expects that the common hagfish makes up the majority of reported catch. Additionally, MPI has no estimates of population size for each species. While the common hagfish and *E. goliath* occupy different depths, the common hagfish and *N. binniplicata* occupy similar depths where their ranges are suggested to overlap. It remains possible, therefore, that restrictive TACCs for either the common hagfish, or *N. binniplicata*, could restrain catch of the other species and hinder utilisation, if they are caught in association. MPI has no information to suggest to what degree these two species are caught in association and welcomes any additional information that stakeholders may have.
79. MPI understands that there may be a preference on the Korean market for hagfish taken from deep depths or beyond a certain distance from shore. The best available information on distribution suggests that *E. goliath* would be a preferred species based on this preference. Furthermore, there is potential for a target fishery for *N. binniplicata* to develop as similar species have been a target of international fisheries. Option 3, unlike Option 2, provides an appropriate framework for ensuring long-term fishing rights and thus promoting sustainable utilisation of *E. goliath* and *N. binniplicata* also.
80. Section 11 measures (such as catch limits) cannot effectively address the management issues identified above. Specifically, MPI considers that introduction into the QMS will provide better opportunity to manage environmental effects and enable utilisation through the allocation of rights than the use of measures under section 11 on their own. The allocation of rights will provide better incentives than exist currently for rights holders to collectively manage the hagfish fishery. The allocation of transferable rights also provides the best opportunity to enable social, cultural and economic well-being to be derived from the fishery.
81. Accordingly, MPI does not consider that the purpose would be better met by setting one or more sustainability measures under section 11, when compared to the benefits of introduction into the QMS

Costs

82. If *E. goliath* and *N. binniplicata* enter the QMS alongside the common hagfish, fishers will be faced with associated costs for three separate QMS species. These include the cost of acquiring ACE or paying deemed values.
83. It is possible that restrictive TACCs for the common hagfish, *E. goliath*, and *N. binniplicata* QMAs could constrain other target fisheries. However, the best available information suggests that levels of hagfish bycatch are 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.
84. It is likely that MPI will propose research projects to investigate biological characteristics of hagfish species, such as growth, productivity, and distribution. MPI expects that these costs will be borne by the Industry.

Benefits

85. Introduction of the common hagfish, *E. goliath* and *N. binniplicata* into the QMS provides the opportunity for three fisheries to develop and provides the most appropriate management of separate biological stocks. A primary benefit of QMS introduction (and consequent allocation or tendering of quota) for these species is that those parties who purchase quota will have greater certainty to invest in these fisheries and will be able to take a long-term view of these resources. The rights-based approach is likely to provide the best opportunity for maximising utilisation of these three fisheries as the security provided by quota ownership will allow owners to invest in catching and developing markets for these species.
86. Introduction into the QMS will provide a further opportunity for better quality information to be obtained. Currently, there is no available information on population size for the common hagfish, *E. goliath*, and *N. binniplicata*, and little is known about their distributions. Furthermore, MPI understands that fishers may currently be reporting multiple hagfish species under the species code HAG. As part of obtaining better quality information, MPI will develop and make available material for fishers that will help to distinguish hagfish species.

OTHER MANAGEMENT CONTROLS CONCURRENT WITH ENTRY INTO QMS

87. Should the Minister agree to introduce hagfish stocks into the QMS, section 18 of the Act requires his decision to be accompanied by a notice in the *Gazette*. Section 19 specifies that the matters to be covered in such a notice include QMAs, the fishing year, the unit of measurement, and any other such matters as may be contemplated by the Act.

Accordingly, these matters are described in more detail below

Quota Management Areas

88. The Act sets out two statutory obligations that must be considered when defining QMAs for stocks introduced into the QMS:

- as far as practicable, the same QMAs should be maintained for different species (s19(2)); and
- a separate QMA may be set for the waters surrounding the Chatham Islands if the species can be managed effectively as a unit (s19(3)).

89. In addition, MPI has developed a set of principles to assist in defining practicable QMAs. In considering these statutory obligations and principles, MPI considers the following are key issues in defining QMAs for hagfish, should they be introduced:

- As hagfish do not have a larval phase and are not known to exhibit migratory behaviour⁵, they likely form small and distinct biological stocks and will be most effectively managed in small divided QMAs.
- The best available information on species distribution indicates that geographic range is restricted for some species. It is appropriate to manage hagfish species in relatively small QMAs in order to develop our understanding of species distribution.
- Given that hagfish likely form discrete biological stocks, waters around the Chatham Islands may be effectively managed as a unit. Considering the economic relevance of this stock for the Chatham Islands, it is appropriate to set a separate QMA for waters surrounding the Chatham Islands (under s19(3)).
- Hagfish are reported as bycatch primarily in the ling, rock lobster, and scampi fisheries. Given the unique characteristics of these fisheries, it is impractical to set QMAs for hagfish species that match QMAs for these target species. Instead, it is appropriate to manage hagfish in QMAs that share boundaries with current FMAs. This will provide the best match to the QMAs of target species as is practicable.

- Taking into account the principles and key management issues noted above, two options for QMAs are proposed: hagfish be managed within four QMAs that share boundaries with current FMAs (Option A; Figure 1); and hagfish be managed within ten QMAs that each match current FMA boundaries (as defined in Schedule 1 to the Act) (Option B; Figure 2).

Proposals

Option A (Figure 1)

90. Option A proposes to manage the relevant hagfish species (under Option 2 or 3) in four separate QMAs (QMA 1, 3, 4, and 10; Figure 1). This option minimises costs to fishers, but may not allow most effectively for sustainable utilisation given that hagfish likely form small discrete biological stocks. MPI recognises that Option B is likely to better provide for sustainable utilisation of hagfish stocks, but welcomes stakeholder opinion regarding the possibility of setting four QMAs.
91. Proposed QMA 1 encompasses FMAs 1, 2, 7, 8 and 9. The majority of hagfish landings have been reported in these areas in recent years (Appendix 1). It may be effective to manage this proposed QMA 1 separately to incorporate the majority of catches within a single management area.
92. Proposed QMA 3 encompasses FMAs 3, 5, and 6, and excludes FMA 4 surrounding the Chatham Islands. FMA 3 accounts for modest hagfish landings, but reported landings in FMAs 5 and 6 are low.
93. Proposed QMA 4 encompasses FMA 4. Modest levels of catch of hagfish have been reported in FMA 4 in the past. Hagfish likely form small discrete biological stocks, therefore, under section 19(3) of the Act, it will be effective to manage hagfish as a unit in the waters of the Chatham Rise and surrounding the Chatham Islands.
94. Proposed QMA 10 incorporates FMA 10. There is no data on commercial catch of hagfish in FMA 10 and there is unlikely to be any development of a fishery in this area. However, given the important characteristics of this FMA (which includes extensive marine reserves), it is appropriate to maintain a separate QMA for hagfish (to be set on a nominal basis given that this area is rarely, if ever, fished).

⁵ Based on information available from species overseas. MPI does not have any available information regarding migratory behaviour in New Zealand hagfish species. Only one species, *E. burgeri*, from Japan, is known to exhibit migratory behaviour, and in migrating only moves between deep and shallow depths within the same geographic location during spawning.

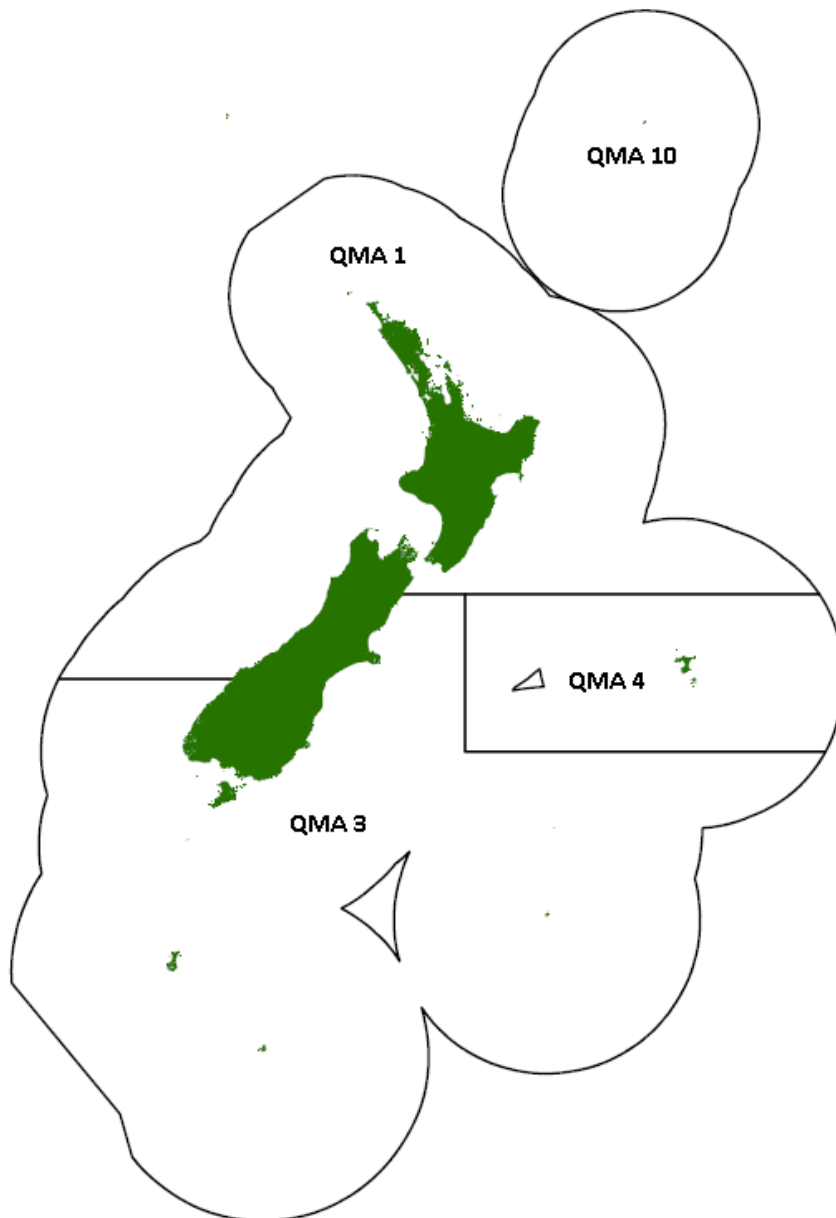


Figure 1: Proposed Quota Management Areas for hagfish under Option A

Option B (Figure 2)

95. Option B proposes to manage the relevant hagfish species (under Option 2 or 3) in ten separate QMAs (QMA 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10; Figure 2). This reflects that due to having no larval phase and no known migratory behaviour, hagfish likely form small discrete biological stocks and will be most effectively managed as such, in smaller and divided QMAs. Furthermore, *E. goliath* and *N. binniplicata* may have restricted ranges relative to common hagfish, and by managing in small QMAs, MPI will be in a better position to improve information on level of catch by area and distribution of these

species. The proposed QMAs would match FMAs, as defined in Schedule 1 to the Act (Figure 2).

96. Catch history indicates that approximately 26% of recent catch has occurred in FMA 1; approximately 30% of recent catch has occurred in FMA 2; and approximately 35% of recent catch has occurred in FMA 7, while modest levels of catch have been landed in FMAs 3 and 9, and low levels in 4, 5, 6, and 8. Given that hagfish likely form small discrete biological stocks, the most effective management may be applied to ten small and divided QMAs to ensure the long-term sustainable utilisation of these species.
97. QMA 4 incorporates FMA 4. Modest levels of catch of hagfish have been reported in FMA 4 in the past. Hagfish likely form small discrete biological stocks, therefore, under section 19(3) of the Act, it is effective to manage hagfish as a unit in the waters of the Chatham Rise and surrounding the Chatham Islands.
98. QMA 10 incorporates FMA 10. There is no data on commercial catch of hagfish in FMA 10 and there is unlikely to be any development of a fishery in this area. However, given the important characteristics of this FMA (which includes extensive marine reserves), it is appropriate to maintain a separate QMA for hagfish (to be set on a nominal basis given that this area is rarely, if ever, fished).

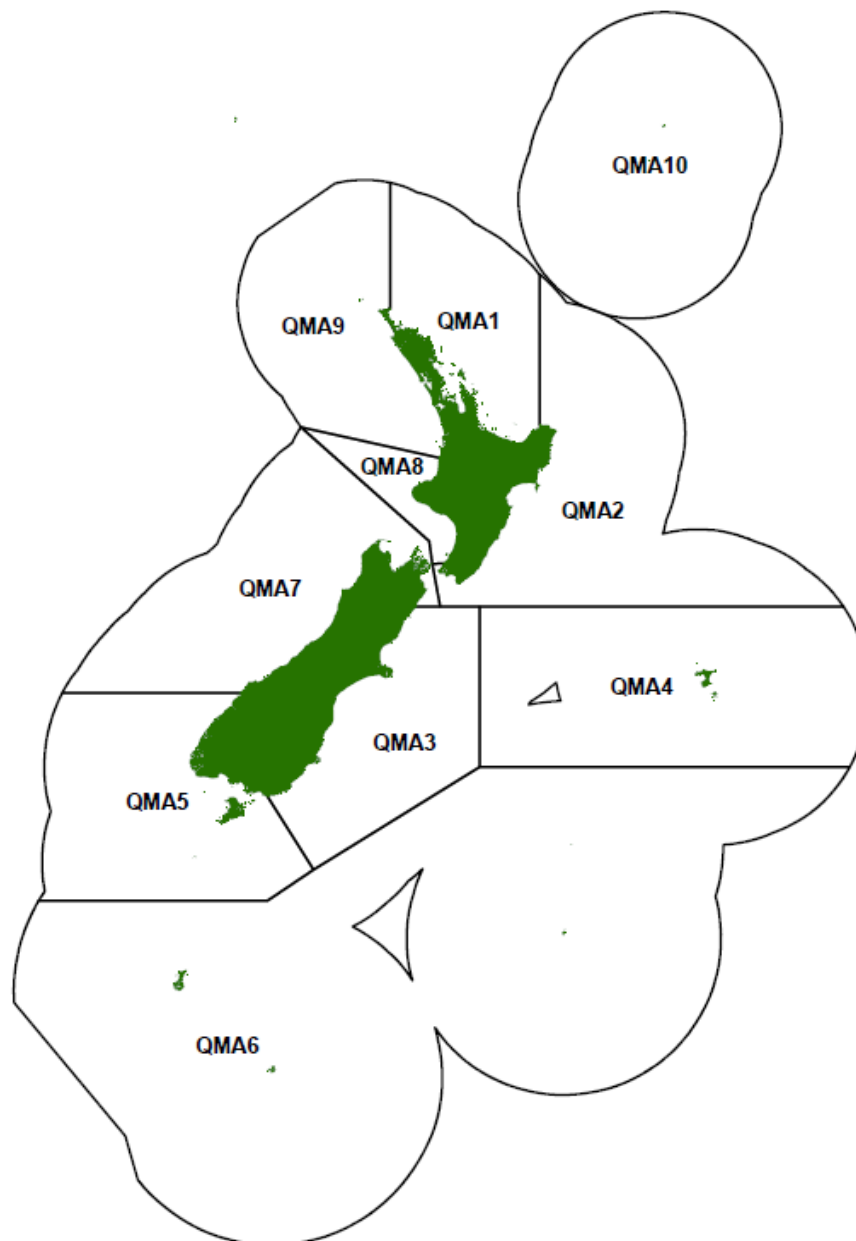


Figure 2: Proposed Quota Management Areas for hagfish under Option B

Fishing Year

99. Should hagfish be introduced into the QMS, MPI proposes that the fishing year be from 1 October to 30 September of the following year.

Meatweight or greenweight

100. The proposed unit of measurement is greenweight. Greenweight has been used historically for management purposes in the hagfish fishery. This unit of measure also applies to all the associated fisheries. There does not appear to be any rationale for changing this unit of measure if hagfish are introduced into the QMS.

Other matters

101. Hagfish are currently managed under Group 7 in the Finfish Plan, which includes all non-QMS species. Should the Minister agree to introduce hagfish into the QMS, MPI will need to consider moving hagfish to another Group.
102. Currently, only the common hagfish has been assigned with a species code (HAG). To promote species identification, and in the event that *E. goliath* and *N. binniplicata* are introduced into the QMS, MPI will need to recommend the creation of additional species codes for hagfish species via regulatory amendments, and the species code HAG would be retained as the code for the common hagfish.

Other Management Issues

103. Should the Minister agree to introduce hagfish stocks into the QMS on 1 October 2014, MPI will consult on additional management measures such as TACs/TACCs and allowances, deemed values, and consequential regulatory amendments.
104. MPI expects that catch is primarily made up of the common hagfish, but has no available information to suggest which other hagfish species may be taken. Under the proposed options, MPI will aim to engage with fishers to increase awareness of hagfish species and promote species-specific reporting, such that catch of all hagfish species can be better monitored. MPI will consider future changes to the management of species not proposed for QMS introduction if it becomes clear that these species are targeted by commercial fishers.
105. Hagfish are targeted by setting long backbones with up to 200 plastic pots attached. MPI is aware of conflicts with other fishing methods and with hagfish pots being lost. There is potential for ghost fishing by lost pots. MPI will consider management controls on pots to address these issues.
106. MPI understands that discard mortality can be as high as 100% for hagfish species, due to an intolerance to temperature fluctuations. In order to minimise discarding, MPI will consider mandatory escape hole sizes and numbers, or other measures that may be useful.
107. If hagfish are introduced into the QMS, MPI will consider proposing amendments to create a specialised reporting form for hagfish. MPI understands that there may be a preference on the export market for individuals taken from deeper depths or from a

certain distance from shore. MPI proposes that reporting of target fishing by longitude and latitude be required to gain more refined information on where hagfish are taken from.

Appendix 1 – Biological and fishery information

BIOLOGICAL AND SPECIES INFORMATION

108. Hagfish are commonly known as snot eels or blind eels. They are a primitive eel-shaped fish, a surviving remnant of one of the earliest groups of fishes that first appeared over 500 million years ago, and which does not have jaws, a bony skeleton, eyes, or true fins.
109. Despite their common names, hagfish are not eels but are members of the superclass Agnatha, the ‘jawless fishes’, a group that includes the modern hagfish and lamprey. Instead of vertically articulating jaws like Gnathostomata (vertebrates with jaws), they have a pair of horizontally moving structures with rasp-like horny projections for pulling off food. There are typically six short tentacle-like protrusions around the mouth, which is a small sucking disc on the front of the body. The skeleton is cartilaginous and hagfish have no paired pectoral or pelvic fins, nor do they have scales. Some taxonomists split the hagfish from the rest of the vertebrates and use the name Craniata as the clade that includes both the hagfish and vertebrates.
110. There may be as many as 8 species of hagfish living in New Zealand waters.⁶ Currently, five hagfish species are described, and are classified in two subfamilies. The subfamily Eptatretinae includes the species *E. cirrhatus* (common hagfish), *E. goliath* (goliath hagfish), and *E. eos*. While *E. eos* is extremely rare in collections, the common hagfish and the goliath hagfish may be found regularly within their geographic ranges. The common hagfish is found throughout coastal New Zealand waters from a depth of 1 m – 900 m, but is most common between 90 m and 700 m. The goliath hagfish is found in the Bay of Plenty region and northwards, including the Three Kings Islands. It is found at depths between 700 m and at least 1200 m. The common hagfish and goliath hagfish can be distinguished by depth, or are also easily distinguished in large size classes by length. The common hagfish reaches a maximum length of approximately 830 mm, while the goliath hagfish may reach a maximum length of up to 1275 mm.
111. Currently there are 2 described species in the subfamily Myxiniinae: *Neomyxine binniplicata* and *Nemamyxine elongata*. While *Nemamyxine elongata* is extremely rare in collections, *N. binniplicata* appears to be quite common within its geographic range, which extends from Christchurch in the south to approximately Whangarei in the north.

These species are not expected to be a major target of fishers as they are skinnier and more elongate than individuals of the subfamily Eptatretinae, though they may be a bycatch species. As species of the subfamily Myxininae have been targeted by international fisheries, it is possible that a target fishery for *N. binniplicata* could develop. MPI welcomes any additional information stakeholders may have regarding hagfish species.

Description

112. Individuals in the subfamily Eptatretinae are characteristically larger than species in the subfamily Myxininae, having a wider girth and fatter body. They are purple-brown in colouration. Species in the subfamily Myxininae are skinnier and more elongated than Eptatretinae. They are a blue-red colour, sometimes appearing lighter in colouration than Eptatretinae.
113. Generally, hagfish species are round-bodied in cross-section and flattened towards the hind end forming small flaps that resemble fins. They have a line of large mucus glands down each side and can produce large quantities of sticky slime when disturbed. The colour of hagfish can be distorted by a blue-grey layer of mucus when seen underwater. At nearly 1 m in length, the common New Zealand hagfish *E. cirrhatus* is one of the larger hagfish known, alongside the goliath hagfish.
114. Hagfish are blind and they exude copious quantities of slime from their skin if disturbed, which is why they are also known as snot eels, and from which the typical species *Myxine glutinosa* (found overseas) was named. Hagfish produce the slime from around 200 specialised glands. When feeding, they produce only a small amount of slime, but when cornered or captured, the fish oozes from all glands at once. The slime begins as a small amount of thick white fluid that absorbs seawater and expands several hundred times in volume.
115. To rid itself of its own slime, the hagfish ties itself in an overhand knot and then sweeps the knot toward the head, scraping itself clean. This travelling-knot behaviour may assist hagfish in extricating themselves from the jaws of predatory fish, and the ‘sliming’ itself also acts to distract predators, since the slime clogs up the gills of fish predators, either suffocating them or driving them off.

⁶ Zintzen, Vincent. Te Papa. Personal communication

Distribution and habitat interactions

116. Hagfish in the subfamily Eptatretinae appear to be common throughout their range in coastal New Zealand waters. Individuals in the subfamily Myxiniinae are less widely distributed and are restricted to the east coast of the North and South Island, New Zealand, from Christchurch to about Whangarei. Specific studies regarding juvenile and adult distributions are not available for New Zealand species. They are bathymersal, non-migratory, and strictly marine, and individuals can be found in rock pools and shallow depths of above 1 m up to at least 1200 m.

117. Hagfish are thought to be extremely important scavengers in the marine environment. In addition, they have been observed to actively hunt small benthic fishes⁷ and are expected to be active predators of starfish, crabs, and other invertebrates also. They are likely to be a critical link in benthic marine food chains.

Growth, reproduction, and recruitment

118. There is very little information available on the growth, reproduction, and recruitment of New Zealand hagfish species. The available information suggests that hagfish are not sexually differentiated at birth, but develop into different sexes over time as gonadal tissue develops. Females develop and mature earlier than males (skewing the sex ratio towards females in small size classes of a population). Males develop and mature later than females, and may make up as little as 5% of a cohort at a point where 85% of the same cohort are mature females. An adult population does not appear to reach sexual maturity for all individuals until a length of 585 mm for *E. cirrhatus* (at which point sex ratio becomes more even)⁸. It is not known whether fertilisation is external or internal, though it can be expected to be external as there is no copulatory organ. Information regarding timing and duration of spawning seasons is not available for New Zealand hagfish species, though there is evidence to suggest that the common hagfish does not display a seasonal spawning pattern.⁹ Hagfish are not known to have a larval phase.

119. Productivity of hagfish populations is expected to be very low as females only produce a small number of large eggs. Furthermore, research from overseas suggests that a proportion of many hagfish populations are sterile, having no detectable gonads, or

⁷ Zintzen, D., Roberts, C., Anderson, M., Stewart, A., Struthers, C., Harvey, E. 2011. Hagfish predatory behaviour and slime defence mechanism. *Scientific Reports* 1:131. DOI 10.1038/srep00131

⁸ Frederic Martini, personal communication

⁹ Frederic Martini, personal communication

having degenerative male and female gonads.¹⁰ Hagfish are likely to be slow growing and suffer low adult mortality. These factors can make hagfish susceptible to overfishing. Many overseas hagfish fisheries have collapsed.

Associated and protected species

120. None known

Stock assessment

121. Stock assessments for hagfish have not been done. 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.

Environmental effects of fishing

122. Hagfish are targeted with fish pots, which take very little bycatch. Furthermore, bycatch species caught in pots are often unharmed and may be easily returned to the water where legally possible.¹¹ Fish pots have limited impact on the benthic environment, though MPI is aware that there has been some degree of ‘ghost fishing’ associated with a previous hagfish fishery. This involves long lines of pots being lost or left behind and fouling other fishing gear, in addition to providing an opportunity for organisms to be caught and permanently trapped.

SOCIAL, ECONOMIC, CULTURAL INFORMATION

Commercial fishery characteristics

123. Commercial interest in hagfish has developed in the past decade. Hagfish are targeted both for their meat, which is eaten in Japan and Korea, and their skin, which is often marketed as ‘eelskin’ and is used as leather for purses, wallets, and other accessories in Korea. A drop in targeted catch in the past two years may be due to two companies going out of business; however, MPI is aware of plans by Industry to escalate targeted fishing pressure on hagfish within the next month.

¹⁰ Up to 14% in populations of *Myxine glutinosa*. (Patzner, R. A. 1998. Gonads and reproduction in hagfishes. *In* J. M. Jorgensen, J. P. Lomholt, R. E. Weber, and H. Malte (eds.), *The biology of hagfishes*, pp. 379–395. Chapman and Hall, London)

Martini, F. Lesser, M. Heiser, J. B. 1997. Ecology of the hagfish, *Myxine glutinosa* L., in the Gulf of Maine: II Potential impacts on benthic communities and commercial fisheries.

¹¹ Individuals on Schedule 6 of the Act may be returned to the water given certain criteria that are specific to each species.

Commercial fishing method

124.As noted above, the primary method for targeting hagfish is with fish pots. Hagfish are also taken as incidental bycatch in rock lobster pots, by bottom long line in the ling fishery, and by bottom trawl in the scampi fishery.

Commercially landed catch

125.Estimated catch data from catch effort returns, together with corresponding landing information, provides the catch data for hagfish. The fishing code, HAG, refers to the common hagfish (*E. cirrhatus*) but it is likely that any other species caught have been landed under this code.

126.Hagfish discards were low from 2002 up to the 2005/06 fishing year (Figure 3). High levels of hagfish started being landed in 2006, concurrent with an increase in the level of discards. The number of landed individuals has been greater than the number discarded in recent years (Figure 3). Hagfish are landed primarily in the northern FMAs and FMA 7 (proposed QMA 1; Figures 4, 5, 10, 11, and 12), whereas hagfish are discarded more frequently in southern FMAs (Figures 6, 7, 8, and 9). A high proportion of landed catch was reported in the southern FMAs (primarily FMA 3) in the 2009/10 fishing year (Figure 6).

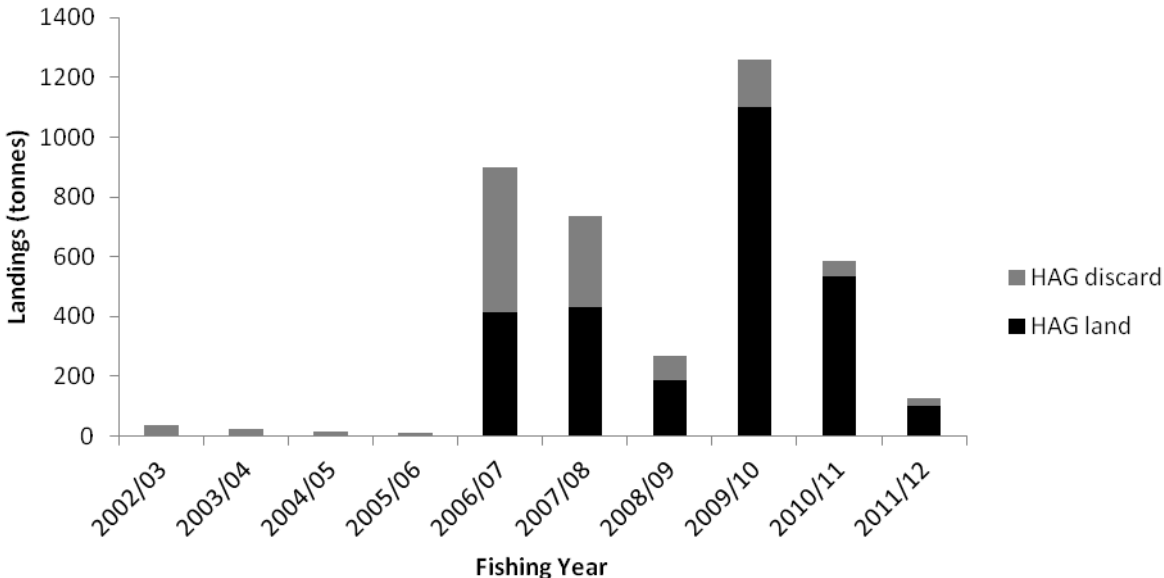


Figure 3: Total reported landed and discarded catch for hagfish from the 2002/03 fishing year up to the 2011/12 fishing year

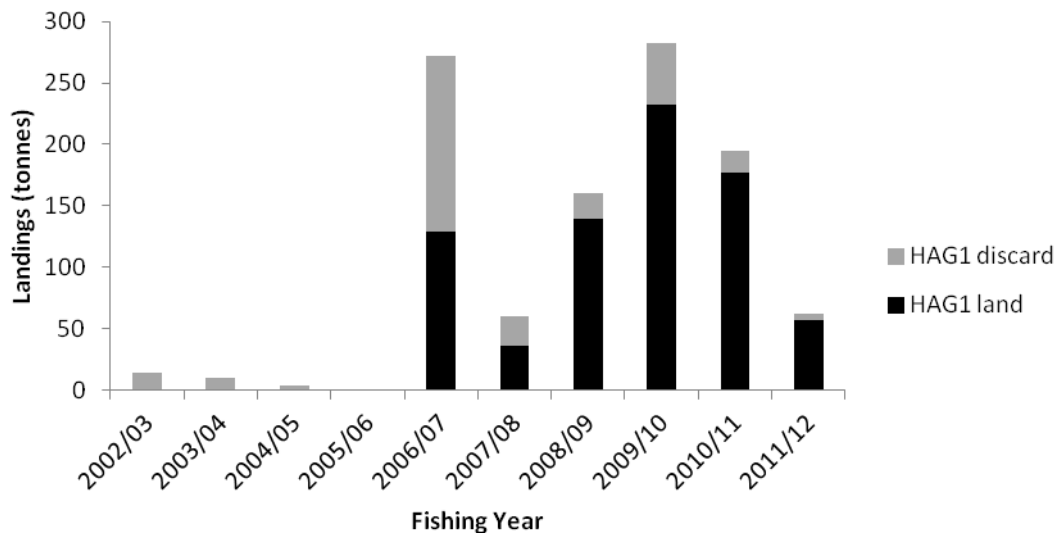


Figure 4: Total reported landed and discarded catch for hagfish in FMA 1 from the 2002/03 fishing year up to the 2011/12 fishing year

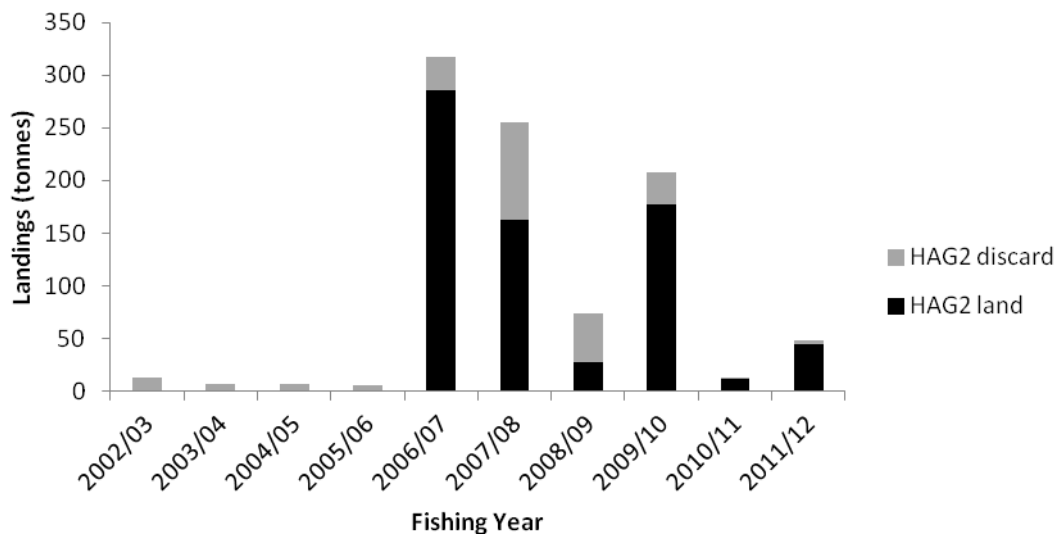


Figure 5: Total reported landed and discarded catch for hagfish in FMA 2 from the 2002/03 fishing year up to the 2011/12 fishing year

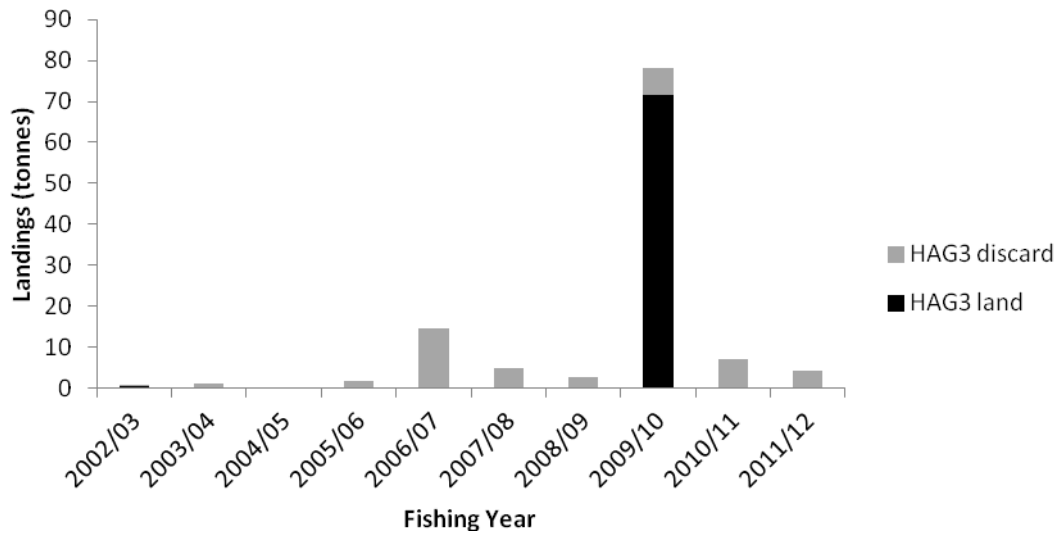


Figure 6: Total reported landed and discarded catch for hagfish in FMA 3 from the 2002/03 fishing year up to the 2011/12 fishing year

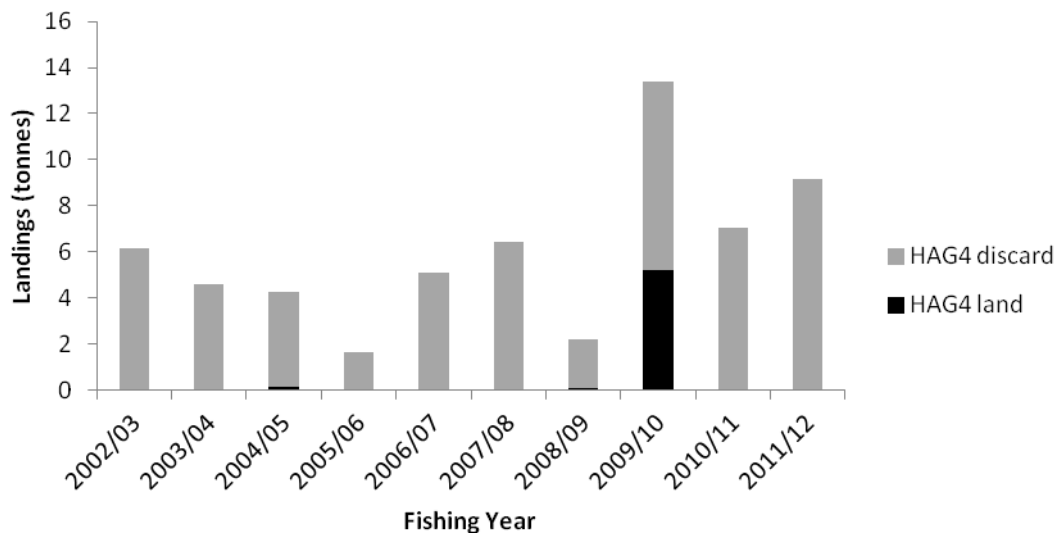


Figure 7: Total reported landed and discarded catch for hagfish in FMA 4 from the 2002/03 fishing year up to the 2011/12 fishing year

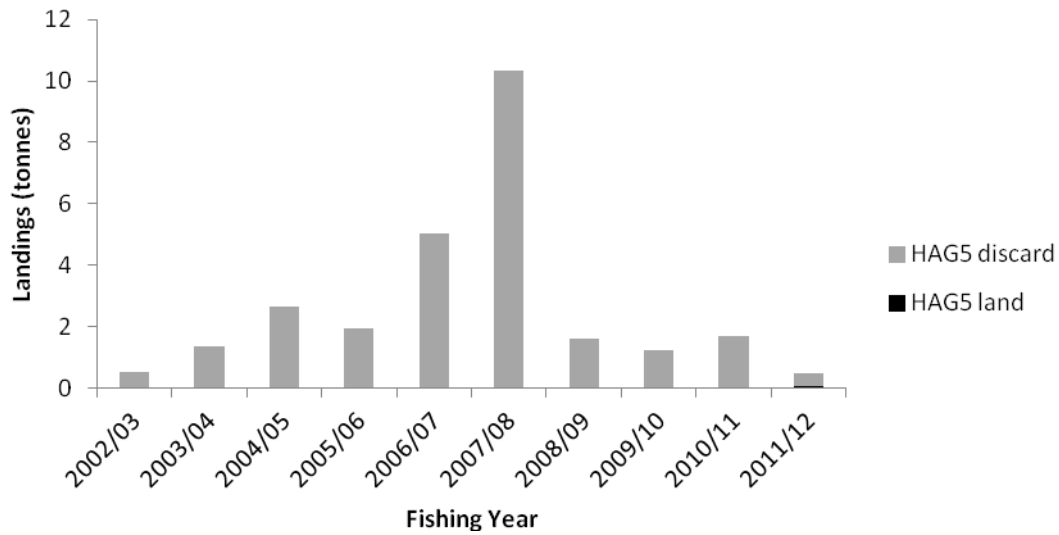


Figure 8: Total reported landed and discarded catch for hagfish in FMA 5 from the 2002/03 fishing year up to the 2011/12 fishing year

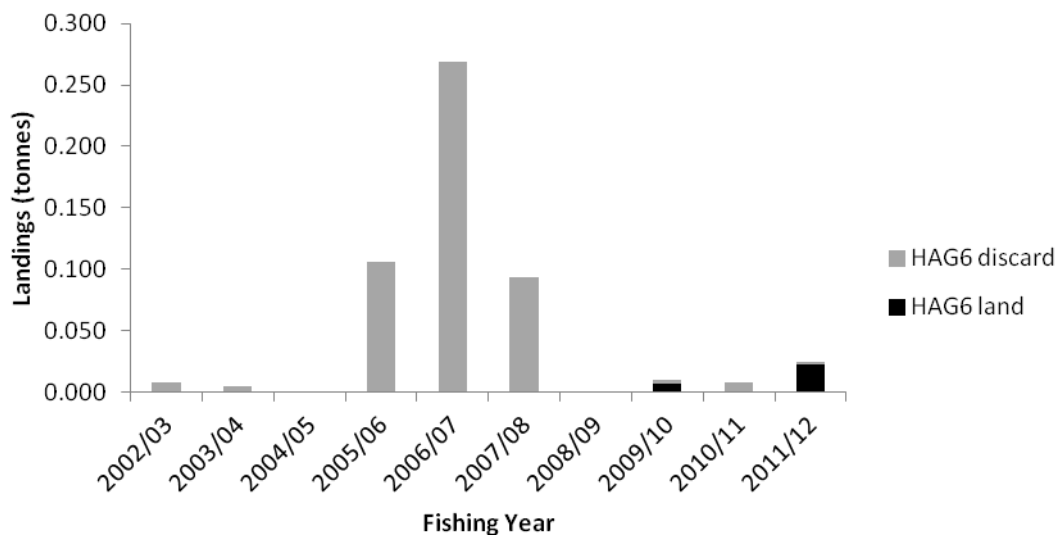


Figure 9: Total reported landed and discarded catch for hagfish in FMA 6 from the 2002/03 fishing year up to the 2011/12 fishing year

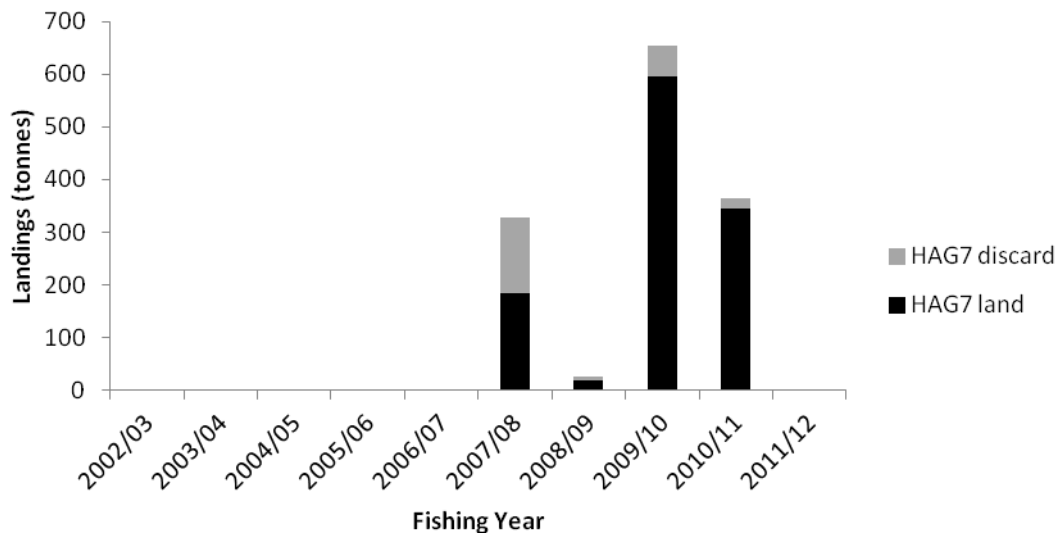


Figure 10: Total reported landed and discarded catch for hagfish in FMA 7 from the 2002/03 fishing year up to the 2011/12 fishing year

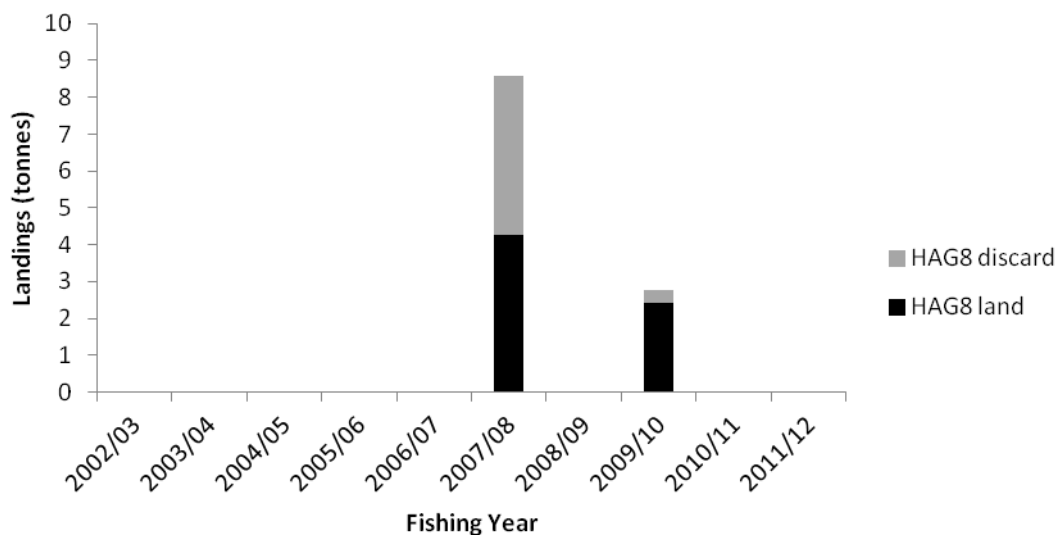


Figure 11: Total reported landed and discarded catch for hagfish in FMA 8 from the 2002/03 fishing year up to the 2011/12 fishing year

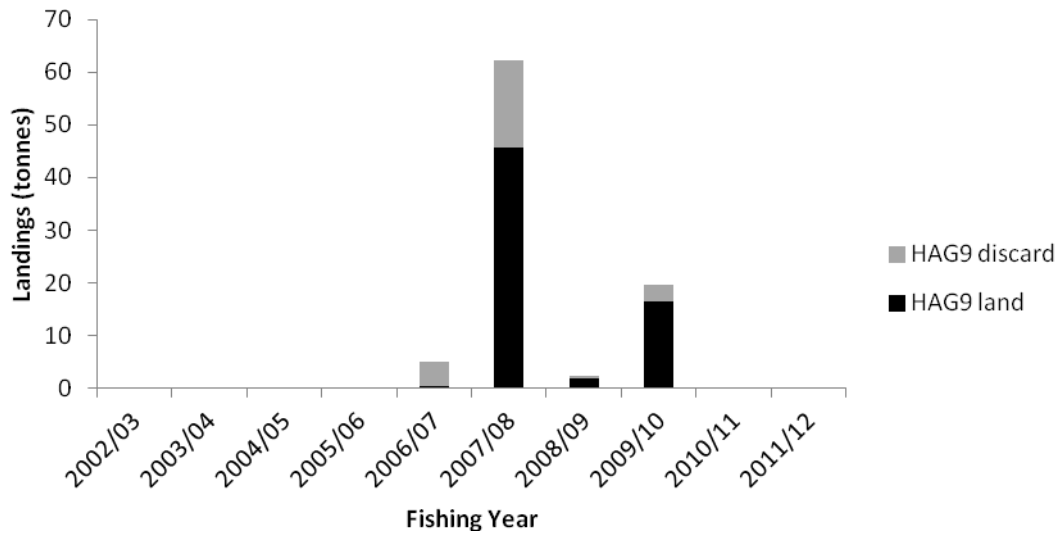


Figure 12: Total reported landed and discarded catch for hagfish in FMA 9 from the 2002/03 fishing year up to the 2011/12 fishing year