INTRODUCTION OF NEW STOCKS INTO THE QUOTA MANAGEMENT SYSTEM ON 1 OCTOBER 2005

CONSULTATION DOCUMENT

29 October 2004

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INTRODUCTION

1 Earlier this year the Ministry of Fisheries undertook consultation with relevant parties on the proposed introduction of species into the QMS on 1 October 2005. MFish undertook consultation on these species in line with the then existing legislative tests, prior to passage of Fisheries Amendment Bill No 3. MFish was not in a position to predetermine the nature of any subsequent legislative amendment. As of 1 October 2004, with the passage of Fisheries Amendment Bill No 3, the relevant legal tests were changed. The Fisheries Act prescribes new legal tests that must be considered by the Minister in his decision to introduce species to the QMS.

2 MFish did not finalise advice in time to obtain the Minister's decision and gazettal of that decision on the introduction of these species prior to 1 October 2004. The result is that, in order that the Minister takes into account the relevant matters, re-consideration with relevant parties is required. The Minister of Fisheries has decided to proceed with consideration of introduction of the species for 1 October 2005. The objective is for a new process to be undertaken with the Minister's decision to be made prior to Christmas this year.

3 In accordance with sections 17B(3) and 19(7) of the Fisheries Act 1996 (the Act), the purpose of this document is to re-consult on behalf of the Minister of Fisheries on those species or stocks proposed for introduction into the Quota Management System (QMS) on 1 October 2005, and in the case of non-QMS scallops introduction on 1 April 2006 (refer Table 1). The Ministry of Fisheries (MFish) requests that you provide your comments on the introduction of these species or stocks into the QMS, their proposed Quota Management Areas (QMAs), fishing year, unit of measure and assessment of the legislative criteria, as outlined in this document.

4 Because of the administrative timeframe to introduce species or stocks into the QMS on 1 October 2005, MFish requests that you provide your written comments in response to this consultation document no later than **26 November 2004.** Your comments should be in response to the proposals for the species or stocks outlined in Table 1 in relation to:

- The assessment of the legislative criteria;
- The QMAs, including alternative options, for each stock;
- The fishing year for each stock; and
- The unit of measure for the expression of TACCs and ACE (greenweight).

5 Please send your written comments on this document to:

Kristin Philbert, Ministry of Fisheries, P O Box 1020, Wellington, (04) 470 2585, or email to kristin.philbert@fish.govt.nz.

Table 1: MFish proposed list of species/stocks to be introduced into the QMS on 1 October 2005 (except for scallops 1 April 2006)

Species (code)	Scientific name
Albacore Tuna (ALB)	Thunnus alalunga
Cockles (COC)	Austrovenus Stutchburyi
Non QMS Dredge Oyster (OYS)	Tiostrea chilensis
Pipi (PPI)	Paphies australis
Non QMS Scallops (SCA)	Pecten novaezelandiae
(1 April 2006 introduction date)	
Bladder kelp (KBB)	Macrocystis pyrifera
Gracilaria weed (GRA)	Gracilaria chilensis
Agar weed (PTE)	Pterocladia lucida and Pterocladia capillacea
Lessonia (LES)	Lessonia variegata
Bull kelp (KBL)	Durvillea spp
Brown kelp (ECK)	Ecklonia radiata
Porphyra (PRP)	Porphyra spp
All seaweeds species in FMA 9 (SEG9)	
Skipjack Tuna (SKJ)	Katsuwonus pelamis
Tuatua (TUA)	Paphies subtriangulata

Note : The species codes for the seaweed species are indicative only at this date.

6 MFish proposes that for non-QMS scallops the fishing year is 1 April to 31 March, and that the TACC and ACE are expressed as meatweight. For all other stocks and species it is proposed that the fishing year is 1 October to 30 September, with the TACC and ACE expressed as greenweight. The proposed QMAs for each stock and an assessment of the legislative criteria relating to QMS introduction are outlined in each of the species-specific sections within this document.

7 MFish will provide final advice to the Minister later this year on whether or not those species outlined in Table 1 will be recommended for introduction into the QMS on 1 October 2005 and 1 April 2006 (in the case of non-QMS scallops), once consultation has occurred and submissions have been considered.

8 If you have any questions regarding the consultation document, or wish MFish staff to attend a meeting/hui to discuss the information, you are encouraged to contact the person responsible for the relevant fisheries outlined in the list below, or contact your nearest MFish office:

Arthur Hore, P O Box 19747, Auckland (09) 820 7686	(Pelagic)
Jodi Mantle, P O Box 19747, Auckland (09) 820 7687	(North Inshore)
Rose Grindley, Private Bag 1926, Dunedin (03) 474 2689	(South Inshore)

Background

9 There are around 100 species of aquatic life commercially harvested in New Zealand that are presently managed outside the QMS. Since 30 September 1992 there has

been a moratorium on the issuance of new non-QMS permits to commercially harvest these species, other than tuna. The permit moratorium was intended to (1) prevent expansion of non-QMS fisheries prior to QMS introduction, (2) avoid the creation of incentives to 'race for catch history', and (3) mitigate risks to stock sustainability. However, the prolonged presence of the permit moratorium has caused some management issues, such as (1) inhibiting the development of new and under-developed fisheries, and (2) preventing MFish from issuing permits to allow fishers to land non-QMS stocks.

10 With the passage by Parliament of amendments to the Fisheries Act 1996, as of 1 October 2004, a number of significant changes have been made. The relevant legal tests relating to the introduction of species into the QMS have changed and for the majority of species the moratorium on issuing new commercial fishing permit has been removed. The fisheries management framework that will be put into effect within the next few years involves the full implementation of the QMS and likely changes to the way any remaining non-QMS fisheries are managed.

11 While MFish supports the introduction of commercially valuable species into the QMS, it should be remembered that introduction would not necessarily lead to expansion of commercial harvests. The QMS meets the Act's purpose 'to provide for the utilisation of fisheries resources while ensuring sustainability', which includes mitigating the impact fishing activity may have on stocks already considered vulnerable. The requirement to ensure sustainability applies equally to species managed outside the QMS. However, MFish considers that the QMS framework provides better means for ensuring sustainability, enhancing fisheries for all resource users.

12 The introduction of species or stocks into the QMS allows the Crown to meet its obligation to Māori under the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992 (the Settlement Act). The Settlement Act established that the Treaty of Waitangi Fisheries Commission would be allocated, on behalf of Māori, 20% of all quota for further stocks introduced into the QMS.

13 In addition, when management measures are considered, including Total Allowable Catches (TACs) and TACCs, for species or stocks to be introduced into the QMS, consideration will also be given to the Crown's settlements with individual iwi. These settlements contain provisions regarding species prohibited from commercial harvest and rights of first refusal over any residual Crown-held quota for particular shellfish species.

Next Steps

14 The next steps in the process of determining whether species or stocks listed in Table 1 above will be introduced into the QMS on 1 October 2005 are as follows:

a) Following the consultation time period, ending **26 November 2004,** MFish will submit final advice and recommendations to the Minister of Fisheries on each species or stock's QMAs, fishing year, unit of measure and the assessment of the legislative criteria.

b) If the Minister agrees that a species or stock should be introduced into the QMS, then a Declaration Notice will be published in the *Gazette* that will

contain each species or stock's introduction date, QMAs, fishing year and unit of measure. Table 2 outlines the indicative combined timeframe involved in introducing species or stocks into the QMS on 1 October 2005 and on 1 April 2006 (in the case of non-QMS scallops).

c) For those stocks that are gazetted for introduction into the QMS, MFish will consult next year on the proposed management measures that will apply, including the total allowable catch and allowances.

Table 2: Indicative combined timeframe for 1 October 2005 QMS introductions

Task	Date
Consultation with stakeholders	Ends 26 November 2004
Final advice paper to the Minister	By 10 December 2004
Section 18 QMS declaration notified in the Gazette	16 December 2004
Tuna catch history years gazetted	Before 25 December 2004
Notification of eligible catch (etc)	31 January 2005
Objection period	1 February 2005 – 29 April 2005
Objection assessment complete	13 May 2005
Notification of PCH (etc)	23 May 2005
Appeal Period	24 May 2005 – 16 August 2005
PCH transfer period	17 August 2005 – 14 September 2005
Notification of quota allocation	26 September 2005

Outline of the Consultation Document

15 This document was compiled in accordance with s 10 of the Act, which requires decisions to be based on the best available information and decision makers to consider any uncertainty in the information available and to be cautious when information is uncertain, unreliable, or inadequate. Section 10 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. Uncertainty or inadequacies of information are noted throughout this document when they arise.

16 The next section of this document, titled 'Quota Management Areas', outlines the statutory obligations and policy principles used by MFish to determine proposed QMAs.

17 A further section titled "Assessment of Legislative Criteria" explains the factors to be taken into account by the Minister when making a determination on whether or not to introduce a species into the QMS. The process for introducing species into the QMS has changed significantly as a result of changes made to the Fisheries Act 1996 that came into effect on 1 October 2004. New legislative provisions have replaced the previous requirement for the Minister to have regard to the costs and benefits of introducing a species into the QMS. An explanation of the new legislative requirements is set out in the section on "Assessment of Legislative Criteria".

18 The remainder of this document consists of a section on each species or stock proposed for QMS introduction on 1 October 2005, and includes the following:

- **Summary of Proposals –** summarises MFish's proposals and alternative options for each stock;
- **Assessment of Legislative Criteria –** outlines the results of MFish's assessments of the legislative criteria, which consider the best available information, including various reports produced by the National Institute of Water and Atmospheric Research (NIWA) on contract to MFish;
- **Stocks and Areas –** describes each stock and issues considered when proposing QMAs;
- **Proposed Quota Management Areas –** outlines MFish's proposed QMAs for each stock;
- **Fishing** Year – outlines MFish's proposed fishing year for each stock; and
- **Unit of Measure** – outlines MFish's proposed unit of measure for each stock.

Quota Management Areas

19 In proposing QMA boundaries for species or stocks to be introduced into the QMS, MFish considered the two statutory obligations set out in the Act:

- As far as practicable, the same QMAs should be maintained for different species (s 19(2)); and
- A separate QMA may be set for the waters surrounding the Chatham Islands if the stock can be managed effectively as a unit (s 19(3)).

20 In addition, MFish has developed a set of principles to assist in defining practicable QMAs, as outlined in Table 3. MFish used the statutory obligations and those principles relevant to each stock to propose QMAs it considers being sensible and effective as long-term stock management boundaries.

Table 3: Principles in setting proposed QMAs

PRINCIPLES	FISHERIES MANAGEMENT OUTCOMES
1. Management areas should be based principally on the biological characteristics of the stock.	• Sustainability requirements of the 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).	• 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.	• 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.	• 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.	• Reduced complexity and business compliance costs. • Flexibility for exercise of customary rights.

21 It is acknowledged that there may be compelling reasons to set QMAs that are different from the boundaries of the biological stock, and, of course biological stock boundaries may not be easy to identify and may vary over time. In some instances it

will be appropriate to set a QMA that encompasses more than one biological stock, and move to smaller units of management using the measures in the Act as more becomes known about the boundaries of a biological stock. Smaller units of management can be implemented using fisheries plans, the QMA subdivision provisions and catch splitting arrangements contained within the Act. Smaller units of management may be particularly applicable for some 'sedentary' species. MFish took these issues into consideration when proposing QMAs for each stock.

Assessment of Legislative Criteria

22 The Minister of Fisheries must make a determination in order to introduce a stock or species into the QMS. In making a determination the Minister is required to consider the criteria specified in s 17B of the Act. MFish has developed a decision path that sets out the criteria the Minister must consider. A description of the decision path and the relevant considerations is set out below.

The Decision Path

23 The analysis of whether a species should be introduced into the QMS will be incorporated into stock strategies[1] in future, although specific consultation on the analysis and determination to introduce is still required. In the interim, the analysis outlined below has been developed to be consistent with the likely process under stock strategies, which is based around risk to legislative and/or fisheries management objectives.

24 The Act specifies separate starting points for those species listed on Schedule 4C of the Act (s 17B(5)) and those species not listed on that Schedule (s 17B(1)). A specific determination under s 17B(1) is required in respect of those species not listed on the Schedule. There are also a number of additional considerations for both Schedule 4C (stocks and species subject to section 93 permit moratorium) and non-Schedule 4C species about the use of measures in s 11 (s 17B(2)) and about management of highly migratory species outside New Zealand fisheries waters (s 17B(6)).

25 Three of the species proposed for introduction into the QMS are not listed on Schedule 4C – albacore tuna, skipjack tuna, and non-QMS dredge oyster. The remaining species – the seven seaweed species, cockles, pipi, non-QMS scallops and tuatua – are listed on the Schedule.

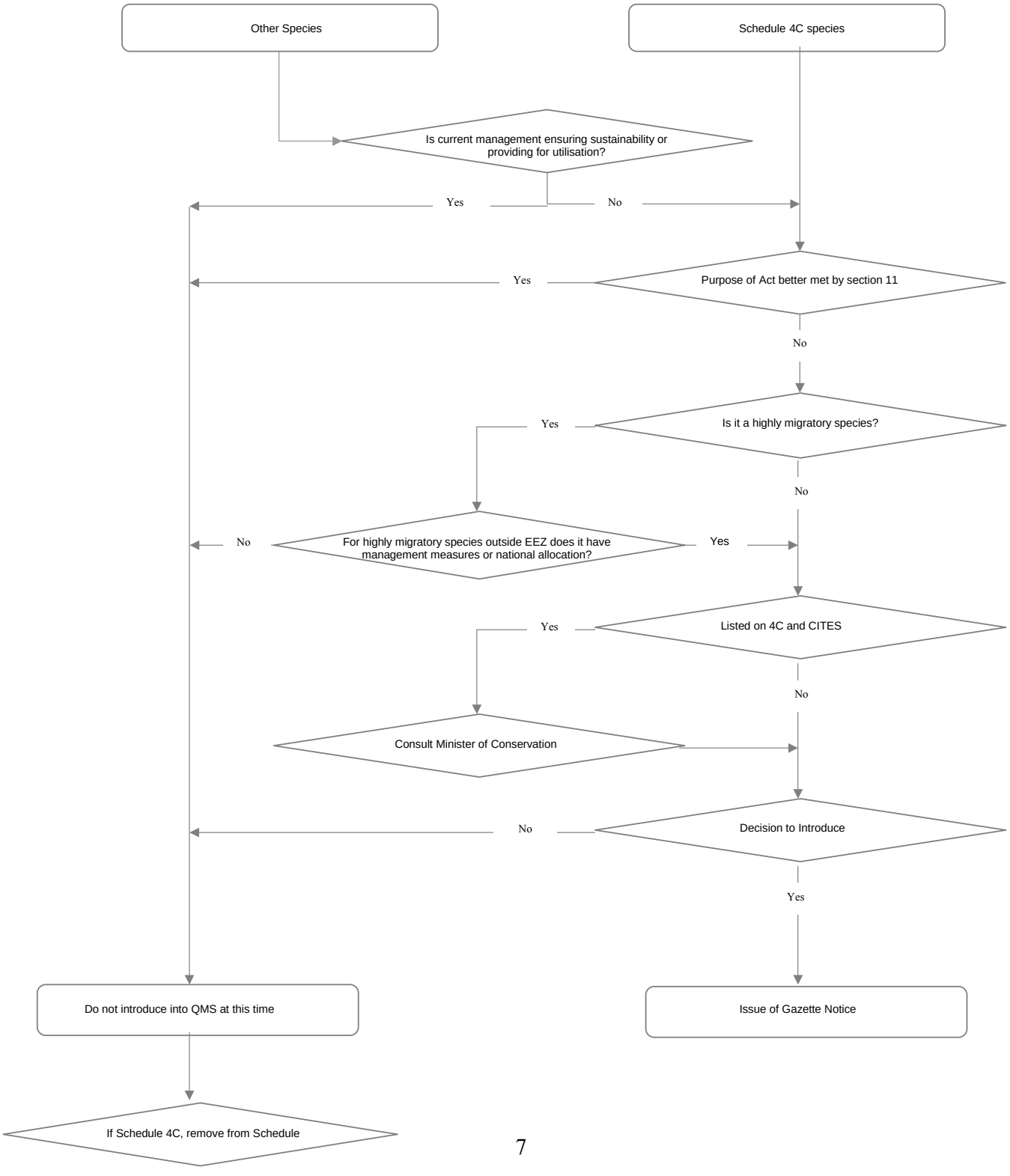
Sustainability and utilisation determination

26 The Act specifies that for species not listed on Schedule 4C, the first step in the process is for the Minister to determine whether or not the current management framework is ensuring sustainability or providing for utilisation. For the Minister to proceed with introduction of a species or species he must be satisfied that current management is not ensuring the sustainability or not providing for the utilisation of the stock or species (see s 17B(1)). If satisfied that one or other of the criteria in s 17B(1) is met, the Minister must also then consider additional factors as identified in the decision path, which are discussed below.

[1] The purpose of stock strategies is outlined in MFish's Statement of Intent 2004-05.

27 In order to test whether the management framework is meeting one or other of the two legislative criteria in s 17B(1), MFish will consider the factors outlined below in the context of the stock or species being considered for introduction. MFish will have regard to the effectiveness of current management measures in terms of both the current known status of the stock or species and also the reasonably foreseeable future status of the stock under that management.

Figure 1 The Decision Path for QMS Introduction



Ensuring Sustainability

28 The Fisheries Act defines ensuring sustainability as –

a) Maintaining the potential of fisheries resources to meet the reasonably foreseeable needs of future generations; and

b) Avoiding, remedying or mitigating any adverse effects of fishing on the aquatic environment:

29 Accordingly, MFish consider that two factors can be considered to determine whether the current management framework is ensuring sustainability.

a) Whether the current management framework is maintaining (or is likely to maintain) the potential of the stock to meet the reasonably foreseeable needs of future generations. The key indicator is whether the stock is overfished or fished unsustainably to the point where it will not or is likely to not meet the reasonably foreseeable needs of future generations. The analysis will determine the reasonably foreseeable needs of future generations on a case-by-case basis having regard to the characteristics of the stock or species.

b) The second factor is whether fishing for the non-QMS stock under the current management framework is having an adverse effect on the aquatic environment. The analysis will consider effects on related species, habitats of significance for fisheries management, and on biodiversity. This factor is likely to be relevant only for a target stock or species. Determination of whether an impact of fishing is adverse will be based in part on any outcome standards in place for the stock or species (ie a Population Management Plan or National Plan of Action) and an assessment of the individual circumstances of the fishery on a case-by-case basis.

Providing for Utilisation

30 The Fisheries Act 1996 defines utilisation as enabling people to provide for their cultural, social and economic well-being. MFish consider that two factors can be considered to determine whether the current management framework is adequately providing for utilisation.

a) The first factor is whether the current management framework is not providing for well-being by inhibiting and or preventing access. Enabling people to provide for their well-being must entail (at the least) the provision of the opportunity for utilisation, within the bounds of ensuring sustainability and subject to any additional statutory obligations, including treaty settlement legislation. To unnecessarily deny access is to disable the ability of a class of people to provide for their well-being, which is contrary to the utilisation obligation in the purpose of the Act. MFish considers that providing open, or unrestrained, access to stocks is consistent with this utilisation obligation. There are few constraints on access for recreational and customary uses, other than for sustainability concerns and allocations between sectors. This intent, in relation to commercial fishing, is reflected in s 91 of the Act, which states "the chief executive must issue to every person who applies for a fishing permit under this Act an appropriate fishing permit …". A critical test is therefore whether this current management framework is providing for access.

b) The second assessment is whether the current management framework enables people to provide for their social, economic and cultural well-being. The first step in "enabling", as required under the Act, is to provide the opportunity for utilisation via access to the resource, within the bounds of ensuring sustainability (as stated above). The second step is to create a framework that provides the opportunity for stakeholders through their access to provide for their social, economic and cultural well-being. Accordingly, an assessment needs to be made of how well the current management framework provides for well-being. Relevant considerations include, the degree of current or likely rent dissipation, overcapitalisation, and conflict between sector groups that are promoted by the current management framework.

Schedule 4C

31 Schedule 4C contains a list of species which remain covered by a moratorium on the issue of fishing permits and where allocation of quota will be on the basis of catch history if the stock is introduced into the QMS before 1 October 2009.

32 Parliament's intent in creating Schedule 4C was to ensure species considered as having sustainability concerns were adequately managed before they were considered for introduction into the QMS. Those species on Schedule 4C were identified as being subjected to a sustainability risk in an open access environment post 1 October 2004.

33 The process for introducing species listed on Schedule 4C is not the same as for other species. Because Parliament has already identified there is a sustainability risk for the species listed on the Schedule, the Minister is not required to make a determination of whether the current management framework will ensure sustainability or provide for utilisation (s 17B(5)). The Minister can determine to introduce a species listed on Schedule 4C into the QMS, subject to consideration of the additional requirements specified in the Act – those requirements are identified in the decision path and discussed below.

34 If the Minister proposes to introduce a species listed on the Schedule 4C that is also listed on CITES then the Minister must consult with the Minister of Conservation (s 17B(7)). None of the species proposed for introduction in this document are listed on CITES.

35 If the Minister determines not to introduce a species listed on the Schedule 4C following the statutory consultation process the outcome is the removal of the species from the Schedule (s 17B(5)(b)). This will also result in removal of the moratorium on issuing permits for the species. In addition, removal from Schedule 4C will mean that catch history will still be used as the basis for quota allocation if the species is subsequently introduced to the QMS before 1 October 2009 (see s 29A(2)(a)).

Purpose of Act Better Met by Use of Section 11 Measure

36 The Act requires the Minister to introduce a stock into the QMS unless the purpose of the Act would be better met by setting one or more sustainability measures under s 11 (see s 17B(2)). The critical question is whether s 11 measures on their own, as compared to the QMS, will be better able to meet the purpose of the Act for the stocks

or species concerned. It is acknowledged that management under the QMS could also include use of s 11 measures, such as use of method restrictions or area closures.

37 Section 11 outlines a non-exhaustive list of sustainability measures that the Minister may apply to a stock. There are potentially an infinite number of types and combinations of management measures that could be considered under s 11. Generically, MFish 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 measure chosen (based on the analysis outlined below).

38 The test under s 17B(2) is therefore to identify whether there is any information to suggest that the generic analysis outlined below does not apply to the particular stock or species, and that management using measures under s 11 on their own would better achieve the purpose and principles of the Act. In particular, MFish notes that a significant limitation of s 11 is that it does not address utilisation considerations. It is not lawful to use a s 11 measure to meet a utilisation obligation. Where utilisation factors arise, the QMS will invariably be the most efficient means of addressing those factors.

Sustainability

39 The Act requires stocks to be managed in order to meet the reasonably foreseeable needs of future generations. The sustainability requirement holds whether stocks are managed within or outside the QMS. However, as mentioned, MFish considers 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.

40 Section 11 of the Act outlines a number of potential sustainability measures, although the list is not exhaustive. The non-QMS framework can restrain individual catch levels, and therefore manage stocks sustainably, through a combination of input controls, such as area closures and gear and method restrictions. The non-QMS framework also includes the ability to set a Catch Limit (CL) or Commercial Catch Limit (CCL), which is a ceiling on the level of commercial harvest of a fishery.

41 However, the setting of a CCL can exacerbate adverse impacts on the fishery and aquatic environment when competition within the fishery becomes excessive. In this situation, a CCL creates an ‘olympic style’ fishery whereby fishers compete for access until the CCL is reached. The time fishers have to ‘race to catch fish’ is constrained more as harvest effort increases.

42 A CCL can have a different effect on a bycatch fishery. In the event the bycatch is taken as an inevitable consequence of a target fishery, and the bycatch fishery CCL has been reached, causing the fishery to be closed, access to the more valued target fishery may then be constrained, thus reducing its value to fishers. However, a CCL applied to a bycatch fishery can also cause a ‘race to catch’ the target species before the fishery is closed due to the bycatch CCL being reached.

43 Fishers typically respond to a CCL or regulatory input controls by investing in vessels and/or gear that circumvent the intended effect of imposing the regulations. The

consequence is that the fishery becomes over-capitalised and inefficient, and, therefore, impacts on peoples' ability to provide for their well-being.

44 The QMS balancing regime strongly discourages the over catch of a TACC while at the same time providing flexibility for those times when catch of a species cannot be avoided, and the fisher does not have authority to catch the species. Overfishing is controlled by graduated administrative incentives based around the payment of deemed values. Over-fishing thresholds, and the ability to restrict harvest via legislative conditions imposed on fishing permits for both QMS and non-QMS stocks, act to prevent fishers who have over caught their ACE from fishing in areas where over catch raises particular sustainability concerns.

45 Method restrictions are a common fisheries management tool. A method restriction constrains the range of harvest methods that can be used for fishing purposes. They can be used to deal with a variety of sustainability issues such as limiting the effects of fishing on the benthos (e.g. restricting harvesting to use of handgathering in place of dredges in vulnerable environments) or to address bycatch issues for seabirds (e.g. use of tori lines) or catch of juveniles species (e.g. mesh size restrictions). However, the tool is not effective in managing fishing effort of the available fishing methods or constraining the quantum of catch taken.

46 Area based controls are designed to deal with issues relating to matters such as maintaining biodiversity (e.g. closure at Spirits Bay), protecting habitats of particular significance for fisheries management (e.g. closure of areas with juvenile stocks), and managing the effects of localised depletion (e.g. temporary closure of customary fishing grounds). However, area closures do not adequately manage the areas open to fishing. One potential outcome is for closures to concentrate fishing effort into the remaining areas thereby increasing the risk to the sustainability of the stock or species.

47 A number of measures relating to a species' biological characteristics or reproductive capacity are available under s 11. The measures relate to the species size, sex, or state. The purpose of such measures is often to ensure that sufficient of the population reaches maturity so that the sustainability of the stock is ensured. Examples include a restriction on the taking of berried female rock lobster or paua less than 125mm in size. The measures can be effective in managing the portion of the stock that is available to fishing, in particular in the case of size limits.

48 Section 11 also provides for the setting of a fishing season. In some jurisdictions overseas fishing seasons are used as way of constraining fishing effort, for example the number of fishing days. In New Zealand those stocks or species with a fishing season, the season is usually determined on the basis of optimal condition of the resource (as in the case of scallops), or the impacts on a protected species with the closure of the fishery due to a protected species interaction. A fishing season in itself may not be effective in managing total catch, and certainly not very effective in achieving utilisation obligations under the Act.

49 Introduction of all stocks with sustainability and/or utilisation concerns will result in the price of quota for target stocks being based, in part, on the price of quota for bycatch stocks. While this outcome may add operating costs in a mixed fishery, it will focus incentives on the management of species groups, rather than solely on target stocks. Furthermore, this situation will require fishers to face more accurately the costs of their operations' impacts on bycatch stocks. Where sustainable catch

limits for bycatch stocks constrain the catch of target stocks, stock value and vulnerability will need to be considered together. Fishers will have increased incentives to minimise their catch of vulnerable stocks, or their impacts on the aquatic environment, by adopting environmentally sensitive technologies and fishing practices.

50 MFish considers that the level of information on stocks and harvest effort will be improved in the QMS environment because of the incentives created by quota allocations, particularly in undeveloped and under-developed fisheries that are likely to be 'proved up' in order to substantiate any consideration of increasing harvest levels. Improvements in the level of available information should also benefit the long-term sustainability of stocks and the environment.

51 QMS introduction should incline commercial fishers to take more interest in the management of fisheries, given their investments. MFish continues to advocate the development of fisheries plans to improve the management of fisheries, and notes that quota allocations can facilitate the formulation of participant-initiated management arrangements. The incentives quota holders have to take an interest in a fishery's management, coupled with non-commercial interests, may prove invaluable in the long-term management of the fishery.

Utilisation

52 MFish considers that because the QMS better provides for sustainable utilisation, it is the best framework for enabling people to provide for their social, cultural and economic well-being.

53 The non-QMS framework does not ration commercial access to a fishery, except by way of the current permit moratorium, because fishing permits are granted upon request. The non-QMS framework also fails to allocate access rights between generations, which inherently results in claims of unfairness. This failing of the non-QMS framework requires the Government to intervene in the resolution of any future access issues.

54 As the non-QMS framework does not define commercial fishers' catch from year to year, it fails to provide them with incentives to maximise the value of a fishery, which then inhibits investments and impedes consideration of management for the future.

55 The allocation of quota provides a significantly better access right than non-QMS fishing permits because it is based on a secure proportion of the TACC allocated in perpetuity. Commercial fishers can retain indefinitely their proportions of the TACC, thus providing certainty and security when planning long-term operations and investments. Quota's security of tenure provides a means of capitalising the value of future harvesting rights in the fishery. The possibility of trade makes this capital value an asset that holders will wish to enhance.

56 The QMS provides the best opportunity for people to pursue economic well-being by allowing quota to be purchased by the most efficient users of the resource. Because quota is divisible, meaning that it can be divided more narrowly, fishers can match quota holdings with their operations through buying and selling. Similarly, the transferability of quota allows less efficient users to exit a fishery by selling their quota and receiving a return on their investment. Lastly, quota's tradability provides

the means for inter-generational transfers. The QMS allows for a smooth re-allocation of access rights, via quota trading, from one generation to the next without requiring Government involvement.

57 QMS introduction is generally preferred because it facilitates the entry of Māori into commercial fisheries and allows the means for the Crown to meet its obligations to Māori under the Deed of Settlement 1992. Transferable commercial access to Māori is not available under non-QMS management.

58 Although no trade in quota occurs between customary and recreational users, these user groups benefit from QMS stocks being sustainably managed and from the Minister considering their interests when setting the TAC and allowances. The QMS operates to place a cap on commercial catch and applies an economic incentive to constrain overcatch by commercial fishers; thereby supporting customary and/or recreational interests in the stock.

59 In addition, since customary and recreational groups have an explicit allowance for a stock on the setting of a TAC under the QMS, they are in a better position to provide their input into its management by way of a fisheries plan or other means. The overall benefits of QMS introduction for the customary and recreational users are derived from improvements to the management of the species or stock.

Highly Migratory Species Considerations

60 If a species proposed for introduction is a highly migratory species, despite meeting the other legislative requirements noted above, the species cannot be introduced into the QMS outside of New Zealand's Exclusive Economic Zone except to give effect to - a national allocation to New Zealand by an international fisheries organisation in relation to that stock; or any other management measures to which New Zealand has agreed, made by an international fisheries organisation in relation to that stock (s 17B(6)). In the absence of these factors, introduction of a highly migratory species is limited to the stock within the EEZ – this is the case for the two tunas species considered in this document.

ALBACORE TUNA (ALB)

Summary of Proposals

1 The Ministry of Fisheries (MFish) proposes that:

a) Albacore be introduced into the quota management system (QMS) on 1 October 2005;

b) The quota management area (QMA) be ALB 1 (Fisheries Management Areas 1-10 combined);

c) The fishing year be 1 October to 30 September; and

d) The unit of measurement be greenweight.

Assessment of Legislative Criteria

Ensuring Sustainability

Harvest of species

2 Albacore tuna (*Thunnus alalunga*) is a member of the family Scombridae, which includes tuna and mackerel species. There are five tunas of the genus *Thunnus* known in New Zealand waters: albacore, bigeye, yellowfin, southern bluefin, Pacific bluefin tuna, and four other Scombrids: skipjack, slender and butterfly tuna, and blue mackerel.

3 Albacore found in New Zealand waters are part of a single South Pacific stock and are widely distributed around New Zealand on a seasonal basis, mostly between the lines of latitude of 34° S to 44° S. They are targeted by trolling, and are caught in surface longline fisheries both as a target species and as a bycatch of target fishing for southern bluefin and bigeye tunas.

4 The maximum recorded fork length for albacore is 127 cm. Female albacore mature at about 85 cm fork length and spawn in the austral summer from November to February in tropical and subtropical waters, between the lines of latitude of about 10ºS and 20º S, west of the line of longitude of 140ºW. Males mature at about 71 cm fork length. Juveniles recruit to surface (troll) fisheries in New Zealand coastal waters and in the vicinity of the sub-tropical convergence zone at about two years of age, at 45–50 cm fork length.

5 The New Zealand troll fishery is operated by domestic vessels and occurs mostly in coastal waters off the west coasts of the North and South Islands. Troll catches ranged from 1 437 to 5 180 tonnes for the period 1991 to 2000. Peak years in the troll fishery were from 1994 to 1996.

6 Most of the longline catch of albacore is from the east coast of the North Island. The proportion of the total albacore landings taken by tuna longlining has progressively increased since the early 1990s as the domestic longline fleet has expanded. The

proportion of total catch by longline increased from around 4% in 1991 to 63% in the 1999 calendar year and 41% in 2000.

7 Most of the fish caught by trolling are juveniles, while surface longlining catches mostly adults and sub-adults. Troll caught fish range from 38–99 cm fork length and a mean of 63 cm, with three modes present, while longline caught fish range from 37–133 cm fork length with a mean of 83 cm and the distribution is bi-modal.

8 Albacore is listed as a highly migratory species in Annex 1 of the United Nations Convention on the Law of the Seas (UNCLOS) and by reference in the Western and Central Pacific Fisheries Convention (WCPFC). Participating countries in the Preparatory Conference establishing the Western and Central Pacific Fisheries Commission (the Commission) have urged states to exercise reasonable restraint in respect of any increase in fishing effort and capacity with regard to the reported status of highly migratory stocks. As yet there are no specific international obligations with regard to management of albacore tuna. The Preparatory Conference may propose interim management measures (which are voluntary) before the Commission starts operating. Once the Commission is formed, decisions on overall catch limits will likely occur within five years; decisions on allocation amongst Commission members will take longer.

9 The Preparatory Conference has charged a scientific coordinating group with providing interim scientific advice on the status of Pacific tuna species. This group has reported that current catch levels from the South Pacific albacore stock appear to be sustainable. However, there is evidence of localized depletion of albacore and this is a potentially important issue, particularly for small island developing states dependant on these resources.

10 In summary MFish consider given: the HMS nature of the albacore; the contribution that New Zealand makes to harvest of the total stock; and, information on stock sustainability, the current management framework is not affecting sustainability

Table 1: Reported New Zealand commercial landings and discards (t) of albacore from CELRs and CLRs, and LFRRs (processor records) by fishing year.

	CELR and CLR		Total	
	Landed	Discarded	Reported	LFRR
1988-89	20	0	20	5000
1989-90	2036	0	2036	3144
1990-91	2295	0	2295	2451
1991-92	3780	1	3782	3434
1992-93	3506	<1	3506	3323
1993-94	6375	0	6375	5315
1994-95	6955	<1	6955	6195
1995-96	6131	<1	6131	6316
1996-97	3938	<1	3938	3728
1997-98	6731	<1	6731	6525
1998-99	3835	<1	3835	3727
1999-00	4960	2	4961	4697
2000-01	5591	20	5611	5509
2001-02	5830	1	5831	5638
2002-03	6579	<1	6579	6354-

Adverse effects on the aquatic environment

11 MFish consider that there are affects on the environment associated with fishing for albacore that can be better managed by introduction of this species into the QMS.

12 Harvesting of tunas may have impacts with regard to predator/prey interactions and trophic dynamics, as tunas feed on a variety of fish and other marine species. NIWA report that observer longline data show that albacore mostly consume fish and squid. Lancetfish and lantern fish are the most commonly consumed fish species. Albacore also consume small amounts of crustaceans and octopus. Further, albacore are found in the stomachs of blue and mako sharks caught by longline.

13 Understanding of food web relationships is still at an early stage, but MFish considers that, if evidence emerges of impacts on biodiversity from harvesting of albacore, this can be managed at that time based on international cooperation where appropriate.

14 In New Zealand waters, a substantial proportion of albacore tuna is taken by trolling. There are no known environmental impacts of this fishing method.

15 There are environmental impacts associated with use of longlines to target albacore, in relation to protected species (around 39 to 63% of the albacore catch has been taken by longline in recent years).

16 MFish note that introduction of other tuna fisheries, particularly southern bluefin tuna, into the QMS may result in a reduction in overall longline effort. While some rationalisation of the tuna fleet is anticipated as a result of introducing key target species into the QMS, all recent trends have been towards a greater proportion of catch being taken by longline. It is not clear whether the impact of introduction will result in a reduction in effort in albacore sufficient to mitigate the impacts associated with use of this method, particularly if albacore remains managed in an open access environment.

17 In general, environmental effects are common to the fishing method rather than specific to fishing for albacore species. One of the key rationales for introducing tunas into the QMS is to provide the opportunity for better management of environmental impacts associated with the fisheries by Government and/or stakeholders holders following allocation of rights. Other key tuna species taken by longline (southern bluefin tuna, yellowfin and bigeye) have been introduced into the QMS on 1 October 2004. Albacore is the last remaining major tuna target species taken by longline. Leaving this fishery outside the QMS under open access has the potential to undermine the ability for environmental issues to be managed by stakeholders across all tuna longline fisheries.

18 Tuna longline fisheries occasionally catch fur seals, cetaceans and turtles within New Zealand fisheries waters. There are therefore potential impacts on associated and dependent species, biodiversity and protected species that will require monitoring and possibly future management action.

19 Fishing vessels sometimes capture seabirds that are chasing baited hooks, and the seabirds drown as the lines sink. Seabirds are also caught in trawl and other fisheries,

but longliners are considered to be the main threat to several vulnerable albatrosses and other seabird species. The risks of seabird capture vary geographically and by species. An active programme is underway to mitigate and monitor the capture of seabirds in surface longline fisheries.

20 MFish has established standard environmental controls on line and trawl target fisheries to mitigate the impact of these fishing methods on marine mammals and seabirds. These include prohibitions on net sonde monitor cables and compulsory reporting of bycatch of protected species. New Zealand surface longline vessels are required to use tori lines of a specified standard. Vessels are also using a variety of practices to reduce seabird bycatch including the use of artificial baits and the practice of setting longlines at night.

21 MFish and the Department of Conservation have developed a National Plan of Action for Seabirds that will result in the development of voluntary codes of practise, that will specify mitigation measures.

Providing for Utilisation

Access is prevented or inhibited

22 Albacore tuna is currently managed under an open access fishery management regime whereby fishers can obtain access to the fishery via the holding or issuing of a fishing permit. MFish does not consider that the current management framework inhibits access to the fishery.

Providing for Well-being

23 Currently albacore is managed under an open access regime. As a target fishery, there is value in the albacore resource and therefore incentives to utilise the resource directly. The fishery is near shore and requires little capital investment to enter. In an open access environment with low entry cost there are strong incentives for fishers to enter the fishery. While the fishery may not be currently fully utilised, competition between fishers does occur in years when albacore abundance is low. This competition will result in diminishing rent from the fishery as fishers compete amongst each other for a share of the resource.

24 There is development potential in the fishery and MFish considers that the current management framework does not provide the best basis for fishery development. Rights are not clearly defined under the current management. The only existing rights are those of access, granted by the fishing permit. Fishers have no ongoing security of access, nor a guaranteed share of the resource. Any development or investment undertaken by fishers is therefore not supported by long-term tenure. Rights cannot be transferred, which means a fishers wishing to leave the fishery will get no return on capital invested (to the extent that the capital is not transferable to another fishery). As such, the existing right within the current management framework does not provide a sound basis for investment, and therefore foundation for development of the fishery.

25 MFish is aware of industry views that further management measures for albacore should not be implemented until regional agreement on management measures, and in

particular national allocations is reached. Industry considers that introduction into the QMS before this time may impact on their well-being by ultimately restricting the amount of allocation New Zealand interests will receive when any national allocations are agreed. MFish does not agree. There is no requirement following introduction of a stock or species into the QMS that requires setting of a constraining catch limit if there are no sustainability concerns. The QMS provides a better and more secure framework for development of the fishery (and therefore provide for well-being) to promote New Zealand's interests.

Determination about Current Management

26 MFish considers that the current management framework may not be adequately managing environmental effects of longlining for albacore and does not provide the best management framework to enable people to provide for their social, cultural and economic well-being given that fishers would like to develop the fishery.

Use of Section 11 Sustainability Measures

27 MFish notes that regulatory measures currently require the use of tori lines to mitigate seabird capture in the tuna longline fisheries. However, MFish considers that introduction to the QMS will provide better opportunity to manage environmental effects and enable utilisation through allocation of rights than use of a measure or measures imposed under s 11. Allocation of rights will provide better incentives that exist currently for rights holders to collectively manage the albacore fishery. Allocation of transferable rights also provides the best opportunity to enable social, cultural and economic well-being in the fishery.

28 Accordingly, MFish does not consider that the purpose of the Act would be better met by setting, on their own, one or more sustainability measures under s 11 compared to the benefits of introduction to the QMS.

Highly Migratory Species Considerations

29 Albacore is a highly migratory stock. MFish is not proposing to introduce the species outside the EEZ into the QMS at this time.

Conclusion

30 There are no known issues with overfishing of albacore. However, there are environmental impacts associated with one of the major methods used to take albacore. The longline method generically takes a number of seabirds and some limited catch of associated rare or protected species such as turtles and marine mammals. Environmental impacts on seabirds are currently mitigated via a regulatory measure requiring the use of tory lines and further voluntary measures implemented by the joint venture tuna longline fleet. Further sustainability measures could be implemented under s 11 or voluntarily to mitigate additional impacts. However, MFish considers further sustainability measures imposed under s 11 on their own may not be successful in further mitigating effects if albacore was to remain outside the QMS and be managed under an open access regime. Additional regulatory controls may inhibit people's ability to provide for their social and cultural well-being.

31 MFish considers that allocation of rights provides a better opportunity to create incentives for stakeholder management. Collective action provides the opportunity for rights holders to identify the most efficient solutions for mitigating adverse effects and thereby creating the best opportunity to enable their social, cultural and economic well being.

32 MFish notes that there may be development opportunity in the albacore fishery. In this situation, the existing management framework fails to produce an environment conducive for investment or development, and as such does not adequately enable well being.

Stocks and Areas

33 Albacore tuna that occur in New Zealand fisheries waters are part of a south Pacific stock. NIWA has recommended a single QMA for New Zealand fisheries waters for a stock boundary for albacore tuna.

Proposed Quota Management Areas

34 The Act defines two statutory obligations that must be considered when defining QMAs:

- As far as practicable, the same QMAs should be maintained for different species – s 19(2); and
- A separate QMA may be set for the waters surrounding the Chatham Islands if the stock can be managed effectively as a unit – s 19(3).

35 The Act requires that, as far as practicable, the same QMAs be maintained for different species. In this case it is most relevant to consider management arrangements that apply to other highly migratory species. In the absence of regional management measures, MFish has decided not to propose including the high seas in the QMAs for other highly migratory species at this time (an exception is for southern bluefin tuna). In effect, New Zealand fisheries waters are being used to define a unit for the purpose of management. A single QMA for New Zealand fisheries waters applies to other tuna (other than southern bluefin tuna) and related bycatch that is taken by surface longline. MFish's initial view is that the QMA for albacore should be the same as for these related species.

36 A single QMA for all of New Zealand fisheries waters would be efficient in that it would allow fishers to take their annual catch entitlement wherever the fish were most abundant and/or fishing costs were lowest. MFish policy principles indicate that stock boundaries should take into account the existing characteristics of the fishery (known fisheries, relevant fisheries management issues). There are no issues that would suggest an alternative QMA option for albacore given the management arrangements for other tuna and highly migratory bycatch species.

37 Albacore tuna are not regularly caught around the Chatham Islands, and there is no reason to consider this area as a separate management unit. MFish concludes that this area can not be effectively managed as a unit

Proposal

ALB 1 (FMAs 1, 2, 3, 4, 5, 6, 7, 8, 9, 10)

38 The proposed QMA encompasses all New Zealand fisheries waters, including the Kermadec FMA (refer Figure 1).

Figure 1: Proposed QMA for albacore tuna.

Fishing Year

39 The current fishing year for albacore tuna is from 1 October to 30 September. The alternative fishing year is 1 April to 31 March.

40 Albacore tuna is often taken in association with bigeye and other tunas. A 1 October fishing year is to apply for these other tuna species, and MFish considers that albacore should be aligned with them.

41 Accordingly, should albacore tuna be introduced into the QMS, MFish proposes that the fishing year be from 1 October to 30 September.

Unit of Measure

42 Greenweight has been used historically for management purposes in the tuna fisheries. MFish considers there is no reason to change this unit of measure should albacore tuna be introduced into the QMS, and accordingly proposes that greenweight be retained as the unit of measure.

COCKLES (COC)

Summary of Proposals

1 The Ministry of Fisheries (MFish) proposes that:

a) Cockles (other than COC1A, COC3, COC7A and COC7B) be introduced into the quota management system (QMS) on 1 October 2005;

b) The quota management areas (QMA) are COC1B, COC2, COC3B, COC4, COC5, COC7, COC8 and COC9;

c) Alternatively, that the QMAs in FMA 1 (outside of COC1A) be COC1B and COC1C;

d) The fishing year be 1 October to 30 September; and

e) The unit of measurement be greenweight.

Assessment of Legislative Criteria

Schedule 4C

2 Four New Zealand cockle (*Austrovenus stutchburyi*, formerly *Chione stutchburyi)* stocks are currently managed under the QMS. These stocks are COC1A[1], COC3, COC7A and COC7B. The remaining stocks of cockles outside of the QMS are listed on Schedule 4C. While on Schedule 4C no new fishing permits can be issued for the commercial harvest on these stocks. The stocks and species on Schedule 4C were identified as having potential sustainability risks in an open access management regime. The purpose of Schedule 4C is to provide an interim measure to limit access until a decision was made about whether to introduce the stock or species into the QMS or to provide for open access and to manage through the use of sustainability measures under s 11.

3 There is limited stock assessment information to determine stock status of non-QMS cockles. The cockle is a relatively common shellfish throughout New Zealand. The species is sometimes found in high densities. However, because of the patchy distribution of cockles, there is no precise information on the distribution of cockle beds throughout New Zealand. Therefore, an accurate estimate of total cockle biomass or sustainable yield is not available from existing data. Given they are easily accessible, cockles are susceptible to localised depletion, particularly if catch levels are significant or concentrated within a small number of areas.

4 Reported commercial catches of non-QMS cockle stocks have been relatively small (see Table 1). MFish does not know if these catch levels are sustainable because there has been no investigation of the status or potential yield of non-QMS cockle stocks. In addition, catch history cannot be used as an indicator of stock abundance because

[1] COC1A – Whangarei Harbour; COC3 – Otago Peninsula; COC7A – Golden and Tasman Bays and COC7B – Marlborough Sounds.

records of cockle catches from non-QMS stocks are poor and the accuracy of the harvest estimates is unknown.

Table 1: Reported landings (t) of cockles by Fisheries Management Area (FMA) for fishing years 1989–90 to 2001–2002.

	Reported landings						
FMA/YEAR	1 +1A	2	3	4	5	7+7A	8
1989–90	233		29			195	
1990–91	382		109	3		535	
1991–92	551		97		<1	276	
1992–93	332		182			293	
1993–94	573		194	4		440	
1994–95	507	<1	344	3	4	325	
1995–96	488		309			329	
1996–97	502	<1	291			320	
1997–98	439		423			512	<1
1998–99	472		383		3	552	
1999–00	505	<1	553		<1	729	
2000–01	424	<1	697		<1	740	3
2001–02	422	3	644			558	

5 Cockles may also be taken as a minor bycatch in the target pipi fishery (also proposed for introduction into the QMS 1 October 2005). Changes to fishing patterns in some shellfish fisheries (including development of new and existing harvest areas) are likely to influence catches of non-QMS cockles.

6 The extent of non-commercial utilisation of non-QMS cockles is not fully known. However, the northeast coast of the North Island is a heavily populated area, with many people having a degree of dependence on the cockle resource for subsistence purposes. In many northern harbours and estuaries the cockle resource is well utilised by fishery interests in the area. MFish has commissioned surveys of intertidal shellfish resources at beaches, mainly in the Auckland metropolitan area, over the last decade, in areas popular with non-commercial fishers. The surveys reveal that some beaches have signs of a decline in biomass, while others appear relatively stable.

7 Cockles, like other sedentary species, form localised populations in open and sheltered sandy habitats. These populations are likely to demonstrate spatial and temporal fluctuations in stock size and structure due to the influence of environmental factors on population dynamics. These factors include water temperature, exposure rates, water currents, sand movement, food availability, and predation. In addition, fishing pressure by commercial and non-commercial fishers may have an impact on population dynamics, as fishers generally harvest large cockles. The biological attributes suggest this species is vulnerable to the effects of fishing and habitat disturbance, and is particularly susceptible to localised depletion.

8 Cockles are an important food source for coastal predatory fish (ie, flounder), crabs and seabirds. Cockles are also likely to play an important role in stabilising sandy beaches and banks by reducing the transport of sediment material. The species may also assist in maintaining water quality through their filter-feeding activity within estuarine and harbour environments. A reduction in cockle biomass may have

implications on associated and dependent species, and on the physical aquatic environment, particularly if localised depletion of discrete cockle populations occurs.

9 Commercial fishers are permitted to use mechanical harvesting within defined areas of the COC7A stock. MFish has no information on the physical impacts of mechanical harvesting for cockles on the benthic environment within COC7A. However all harvesting is restricted to three discrete areas within COC7A to restrict environmental impacts and control sustainability.

10 With the exception of the COC7A fishery, all commercial and non-commercial harvesting for cockles is restricted to handgathering. Handgathering is a low impact method that essentially has no discernable effect on the environment.

11 If a decision is made not to introduce non-QMS cockles into the QMS, then it will be removed from the Schedule and the moratorium on issuing commercial fishing permits will be removed. There is a risk that commercial fishing effort for cockles would increase under open access if market demand increases. This risk arises because cockles are a highly marketable shellfish species and the cost of entry into the fishery would be relatively low (ie, it is a beach-based fishery). Given the localised nature of cockles, an increase in unconstrained fishing effort could give rise to sustainability concerns in both existing and new harvest areas.

Use of Section 11 Sustainability Measures

12 Increases in both commercial and non-commercial catches may create potential allocation issues between users over access to localised cockle populations. Conflict of access may also arise in direct response to increasing population in northern New Zealand given the relative accessibility of fishers to coastal areas where cockle beds occur. These issues will be exacerbated by an increase in preference for cockles by customary and recreational fishers in response to changes in population demographics.

13 The cockle resource has been subject to considerable fishing pressure in some areas of the Hauraki Gulf and Bay of Plenty, and environmental degradation from urban development is a feature affecting the status of a number of beds. There is evidence to suggest that the abundance of the resource is not meeting the interests of non-commercial fishers in northern New Zealand. Temporary or longer term regulatory measures have been applied to prohibit the use of the cockle resource in parts of Auckland and the western Coromandel Peninsula as a means to address local sustainability concerns.

14 In other areas of New Zealand there may be under-utilisation of the resource. MFish has not issued any commercial fishing permits in these areas since 1991. MFish is unable to predict the extent of the potential interest in developing a cockle fishery in those areas currently outside of the QMS. Such interest is likely to be influenced by the availability of significantly sized beds that would support year round economic activity.

15 Retaining non-QMS cockles indefinitely on Schedule 4C is not a strategy that best meets the purpose of the Act. Nor would retention of the permit moratorium on a long term basis be necessary to achieve the purpose of the Act. The options are to

manage the species under the QMS or to use s 11 measures. Current information suggests that there is a need for active management of non-QMS cockles.

16 The s 11 measures on their own do not provide an effective means of addressing the utilisation of the resource, either by commercial fishers, or in allocating the resource between sectors. The existing regulatory areas specifying the few areas in northern New Zealand where commercial fishing may occur inhibits access to the fishery. Nevertheless, these areas require review given that these areas may no longer be suitable as commercial fishing areas, as many of them are important non-commercial fisheries. The specification of areas where commercial fishing may occur does not necessarily constrain catch within these areas.

17 A Commercial Catch Limit may act to constrain commercial catch. However, in the absence of measures such as deemed values, the only means available to give effect to a CCL is to close the fishery when the catch limit is reached. The use of a CCL may lead to the closure of the fishery and, subject to the method of harvest, could in practice, due the effect of s 241, result in the effective closure of associated sedentary shellfish fisheries should cockles be taken as a bycatch.

18 In comparison to s 11 measures on their own, the QMS enables people to invest in, and develop, a fishery when they choose to do so, where a TACC has been set. Although, there is no immediate commercial interest in the species, it is preferable that any development of the fishery occurs within the context of the QMS. Unlike an open access regime, the QMS provides greater incentives to commercial fishers to develop and manage the fishery sustainably through the provision of secure property rights. The establishment of a defined stock also provides greater opportunity for better planning and organisation around management of the stock by all stakeholders, including non-commercial fishers. In addition, the QMS provides the most effective means of providing for the utilisation interests of all sectors, through the setting of a TAC, allocating the resource between sectors, and application of measures that effectively constrain commercial catch. It is acknowledged that management under the QMS could also include use of s 11 measures, such as retention of method restrictions.

19 The conclusion is that, in the case of non-QMS cockles, the s 11 measures on their own do not, compared to the QMS, better meet the purpose of the Act.

Highly Migratory Species Considerations

20 Cockles are not a highly migratory species, so this consideration is not applicable.

CITES Listing

21 The species is not listed on CITES – hence there is no requirement to consult with the Minister of Conservation when considering introduction of cockles into the QMS.

Stock and Areas

22 Cockles are found widespread on sandy, protected beaches and banks around the North Island, South Island, Stewart Island, Chatham Islands and Auckland Islands.

23 NIWA advises that boundaries of individual stocks of cockles should be based on biological characteristics of the stock. There are many spatially defined beds of juveniles/adults, which are likely to be linked to other beds through the relatively extended and mobile planktonic larval stage, receiving and providing spat from/to other beds nearby. NIWA suggests that stock boundaries for management purposes can be encompassed within the general Fisheries Management Areas (FMAs).

Proposed Quota Management Areas

24 The Act sets out two statutory obligations that must be considered when defining QMAs.

- As far as practicable, the same QMAs must be maintained for different species (s 19(2)); and
- A separate QMA may be set for the stock in the waters surrounding the Chatham Islands if the stock in that area can be managed effectively as a unit for fisheries management purposes (s 19(3)).

25 In addition to the matters above, MFish has developed a set of principles to assist in defining practicable QMAs, which is set out in the introduction section of this paper. In considering these statutory obligations and principles, MFish considers the following are key factors in defining QMAs for the non-QMS cockles:

a) Cockle beds are widespread throughout New Zealand, although their relative distribution and abundance is reflective of the availability of suitable habitat;

b) It would be impractical and administratively costly to manage cockles based on each bed (unless they were significantly sized), and fine scale management of each bed may be achieved in conjunction with a management framework applied at an appropriate scale;

c) Cockles are often located in areas with other sedentary shellfish species, such as pipi. The management of cockles needs to be closely aligned with these associated fisheries; and

d) Cockles are found in the Chatham Islands. Given the likelihood that this population is quite distinct, and is likely to form its own biological stock, it is appropriate to establish a separate QMA for this area.

e) There is unlikely to be any development of a cockle fishery within FMA 10, given the lack of potential habitat, and the presence of a marine reserve. Consequently, it is appropriate to retain FMA 10 outside the QMS as a non-QMS fishery.

Proposals

26 MFish proposes that non-QMS cockles should be managed within eight or nine QMAs (refer to Figure 1 below). The proposed QMAs are aligned with the QMAs for the pipi, and to a lessor extent, the tuatua fisheries, to reflect the close association between these fisheries.

27 For FMA 1, two options are proposed – the first option being a single QMA (i.e. COC 1B - that portion of FMA 1 outside of COC 1A). A larger QMA may provide greater flexibility to provide for all types of fishing interests within the QMA. There is the ability to provide for finer scale management through other measures, including fisheries plans. Smaller QMAs may be affected by a variety of spatial measures, including marine farming areas, mātaitai, and marine reserves (although even with two QMAs within FMA 1, the areas still are geographically quite large and there is likely to be little new ground for marine farming within FMA1 that would conflict with areas where cockles are found). However, in this instance a QMA based upon the existing FMA may not accurately reflect the circumstances prevalent in the fishery.

28 The alternative option is for two QMAs. The north-east coast of the North Island is a heavily populated area, with many people having a degree of dependence on cockles for subsistence purposes. The Northland cockle beds are likely to be in a better state than the beds found in the Hauraki Gulf/Bay of Plenty area given differences in size of beds, intensity of use, and the environmental pressures prevalent. The interests of non-commercial stakeholders are more likely to be aligned to treating Northland and the Hauraki Gulf/Bay of Plenty area as distinct management areas.

29 In addition, the considerable use of the resource in both areas has, and will continue to, attract representatives of the community with an interest in contributing to the management of local beds. The QMAs then proposed, as COC 1B and COC 1C, still offers considerable flexibility to fishery interests in the respective areas to discuss the basis for management at a smaller scale. A description of the features of these two proposed QMAs, and the others proposed, follows.

COC 1B (part FMA 1 north of Te Arai Point, Pakari Beach)

30 This proposed QMA extends from North Cape to Te Arai Point, Pakari Beach, incorporating the east coast of Northland. COC1B excludes Whangarei Harbour, already established as COC1A. The proposed QMA includes many northern harbours and estuaries where the cockle resource is well utilised by fishery interests in the area. The southern boundary for this proposed QMA is the same as that used for rock lobster, sea urchin, and sea cucumber fisheries.

COC 1C (part FMA 1 south of Te Arai Point, Pakari Beach)

31 This proposed QMA covers an extensive area extending from Te Arai Point, Pakari Beach to Cape Runaway, incorporating the Hauraki Gulf and Bay of Plenty. The QMA is characterised by well utilised cockle resources in parts of the inner and outer Hauraki Gulf, the Coromandel Peninsula, and western and central parts of the Bay of Plenty.

32 The cockle resource has been subject to considerable fishing pressure in some areas of this proposed QMA, and environmental degradation from urban development is a feature affecting the status of several beds. Temporary or longer term regulatory measures have been applied to prohibit the use of the cockle resource in parts of Auckland and the western Coromandel Peninsula as a means to address local sustainability concerns.

COC 2 (FMA 2)

33 This proposed QMA extends from Cape Runaway to the coast adjacent to Porirua. There are relatively few suitable areas within this proposed QMA where cockle habitat is found.

COC 3B (FMA 3)

34 This proposed QMA extends from the Clarence River mouth (Marlborough) to Slope Point on the Catlins coast (Southland), excluding the area encompassed within the existing QMA COC 3.

COC 4 (FMA 4)

35 This proposed QMA encompasses the Chatham Islands and the eastern Chatham Rise. Commercial catches of cockle are taken from the Chatham Island beaches.

COC 5 (FMAs 5 & 6)

36 MFish notes there is unlikely to be any development of a cockle fishery within FMA 6. In such areas MFish usually sets larger QMAs to reduce management costs. MFish proposes to combine FMAs 5 and 6 in proposing a QMA for the COC 5 stock. MFish considers the combination of these two FMAs to form a single management unit appropriate.

COC 7C (FMA 7)

37 This proposed QMA extends from Awarua Point, Westland to Bush End Point, Farewell Spit, excluding those areas encompassed within the existing QMAs, COC 7A and COC 7B. The lack of suitable habitat along the west coast limits the cockle resource to only a few localities.

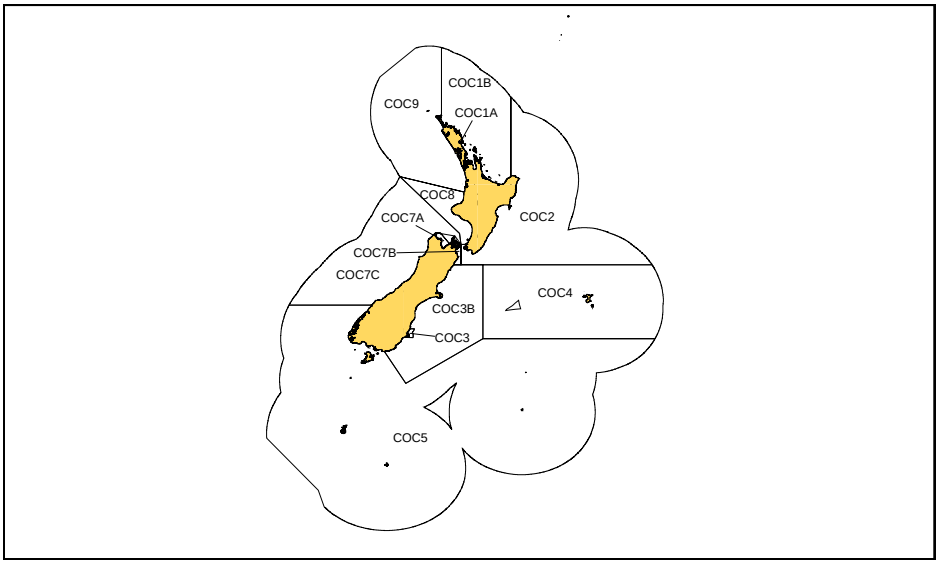
COC 8 (FMA 8)

38 This proposed QMA extends from the Porirua coast north to Tirua Point, south of Kawhia Harbour.

COC 9 (FMA 9)

39 This proposed QMA extends from Tirua Point to North Cape. Cockle resources are found within the harbour environments, and are well utilised by local communities and people from adjacent major urban centres such as Hamilton and Auckland.

Figure 1. Proposed Quota Management Areas for cockles



Note that Figure 1 illustrates FMA 1 with a single QMA outside of COC 1A. An alternative proposal is to split 1B represented in the figure into 1B and 1C, separating Northland from the Hauraki Gulf and the Bay of Plenty.

Fishing Year

40 The proposed fishing year for cockles is from 1 October to 30 September. This is consistent with the fishing year that applies to the associated pipi and tuatua fisheries.

Unit of Measure

41 MFish considers the unit of measurement should be greenweight. Greenweight has been used historically for management purposes in the cockle fishery. This unit of measure also applies to all the associated shellfish QMS fisheries. There does not appear to be any rationale for changing this unit of measure should non-QMS cockles be introduced into the QMS.

NON-QMS DREDGE OYSTER (OYS)

Summary of Proposals

1 The Ministry of Fisheries (MFish) proposes that:

a) Dredge oyster stocks not already in the QMS be introduced into the QMS on 1 October 2005;

b) The QMAs be OYS1 (FMA 1), OYS2 (FMA 2), OYS3 (FMA 3), OYS4 (FMA 4), OYS5B (FMAs 5 & 6 not including OYU5), OYS7A (FMA 7 - west coast of the South Island), OYS7B (FMA 7 to the north and west of Bush End Point, Farewell Spit), OYS7C (east part of FMA 7, Clarence River mouth to West Head, Tory Channel), OYS8 (FMA 8), OYS9 (FMA 9);

c) The fishing year be 1 October to 30 September; and

d) The unit of measurement be greenweight.

Assessment of Legislative Criteria

Ensuring Sustainability

Harvest of species

2 On 1 October 2004 the permit moratorium ended for non-QMS[1] dredge oyster stocks (*Tiostrea chilensis*). The current management of these stocks consists of open access and a number of regulatory controls, such as method, season and area controls.

3 Catch levels of non-QMS dredge oysters are likely to increase under current management and to pose a sustainability problem, because the biological attributes of dredge oysters make them susceptible to the effects of fishing.

4 The commercial potential of non-QMS dredge oysters is not known. However, fishers have recently approached MFish regarding being able to target non-QMS dredge oysters. These inquiries indicate there is interest in increased targeting of non-QMS dredge oyster under the current management regime, especially as there is an established market for dredge oyster.

5 An increase in effort for target stocks that take dredge oyster as bycatch is also likely to affect the sustainability of non-QMS dredge oyster populations. MFish is recommending that non-QMS scallop stocks be introduced into the QMS to ensure sustainability and efficient utilisation. Dredge oysters are a significant scallop bycatch fishery and their bycatch would likely increase with an increase in effort in the non-QMS scallop fisheries. Non-QMS dredge oysters are already taken as a bycatch of the Chatham Island scallop fishery.

[1] Two dredge oyster stocks are managed in the QMS (OYS 7 and OYU 5).

6 Reported commercial catches of non-QMS dredge oyster stocks have ranged between 0 tonnes in 1990-91 and 86 tonnes in 1997-98 (Table 1). Records of oyster catches from non-QMS stocks are poor and the accuracy of the harvest estimates is unknown. Past catch levels are unlikely to be a good indicator of likely future catch as access to the fishery has been restricted under the permit moratorium.

Table 1 **Reported landed catch (tonnes) of OYS for fishing years 1989-90 to 2002-03. FMA 5B = FMA 5 minus OYU 5; FMA 7B = FMA 7 minus OYS 7. Catch data extracted from FIS database except data for FMA 7B which was provided by NIWA.**

Fishing year	FMA 1	FMA 2	FMA 3	FMA 4	FMA 5B	FMA 6	FMA 7B	FMA 8	FMA 9	FMA 10	Total
1989-90							0.20				0.20
1990-91											0.00
1991-92	0.08		0.65					4.37			5.10
1992-93			0.54				0.70				1.24
1993-94			0.03						0.34		0.37
1994-95			0.00	0.50							0.50
1995-96	4.98	0.67	4.13	9.65			1.40				20.83
1996-97	2.01	0.95	0.15	15.49		2.92	1.00		0.82		23.34
1997-98	0.53	0.44		84.36	0.12		0.20			0.40	86.04
1998-99	0.44	0.13	0.12		13.33		0.20				14.22
1999-00			0.14	0.06							0.19
2000-01	0.08	0.10	0.13	0.34							0.65
2001-02	0.01			3.63				0.01			3.65
2002-03	0.05		0.60	1.48	0.15			0.02			2.29
Total	8.18	2.29	6.49	115.49	13.60	2.92	3.70	4.39	1.16	0.40	158.62

7 There are no estimates of current or reference biomass, or sustainable yield for non-QMS dredge oysters. However, the biological attributes of dredge oysters means increased catch under the current management regime is unlikely to maintain the potential of fisheries resources to meet the reasonably foreseeable needs of future generations. Oysters are sedentary, long lived, slow growing in some areas, brood relatively few larvae that usually do not disperse widely, and may have high post-settlement mortality, and populations outside established commercial fishery areas are likely to be in small and localised areas. All these traits indicate that repeated dredging of localised beds under the current management regime is likely to lead to localised depletion.

8 The existing regulatory controls relevant to non-QMS dredge oyster will not ensure sustainability. For example, the areas closed to dredging do not apply to deeper offshore water areas that have commercial potential, such as Port Underwood and other areas on the east coast of the South Island. Method controls on the size of shellfish dredges in the Fisheries (Commercial Fishing) Regulations 2001 do not control the total catch level that can be taken. The season control set for South Island fisheries waters (generally south of Cook Strait) in the Fisheries (Commercial Fishing) Regulations 2001 also fails to control the total commercial take of oysters during the open season.

Adverse effects on the aquatic environment

9 Dredge oysters are exclusively taken by dredging, which can have adverse effects on the aquatic environment and affect biological diversity. Following recent enquiries from fishers interested in targeting dredge oysters under open access, MFish considers there is a risk that dredging for non-QMS stocks could expand to new areas and cause adverse effects on undredged areas.

10 Dredge oysters outside the Foveaux Strait are mainly found on mud and sand substrates in coastal areas, and are generally not part of biogenic reefs as they are in Foveaux Strait. Nevertheless, there will be some populations that occur in more structural habitat that could be damaged if dredging effort increased. Populations are known in harbours and inlets around New Zealand, for example in shallow waters at Stewart Island, Fiordland, Marlborough Sounds, and in the Bluff, Otago, Lyttelton, Akaroa, Wellington, Kaipara and Manukau harbours. They are also found in deeper offshore waters along the south and east coast of the South Island and off the North Island along the coasts of Taranaki, Wairarapa, Hawkes Bay, Bay of Plenty, and Firth of Thames. In these areas with minimal structural habitat, oysters may play a significant role for larval settlement. In the Foveaux Strait for example, oyster spat settle primarily on live oysters, oyster shells and circular saw shells. MFish considers that unconstrained fishing of non-QMS dredge oysters beds, as is likely to occur under current management, would remove important settlement habitat and pose a significant risk to sustainability.

11 Dredge oysters are taken together with scallops, green-lipped mussel and occasionally horse mussels and volutes, but little is known about the relationship between oysters and these other species. An increase in dredging activity could increase the catch of, and adversely affect, the sustainability of these other species. Such an increase in dredging activity is likely under the current open access management regime for dredge oysters.

Providing for Utilisation

Access is prevented or inhibited

12 Currently there is open access to non-QMS dredge oysters, so access is not prevented or inhibited.

Providing for well-being

13 Dredge oysters are locally important to recreational and customary fishers. Under current management, competition between commercial and non-commercial sectors may lead to a decrease in the quality of the oyster fishery for the non-commercial sector. While poorly estimated, non-commercial catch is likely to be less than commercial catch[2]. Non-QMS oyster populations are patchily distributed around New Zealand coastal waters including Pauatahanui Inlet, Fiordland, Lyttelton, Akaroa, Wellington, Kaipara and Manukau Harbours. Increased commercial effort in such coastal locations could subject the resource to localised depletion. This situation would require an allocation decision to be made between commercial and non-

[2] An amateur daily bag limit of 50 is set for most recreational fishing areas.

commercial sectors. Since customary and recreational groups have an explicit allowance for a stock on the setting of a TAC under the QMS, they are in a better position to have their interests provided for.

14 The current management regime for non-QMS dredge oysters does not provide the economic well-being benefits that the allocation of property rights under the QMS does. Non-QMS dredge oyster stocks are developmental fisheries that are likely to require investment to demonstrate catch levels can be increased while ensuring sustainability. Current management does not provide the security and certainty the QMS does to encourage investment. Instead, open access can result in a "race for fish", as fishers try to maximise their share of a limited resource. In such a situation there is little interest or individual to be derived benefit from implementing sustainable fishing practices.

Determination about current management

15 MFish considers the current management of non-QMS dredge oyster is not ensuring sustainability, nor providing for the utilisation of non-QMS dredge oyster stocks.

16 The current open access management and various regulatory controls relevant to non-QMS dredge oysters do not control the level of catch that can be taken from these stocks. Targeting of non-QMS dredge oysters is likely to increase under open access, given the level of inquiries that MFish has received from fishers interested in targeting non-QMS dredge oysters.

17 The biological attributes of dredge oysters means unrestricted fishing of non-QMS dredge oysters is unlikely to meet the criteria of maintaining the potential of fisheries resources to meet the reasonably foreseeable needs of future generations. Oysters are sedentary, long lived, slow growing in some areas, brood relatively few larvae that usually do not disperse widely, and may have high post-settlement mortality, and populations outside established commercial fishery areas are likely to be in small and localised areas. All these traits indicate that unconstrained dredging of non-QMS dredge oysters under the current management regime is likely to lead to localised depletion.

18 Increased targeting of non-QMS dredge oysters is also likely to increase the risk that the adverse effects of dredging on the aquatic environment will not be avoided, remedied or mitigated, especially where dredging occurs in previously undredged areas.

19 In addition, the current management framework is not enabling people to provide for their social, economic, and cultural well-being. For example, increased targeting of non-QMS dredge oysters is likely to result in conflict between the commercial and non-commercial sectors, as dredge oysters are of local importance to recreational and customary fishers. Unlike the QMS, current management does not provide for the interests of the non-commercial sector. The current management regime also fails to provide the incentives of the QMS for right holders to invest and develop fisheries, to provide for their well-being.

Use of Section 11 Sustainability Measures

20 The biological attributes of dredge oysters mean they are susceptible to the effects of fishing, particularly via localised depletion. There is significant potential for increased targeting of non-QMS populations under open access. Increasing catch effort would raise the risk of greater adverse effects on the aquatic environment and associated species. In addition, there are potential allocation issues between the commercial and non-commercial sectors that are best resolved in the QMS framework.

21 There are no specific circumstances for non-QMS oysters that mean the purpose of the Act would be better met by setting, on their own, one or more measures (other than a TAC) under s 11. Using such measures as competitive catch limits, and area, method and season controls under open access is unlikely to address the sustainability issues identified as they do not control the quantum of catch. Using large-scale area closures to address sustainability issues and conflict over access between sectors is likely to unnecessarily constrain utilisation and not provide for social, economic, and cultural well-being.

22 Under open access there is little incentive for commercial fishers to ensure the long-term sustainability of the resource. In contrast to a Commercial Catch Limit on its own, the QMS enables fishers to actively develop a dredge oyster fishery within sustainable limits and gain benefits that accrue from having secure access rights. The QMS also has inherent incentives to mitigate the potential effects of fishing on the aquatic environment and on other fisheries sectors through adopting environmentally appropriate technologies and fishing practices, which are of particular concern for dredge fisheries. However, it is acknowledged that management under the QMS could also include use of s 11 measures, such as closed areas.

23 The conclusion is that, in the case of non-QMS dredge oysters, the s 11 measures on their own do not, compared to the QMS, better meet the purpose of the Act.

Highly Migratory Species Considerations

24 Dredge oyster is not a highly migratory species, so this consideration is not applicable to this species.

CITES Listing

25 Dredge oyster is not listed on CITES, so there is no requirement for Minister of Fisheries to consult with the Minister of Conservation when making a determination on whether to introduce non-QMS dredge oyster into the QMS.

Stock and Areas

26 There have been no biological studies that are directly relevant to the recognition of non-QMS stocks of dredge oysters around New Zealand. Dredge oysters have a relatively cosmopolitan distribution and are found in inlets and harbours, as well as in deeper offshore waters. Information currently available supports limited larval dispersion from localised patches of oysters, suggesting genetically and geographically more or less distinct stocks around New Zealand.

27 NIWA recommends that the ten standard FMAs apply to the non-QMS dredge oyster stocks, with any particular beds warranting it later being managed as constituent substocks of the FMAs.

Proposed Quota Management Areas

28 The Act sets out two statutory obligations that must be considered when defining QMAs:

- As far as practicable, the same QMAs must be maintained for different species (s 19(2)); and
- A separate QMA may be set for a stock in the waters surrounding the Chatham Islands if the stock in that area can be managed effectively as a unit for fisheries management purposes (s 19(3)).

29 In addition to the statutory matters above, MFish has developed a set of principles to assist in defining practicable QMAs, which is set out in the Introduction section of this paper. In considering these statutory matters and principles, MFish considers that the following are key factors in defining QMAs for non-QMS dredge oysters:

a) The management of non-QMS dredge oysters needs to be aligned with associated fisheries, such as scallop and green-lipped mussel;

b) There are no known biological reasons to suggest any particular partitioning of stocks;

c) Dredge oysters are commercially harvested at the Chatham Islands. The Chatham Islands' dredge oyster stock can be effectively managed as a unit if a QMA is set for the waters surrounding the Chatham Islands; and

d) Larger QMAs that align with associated fisheries provide administrative savings and greater flexibility for right holders to decide the most efficient way to use the resource and meet the requirements of the Act.

30 MFish does not propose to manage dredge oysters in FMA 10 in the QMS. The relative lack of catch records from FMA 10, coupled with the presence of a marine reserve and the isolation from the mainland suggest the development potential of a dredge oyster fishery in FMA 10 is low.

Proposals

OYS1 (FMA 1)

31 This proposed QMA extends from North Cape to Cape Runaway, incorporating the northern parts of the east coast of the North Island.

OYS2 (FMA 2)

32 This proposed QMA extends from Cape Runaway to the coast adjacent to Porirua.

OYS3 (FMAs 3)

33 This proposed QMA extends from the Clarence River mouth (Marlborough) to Slope Point on the Catlins coast (Southland).

OYS4 (FMA 4)

34 This proposed QMA encompasses the Chatham Islands and the eastern Chatham Rise.

OYS5B (FMAs 5 & 6 excluding the Foveaux Strait oyster fishery OYU5)

35 MFish notes there is unlikely to be any development of an OYS fishery within FMA 6. In such areas MFish usually sets larger QMAs to reduce management costs. MFish proposes to combine FMAs 5 and 6 for OYS, excluding the Foveaux Strait oyster fishery OYU5.

OYS7A (FMA 7 - West Coast South Island)

36 This proposed QMA extends from Awarua Point, Westland to Bush End Point, Farewell Spit. The proposed QMA aligns with the GLM7B for the associated green-lipped mussel fishery.

OYS7B (FMA 7 – north and west of Bush End Point, Farewell Spit) and OYS7C (east part of FMA 7, Clarence River mouth to West Head, Tory Channel)

37 MFish notes the need to align the dredge oyster QMAs for FMA 7 with GLM 7A of the associated green-lipped mussel fishery. The existing OYS7 QMA complicates meeting this requirement. MFish considers the best approach is to create separate QMAs for the rest of GLM7A that lies outside OYS7. MFish does not support amending the First Schedule to change the boundaries of OYS7 to include the rest of GLM7A. MFish considers the creation of the new proposed QMAs allows the normal quota share allocation process set out in the Act to be followed to ensure no parties are unduly favoured or disadvantaged.

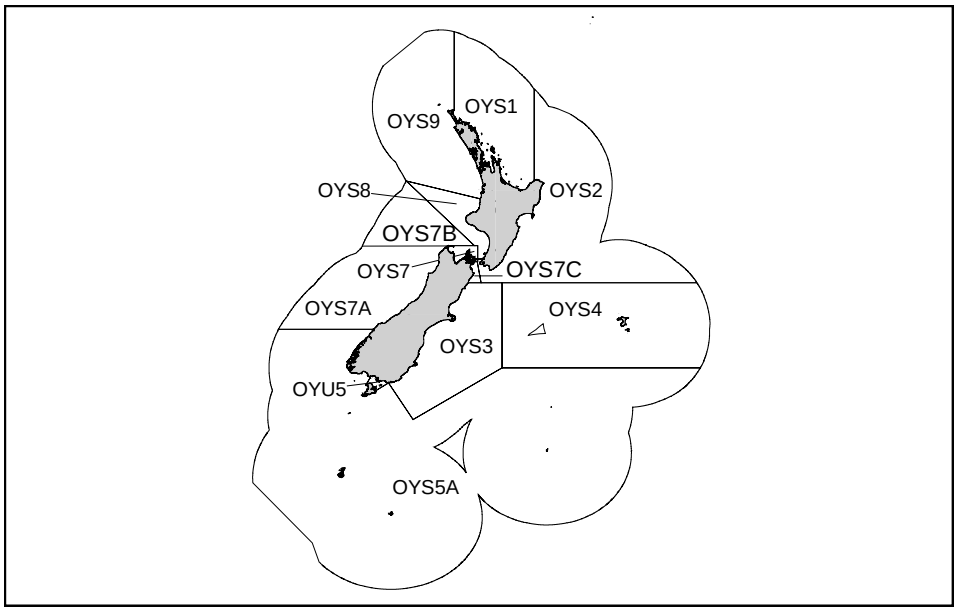
OYS8 (FMA 8)

38 This proposed QMA extends from the Porirua coast north to Tirua Point, south of Kawhia Harbour.

OYS9 (FMA 9)

39 This proposed QMA extends from Tirua Point to North Cape.

Figure 1 **Map of proposed and existing dredge oyster quota management areas**



Fishing Year

40 A 1 October to 30 September fishing year is consistent with the fishing year for dredge oyster stocks already managed in the QMS.

Unit of Measure

41 The unit of measure in the Foveaux Strait QMS oyster fishery is numbers of oysters, but in the OYS7 fishery and non-QMS dredge oyster stocks the unit of measure is greenweight. MFish considers there is no need to change the unit of measure for non-QMS oysters if they are introduced into the QMS. To standardise the unit of measure for all dredge oyster fisheries to be the number of dredge oysters, would require a major amendment to the Act at significant cost to change the unit of measure for OYS7.

PIPI (PPI)

Summary of Proposals

1 The Ministry of Fisheries (MFish) proposes that:

a) Pipi be introduced into the quota management system (QMS) on 1 October 2005;

b) The quota management areas (QMAs) be PPI 1B (FMA 1 excluding PPI 1A), PPI 2 (FMA 2), PPI 3 (FMA 3), PPI 4 (FMA 4), PPI 5 (FMA 5 & FMA 6), PPI 7 (FMA 7), PPI 8 (FMA 8) and PPI 9 (FMA 9);

c) Alternatively, that the QMAs in FMA 1 (outside of PPI 1A) be PPI 1B and PPI 1C;

d) The fishing year be 1 October to 30 September; and

e) The unit of measurement be greenweight.

Assessment of Legislative Criteria

Schedule 4C

2 Pipi (*Paphies australis*) is listed on Schedule 4C. While on Schedule 4C, no new fishing permits can be issued for the commercial harvest of the species. The species on Schedule 4C were identified as having potential sustainability risks in an open access management regime. The purpose of Schedule 4C is to provide an interim measure to limit access until a decision is made about whether to introduce the stock or species into the QMS or to provide for open access and to manage through the use of sustainability measures under s 11.

3 Pipi is a common shellfish throughout New Zealand. The species is found widespread in suitable sandy and soft-bottom habitats, and is most abundant in the northern North Island. MFish has limited stock assessment information to determine the stock status of pipi. There are no estimates of current or reference biomass, or sustainable yield.

4 Pipi inhabit both the intertidal and subtidal zones of sheltered beaches in bays, harbours and estuary mouths. This species is sometimes found in high densities, over 1000 per m^2. While pipi can be found in large numbers, they have a patchy distribution and are easily accessed by gatherers. Given their sedentary nature, this species is vulnerable to the effects of fishing and habitat disturbance. Pipi are susceptible to localised depletion, particularly if catch levels are significant or concentrated within a small number of areas.

5 Almost all commercial catches (ie, 99%) are taken from PPI 1A - the Mair Bank pipi fishery in Whangarei Harbour. PPI 1A was introduced into the QMS on 1 October 2004. Very small catches are taken from other areas. Annual catches of pipi are shown in Table 1 below.

Table 1: **Estimated catches (tonnes) of pipi for fishing years 1989–90 to 2001-02. Catches based on data extracted from MFish databases by NIWA.**

Fishing year	Estimated catch	Landing (CELR)
1989–90	120.547	120.892
1990–91	276.042	274.867
1991–92	302.637	326.674
1992–93	188.262	186.267
1993–94	244.210	243.673
1994–95	175.108	171.923
1995–96	137.889	135.880
1996–97	145.814	145.736
1997–98	120.354	119.439
1998–99	125.976	126.914
1999–00	153.334	152.942
2000–01	186.644	187.264
2001–02	192.552	192.247
Total	2369.4	2384.7
Mean	182.3	183.4

6 Annual commercial catches from pipi beds outside Whangarei Harbour are not known but are expected to be minor. Pipi has been taken as a bycatch in the target Challenger cockle fishery (Area 7), and is also likely to be taken as a minor bycatch in the target tuatua and surf clam fisheries in other areas. Changes to fishing patterns in these target fisheries (including development of new and existing harvest areas) are likely to influence catches of pipi.

7 If a decision is made not to introduce pipi into the QMS, then it will be removed from the Schedule and the moratorium on issuing commercial fishing permits will be removed. Commercial fishing effort in areas outside of Whangarei Harbour may increase under open access, if market demand for pipi increases. Pipi is a marketable shellfish species, and the cost of entering the pipi fishery is relatively low (ie, it is a beach-based fishery). Given the localised nature of pipi, an increase in unconstrained fishing effort could give rise to sustainability concerns.

8 Pipi are an important food source for harbour fish (particularly juvenile fish), crabs and seabirds. Pipi are also likely to play an important role in stabilising sandy beaches and banks by preventing the transport of finer sediment material. Additionally, pipi are known to play an important role in maintaining the water quality in estuarine systems (by their filter-feeding activity).

9 While catch levels of pipi are currently low for areas outside Whangarei Harbour, an increase in catch levels may have implications on the ecosystem, and on the physical aquatic environment. These implications are most likely to arise if localised pipi populations become depleted. Constraining catches to appropriate levels would reduce the effects of fishing on the aquatic environment.

10 All commercial and non-commercial harvesting of pipi is commonly restricted to handgathering, a low impact method. Handgathering essentially has no discernable effect on the environment where harvesting occurs. Any potential adverse effect of fishing on the aquatic environment is therefore related to the quantity of catch, not the harvest methods.

Use of Section 11 Sustainability Measures

11 MFish is unable to predict the extent of the potential commercial interest in developing pipi. The current level of catch outside of Whangarei Harbour may not necessarily be reflective of potential catch given the opportunity for new entrants in the fishery, although several pipi beds may already be exploited to full capacity by non-commercial fishers alone. Commercial fishers in FMA 1 are currently restricted to a catch limit of 200 kg per day. This catch limit impacts on harvest efficiency of pipi stocks. The potential to develop pipi fisheries in areas of relatively high abundance outside of the PPI 1A stock arise if market demand for pipi increases, and because of the low entry costs into the fishery. Increased effort in the associated shellfish fisheries such as cockle, tuatua and surf clams, may also result in an increase in bycatch of pipi, although this may not lead to sustainable concerns.

12 The north-east coast of the North Island is a heavily populated area, with many people having a degree of dependence on the pipi resource for subsistence purposes. In many areas the pipi resources are well utilised by non-commercial fishers. The pipi resource has been subject to considerable fishing pressure in some areas, and environmental degradation from urban development is a feature affecting the status of a number of beds. Temporary or longer term regulatory measures have been applied to prohibit the use of the pipi resource in parts of Auckland and the western Coromandel Peninsula as a means to address local sustainability concerns.

13 An increase in catch levels, and provision for new commercial access could lead to utilisation issues between commercial and non-commercial users. Unconstrained fishing may lead to localised depletion of beds that are shared between different sectors, and this could create conflict of access issues due to the reduced availability of pipi for non-commercial fishers. Conflict of access may also arise in direct response to increasing population growth in northern New Zealand, given the relative accessibility of fishers to coastal areas where pipi beds occur. These issues will be exacerbated by an increase in preference for pipi by non-commercial fishers in response to changes in human population demographics. MFish considers that pipi requires active management to ensure the sustainability of stocks and avoid potential allocation problems.

14 Retaining pipi indefinitely on Schedule 4C is not a strategy that best meets the purpose of the Act. Nor would retention of the permit moratorium on a long term basis be necessary to achieve the purpose of the Act. The options are to manage the species under the QMS or to use s 11 sustainability measures.

15 Although there is the potential that the measures available under s 11 of the Act could manage the sustainability of the resource, these measures do not provide an effective means of addressing the utilisation of the resource, either by commercial fishers, or in allocating the resource between sectors. The closure of areas does not constrain catch within the remaining areas. The use of a CCL may lead to the closure of the fishery and, if harvesting occurs by methods other than handgathering, could in practice, due the effect of s 241, result in the effective closure of associated sedentary shellfish fisheries.

16 In comparison to s 11 measures on their own, the QMS enables people to invest in, and develop, a fishery when they choose to do so, where a TACC is set. It is

preferable that any development of the fishery occurs within the context of the QMS. Unlike an open access regime, the QMS provides greater incentives to commercial fishers to develop and manage the fishery sustainably through the provision of secure property rights. The establishment of a defined stock also provides greater opportunity for better planning and organisation around management of the stock by all stakeholders, including non-commercial fishers. In addition, the QMS provides the most effective means of providing for the utilisation interests of all sectors, through the setting of a TAC, allocating the resource between sectors, and application of measures that effectively constrain commercial catch. It is acknowledged that management under the QMS could also include use of s 11 measures, such as retention of method restrictions.

17 The conclusion is that, in the case of pipi, the s 11 measures on their own do not, compared to the QMS, better meet the purpose of the Act.

Highly Migratory Species Considerations

18 Pipi is not a highly migratory species, so this consideration is not applicable.

CITES Listing

19 The species is not listed on CITES – hence there is no requirement to consult with the Minister of Conservation when considering introduction of pipi into the QMS.

Stock and Areas

20 Pipi are distributed throughout mainland New Zealand, and Stewart, Chatham and Auckland Islands. They are found in sheltered beaches in bays, harbours and the mouths of estuaries. NIWA advises there have been no biological studies directly relevant to the identification of separate stocks of pipi around New Zealand.

21 NIWA suggest the ten standard FMA's be applied for pipi.

Proposed Quota Management Areas

22 The Act sets out two statutory obligations that must be considered when defining QMAs:

- As far as practicable, the same QMAs must be maintained for different species (s 19(2)); and
- A separate QMA may be set for a stock in the waters surrounding the Chatham Islands if the stock in that area can be managed effectively as a unit for fisheries management purposes (s 19(3)).

23 In addition to the above matters, MFish has developed a set of principles to assist in defining practicable QMAs, which is set out in the introductory section of this paper. In considering these statutory matters and principles, MFish considers the following are key factors in defining QMAs for tuatua.

a) Pipi beds are common throughout New Zealand, although populations may be more localised in their distribution where suitable habitat is lacking;

b) Pipi resources in north-eastern New Zealand are subjected to high levels of fishing pressure and are also subject to environmental effects from urbanisation and land management practices;

c) It would be impractical and administratively costly to manage pipi based on small statistical reporting areas;

d) Pipi are often found in areas with other sedentary shellfish species such as cockle, tuatua and surf clams. The management of pipi needs to be closely aligned with these associated fisheries;

e) Pipi are found in the Chatham Islands. Given the likelihood that this population is quite distinct, and is likely to form its own biological stock, it is appropriate to establish a separate QMA for this area; and

f) MFish does not propose the establishment of PPI 10 as pipi are an intertidal species and the Kermadec intertidal zone is encompassed within a marine reserve (all fishing activities are prohibited in the Kermadec marine reserve). Consequently, it is appropriate to retain FMA 10 outside the QMS.

Proposals

24 MFish proposes that pipi be managed within eight or nine QMAs (refer to Figure 1 below). The proposed QMAs are aligned with the QMAs for the various surf clams (other than an option proposed for FMA 1, where incidentally, surf clam stocks are not typically associated with pipi populations in significant numbers), as well as the proposed QMAs for the cockle and tuatua fisheries to reflect the close association between these fisheries.

25 For FMA 1, two options are proposed – the first option being a single QMA (PPI1B, encompassing all of FMA 1 outside of PPI1A). A larger QMA may provide greater flexibility to provide for all types of fishing interests within the QMA. There is the ability to provide for finer scale management through other measures, including fisheries plans. Smaller QMAs may be affected by a variety of spatial measures, including marine farming areas, mātaitai, and marine reserves, (although even with 2 QMAs within FMA 1, they still are geographically quite large and there is little new ground for marine farming within FMA1 that would conflict with areas where pipi are found). However, in this instance a QMA based upon the existing FMA may not accurately reflect the circumstances prevalent in the fishery.

26 The alternative option is for two QMAs. The north-east coast of the North Island is a heavily populated area, with many people having a degree of dependence on the pipi resource for subsistence purposes. Comparatively, there are likely to be a greater number of beds in the northeast coast than in other areas of New Zealand, and correspondingly sufficient economies of scale in managing at a level beneath an area based on an arbitrary Fishery Management Area. The Northland pipi beds are likely

to be in a better state than the beds found in the Hauraki Gulf/Bay of Plenty area given differences in size of beds, intensity of use, and the environmental pressures prevalent in that area.

27 In addition, the considerable use of the resource in both areas has, and will continue to, attract representatives of the community with an interest in contributing to the management of local beds. The QMAs then proposed, as PPI 1B and PPI 1C, still offer considerable flexibility to fishery interests in the respective areas to discuss the basis for management at a smaller scale. A description of the features of these two proposed QMAs, and the others proposed, follows.

PPI1B (part FMA 1 north of Te Arai Point, Pakari Beach)

28 This proposed QMA extends from North Cape to Te Arai Point, Pakari Beach, incorporating the east coast of Northland. PPI1B excludes Whangarei Harbour, which has already been established at PPI1A). The proposed QMA includes many northern harbours and coastal embayments where the pipi resource is well utilised by fishery interests in the area. The southern boundary for this proposed QMA is also the same as that used for rock lobster, sea urchin, and sea cucumber fisheries.

PPI1C (part FMA 1 south of Te Arai Point, Pakari Beach)

29 This proposed QMA covers an extensive area extending from Te Arai Point, Pakari Beach to Cape Runaway, incorporating the Hauraki Gulf and Bay of Plenty. The QMA is characterised by well utilised pipi resources in parts of the outer Hauraki Gulf, the Coromandel Peninsula, and western and central parts of the Bay of Plenty.

30 The pipi resource has been subject to considerable fishing pressure given its localised nature within some areas of this proposed QMA, and environmental degradation may be a feature affecting the status of several other beds. Temporary or longer term regulatory measures have been applied to prohibit the use of the pipi resource in parts of Auckland and the western Coromandel Peninsula as a means to address local sustainability concerns.

PPI2 (FMA 2)

31 This proposed QMA extends from Cape Runaway to the coast adjacent to Porirua.

PPI3 (FMA 3)

32 This proposed QMA extends from the Clarence River mouth (Marlborough) to Slope Point on the Catlins coast (Southland).

PPI4 (FMA 4)

33 This proposed QMA encompasses the Chatham Islands and the eastern Chatham Rise.

PPI5 (FMAs 5 & 6)

34 MFish notes there is unlikely to be any development of a pipi fishery within FMA 6. In such areas, MFish usually sets larger QMAs to reduce management costs.

MFish proposes to combine FMAs 5 and 6 for this species. The proposed QMA extends from Slope Point on the Catlins coast to Awarua Point, Westland, and includes all southern waters of New Zealand and the sub-Antarctic islands.

PPI7 (FMA 7)

35 This proposed QMA extends from Awarua Point, Westland around the top of the South Island to the Clarence River on the east coast of the South Island.

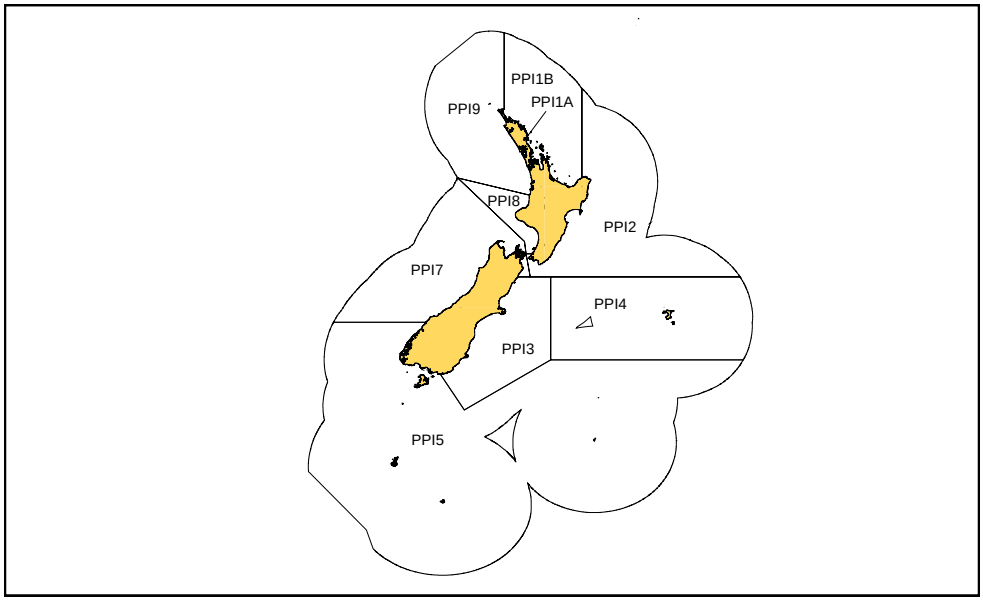
PPI8 (FMA 8)

36 This proposed QMA extends from the Porirua coast north to Tirua Point, south of Kawhia Harbour.

PPI9 (FMA 9)

37 This proposed QMA extends from Tirua Point to North Cape. Pipi resources are mainly found within the harbour environments, and are well utilised by local communities and people from adjacent major urban centres such as Hamilton and Auckland.

Figure 1 Quota Management Areas for Pipi



Note that Figure 1 illustrates FMA 1 with a single QMA outside of PPI1A. An alternative proposal is to split 1B represented in the figure into 1B and 1C, separating Northland from the Hauraki Gulf and the Bay of Plenty.

Fishing Year

38 The proposed fishing year for pipi is from 1 October to 30 September. This is consistent with the fishing year that applies to the associated cockle and tuatua fisheries.

Unit of Measure

39 MFish considers the unit of measurement should be greenweight. Greenweight has been used historically for management purposes in the pipi fishery. This unit of measure also applies to all the associated cockle and surf clam QMS fisheries. There does not appear to be any rationale for changing this unit of measure should pipi be introduced into the QMS.

NON-QMS SCALLOPS (SCA)

Summary of Proposals

1 The Ministry of Fisheries (MFish) proposes that:

a) Scallop stocks not already in the QMS be introduced into the QMS on 1 April 2006;

b) The QMAs are SCA1A (remainder of FMA 1 outside SCA1 and SCACS), SCA 2 (FMA 2), SCA3 (FMA 3 and FMA 4 excluding SCA4), SCA5 (FMA 5 and FMA 6), SCA7A (FMA 7 west coast of the South Island), SCA7B (FMA 7 to the north and west of Bush End Point, Farewell Spit), SCA7C (east part of FMA 7, Clarence River mouth to West Head, Tory Channel), SCA8 (FMA 8), and SCA9 (FMA 9 outside SCA1);

c) The fishing year is 1 April to 31 March; and

d) The unit of measurement is meatweight.

Assessment of Legislative Criteria

Schedule 4C

2 Non-QMS scallops[1] (*Pecten novaezelandiae*) were placed on Schedule 4C of the Act, as the targeting of non-QMS scallops is likely to increase under open access, and because these stocks are susceptible to the effects of overfishing. No new fishing permits can be issued for the commercial harvest of species and stocks liste don Schedule 4C. The stocks and species on Schedule 4C were identified as having potential sustainability risks in an open access management regime. The purpose of Schedule 4C is to provide an interim measure to limit access until a decision was made about whether to introduce the stock or species into the QMS or to provide for open access and to manage through the use of sustainability measures under s 11 of the Act.

3 There has been reported commercial catches of non-QMS scallop ranging from 55 tonnes in 1989–90 to 0.4 tonnes in 2000–01 (Table 1). The estimated catch data is unreliable, as NIWA advises that most of the catches in FMAs 3 and 5 are probably queen scallops, and there are likely to be other reporting errors. However, there is likely to have been significant catches of non-QMS scallops in the past. There is an established market for scallops and entry costs are low, given the over capacity that exists in scallop fisheries. In addition, fishing permits have been issued before the moratorium, and renewed during the moratorium, that suggest there are accessible scallop fisheries not managed in the QMS.

[1] A number of scallop stocks are managed under the QMS (SCA 1, SCA CS, SCA 4, and SCA 7).

Table 1 **Estimated catches (tonnes) from CELR data where reporting areas were combined (with approximation at some boundaries) into non-QMS stock boundaries by FMA.**

Fishing year	FMA 2	FMA 3	FMA 5	FMA 7	FMA 8	FMA 10	Total
1989-90	35.0	19.8	0.0	0.0	0.0	0.0	54.9
1990-91	2.1	2.1	0.6	0.0	1.1	0.0	5.8
1991-92	2.2	1.5	0.0	0.0	0.0	0.0	3.6
1992-93	0.8	3.3	0.3	0.0	0.0	0.0	4.4
1993-94	1.0	0.1	0.1	0.7	0.0	0.0	1.9
1994-95	1.6	0.1	0.0	0.0	16.9	0.0	18.6
1995-96	5.1	11.7	3.9	0.0	0.4	0.0	21.1
1996-97	2.8	10.9	2.5	1.2	0.0	0.4	17.8
1997-98	0.3	16.3	1.3	2.6	0.2	0.0	20.6
1998-99	2.6	2.4	0.0	2.0	0.0	0.0	6.9
1999-00	0.0	0.3	5.8	3.5	0.0	0.0	9.7
2000-01	0.0	0.2	0.0	0.0	0.0	0.0	0.4
2001-02	0.1	0.0	0.1	0.0	0.7	0.0	0.8
Total	53.5	68.6	14.5	10.0	19.2	0.4	166.5

4 There are no estimates of current or reference biomass, or sustainable yield for non-QMS scallops. MFish considers the population dynamics of localised populations means non-QMS scallops will be susceptible to the effects of fishing in an open access environment. Enduring populations of non-QMS scallops are likely to be geographically separated. These populations are located in areas where local hydrographic features allow the retention of larvae, particularly in enclosed harbours and inlets (e.g. Port Pegasus, Stewart Island and Fiordland Sounds). MFish considers these high density, isolated, enduring populations would be at risk if catch levels increased in an open access regime. The potential for localised depletion is increased because scallop populations typically vary greatly in size from year to year due to the influence of environmental factors.

5 Bottom dredging is the main method used to commercially harvest scallops. Dredging, especially in areas with high silt levels, is thought to remove settlement surfaces and suspend silt that causes high mortality in newly settled spat. If dredging effort increases there may be adverse affects on settlement and recruitment.

6 Bottom dredging can have adverse effects on the aquatic environment and affect biological diversity. The extent to which an increase in dredging effort targeted at non-QMS scallop stocks would promote adverse effects is unknown. The diversity of epibenthic macrofauna on scallop habitats is relatively low compared to other marine habitats and there are probably few direct associations with other species.

7 However, the fishing permit moratorium has largely prevented the development of scallop dredging in non-QMS populations, and MFish considers that new areas could be dredged for scallops once the moratorium is removed. Previously undredged areas will be subject to a higher level of adverse affects than modified habitat that supports the QMS stocks.

8 In addition, scallops in some northern areas inhabit the same areas as high densities of horse mussels (*Atrina zelandica*), in the Challenger area with green-lipped mussels (*Perna canaliculus*) and dredge oysters (*Ostrea chilensis*), and at the Chatham Islands and in Southland with dredge oysters. In localised areas where these filter-feeding

species occur together in high densities, there may be competition for food. In addition, scallops have a wide range of invertebrate and vertebrate predators. There may be adverse affects on these relationships if catch levels increase in an open access environment.

Use of Section 11 Sustainability Measures

9 The biological attributes of scallop populations mean they are susceptible to the effects of fishing, particularly via localised depletion. There is significant potential for increased targeting of non-QMS populations under open access. Increasing catch effort would raise the risk of greater adverse effects on the aquatic environment and associated species. In addition, there are potential allocation issues between the commercial and non-commercial sectors that are best resolved in the QMS framework. There is a high level of interest by non-commercial fishers in scallops. Competition between sectors over a limited resource is likely.

10 There are no specific circumstances for non-QMS scallops that mean the purpose of the Act would be better met by setting, on their own, one or more measures (other than a TAC) under s 11. Using such measures as area, method and season controls under an open access regime is unlikely to address the sustainability issues identified as they do not control the level of catch taken in areas open to fishing. Given the nature of scallop fisheries it is important that the level of catch is constrained. Using large-scale area closures to address sustainability issues and conflict over access between sectors is likely to unnecessarily restrict utilisation and to be inefficient.

11 MFish is unable to predict the extent of the potential interest in developing a commercial scallop fishery in those areas currently outside of the QMS. Such interest is likely to be influenced by the availability of significantly sized beds that would support sustained commercial fishing. However, under open access there is the potential for 'race for catch' to occur, with little incentive for fishers to ensure the sustainability of the resource.

12 In contrast to a Commercial Catch Limit on its own, the QMS enables fishers to actively manage the scallop fishery within sustainable limits and gain benefits that accrue from having secure access rights. Those rights would provide benefits by enhancing fishers' ability to enter into long-term fine scale management, as demonstrated in the SCA7 fishery. The QMS would also confer incentives for the sustainable development of fisheries in both existing and new harvest areas. The QMS also has inherent incentives to mitigate the potential effects of fishing on the aquatic environment and on other fisheries sectors through adopting environmentally appropriate technologies and fishing practices, which are of particular concern for dredge fisheries. However, it is acknowledged that management under the QMS could also include use of s 11 measures, such as retention of method restrictions.

13 The conclusion is that, in the case of scallops, the s 11 measures on their own do not, compared to the QMS, better meet the purpose of the Act.

Highly Migratory Species Considerations

14 Non-QMS scallops are not a highly migratory species.

CITES Listing

15 Scallop is not listed on CITES, therefore the Minister of Fisheries is not required to consult with the Minister of Conservation when considering introducing non-QMS scallop into the QMS.

Stock and Areas

16 There have been no biological studies that are directly relevant to the recognition of separate stocks of scallops around New Zealand. The potential for planktonic larvae to be widely dispersed by currents increases the potential for gene flow over large distances. Some populations, particularly over the Chatham Islands, may be geographically separated. In addition, high-density enduring populations are geographically separated. Enduring populations of non-QMS scallops tend to be in areas where local hydrographic features allow the retention of larvae, particularly in enclosed harbours and inlets (e.g. Paterson Inlet and Port Pegasus, Stewart Island; Fiordland sounds), and several of these support recreational and customary Maori fisheries. NIWA recommends that these populations could be managed as sub-areas within FMAs, with sub-area boundaries defined by geographical features likely to retain larvae (individual inlets and sounds).

17 The relatively long planktonic larval life of scallops provides an opportunity for gene flow across large distances when larvae are transported away from nuclear populations by currents. Ephemeral and low density populations, usually found along lengths of coastline with alongshore current flows and without features capable of retaining larvae, could also be managed as sub-areas within FMAs, but with fine spatial scale reporting of catch and effort.

18 NIWA recommend that there is no known biological reason to suggest any particular portioning of stocks.

Proposed Quota Management Areas

19 The Act sets out two statutory obligations that must be considered when defining QMAs:

- As far as practicable, the same QMAs must be maintained for different species (s 19(2)); and
- A separate QMA may be set for a stock in the waters surrounding the Chatham Islands if the stock in that area can be managed effectively as a unit for fisheries management purposes (s 19(3)).

20 In addition to the statutory matters above, MFish has developed a set of principles to assist in defining practicable QMAs, which is set out in the Introduction section of this paper. In considering these statutory matters and principles, MFish considers that the following are key factors in defining QMAs for non-QMS scallops:

a) The management of non-QMS scallops needs to be aligned with associated fisheries, such as green-lipped mussel and dredge oysters;

b) There are no known biological or other reason to suggest any particular partitioning of stocks;

c) There is already a small QMA around the Chatham Islands;

d) Larger QMAs that align with associated fisheries provide administrative savings and greater flexibility for right holders to decide the most efficient way to use the resource and meet the requirements of the Act; and

e) The relative lack of catch records from FMA 10, coupled with the presence of a marine reserve and the isolation from the mainland suggest the development potential of a scallop fishery in FMA 10 is low. Hence it is proposed to retain FMA 10 outside the QMS as a non-QMS fishery.

21 In addition, MFish notes that a statutory amendment will be required to s 312(2) of the Act will be required.

Proposals

SCA1A (remainder of FMA 1 outside SCA1 and SCACS)

22 This proposed QMA includes the part of fishery management area 1 that is excluded from existing scallop QMAs for SCA1 and SCACS. SCA1A starts in the Bay of Plenty, east of SCACS, and south of SCA1, and extends easterly to Cape Runaway. This relatively small QMA allows the QMAs for SCA to be aligned with other associated fisheries, such as the green-lipped mussel fishery.

SCA2 (FMA 2)

23 This proposed QMA extends from Cape Runaway to the coast adjacent to Porirua.

SCA3 (FMAs 3 and 4 excluding SCA4)

24 This proposed QMA extends from the Clarence River mouth (Marlborough) to Slope Point on the Catlins coast (Southland), and encompasses FMA 4, excluding the Chatham Island scallop fishery, already established as SCA4.

SCA5 (FMAs 5 & 6)

25 MFish notes there is unlikely to be any development of a SCA fishery within FMA 6. In such areas MFish usually sets larger QMAs to reduce management costs. MFish proposes to combine FMAs 5 and 6 for non-QMS scallops.

SCA7A (FMA 7 - West Coast South Island)

26 This proposed QMA extends from Awarua Point, Westland to Bush End Point, Farewell Spit. The proposed QMA aligns with the GLM7B for the associated green-lipped mussel fishery.

SCA7B (FMA 7 – north and west of Bush End Point, Farewell Spit) and SCA7C (east part of FMA 7, Clarence River mouth to West Head, Tory Channel)

27 MFish notes the need to align the scallop QMAs for FMA 7 with GLM 7A of the associated green-lipped mussel fishery. The existing SCA7 QMA complicates meeting this requirement. MFish considers the best approach is to create separate QMAs for the rest of GLM7A that lies outside SCA7. MFish does not support amending the First Schedule to change the boundaries of SCA7 to include the rest of GLM7A. MFish considers the creation of the new proposed QMAs allows the normal quota share allocation process set out in the Act to be followed to ensure no parties are unduly favoured or disadvantaged.

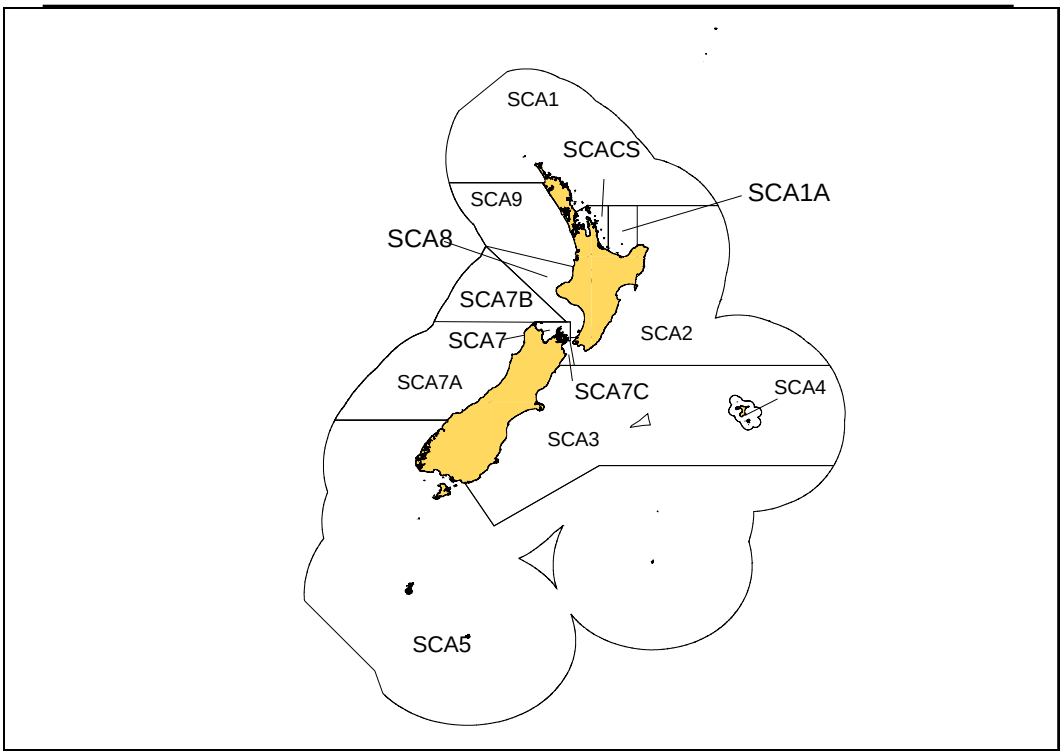
SCA8 (FMA 8)

28 This proposed QMA extends from the Porirua coast north to Tirua Point and allows for alignment with the QMAs of other potentially associated fisheries.

SCA9 (FMA 9 outside SCA1)

29 This proposed QMA extends north from Tirua Point to Tauroa Point and allows as far as practicable for alignment with the QMAs of other potentially associated fisheries.

Figure 1 Map of proposed and existing scallop quota management areas



Fishing Year

30 The proposed fishing year for non-QMS scallops is from 1 April to 31 March, as this is consistent with the fishing year for scallop stocks already managed in the QMS. There is no biological reason for an alternative fishing year.

Unit of Measure

31 Meatweight is used for management purposes in the QMS scallop stocks. There is no reason to change this unit of measure should non-QMS scallop be introduced into the QMS.

SEAWEEDS

Summary of Proposals

1 The Ministry of Fisheries (MFish) proposes that:

a) The following seven seaweed species be introduced into the QMS as individual species on 1 October 2005:

i) Bladder kelp - *Macrocystis pyrifera* (KBB);

ii) Gracilaria weed - *Gracilaria chilensis* (GRA);

iii) Agar weed - *Pterocladia lucida* and *Pterocladia capillacea* (PTE);

iv) Lessonia - *Lessonia variegata* (LES);

v) Bull kelp - *Durvillea spp* (KBL);

vi) Brown kelp - *Ecklonia rad*iata (ECK); and

vii) Porphyra - *Porphyra spp* (PRP).

(Note that the species codes are indicative only)

b) The QMAs for the seven species of seaweed be:

KBB1[1], KBB2, KBB3A (boundary statistical area 022/024 to FMA3/7 boundary), KBB3B (rest of FMA3), KBB4, KBB5, KBB7A (boundary statistical area 035/036 to boundary of FMA5/7), KBB7B (rest of FMA7), KBB8, KBB9.

LES1, LES2, LES3A (boundary statistical area 022/024 to FMA3/7 boundary), LES3B (rest of FMA3), LES4, LES5, LES7A (boundary statistical area 035/036 to boundary of FMA5/7), LES7B (rest of FMA7), LES8, LES 9.

KBL1, KBL2, KBL3A (boundary statistical area 022/024 to FMA3/7 boundary), KBL3B (rest of FMA3), KBL4, KBL5, KBL7A (boundary statistical area 035/036 to boundary of FMA5/7), KBL7B (rest of FMA7), KBL8, KBL 9.

PRP1, PRP2, PRP3A (boundary statistical area 022/024 to FMA3/7 boundary), PRP3B (rest of FMA3), PRP4, PRP5, PRP7A (boundary statistical area 035/036 to boundary of FMA5/7), PRP7B (rest of FMA7), PRP8, PRP9.

GRA1, GRA2, GRA3, GRA4, GRA5, GRA7A (boundary statistical area 035/036 to boundary of FMA5/7), GRA7B (rest of FMA7), GRA8, GRA9.

PTE1A (boundary FMA1/9 to boundary stat area 008/009), PTE1B (rest of FMA1), PTE2A (boundary FMA1/2 to boundary stat area 013/014), PTE 2B (rest of FMA2), PTE3, PTE4, PTE5, PTE7, PTE8, PTE 9.

ECK1A (boundary FMA1/9 to boundary stat area 008/009), ECK1B (rest of FMA1), ECK2A (boundary FMA1/2 to boundary stat area 013/014), ECK2B

[1] Unless specified numeric values correspond to FMAs

(rest of FMA2), ECK3, ECK4, ECK5, ECK7A (boundary statistical area 035/036 to boundary of FMA5/7), ECK7B (rest of FMA7), ECK8, ECK 9.

OR

c) The seven species of seaweed be introduced in the QMAs specified in b) above, but exclude FMA9 and that FMA 9 remains outside the QMS with the seven species then being removed from Schedule 4C;

OR

d) The seven species of seaweed be introduced in the QMAs specified in b) above, but exclude FMA9 and that all seaweed species be introduced into the QMS as a single stock in FMA 9 (SEG9).

AND IN ALL CASES

e) The fishing year be 1 October to 30 September; and

f) The unit of measurement be greenweight.

Background

Seaweed species

2 There are estimated to be at least 800 species of seaweed in New Zealand. Seaweeds are important components of most of New Zealand's coastal reefs and inland waterways and the biomass of seaweeds in some areas is very high. Some seaweed species, including *Macrocystis pyrifera*, *Gracilaria chilensis*, and *Porphyra* spp are productive, and successfully harvested on a large scale overseas. Significant quantities of other species, such as *Pterocladia lucida*, have been extensively harvested in the past in New Zealand. However, as described in the appendices, other seaweed species, such as *Durvillea antarctica,* can be susceptible to overexploitation and unable to sustain significant levels of harvest due to their slow growth rate or morphology.

3 At present, there are only a limited number of species of commercial interest. Based on landings, existing permits and information on commercial activity, and the value of seaweed products, MFish considers that seaweed species of immediate commercial interest are *Macrocystis pyrifera*, *Gracilaria chilensis*, *Pterocladia lucida*, *Pterocladia capillacea*, *Porphyra* spp, *Lessonia variegata*, *Ecklonia radiata* and *Durvillea antarctica*. While information on seaweed biomass is sketchy, *Macrocystis pyrifera, Lessonia variegata*, *Ecklonia radiata* and *Durvillea antarctica* make up a large proportion of New Zealand's seaweed biomass.

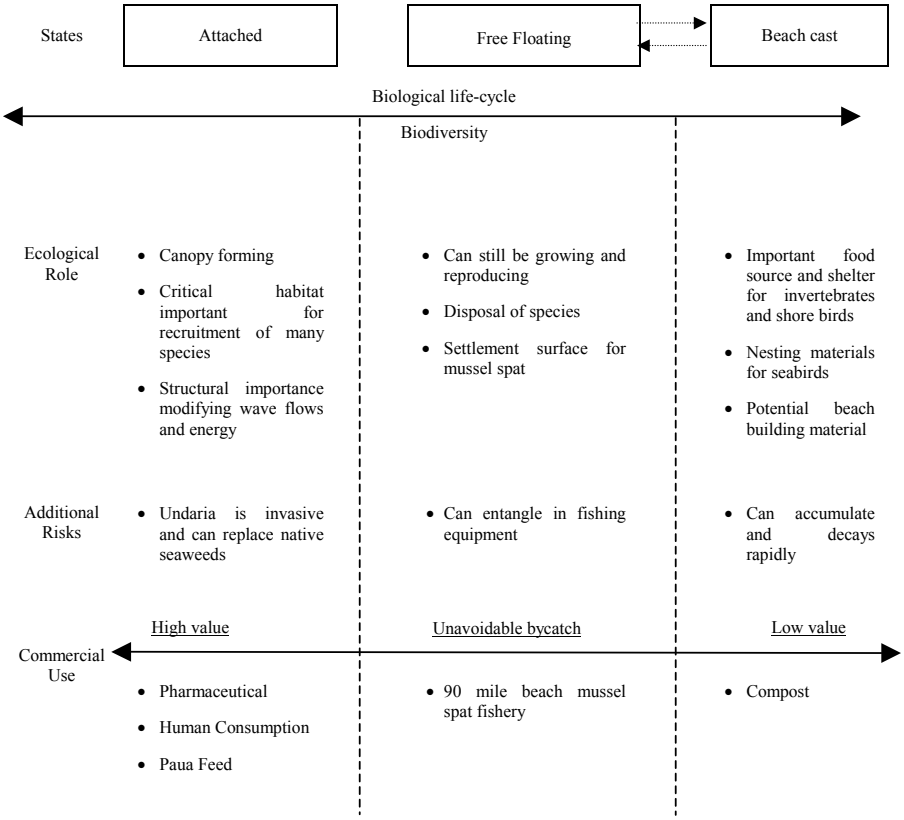
4 Note, in this document MFish has proposed the introduction of *Durvillea spp* as a single species grouping and also proposes the introduction of both *Pterocladia lucida and Pterocladia lucida* as a single species, in line with the species groupings identified in Schedule 4C of the Act. (Note this is a change from the paper consulted on earlier this year).

5 None of the remaining 800 or so species are currently commercially targeted on a significant scale and most are small and/or sparsely distributed.

Different seaweed states

6 Seaweed can be found in three different states - attached to the substrate, free floating or beach cast. The key characteristics of each of the three states are set out in Table 1 below.

Table 1: Key Characteristics of Seaweed States



7 Each of the states has different roles from an ecological perspective. Seaweeds in their attached state are important components of coastal reefs, forming nursery and habitat and food for many marine species. The role of attached reefs of seaweed is considered critical for the recruitment and protection of many commercially important fisheries such as rock lobster, paua and the green-lipped mussel spat fishery, although the interactions and associations are not well understood or documented. In inland waterways, freshwater algae may provide the same function for freshwater fish, invertebrates and crustaceans.

8 Seaweed reefs are also important, structurally, in the inshore coastal area, modifying wave flows and energy.

9 While free-floating seaweed has been detached from the substrate, in some instances it continues growing and reproducing for prolonged periods before being cast ashore and/or decaying. Such seaweed may contribute to the reproductive potential of the seaweed stock from which it is derived, particularly in terms of long-distance reproductive dispersal. It also acts as a settlement surface for mussel spat.

10 Ultimately, a large amount of seaweed ends up being cast ashore. The amount of seaweed material cast ashore at any one time can vary tremendously depending upon storm events, tides, currents and wind direction.

11 The majority of beach-cast seaweed decays rapidly and does not contribute directly to the growth and reproduction of the stock from which it is derived. Therefore, there is considered to be little direct link between harvest of beach-cast seaweed and the sustainability of the attached seaweed stock from which it is derived. The rapid decay of beach-cast seaweed may make it difficult to separate and weight individual species taken for composting purposes.

12 No studies have been conducted in New Zealand to examine the effects of removing beach cast seaweeds on the inshore ecosystem. However, research in Australia has identified the following adverse effects may arise from the harvesting of beach cast seaweed:

a) Loss of nutrients from the inshore system through the loss of nutrient recycling;

b) Removal of an important food source and shelter for invertebrates and shore birds;

c) Loss of nesting material for certain seabirds; and

d) Removal of potential beach building material, as beach cast seaweeds are effective at trapping wind-blown sand and reducing erosion."

13 The different levels of risk associated with harvesting the different states of seaweed suggest different sustainability settings may be appropriate. Managing all states of a species together will present challenges in terms of providing for utilisation across all states at an appropriate level, since sustainability measures are likely to be driven by the most vulnerable attached state. For example, management measures for reef-forming species such as *Macrocystis pyrifera, Lessonia variegata*, *Ecklonia radiata* and *Durvillea antarctica* will need to reflect potential adverse impacts from cutting these species on the aquatic environment, other species and biological diversity.

14 Difficulties in determining the state in which seaweed has been taken could potentially cause significant compliance difficulties if the states are managed on a separate basis. For example, if it is not possible to determine if the seaweed has been taken when free floating, beach-cast, or attached, then the attached stock is at risk from illegal unsustainable harvesting. It is also likely to be difficult from a practical perspective to define what is beach-cast as opposed to free floating when the seaweed can be deposited on the beach by one tide then removed in the subsequent high tide.

15 There are different uses of seaweed based on the particular state. The value derived from seaweed is likely to fall on a continuum, with attached seaweed having the highest value and beach-cast seaweed for composting purpose having the lowest value. The relative ease of harvest, the quantum of harvest required, and the purpose for which the seaweed is used are likely to be important factors in determining the level of interest in harvesting of seaweeds.

Assessment of Legislative Criteria

Schedule 4C

16 The seven seaweed species proposed for introduction are listed on Schedule 4C to the Act. (Note the species groupings proposed for introduction are consistent with those listed on Schedule 4C. One additional seaweed species is listed on the Schedule – sea lettuce). The species were listed on the Schedule because they were identified as being subject to a sustainability risk in an open-access permit environment and to ensure sustainability risks were adequately managed while being considered for introduction into the QMS.

17 Information on seaweed taken under fishing permits during the 2001-02 fishing year is set out in Table 2 below.

Table 2. Reported catch of seaweed for the fishing year 2001-02

Species Caught	Fishing Year	Total Estimated Catch Weight (kg)
Bladder kelp (Macrocystis pyrifera)	2001-02	106 206
Bull kelp (Durvillea antarctica)	2001-02	3 805
Lessonia (Lessonia variegata)	2001-02	3 644
Porphyra (Porphyra spp)	2001-02	935
Agar weed (Pterocladia lucida)	2001-02	446
Brown kelp (Ecklonia radiata)	2001-02	11 525
SEO (Seaweed unspecified)	2001-02	54 650

18 Most of this seaweed is taken when beach-cast, but all *Porphyra* spp and some *Lessonia variegata*, *Durvillea antarctica* and *Pterocladia lucida* is taken from attached seaweed beds. Seaweed taken under special permit by paua farmers is additional to the above figures. Approximately 300 tonnes of beach-cast and free-floating seaweed, primarily *Macrocystis pyrifera,* is taken annually under these special permits.

19 In addition, a variable quantity (but in the hundreds of tonnes) of (mainly) free-floating and beach cast seaweed is taken annually as an unavoidable bycatch of green-lipped mussel spat. Under the previous legislative and regulatory framework, the collection of green-lipped mussel spat has been the predominant use of seaweed in QMA 9.

20 Free-floating and attached seaweed is sometimes also inadvertently taken during trawling, potting and set netting (and usually returned to the sea).

21 An unreported amount of red beach-cast seaweed (primarily *Pterocladia lucida* and *Gracilaria chilensis*) is also taken for commercial use under the permit exemption.

MFish is unaware of any current harvest of marine and freshwater micro-algae or seagrass in New Zealand[2].

22 Recreational fishing surveys have not included seaweeds and, therefore, information on the level of non-commercial seaweed harvest is anecdotal. Some seaweeds are considered to be of high importance for customary fishers and are important to some recreational fishers. Māori historically used seaweeds such as *Porphyra* spp (Karengo) and other seaweeds for food, and *Durvillea antarctica* (Rimurapa) for storage and other uses. A number of customary fishers have noted the importance of seaweeds as a resource, and while no data on the customary harvest is available, seaweeds remain an important element of customary fishing throughout many parts of New Zealand. This is reflected in the inclusion of certain seaweeds in Deeds of Settlement of Maori Claims[3].

23 A summary of information on seaweeds prepared by NIWA (Appendix 2) includes more detailed information on seaweed catch at a species level.

24 Since 1992, there have been tight constraints on harvesting attached seaweeds as a result of the permit moratorium, therefore, few sustainability issues are currently evident for attached seaweed. However, if managed under an open-access permit regime an expansion in harvest of commercially valuable species of attached seaweeds is likely, which may result in a risk to the sustainability of those species and adverse effects on the aquatic environment, associated and dependent species and biological diversity. As well as potentially removing important canopy-forming seaweeds, such as *Macrocystis pyrifera*, *Lessonia variegata*, *Ecklonia radiata* and *Durvillea antarctica,* which are an important structural component of coastal reefs, harvesting could result in long-term changes in seaweed diversity and distribution. For example, inappropriate harvesting of native seaweeds could result in replacement by invasive seaweeds such as *Undaria pinnatifida.*

Use of Section 11 Sustainability Measures

25 The Act requires the Minister to introduce a stock into the QMS unless the purpose of the Act would be better met by setting one or more sustainability measures under section 11 (see section 17B(2)). The critical question is whether section 11 measures on their own, as compared to the QMS, will be better able to meet the purpose of the Act for the stocks or species concerned.

26 Sustainability measures under section 11 of the Act could be set for the purpose of managing all states of the seven seaweed species under an open-access regime. Implementation of area closures, restrictions on harvesting of attached seaweed and commercial catch limits would manage the sustainability concerns associated with harvest of attached seaweed.

27 However, regulations to manage attached seaweed would be difficult to enforce given the difficulty in distinguishing whether the seaweed was harvested in a free floating or

[2] 'Seaweed'[2] under the Fisheries Act as: "…all kinds of algae and sea-grasses that grow in New Zealand fisheries waters at any stages of their life history, whether living or dead". Refer appendix 1.

[3] For example, the Ngai Tahu Claims Settlement Act 1998 specifies that *Durvillea* spp, *Porphyra columbina* and *Ulva* spp are non commercial species across Ngai Tahu's rohe.

attached state. Given value in the resource and low costs of start-up capital there would be strong incentives for fishers to enter the fishery and equally strong incentives in the face of increasing competition in the beach cast seaweed fishery to begin harvesting attached weed.

28 Further, as well as ensuring sustainability, the purpose of the Act is to provide for utilisation of fisheries resources thereby enabling people to provide for their social, cultural and economic well-being. The first step in enabling a person to provide for their social, cultural and economic well-being is to enable access to a resource (within the bounds of sustainability). There is undoubted value in the harvest of attached seaweed. However, there is risk to sustainability associated with the harvest. The optimal management framework should incentivise those who wish to get economic return from the resource to determine where the sustainability risks lie (subject to standards and specifications approved by the Crown) and then develop solutions to harvest within the parameters of risk identified to mitigate that risk.

29 MFish does not consider that the s 11 measures, of themselves, provide that incentive. The seaweed resource would benefit from fine-scale management of the risks and opportunities associated with the different states and different species. Allocation of secure rights to a share of the resource provides a better foundation for the investment necessary to investigate and develop solutions for sustainability concerns. The ability to capitilise future returns via the value of that right also provides incentives to encourage better long-term management of the resource than occurs currently under s 11 measures. However, it is acknowledged that even if managed under the QMS it is likely that a number of s 11 measures may still be adopted to address the specific requirements for the individual species.

30 Retaining the seven seaweed species indefinitely on Schedule 4C is not a strategy that best meets the purpose of the Act. Nor would retention of the permit moratorium on a long-term basis achieve the purpose of the Act. The option is to manage the species under the QMS or to use sustainability measures under s 11 of the Act. On balance given the factors outlined above MFish considers that s 11 measures on their own do not, compared to the QMS, better meet the purpose of the Act.

FMA 9

31 The green-lipped mussel fishery was introduced into the QMS on 1 October 2004. The existing management regime for seaweed allows seaweed to be taken as an incidental bycatch of the green lip mussel spat harvesting.

32 In FMA9, a range of seaweed species provide the primary substrate for settlement of pelagic green-lipped mussel spat. Preliminary analysis suggests a composition of some thirteen species, only one of which is on Schedule 4C (*Pterocladia capilleacea*). The predominant use of seaweeds in FMA9 is currently as a 'bycatch' of the green-lipped mussel spat fishery and, therefore, seaweeds are not differentiated into species when taken.

33 In order to address the specific circumstances applicable to FMA 9, three potential management options are proposed:

a) Option one - introduce all seaweeds in FMA 9 into the QMS;

b) Option two - introduce only the seven seaweed species in FMA 9 as individual stocks; or

c) Option three - to not introduce any seaweed species into the QMS in FMA 9 on an interim basis.

34 **Option one** is to introduce all seaweeds in FMA 9 into the QMS as a single stock. In order to introduce all seaweed species into the QMS, the Minister needs to be satisfied that the current management framework is not ensuring the sustainability or is not providing for the utilisation of the species concerned. If this test is met, the Minister must determine whether or not the setting of one or more sustainability measures under section 11 of the Act, as compared to the use of the QMS, would better meet the purpose of the Act. On the basis of feedback on the initial consultation released earlier this year it remains equivocal as to whether the current management measures are not providing for the utilisation of all seaweed species in FMA 9.

35 Given the inter-related nature of seaweeds and green lipped mussel spat and the importance of green-lipped mussel spat from this area in terms of New Zealand's aquaculture industry, management of seaweed as separate species in this management area at this time may impose unnecessary cost on the harvesting of green lip mussel spat. Hence there may be merit in establishing a seaweed stock that represents a combination of species. From that base, fine-scale management for individual species could, if considered desirable, be achieved through the use of various mechanisms provided under the Fisheries Act including fisheries plans.

36 But as noted, the test in the Act would need to be applied to the stock complex in order to determine whether the purpose of the Act was being met under an existing management regime. In general, information suggests that attached seaweed is susceptible to overfishing, particularly those that are slow growing. In addition, seaweed in all states forms an important role in the aquatic ecosystem as habitat for other aquatic species and food. There is no known information that would indicate a sustainability concern currently for the majority of the seaweed species in FMA 9. As noted, these seaweeds are currently managed under an open-access permitting regime with few constraints on ability to harvest these species.

37 In the absence of information to the contrary, MFish's preliminary view is that current information does not suggest that the current management measures in FMA 9 are failing to provide for the sustainability of all remaining seaweed species (i.e. other than the seven specific species proposed for introduction into the QMS).

38 Hence, in terms of option one MFish's preliminary view is that the current available information does not indicate that current management is not ensuring the sustainability or is not providing for the utilisation of all seaweed species in FMA 9 other than then seven specific species proposed for introduction into the QMS.

39 **Option two** is to introduce the seven species individually only in FMA 9. The seven species outlined in this paper are those where there is a general sustainability concern in an open access regime. That is the basis for listing on Schedule 4C. MFish consider that the QMS creates the best opportunity for rights holders to provide for their social, cultural and economic well-being. As such development of a seaweed fishery for these species should occur within the QMS framework.

40 There is the potential that the introduction of those species may impose significant costs and practical impediments to the harvesting of mussel spat, or hinder the utilisation of the seven individual species. However, they are not known to be taken in the spat fishery (with the exception of *Pterocladia capillacea*) and an open access regime for all other species would not impede access to seaweed for spat harvesting purposes. There is the potential that in an open access environment mussel spat harvesters could face competition from those harvesting seaweeds for other purposes. However, as in all other areas, should valuable target fisheries develop for seaweeds in their own right in FMA 9 or there is a specific sustainability concern relating to a specific species of seaweed, then those species could be considered for introduction into the QMS at a later date.

41 **Option three** is to not introduce any seaweed species into the QMS in FMA 9. If the Minister adopted this option he would be legally required to remove the seven seaweed species from Schedule 4C. MFish does not consider that there are any immediate sustainability concerns because of the particular circumstances that apply in FMA 9. At present there is a demand for seaweed in FMA 9 for mussel spat harvesting purposes. A research paper for PhD purposes has identified what seaweed species are taken on 90 Mile Beach. The species taken included only one of the seven species listed on Schedule 4C proposed for introduction, *Pterocladia capillacea*. Pterocladia is likely to be harvested only in small quantities. Twelve other red and brown algae were also identified as being harvested. However, current information does not suggest that there is a sustainability concern and is equivocal as to whether the need to provide for utilisation necessitates the introduction of all 800 seaweeds (or a potential sub-set) into the QMS in FMA 9.

42 MFish considers that option three provides an opportunity to further consider the specific circumstances applicable to FMA 9. An implication of not introducing the seven species in FMA 9 is that they would be removed from Schedule 4C. The result is that the permit moratorium would be removed and fishers would be able to harvest the seven species along with all other seaweed species in FMA 9. However, the potential risk to sustainability of those species under an open access regime is mitigated by the lack of evidence to suggest the general sustainability risk relates to FMA 9 (where the seven seaweed species are not the focus of any commercial activity) and the setting of a ratio of mussel spat to seaweed for 90 Mile Beach. Commercial fishers taking seaweed with green-lipped mussel spat attached at 90 Mile Beach are required to hold ACE for green-lipped mussels or pay deemed values. Hence, there is a potential additional cost for those fishers taking seaweed that are not part of the green-lipped mussel industry.

43 MFish seeks stakeholder views on:

a) whether a single stock for all seaweeds in FMA 9 be introduced into the QMS;

b) whether the introduction of the seven single species in FMA 9 would better meet the purpose of the Act; or.

c) Whether to not introduce any seaweed species into the QMS in FMA 9 on an interim basis and to remove the seven species from Schedule 4C.

44 A further consideration is the potential use of s 11 measures. The seaweed that is taken by mussel spat harvesters in FMA 9 is generally free floating or beach cast and

there are no significant sustainability concerns with the harvesting activity. An open access management regime may not provide for sustainable management of attached seaweed. There are incentives for fishers to begin harvest of attached weed, given that it is generally of higher value than free floating/beach cast weed. Section 11 measures could be introduced to prevent harvest of attached seaweed. However, as noted in the discussion above, MFish does not consider that the s 11 measures on their own provide the best opportunity to enable development of the attached seaweed fishery where rights holders investigate and mitigate sustainability concerns.

45 Accordingly, MFish considers that in respect of option two a clear case is established in the previous section "Use of Section 11 Sustainability Measures" for use of the QMS rather than s 11 measures. Similarly, for option one the relevant factors identified in respect of the utilisation benefits provided by the QMS indicate that the purpose of the Act would be better met by the use of the QMS, rather than s 11 measures. In terms of option two, s 11 measures could be used on an interim basis to manage any immediate issues that might arise under an open access environment with the removal of the seven seaweed species from Schedule 4C. However, the intention would be to provide further time to consider the specific circumstances applicable to FMA 9 and to not signal that s 11 was necessarily the optimal management framework for all or any specific seaweed species in FMA 9.

Stocks and Areas

46 The summary of information prepared by NIWA (Appendix 2) includes information on the distribution and recommended fishstock boundaries for the seven seaweeds proposed for QMS introduction.

47 NIWA advises that *Porphyra* spp includes 35 species all previously thought to be the one species, *Porphyra columbina.* MFish proposes these species be managed within the species grouping *Porphyra* spp. Given that many of these species can only be differentiated by microscopic or molecular sequencing techniques, it is not practical to manage them separately at this time. Management settings within the QMS will, however, need to take into account the uncertainty regarding actual species composition.

48 Similarly, a cryptic, unnamed, species of *Gracilaria* may be growing alongside *Gracilaria chilensis* in Manukau and Waitemata Harbour. As this species cannot be distinguished from *Gracilaria chilensis* except by molecular sequencing techniques, again MFish proposes this species will be managed as *Gracilaria chilensis* in the QMS.

49 There are a number of *Gracilaria, Lessonia, Pterocladia* and *Durvillea* species, the less abundant of which are currently of little commercial interest. MFish proposes to manage both all species of *Durvillea* as a single species and both species of agar weed - *Pterocladia lucida* and *Pterocladia capillacea* as a single species, in line with the species groupings identified in Schedule 4C of the Act.

50 Like other sedentary stocks introduced into the QMS over the past year (kina, surf clams and sea cucumber), the biological characteristics of seaweeds suggest they

should be managed on a small spatial scale and that they are vulnerable to local over-harvesting.

51 MFish considers that QMAs for seaweeds should provide the boundaries within which seaweed quota holders and stakeholders can practice small-scale management and adaptively move to smaller stock management over time, using fisheries plans, alteration of QMAs and other measures within the Act.

Proposed Quota Management Areas

52 The Act sets out two statutory obligations that must be considered when defining QMAs:

- As far as practicable, the same QMAs should be maintained for different species (s 19(2)); and
- A separate QMA may be set for the waters surrounding the Chatham Islands if the stock can be managed effectively as a unit (s 19(3)).

53 In addition, MFish has developed a set of principles to assist in defining practicable QMAs, which is set out in the generic section. In considering these statutory obligations and principles, MFish considers the following are key issues in defining QMAs for seaweeds:

- The species proposed for introduction vary considerably in terms of their biology, habitat, distribution and existing fishery. They are able to be target-fished and are not usually taken together in the same fishery. Consequently, it is not necessary to set the same QMAs for different species.
- NIWA notes that spores of most seaweed species do not travel far. Therefore, the biological characteristics of seaweeds suggest they should be managed on a small spatial scale, however, in most cases there is insufficient information to indicate appropriate boundaries for small-scale management.
- MFish prefers to amalgamate QMAs in areas outside the normal range of the seaweed species and where the species is unlikely to be abundant or unable to be targeted. This reduces administrative and business compliance costs.

54 Therefore, the proposed QMAs are based on standard FMAs except where the above statutory directions and principles suggest a subdivision or amalgamation is required.

55 Any areas of potential interest in terms of seaweed harvest in FMAs 6 and 10 are closed to fishing. Therefore, FMAs 6 and 10 are not included in these proposals.

Proposals

56 For FMA 9 three options are proposed - a single stock SEG9 for all seaweeds be introduced into the QMS, the seven individual species be introduced, or no seaweed species be introduced in FMA 9 at this time. (Note the maps set out only the option of a single stock SEG9 for all seaweeds in FMA9. In addition, note that all species codes are indicative only).

57 In the event that the seven individual species are introduced, MFish proposes the same QMAs (Figure 1) for *Macrocystis pyrifera*, *Lessonia variegata*, *Durvillea spp* and *Porphyra* spp, based on standard FMA boundaries for areas where these species are likely to be less abundant, and subdivisions in FMA3 and FMA7 where the species is abundant and where there are natural stock boundaries for these species:

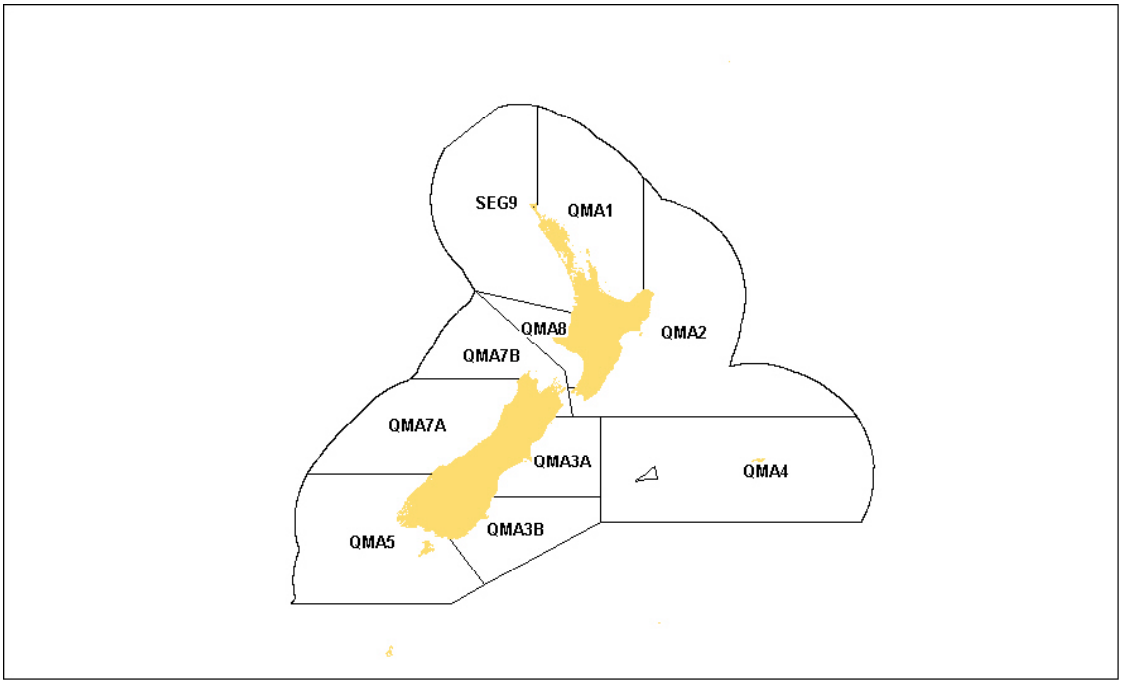
KBB1[4], KBB2, KBB3A (boundary statistical area 022/024 to FMA3/7 boundary), KBB3B (rest of FMA3), KBB4, KBB5, KBB7A (boundary statistical area 035/036 to boundary of FMA5/7), KBB7B (rest of FMA7), KBB8, KBB9.

LES1, LES2, LES3A (boundary statistical area 022/024 to FMA3/7 boundary), LES3B (rest of FMA3), LES4, LES5, LES7A (boundary statistical area 035/036 to boundary of FMA5/7), LES7B (rest of FMA7), LES8, LES9.

KBL1, KBL2, KBL3A (boundary statistical area 022/024 to FMA3/7 boundary), KBL3B (rest of FMA3), KBL4, KBL5, KBL7A (boundary statistical area 035/036 to boundary of FMA5/7), KBL7B (rest of FMA7), KBL8, KBL9.

PRP1, PRP2, PRP3A (boundary statistical area 022/024 to FMA3/7 boundary), PRP3B (rest of FMA3), PRP4, PRP5, PRP7A (boundary statistical area 035/036 to boundary of FMA5/7), PRP7B (rest of FMA7), PRP8, PRP9.

Figure 1: Quota Management Areas for KBL, KBB, LES, PRP

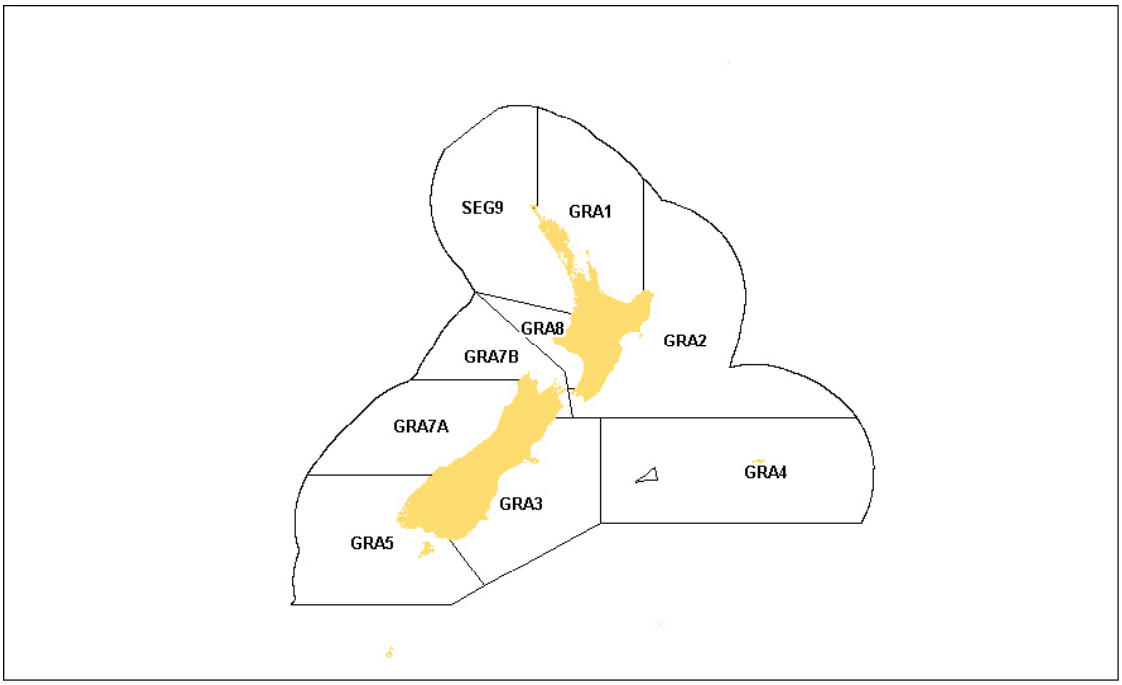


58 MFish proposes the following QMAs for *Gracilaria chilensis,* based on standard FMA boundaries except where there is a natural stock boundary (FMA7):

GRA1, GRA2, GRA3, GRA4, GRA5, GRA7A (boundary statistical area 035/036 to boundary of FMA5/7), GRA7B (rest of FMA7), GRA8, GRA9.

[4] Unless specified numeric values correspond to FMAs

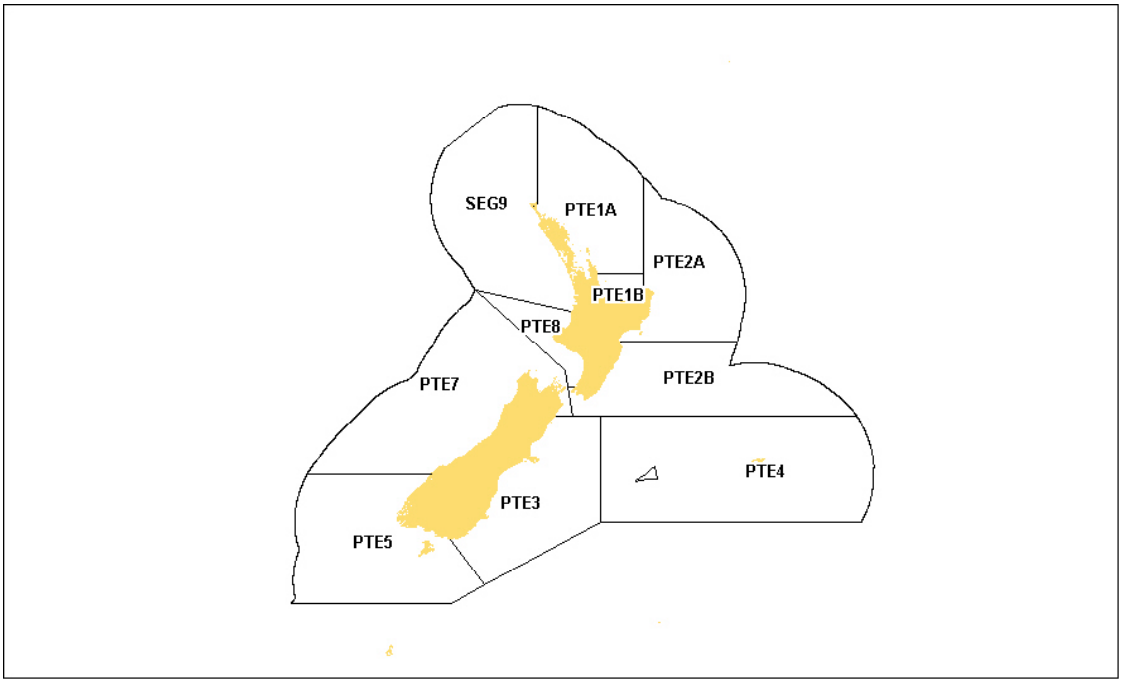
Figure 2: Quota Management Areas for GRA



59 MFish proposes the following QMAs for *Pterocladia lucida* and *Pterocladia capillacea* based on standard FMA boundaries except where there is a natural stock boundary (FMA1):

PTE1A (boundary FMA1/9 to boundary stat area 008/009), PTE1B (rest of FMA1), PTE2A (boundary FMA1/2 to boundary stat area 013/014), PTE 2B (rest of FMA2), PTE3, PTE4, PTE5, PTE7, PTE8, PTE9.

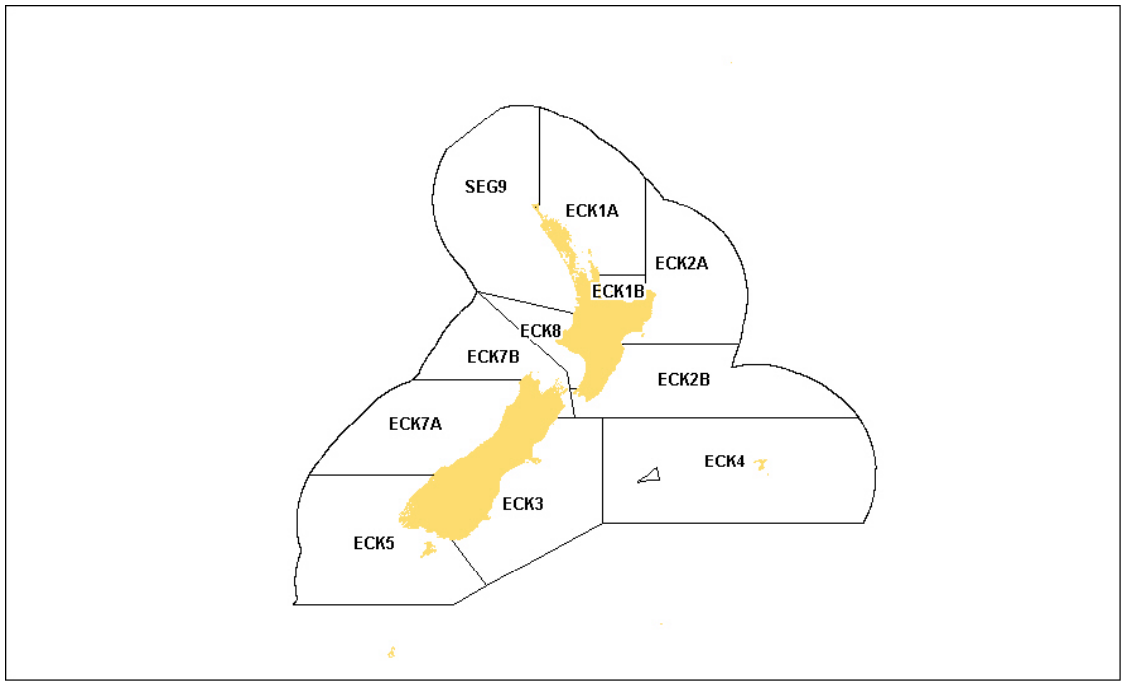
Figure 3: Quota Management Areas for PTE



60 MFish proposes the following QMAs for *Ecklonia radiata* based on standard FMA boundaries except where there are natural stock boundaries (FMA1 and FMA7):

> ECK1A (boundary FMA1/9 to boundary stat area 008/009), ECK1B (rest of FMA1), ECK2A (boundary FMA1/2 to boundary stat area 013/014), ECK2B (rest of FMA2), ECK3, ECK4, ECK5, ECK7A (boundary statistical area 035/036 to boundary of FMA5/7), ECK7B (rest of FMA7), ECK8, ECK9.

Figure 4: Quota Management Areas for ECK



Fishing Year

61 The proposed fishing year for seaweed is from 1 October to 30 September.

Unit of Measure

62 MFish considers the unit of measurement should be greenweight.

APPENDIX ONE: DEFINITIONS AND CURRENT MANAGEMENT REGIME FOR SEAWEEDS

63 'Seaweed'[5] is defined under s2 of the Fisheries Act 1996 as:

"…all kinds of algae and sea-grasses that grow in New Zealand fisheries waters at any stages of their life history, whether living or dead".

64 'Beach-cast seaweed' is defined under s2 of the Act as:

"…seaweed of any species that is unattached and cast ashore".

65 'New Zealand fisheries waters' is defined in the Act as:

a) all waters in the exclusive economic zone

b) all waters of the territorial sea of New Zealand

c) all internal waters of New Zealand

d) all other fresh or estuarine waters within New Zealand where fish, aquatic life, or seaweed that are indigenous to or acclimitised includes marine, estuarine, and freshwater waters.

66 The scope of these definitions is broader than might usually be considered under the term 'seaweed' and includes not only the marine macro-algae that might be expected but also sea-grasses along with algae in the freshwater environment. Note that vascular aquatic plants, such as watercress, are not included in this definition. In addition, freshwater or marine algae, such as *Undaria pinnatifida,* that are currently managed as unwanted organisms under the Biosecurity Act, are exempt from the requirement to hold a fishing permit under s 89 of the Fisheries Act. Therefore, the management of such species is effectively outside the ambit of the Fisheries Act.

67 Commercial access to seaweed has historically been constrained by moratoria on new non-QMS permits. The most recent of these was implemented in 1992. While this moratorium was generally lifted for non-QMS stocks from 1 October 2004, it remains in place for a few non-QMS stocks, including eight seaweeds, where there is deemed to be a level of risk with an open access permit regime. The eight seaweeds are *Pterocladia, Mcrocystis, Ecklonia, Durvillea, Gracilaria, Lessonia, Porphyra and Ulva*[6].

68 There are extant permits, issued prior to 1992, for some of these seaweeds[7] and moratorium restrictions do not apply to beach-cast material of these seaweeds[8].

[5] The proposals contained in this paper relate to the harvest of 'wild' stocks of seaweed-only. The harvest of seaweed growing[5] on marine or land based farms is not included in this paper. The nature of authorisations required for the harvest and removal of such seaweed is considered as part of the existing and proposed aquaculture legislation.
[6] See Schedule 4C of the Fisheries Act 1996 for full details.
[7] *Macrocystis* (2), *Durvillea* (1), *Gracilaria* (3), *Lessonia* (1), *Porphyra* (1), *Pterocladia* (5).
[8] Beachcast seaweed is currently managed under the generic reporting code SEO. Regulations are in place governing the areas beach-cast seaweed can be taken.

Commercial use of all beach-cast red[9] seaweed has also been exempt from the requirement to hold a fishing permit since the 1980s[10].

69 In a few case special permits allow paua farmers to take free-floating material of these seaweeds for the sole purpose of feeding their paua.

70 In all cases, the targeted harvest of seaweeds is limited, by regulation, to the method of hand-gathering.

71 Non-commercial access to seaweeds is unrestricted. There are no "recreational" daily limits set for seaweeds.

72 The apparent complexity of these regimes is due to the different level of sustainability risk associated with beach-cast and the other states of seaweed, and the relaxation of the moratorium environment in a piecemeal fashion over time. MFish considers the regimes lack integration and have the potential to cause unnecessary complication in their management and for the activities of commercial participants.

[9] Class Rhodophyceae
[10] s 89(2)(f) of Fisheries Act 1996.

APPENDIX TWO – SPECIES BIOLOGY

Bladder Kelp – *Macrocystis pyrifera* – (KBB)

Species

73 *Macrocystis pyrifera* (L.) C.Agardh is a member of the kelp order Laminariales, and belongs to the family Lessoniaceae. This species is also found in south-eastern Tasmania, southern South America (to Peru on the west coast and to 50°S on the east coast), and in the northern hemisphere from California to Baja. The common name, 'bladder kelp', used by the Ministry of Fisheries, is not used in other parts of the range of this species and is not commonly applied in New Zealand as it causes confusion with other brown algal species possessing bladders.

Biological Summary

Distribution

74 *Macrocystis pyrifera* occurs in the southern North Island around Cook Strait (from Kapiti Island on the west coast to Castlepoint on the east coast), South, Stewart, Chatham, Bounty, Antipodes, Auckland and Campbell Islands (Adams 1994). The distribution is patchy and there is both seasonal and interannual variation in abundance (Hay 1990, Pirker *et al*. 2000).

75 *Macrocystis* frequently forms colonies or large populations in calm bays, harbours or in sheltered offshore waters. It can tolerate a wide range of water motion including areas where tidal currents reach 5-7 knots (Hay 1990). Smaller thalli can be found in shallow pools and channels and there are free-living populations known from Port Pegasus and Paterson Inlet on Stewart Island.

76 Devinny & Volse (1978) studied the impact of sediments on the development of *M. pyrifera* gametophytes and found that sediments interfered with the settlement of spores and the process of attaching to substrate, as well as negatively effecting sporelings that had already settled. In the presence of water motion, sediments had a scouring effect on sporelings and survivorship was reduced.

Reproduction

77 This species has a diplobiontic, hetermorphic life history in which the conspicuous sporophyte phase alternates with a microscopic, dioecious gametophyte phase. Sori are produced on basal sporophylls.

Age and growth

78 *Macrocystis* thalli are perennial and grow to 20 m in length. A number of studies of *Macrocystis* in New Zealand have examined growth characteristics (e.g. Rapson *et al*. 1942, Moore 1942, Kain 1982, Nyman *et al.* 1990, 1993; DeNys *et al.* 1990, 1991, Brown *et al.* 1997). For *M. pyrifera* the seasonal pattern of blade relative growth rate (RGR) in Otago Harbour varies between years. Blade RGR's during 1986-87 were

similar year-round except for summer when lower rates were recorded, leading Brown *et al.* (1997) to conclude that this pattern represented N-limited growth similar to that of *M. pyrifera* in California. However, ongoing work on a nearby *M. pyrifera* population indicates that between 1998-2000, blade RGR was light-limited during winter and N-limited from mid-summer, a pattern consistent with *M. pyrifera* from British Columbia, Canada (Wheeler and Srivastava 1984) and the Falkland Islands (van Tussenbrook 1989) (Hurd pers. comm.). The high inter and intra-annual variation seen in growth rates of *M. pyrifera* illustrate the importance of long-term (> 1-year) monitoring to gain a thorough understanding of seasonal patterns. Seasonal patterns of nitrogen-limited growth can be implied from the ratio of tissue carbon (C) and nitrogen (N) (C:N) with higher ratios indicating greater N-limitation. For the Order Laminariales, 10-15 indicates N-sufficiency, 16-20 indicates mild N-limitation while values of >25 indicate severe N-limitation For *Macrocystis pyrifera* from Otago Harbour, the maximum C:N ratio is rarely >20 indicating only mild N-limitation of growth in summer.

79 McCleneghan & Houk (1985) examined the impact of canopy removal on holdfast growth in *M. pyrifera* in California and concluded that kelp canopy removal reduces hapteral divisions thus slowing holdfast growth, an impact that was still apparent six weeks following harvest. However Barilotti *et al*. (1985) found no effects of harvesting on hapertal elongation and branching as well as on plant survivorship.

Relationship with other species

80 *Macrocystis* forests are characterised as being amongst the most productive marine communities in temperate waters. Schiel & Foster (1992) state " the high productivity and habitat complexity of these plants contribute to the formation of diverse communities with considerable ecological, aesthetic and economic value. Moreover, food and habitat are exported from kelp forests to associated communities such as sandy beaches and the deep sea."

81 Along the east coast of the South Island the major understorey species associated with *Macrocystis* forests are the brown algae *Ecklonia radiata* and *Carpophyllum flexuosum*, along with a rich fauna of sessile invertebrates (Pirker *et al.* 2000).

82 Small scale harvesting experiments carried out in Akaroa Harbour showed that "harvesting canopy biomass had no measurable effect on *Macrocystis* plants, and the dominant understorey species" (Pirker *et al*. 2000).

Biomass Estimates

83 Maximum biomass of *Macrocystis* occurs in the winter months (Cummack 1980, Pirker *et al.* 2000). Pirker *et al.* noted that marked differences can exist in the demography of *Macrocystis* at a spatial scale of only a few kilometres – and that beds decline and regenerate at different times. In the Akaroa Harbour sites they studied they concluded that no one forest is capable of supporting the removal of consistent amounts of canopy, although two harvests could be sustained per year – one in late spring/early summer just prior to frond senescence and then another cut in late autumn/early winter.

Recommended Fishstock Boundaries

84 Fishstock boundaries must take into account several key principles. Comments which can be made on *M.pyrifera* in these principles are very limited.

- Management areas should be based principally on the biological characteristics of the stock. Data from the Banks Peninsula area indicates that sustainable harvesting will require a local/population focus, given the inter-annual variations in population size and recruitment.
- The stock boundaries should take into account the existing characteristics of the fishery (known fisheries, relevant fisheries management issues).
- Where practicable, QMAs for species taken together in the same fisheries should be aligned.
- Where practical, the same QMAs should be set for different species.
- A separate QMA should be set for the waters surrounding the Chatham Islands if the stock can be managed effectively as a unit.
- QMAs with new boundaries may be appropriate for species with populations whose distributions do not align with existing QMA boundaries.
- Subject to the principles noted above QMAs should be as large as possible.

Assessment and catch summary

Previous assessments

85 No previous assessments of commercial catch. Experimental harvest data present in Cummack (1980) and Pirker *et al*. (2000).

Catch History

Catch and landing by region

Table 3: Seaweed Estimates Database: reported weight (kgs) by year and fishing area

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
2										2000	
15										110	
17					11						
19	50										
22				1285	27,100	276,250	199,500	18,000			
24		25,700	42,300	8,100	139,460	77,699	113,300	102,200	306,600	74,500	80,500
26	250	60									
27					2270	3690	4245				
49	850	6000	6000	3900	0	140*	0	0	105	200	134
940					590	580	100	200	25	60	
Null					800						

86 Three different systems for numbering fishing areas have been used in the above table. As *Macrocystis* only grows south of Castlepoint in the Wairarapa coast it will not be found in area 002 on the far north east coast of the North Island. Area 19 is an

oceanic fishing zone and includes no coastal area. Areas 49 and 940 cover essentially the same area, on the north west of Chatham Island.

Table 4: Seaweed Landings Database: Reported green weight (kgs) by year and landing point

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
KBB1							80				
KBB2										70	
KBB3	218		0	1250*	136,610*	32,670,360*	7,165,500*	670,000*			
KBB4	850*	3500*	5500*	4000*	570*	706*	550*	600*	128*	220*	136
KBB5					1710	350					
KBB6										20*	
KBB7					12						
Null						3320	4345		2		

*predominantly U. The abbreviation 'U' stands for bait which is a puzzling category to be used in the context of kelp. (Some kelps are used as feed stock for herbivores such as paua.)
The quantities recorded for some areas/years are very large and do not relate clearly to the data in the Seaweed Estimates Database.

Table 5:

	Landing Point
KBB1	Raglan
KBB2	Emerald Pearls
KBB3	Hina Hina, Wainui,
KBB4	Whangamoe, Whanganui, Whangarei, Port Hutt
KBB5	Halfmoon Bay, Auckland Bay
KBB6	Whangamoe
KBB7	Te Awaiti
Null	Halfmoon Bay, Whangaroa

Catch by method

87 The Seaweed Estimates database shows 6 records of SN (target BUT, method SN and also target MOK, method SN). There are also records with GRA and KBL as the target species - although both of these are seaweeds they occupy entirely different habitats from *Macrocystis*.

88 The method D (dredge) was entered for three records, with the remaining ca. 770 records listing 'H' (hand).

General Issues

89 Pirker *et al.* (2000) concluded that sustainable harvest of *Macrocystis* is possible in New Zealand using similar strategies to those employed by the State of California for the *Macrocystis* beds there. They considered that a combination of aerial photography and *in situ* measurements provide an easy method for assessing canopy biomass. They caution, however, that high levels of annual variation in canopy biomass, within and between forests, necessitates the need for annual stock assessments at a population scale until a better understanding of variability is reached.

90 Pirker *et al.* provide detailed options for harvesting strategies for the Banks Peninsula sites studies. They also consider that harvesting of other *Macrocystis* forests should not be allowed before stock assessment surveys have been carried out.

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Lessonia – LES

Species

91 The seaweeds referred to under the group name *Lessonia* are placed in the family Lessoniaceae, order Laminariales. In New Zealand waters *Lessonia* is represented by 4 species: *L. adamsiae, L. brevifolia, L. tholiformis* and *L. variegata.*

Biological Summary

Distribution

92 The genus *Lessonia* is distributed on exposed rocky shores across 18º of latitude from Spirits Bay to Campbell Island. *Lessonia variegata* is the most widely distributed of the four species occurring on exposed coasts around the North and South Islands. It is much less common in northern New Zealand where it is restricted to rocky headlands (e.g. Cape Brett). Although this species is recorded from Stewart Island and Fiordland

there is uncertainty about the identification of specimens from some populations in these regions (Adams 1994, Schiel & Hickford 2001).

93 *L. adamsiae* is restricted to the Snares Islands, *L. tholiformis* to the Chatham Islands, and *L. brevifolia* is found on the Bounty, Antipodes, Auckland and Campbell Islands.

Reproduction

94 *Lessonia* has a diplobiontic and heteromorphic life history. That is, the conspicuous kelp phase is the diploid stage and this alternates with a microscopic gametophyte phase. Very little is known about the details of fertility in the New Zealand species although it is thought that the sporophyte phase is winter fertile. (A FRST funded research project on *Lessonia variegata* is currently underway, examining aspects of population structure and productivity, and the timing of fertility.)

Age and growth

95 No data are available on the age of first reproductive maturity (of sporophytes), the reproductive output of individuals, or the longevity of sporophytes. There is also no information available on the responses of populations to removal of adults from the canopy either through harvesting or through storm impacts. It is also not known how removal of blades without removal of holdfasts influences growth and survival of the remaining thallus. The meristem in *Lessonia* spp. is located at the base of each blade immediately adjacent to the junction with the stipe. If the meristem is removed the stipe is not able to regenerate a new blade. If the distal end of the blade is removed the meristem is able to continue functioning.

Relationship with other species

96 Schiel and Hickford (2001) observed that *Lessonia variegata* dominates some exposed east coast and Fiordland sites but is not an overall habitat-former in the areas they studied. At the Chatham Islands, however, *L. tholiformis* dominates shallow coastal areas that on the mainland are generally occupied by *Ecklonia radiata.*

Biomass Estimates

Table 6: A summary of studies reporting on the quantitative abundance of *Lessonia* spp. at various locations in New Zealand

Reference	Location	Species/ assemblage	Measure of abundance	Factors considered
Choat & Schiel 1982	Three Kings Northeastern NZ (x4) Owhiro Bay, Wellington	Lessonia variegata	Density/m^2	Depth, site
Schiel et al. 1995	Chatham Islands	Lessonia tholiformis	% cover Density/m^2	Site, depth
Schiel & Hickford 2001	Kaikoura, Banks Peninsula	Lessonia variegata	% cover Density/m^2	Site, coast, depth
Schiel & Hickford 2001	Fiordland	Lessonia spp.	% cover Density/m^2	Site, depth
Schiel & Hickford 2001	Chatham Islands	Lessonia tholiformis	% cover Density/m^2	Site, depth

Recommended Fishstock Boundaries

97 Fishstock boundaries must take into account several key principles.

- Management areas should be based principally on the biological characteristics of the stock. *Lessonia* spp. are very locally distributed on exposed rocky shores. Although these species are known to have a biphasic life history it is not known how the species disperse and which phase is most significant for the dispersal and/or recruitment within populations. There are no data available on the longevity of the sporophyte phase or on the length of survival of the gametophytes.
- The stock boundaries should take into account the existing characteristics of the fishery (known fisheries, relevant fisheries management issues).
- Where practicable, QMAs for species taken together in the same fisheries should be aligned.
- Where practical, the same QMAs should be set for different species.
- A separate QMA should be set for the waters surrounding the Chatham Islands if the stock can be managed effectively as a unit. There is a single island-endemic species on the Chatham Islands, *L. tholiformis.*
- QMAs with new boundaries may be appropriate for species with populations whose distributions do not align with existing QMA boundaries
- Subject to the principles noted above QMAs should be as large as possible.

Assessment and catch summary

Previous assessments

98 No previous assessments have been made for any of the species.

Catch history and landing by region

Table 7: Seaweed Estimates Database: Reported harvest in kgs

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
11													398
12									200				
14											20		
15				330	540	920	1940	2560	1990	1560	1500	1536	2970
18									40				
27							2270	3250	2140				
913	510	365	120										
null							210						
Totals	510	365	120	330	540	920	4420	5810	4370	1560	1520	1536	3368

These data exclude 26 records based on method anomalies.

Table 8: Seaweed Landings Database: Reported harvest in kgs

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
LES1			131				352			488
LES2						29			217	2908
LES5			9	1950	380					
LES7	36									
Null					2920	2340				
Totals	36	0	140	1950	3300	2369	352	0	217	3396

*ES1: Auckland, Tauranga, Cape Runaway
LES2: Cape Runaway, Te Awhiti, Te Awaite, Emerald Pearls, Iron Pot
LES5: Halfmoon Bay, Riverton
LES7: Havelock
Null: Halfmoon Bay

Catch by method

99 Records for BT, RLP, BPT have been excluded as these methods are unlikely for the collection of *Lessonia* and in each case the target species listed was either a fish species (e.g. RCO, GUR, FLA) or in the case of RLP was CRA (rock lobster). All other records listed 'H' (hand) as method of collection.

General Issues

100 *Lessonia* spp. grow on exposed coasts and are predominantly subtidal. Because of the patchy distribution of these species there is potential for over-harvest and resource damage, unless a locally focused management regime is in place.

101 Management of *Lessonia* as a single stock (i.e. *L. variegata*) is possible around mainland New Zealand. Management at a population level in the short-term would be the most effective approach to decisions on resource access and quantities to be harvested, as there is extremely limited information on the biology or ecology of any

species of *Lessonia*. If intensive removal of attached *Lessonia* thalli is undertaken it would be important to know about the impacts of harvesting on survival of individuals (if regrowth is the intention) or on the capacity for recruitment. This would require quantitative and seasonal field observations on biomass, productivity, distribution, reproduction and a recognition that these may differ in different regions within New Zealand

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BULL KELP – *Durvillaea* spp. – (KBL)

Species

102 Seaweeds referred to under the group name of *Durvillaea* belong to the family Durvilleaceae placed in the order Fucales. There are four species found in New Zealand waters; three are described and one is undescribed.

Biological Summary

Distribution

103 All species except *D. antarctica* are restricted to New Zealand waters: *D. antarctica* has a south circumpolar distribution and is also known from southern Chile and Argentina, Falkland, South Georgia, Gough, Crozet, Heard, Macquarie Islands.

104 *D. antarctica – D. antarctica* is the most commonly found species in New Zealand, occurring from the Three Kings Islands south to the subantarctic islands. It is found only on the most exposed headlands in the northern North Island, becoming more common towards Cook Strait, and is present on exposed shores in the South, Chatham, Stewart, Snares, Bounty, Antipodes, Auckland, and Campbell Islands. This species is confined to the low intertidal zone. It is the largest species in the genus with an unbranched stipe and blades which can grow to 10m in length. The blades float because there are gas-filled air sacs within the plant in a honeycomb-like network

105 *D. chathamensis – D. chathamensis* is restricted to the Chatham Islands where it is found on the low intertidal shore at a slightly lower level than *D. antarctica*. Although superficially similar to *D. antarctica,* this species lacks the buoyant

honeycomb tissue and has thinner blades with sinuous margins. As well as being shorter than *D. antarctica,* it does not have branched stipes as found in *D. willana.*

106 *D. willana – D. willana* is restricted to the South and Stewart Islands and does not extend into the subantarctic, or to the Chatham archipelago. It grows in the upper subtidal zone at around 1-2 m depth. The thalli are shorter with longer and thicker stipes than *D. antarctica* and have side branches growing out of the main stipe. The blades grow to ca. 5m in length and the thalli are not buoyant. *D. willana* can co-occur with *D. antarctica*.

107 The undescribed species is known solely from the Antipodes Islands where it forms dense subtidal forests from the upper subtidal zone through to depths of 10-15m. This species grows to 5m with a long stipe (to 1m), no honeycomb tissue, and with marginal, stipitate lateral blades.

108 *Durvillaea* spp. have the highest alginate contents of any seaweed (South 1979; South and Hay 1979; Hay and South 1979; Kelly and Brown 2000).

Reproduction

109 *Durvillaea* spp. have direct life histories with diploid dioecious thalli, that is, separate female and male thalli, producing eggs and sperm. In New Zealand reproduction is from late autumn to early spring (April to September) with peak fertility in June-July (Hay 1994).

Age and growth

110 Large *D. antarctica* thalli may be 10 years old but more typically are 5-8 years. The life span of *D. willana* is longer; although the rigid stipe of this species is more vulnerable to snapping in severe storms, the holdfast of this species is not affected by burrowing animals as occurs in *D. antarctica.*

111 Hay (1994) summarises information available on growth rates in *Durvillaea.* Individual growth rates of *D. antarctica* and *D. willana* are highly variable. There is an inverse relationship between relative growth and plant size. In winter months tissue may erode more rapidly than it is produced. Growth rates for *D. antarctica* are fastest during late spring and summer, that is, after the reproductive period

Relationship with other species

112 At exposed sites in all regions *Durvillaea* spp. are the dominant algae of the immediate subtidal zone (Schiel & Hickford 2001). Schiel & Hickford examined the interactions of species at three spatial scales in the Chatham Islands, including *Durvillaea* spp. They recorded a positive correlation between *Haliotis iris* adults and *Durvillaea* spp.

113 Harvest trials of *Durvillaea* spp. revealed that in order to allow recruitment of new thalli attached thalli should only be harvested in winter during the fertile period. Harvests outside this time resulted in many competing species replacing *Durvillaea* spp. and the *Durvillaea* populations did not recover or return to pre-harvest biomass for some years (Hay & South 1979). These harvest experiments also showed that the

whole thalli, including holdfasts, need to be removed as the holdfasts take a considerable time to rot and the presence of the dead holdfasts prevents resettlement of new *Durvillaea* thalli.

Biomass estimates

114 A summary of studies reporting on the quantitative abundance of *D. antarctica* at various locations in New Zealand is given below:

Table 9: Summary of studies on *D. antarctica*

Reference	Location	Species/assemblage	Measure of abundance	Factors considered
Hay 1994	Various	Durvillaea antarctica	Density/m^2	Wave force
Hay & South 1979	Kaikoura, Otago	Durvillaea antarctica	Density/m^2	Time, clearance
Paine 1971	Northwestern NZ	Durvillaea antarctica	Proportion cover	Stichaster removal
South & Hay 1979	Auckland, Kaikoura (x3), Westland, Otago, Stewart island	Durvillaea antarctica	Density/m^2	Site, wave action

Recommended Fishstock Boundaries

115 Fishstock boundaries must take into account several key principles.

- Management areas should be based principally on the biological characteristics of the stock. *Durvillaea* spp. are located only on the most wave exposed headlands and coastal areas. The limited fertile period in which harvesting should occur and the patchy distribution of populations suggest that management at local scales will be required
- The stock boundaries should take into account the existing characteristics of the fishery (known fisheries, relevant fisheries management issues).
- Where practicable, QMAs for species taken together in the same fisheries should be aligned.
- Where practical, the same QMAs should be set for different species. Different species of *Durvillaea* have different geographical distributions and ecological distributions and these will need to be considered in setting of QMAs
- A separate QMA should be set for the waters surrounding the Chatham Islands if the stock can be managed effectively as a unit.
- QMAs with new boundaries may be appropriate for species with populations whose distributions do not align with existing QMA boundaries.
- Subject to the principles noted above QMAs should be as large as possible. N/A

Assessment and catch summary

Previous assessments

116 Hay (1994) presents some partial data from harvest trials carried out in the 1970s on the east coast of the South Island. Between May 1971 and November 1973 approximately 75 T of dried *Durvillaea* was harvested with a maximum monthly harvest of 15 T.

Catch history and landing by region

Table 10: Seaweed Estimates Database: Reported weight (kgs) by year and fishing area

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
14	70										
15		1040	3441	3271	4580	5220	7000	6200	6340	5165	3500
17		5									
19		50									
22			10	1285	3150	40100	55500	5000			
26	250	100									
913	625										
totals	945	1195	3451	4556	7730	45320	62500	11200	6340	5165	3500

There are some entries which register GRA (*Gracilaria*) as the target species and KBL as the species harvested. This seems most unlikely as these algae grow in entirely different habitats.

Table 11: Seaweed Landings Database: reported green weight (kgs) by year and landing point

year	KBL2	KBL3	KBL7	NULL	green wt (kgs)	comments
1992		189			189	L
1993		0	6		6	L
1994		0			0	U
1995		300			300	all 'U'
1996		2900			2900	all 'U'
1997		1,599,100		100	1,599,100	all 'U'
1998		658,000			658,000	all 'U'
1999		60,000			60,000	all 'U'
2000					0	
2001	250				250	L
2002	3441				3441	L

The abbreviation 'U' stands for bait which is a puzzling category to be used in the context of kelp. (Some kelps are used as feed stock for herbivores such as paua.) These data are difficult to reconcile with the Seaweeds Estimates data with respect to quantity harvested. The quantities appear to be very large, particularly in years 1997-1999.

Catch and landing by region

117 The majority of the harvest recorded in the Seaweed Estimates Database comes from the Wairarapa coastline and from south of Banks Peninsula and south Otago. The fishing area 19 has no coastline so this record is viewed as anomalous. In the Seaweed Landings database the landing points are as follows:

- KBL2: Te Awhiti, Te Awaite, Emerald Pearls
- KBL3: Hina Hina, Wainui
- KBL7: Ward Beach
- Null – Wainui

Catch by method

118 In the Seaweed Estimates Database for Bull Kelp there are 527 entries all of which give H (hand) except one (MOK, SN, KBL = 5 kg).

General Issues

119 Hay & South (1979) studied the impacts of harvesting in different seasons on the recruitment and recolonisation of *D. antarctica* and *D. willana* populations. They concluded that year round harvesting would result in depletion of the resource as season is critically important to recolonisation. They recommended that harvesting should only occur during the winter. This is the fertile period for *Durvillaea* spp. (May to September for *D. antarctica* and June to October for *D. willana*), and thus is when zygotes are being produced and able to settle and re-establish.

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Porphyra – (PRP)

Species

120 The seaweeds referred to under the group name *Porphyra* are found throughout the world from polar to tropical seas, with in excess of 130 species described. For many years the name *Porphyra columbina* was applied to all *Porphyra* collected from rocky shores around New Zealand. However it has been clear for some time that this does not adequately represent the diversity present here (Nelson & Conroy 1989, Adams 1994).

121 Current research work indicates that New Zealand is likely to be one of the richest regions in the world in terms of *Porphyra* species diversity. At present 35 species are able to be distinguished by unique 18S rDNA sequences; new species have been discovered in each of the past 15 years. Four new endemic species have been described for New Zealand (Nelson *et al.* 2001) and the occurrence of the widespread *P. suborbiculata* confirmed (Broom *et al.* 2002). Three obligate epiphytic species

endemic to New Zealand and previously placed in *Porphyra* have been transferred to new genera in a different order (Nelson *et al*. 2003)

Biological Summary

Distribution

122 Some of the species are widespread, occurring through the North and South Islands, and extending to the Chatham Islands and Stewart Island, whereas others have highly restricted distributions. Some taxa are currently known from a single locality. Although in New Zealand *Porphyra* spp. have been traditionally regarded as growing only in the upper intertidal zone, in fact the ecological niches occupied by particular species vary widely, for example:

123 *P. coleana* is always found at the highest levels of the intertidal zone and higher on the shore than all other species. It is only present on rocky reef habitats from North Cape to the northern South Island and on the Chatham Islands, and can be found from late summer through to spring (February to November).

124 *P. viridiidentata* is found in the mid-low intertidal zone on rock, sometimes partially buried in sand. It reaches the northern shore of Cook Strait and is also found on the east coast of the South Island. It is highly seasonal in its growth, occurring from mid-winter to spring (July to October).

Reproduction

125 *Porphyra* species possess a diplobiontic, heteromorphic life history with a number of accessory reproductive modes. That is, the bladed phase (haploid stage) alternates with a microscopic (diploid) phase. The microscopic phases is also referred to as the conchocelis stage as it is known to live within the lamellae of mollusc shells and rocks. Species of *Porphyra* are considered to display some of the most complex life histories known in the algae. In addition to sexual reproduction and alternation of generations, particular species may have a wide array of accessory reproductive modes including archeospores, agamospores, neutral sporangia (on both conchocelis and blade phase), and endospores.

Age and growth

126 Data on age and growth are species specific and there are few data available. Although a study on growth and reproduction of *Porphyra* was carried out at three sites in southern New Zealand (Brown et al. 1990), it is now recognised that multiple species occur at each of these sites and thus the data do not contribute to an understanding of growth and age for any particular species.

Relationship with other species

127 Not possible to generalise about ca. 35 species with very different geographical and ecological distributions.

Biomass Estimates

128 A study was carried out in the Kaikoura area in the 1980s to examine harvest method and timing, and the impact of previous harvesting on yield and regeneration (Nelson & Conroy 1989, Nelson *et al.* 1990). The method of harvest was found to have a major effect on the extent of regeneration: where basal tissue was left, thalli were able to be harvested again in two months whereas complete removal of thalli saw very little new recruitment and growth.

129 This study did not address inter-annual variation in population size or the impact of harvesting on the growth in subsequent seasons. It did show, however, that if harvesting is carried out in such a way as to leave basal material, regeneration occurs rapidly and thus, multiple harvests can occur.

130 Previous examinations of the populations at Kaikoura by MAF staff, and discussions with the permit holder during the 1980s suggested that there are significant inter-annual variations in the biomass and local distribution of *Porphyra* spp. at Kaikoura. This variability has since been observed around the country with a range of species.

Recommended Fishstock Boundaries

131 Fishstock boundaries must take into account several key principles.

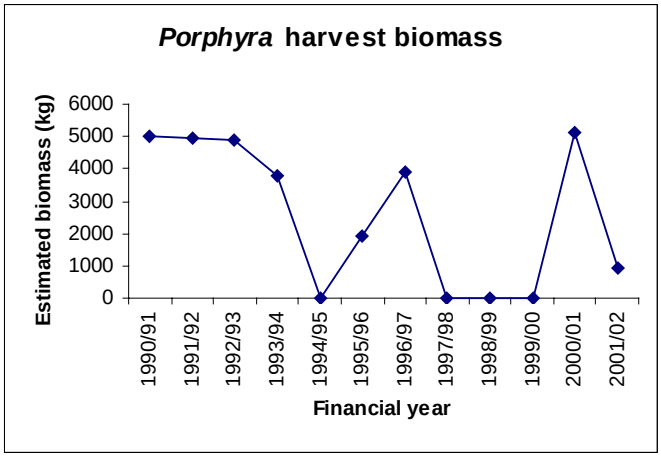
- Management areas should be based principally on the biological characteristics of the stock. Management areas should be small given the local nature of the resource and the fact that a number of species with very different life history characteristics may live adjacent to one another at a single site.
- The stock boundaries should take into account the existing characteristics of the fishery (known fisheries, relevant fisheries management issues).
- Where practicable, QMAs for species taken together in the same fisheries should be aligned.
- Where practical, the same QMAs should be set for different species. N/A
- A separate QMA should be set for the waters surrounding the Chatham Islands if the stock can be managed effectively as a unit.
- QMAs with new boundaries may be appropriate for species with populations whose distributions do not align with existing QMA boundaries. N/A
- Subject to the principles noted above QMAs should be as large as possible. N/A

Assessment and catch summary

Previous assessments

132 No published data available although there may be data in internal Fisheries reports from the early 1980s when the Kaikoura resource was first examined prior to a permit being issued.

Catch History



Catch and landing by region

133 All recorded harvest is from the Kaikoura region (area 18).

Catch by method

134 All recorded harvest is by hand picking

General Issues

135 Karengo is listed as a taonga in the Ngai Tahu Deed of Settlement. The harvest of *Porphyra* spp. around Kaikoura has been operating sustainably for more than 15 years. It is important that the management regime for this resource recognises the regional characteristics (for example in the species present, the timing of growth and fertility with temperature) as well as site specific features. Seasonal and inter-annual variation in population size and growth mean that caution is required when setting harvest limits.

136 Management of a genus as a single stock is unlikely to succeed, given that the genus includes up to 35 species. There are no data available which would provide a biogeographic or species-defined basis for decision making: there is no information about standing stock, productivity, seasonality of growth for any species or group of species.

137 Management at a population level is limited also by the absence of data, but in the short-term would be the most effective approach to decisions on resource access and quantities to be harvested. This would require quantitative field observations on biomass, productivity, distribution, and seasonality.

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Gracilaria spp. - (GRA)

Species

138 The seaweeds referred to under the group name *Gracilaria,* are included in a red algal genus that belongs to the family Gracilariaceae, order Gracilariales. There are 6 species currently recognised in this genus in New Zealand and three of these are undescribed. The most well known species are *G. chilensis* (previously known as *G. sordida*), *G. secundata* and *G. truncata* (Adams 1994). These species differ significantly morphologically and occupy very different habitats. Both *G. chilensis* and *G. secundata* are species that are terete (round in cross section) whereas *G. truncata* has a flattened thallus.

139 The three undescribed species consist of two cryptic species that strongly resemble other members of the flora and one species that is restricted to the subantarctic islands. One of the cryptic species is present in large quantities in the Manukau Harbour. The application of molecular sequencing techniques has enabled this species to be distinguished from *G. chilensis*, (Candia *et al*. 1999) and the difference in these species is also reflected in their chemistry (Wilcox *et al.* 2001).

Biological Summary

Distribution

140 Species of *Gracilaria* are found from northern New Zealand through to the subanatarctic islands. *Gracilaria* has also been collected from the Kermadec Islands but as this was sterile material it has not been able to be identified to species.

141 *Gracilaria chilensis* is found in sheltered sites, frequently in harbours and estuaries and often in areas with muddy sands. It grows attached to shell fragments as well as on living cockles, cobbles and rocks, in the low intertidal zone through to the upper subtidal (to ca. 1-2 m). Occasionally it grows in free-living masses. It is found from the northern North Island through to Stewart Island and also in the Chatham Islands.

142 *Gracilaria secundata* is found on open exposed coasts attached to rock in the low intertidal zone extending to considerable depth subtidally. It often grows on rocks that are periodically buried by sand. It is found from the southern North Island through to Stewart Island and the Chatham Islands and has also been found on the Auckland Islands.

143 *Gracilaria truncata* is found both in harbours and on the open coast from the northern North Island through to Stewart Island. It grows in the low intertidal and also subtidally. It can be readily mistaken for several other unrelated macroalgae.

144 One of the cryptic species is likely to be of commercial interest. It is indistinguishable in the field from *G. chilensis* and is so far only able to be certainly identified using molecular sequencing tools. It is growing in abundance in the Manukau Harbour and has also been found in the Orakei Basin, Waitemata Harbour. Further research is required to understand the distribution of this species and to determine morphological features to distinguish this species from *G. chilensis*. Given the unusual distribution of this species, restricted to 2 harbour areas that are highly modified, the possibility that species is not native needs to be considered.

Reproduction

145 Members of the genus *Gracilaria* have an alternation of isomorphic tetrasporophyte and dioecious gametophyte generations. That is, the thalli have the same morphology in all stages of the life history. The carposporophyte stage is conspicuous with large cystocarps formed on female gametophytes.

Age and growth

146 It is not possible to generalise about species specific characteristics. Laing *et al*. (1989) grew *G. chilensis* in culture, examining the influence of temperature, light and nitrogen on growth. Laboratory experiments on *G. chilensis* and *G. truncata* gave relative growth rates of 5-8% per day for *G. chilensis* and 2-4 % per day for *G. truncata* for 5 weeks in culture, with *G. truncata* becoming necrotic after this point (Pickering *et al.* 1993). Growth is faster for *G. chilensis* in summer and late autumn, increasing with temperature from 10-25ºC (Terzaghi *et al*. 1987).

Relationship with other species

147 As the widely distributed *Gracilaria* species in New Zealand occupy different habitats their relationships with other species are species specific. There are few data available about the ecology of these species in relation to other species. There are some autecological data for *G. chilensis* in unpublished theses and in Nelson (1989) amd Pickering *et al*. (1990). It is not known what interactions occur between *G. chilensis* and the co-occurring undescribed species in the Manukau Harbour, and whether one species is displacing the other.

Biomass Estimates

148 As part of autecological studies, Nelson (1989) and Pickering *et al*. (1990) presented data on the biomass of *G. chilensis* from the Wellington region and Invercargill respectively. A series of reports produced in 1980s on the potential for aquaculture of

Gracilaria (Nelson *et al.* 1986, Terzaghi *et al*. 1987) estimated a production rate of ca. 30 T/hectare of *G. chilensis*. These estimates in part were based on data from the studies carried out at the Auckland Regional Authority Manukau Sewage Purification Works. Adjacent to this area there were very extensive beds of *Gracilaria,* which were considered to be a result of the high nutrient levels in the effluent from the Works, and during the 1980s there were various attempts to harvest the *Gracilaria* in these beds. In the past two years the oxidation ponds in the Manukau have been dismantled and the area where the *Gracilaria* beds once were found is now substantially physically altered. There are still extensive beds of *Gracilaria* in other parts of the Manukau Harbour, although the relative proportions of the two terete *Gracilaria* species is unknown.

Recommended Fishstock Boundaries

149 Fishstock boundaries must take into account several key principles in the 1996 Fisheries Act which promote sustainability.

- Management areas should be based principally on the biological characteristics of the stock. This would require a population based approach to be applied as the populations are patchy in distribution.
- The stock boundaries should take into account the existing characteristics of the fishery (known fisheries, relevant fisheries management issues).
- Where practicable, QMAs for species taken together in the same fisheries should be aligned.
- Where practical, the same QMAs should be set for different species.
- A separate QMA should be set for the waters surrounding the Chatham Islands if the stock can be managed effectively as a unit. The major area where *G. chilensis* grows on the Chatham Islands is in the Te Whanga Lagoon; this area is managed by the local authority.
- QMAs with new boundaries may be appropriate for species with populations whose distributions do not align with existing QMA boundaries.
- Subject to the principles noted above QMAs should be as large as possible.

Assessment and catch summary

Previous assessments

150 No data are available for previous assessments based on catch history.

Catch history and landing by region

Table 12: Seaweeds Landings Database: green weight (kgs) by year

stock	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	kgs
GRA1		128	85				97	298	396		3				1007
GRA2	10	47					3				60		273		393
GRA3		6		187					517		321				1031
GRA4						175	700	67							942
GRA5	7	1	0	210	32			195	38					4	487
GRA6							911	400	330		142				1783
GRA7			1				12	29							42
GRA8					487	19	554	472	915				714		3161
GRA9												10			10
	17	182	86	397	519	194	2277	1461	2196	0	526	10	987	0	

Quantities vary widely from year to year:

Table 13: Landing points

stock	destinations	
GRA1	L	Northland west & east coasts
GRA2	L	Northland and Great Barrier
GRA3	L	Gisborne to Port Chalmers
GRA4	U (875), L (67)	Chatham Islands (U), Wellington (L)
GRA5	L, F	Port Underwood to Akaroa
GRA6	L	Chatham Islands
GRA7	L	Otago
GRA8	L	Bluff, Stewart Island, Milford Sound, Opunake
GRA9	L	Kawhia

Table 14: Seaweed Estimates Database: weight (kgs) by year and fishing area

Data from this database also present a picture of fluctuating catch levels. The following data are excluded from the summary table:

- entries which listed methods BLL, BS, BT as these all seemed most unlikely methods for species that are found largely in intertidal and upper subtidal zones
- entries where target was CRA and method RLP as it appeared very likely that the landed species GRA was incorrectly entered 2 records with target SNA and GMU using method SN.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
14			70								
15				1065	730	660	1160	460	840	760	660
19			70								
20						22,500					
24				18,700							
26			250								
49					175	1484		30			
51										460	105
913	400	1226	912								
940						124	220	20			
943						131	129				
	400	1226	1302	19,765[1]	905	24,899[2]	1509	510	840	1220	765

[1]includes 6 records of between 2,500 and 3,500 kg
[2]includes 2 records of 10,500 and 12,000 kg.

151 A significant quantity of GRA was landed (in areas 24 and 49, with 13 875 kg in years 1993-1995) where the target was given as KBB. It seems highly improbable that *Gracilaria* would be harvested when targeting species of *Durvillaea*.

152 Area 19 has no coastline so the single entry included here is an unlikely record.

Catch by method

153 Seven codes have been assigned in the database for method of harvest - BLL (bottom long lining), BS (beach seining), BT (bottom trawl), SN (set netting), RLP (rock lobster potting), DI (diving) and H (hand). The first five of these appear unlikely as methods of harvest/collection.

154 Entries in both databases give "H" and "DI" as the predominant catch methods.

General Issues

155 Management of this genus as a single stock is unlikely to succeed, given that *Gracilari*a in mainland New Zealand includes at least four species with commercial potential, occupying different habitats. In the past *G. chilensis* has been regarded as the species with the most significant commercial potential, both as an agarophyte and as a species that can be used to feed farmed paua. There is a major problem, however, resulting from the recent discovery of the cryptic species in the Manukau Harbour, as it apparently grows alongside *G. chilensis*, occupying a similar ecological niche. There are no data available on how, or if, the productivity and growth of these species differ. Although a number of studies have been carried out in the Manukau, the stocks there were treated as a single species and thus there must be questions about the reliability of these data.

156 At least in the case of the harbour and estuary populations of *Gracilaria*, gene flow or recruitment between populations is most unlikely (e.g. *G. chilensis, G. truncata* and the Manukau Harbour cryptic species). Because of the patchy distribution of all species of *Gracilaria* there is potential for over-harvest and resource damage unless a locally focused management regime is in place.

157 Management at a population level is limited by the absence of data for most sites, but in the short-term would be the most effective approach on which to base decisions on resource access and quantities to be harvested. This would require quantitative field observations on biomass, productivity, distribution, and seasonality. Although the polysaccharide agar does not appear to differ between life history phases, it is not known how each phase contributes to the reproduction/population stability. Research is required to determine if harvesting regimes and management approaches need to take this into account.

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Pterocladia - (PTE)

Species

158 The seaweeds grouped under the name *Pterocladia* include two species in different genera, *Pterocladia lucida* and *Pterocladiella capillacea* (previously *Pterocladia capillacea*), both of which belong to the red algal family Gelidiaceae in the order Gelidiales. Members of this order of red algae contain the cell wall polysaccharide agar.

159 *Pterocladia lucida* is a richly branched robust alga reaching 20-50 cm in height. Amongst individuals there is a great deal of variation in the appearance of thalli, largely owing to variation in the degree of branching and the width of axes, to the extent that at various stages a number of varieties have been described. It is generally accepted that these are environmental or strain variants but are not worth recognition at a higher taxonomic rank.

160 *Pterocladiella capillacea* grows to ca. 10 cm in height in tufts, with individual thalli frequently very densely branched. It has much finer axes than *P. lucida.*

161 Approximately 95% of the harvest is reported to consist of *Pterocladia lucida* with the remaining 5% consisting of *Pterocladiella capillacea* (Luxton & Courtney 1987).

Biological Summary

Distribution

162 *Pterocladia lucida* is known from parts of Australia and New Zealand. In New Zealand it occurs from the Three Kings Islands, North Island, the South Island from NW Nelson on the west coast to the Kaikoura peninsula on the east coast, and also on the Chatham Islands. It is primarily a subtidal reef species and is found on open, exposed coasts. (Adams 1994)

163 In New Zealand *Pterocladiella capillacea* is found from the Kermadec Islands, Three King Islands, North Island to the northern South Island, extending to Fiordland on the west coast, and in the Chatham Islands. Typically this species is found in the low intertidal zone, occasionally extending into the upper subtidal zone. It is found most commonly on open exposed coasts, in pools and channels where water is retained at low tide. (Adams 1994)

164 Dr Lucy Moore, working for Botany Division DSIR, was involved in the early development of the NZ agar industry and responsible for locating appropriate resources for harvest. Moore (1946) discussed the distribution of *Pterocladia lucida* and *Pterocladiella capillacea* at a number of localities in the North Island and the harvest obtained from 1942-1945.

Reproduction

165 Both species have isomorphic monoecious gametophyte and tetrasporophyte phases. That is, female and male reproductive structures are found on different individuals, and these gametophytes look the same as the phase that produces tetrasporangia.

166 *P. lucida* is frequently found to be fertile whereas reproductive structures are rarely found on *P. capillacea*.

Age and growth

167 Research to date has focused on *Pterocladia lucida*. Gerring *et al.* (2001) found that thalli harvested in summer either by plucking or by cutting recovered to their initial biomass within 12 months, whereas when harvested in winter, the cut and the plucked thalli remained smaller than the control thalli and did not recover biomass within a year. They concluded that sustainable harvest of the resource was possible if the removal occurred in summer – but cautioned that this conclusion needed to be tested at larger physical scales, over longer time periods and at other sites.

Relationship with other species

168 Gerring *et al*. (2001) examined the effects of harvesting *Pterocladia lucida* on species that co-occur. There was no evidence to suggest that either plucking or cutting of *P. lucida* altered the densities of the large brown alga *Carpophyllum maschalocarpum,* or the invertebrates kina or *Cookia sulcata* occurring within the experimental sites. However, they caution that "the lack of effect may have been due to the small scale of the harvesting experiments, and if large scale harvesting was to occur, then a further study investigating these ecological impacts is recommended".

169 No information is available for *P. capillacea.*

Biomass Estimates

170 There have been two research studies on the assessment of stocks of *Pterocladia lucida*. McCormick (1990) compared a variety of survey techniques at sites in the Leigh Marine Reserve in the north eastern North Island and at Ngawihi on the south Wairarapa coast. He concluded that a semi-systematic design with replicate quadrats at fixed depths with regularly spaced sites was the preferred approach as it was less time consuming than other methods tried and allowed statistical comparisons of biomass between depths, sample sites and geographic locations as well as an acceptable ability to estimate standing crop. McCormick found that the biomass of *P. lucida* at Leigh was highly variable along and down the reef. Much of the variation was explained by differences between depths although there was even greater variation between quadrats. Thus although there was a general trend with depth there was very significant patchiness in distribution. This contrasts with the pattern of

distribution found at Ngawihi where much of the variability in *P. lucida* biomass was attributable to differences between quadrats and there was no depth trend found in the biomass data. McCormick considered that these differences were at least in part attributable to the differing reef topography with steeply sloping short reef structure at Leigh and long and gradually sloping reefs on the Wairarapa coast at Ngawihi. These differences in topography will effect the influence of wave exposure and light penetration, two key environmental factors influencing macroalgal distribution.

171 Gerring *et al*. (2001) assessed biomass of *P. lucida* at Waihau Bay in the eastern Bay of Plenty using two approaches and obtained estimates for both summer-autumn and for winter.

172 Although various figures have been published describing the *Pterocladia* resources these estimates are very locally focused and somewhat difficult to compare. For example, Luxton & Courtney (1987) stated 'relatively small areas have sustainable yields in excess of 10 t dry wt.yr^{-1}'. McCormick (1990) gave a standing crop estimate for a 3 km stretch of coast in north eastern North Island as between 25 336 kg ± 9 159 and 32 980 kg ± 5 081 kg depending on which method was used for surveying the populations. Gerring *et al*. (2001) recorded 146-200 wet weight t in a 436 556 m^2 area sampled in summer autumn and a winter biomass of 119-121 wet weight t for the same area. They converted this to an estimated figure of 173 t wet weight over the 4.4 km of coastline studied. McCormick (1990) calculated a wet weight to dry weight regression equation (dry weight = 0.116 + 0.316 x wet weight) and thus at the Waihau Bay study site there was ca. 55 t dry weight of *P. lucida.*

173 Gerring *et al*. (2001) cautioned that there is likely to be significant interannual variability in the abundance of *P. lucida* and that this limits the extent to which results from a specific site/time can be generalised to other places and times.

174 No information is available for *P. capillacea.*

Recommended Fishstock Boundaries

175 Fishstock boundaries must take into account several principles.

- Management areas should be based principally on the biological characteristics of the stock. This would need to focus on the site-attached nature of the resource and thus need to use small-scale management. Although there are no specific data available it is highly likely that the productivity of populations in northern New Zealand (Ahipara, Bay of Islands, Bay of Plenty) will differ from those in the southern Wairarapa/Cook Strait or Kaikoura.
- The stock boundaries should take into account the existing characteristics of the fishery (known fisheries, relevant fisheries management issues). This fishery has been operating for 60 years and distinct regional characteristics are apparent in the methods of collection that predominate in particular places.
- Where practicable, QMAs for species taken together in the same fisheries should be aligned. N/A
- Where practical, the same QMAs should be set for different species. N/A
- A separate QMA should be set for the waters surrounding the Chatham Islands

if the stock can be managed effectively as a unit. Although both species occur around the Chatham Islands there is no historical or current harvest in this region.

- QMAs with new boundaries may be appropriate for species with populations whose distributions do not align with existing QMA boundaries.
- Subject to the principles noted above QMAs should be as large as possible. N/A

Assessment and catch summary

Previous assessments

176 Nelson (1986) summarised harvest statistics for the years 1982-1985 for the regions Wairarapa, Bay of Plenty, Ahipara, Bay of Islands, and Hokianga.

Catch History

Table 15: Data on *Pterocladia* from the databases:

year	seaweed landings (green weight kgs)	seaweed estimates (weight kgs)
1991	292	1473
1992	8616	34553
1993	5874	28345
1994	7693	36561
1995	7529	33643
1996	1742	11397
1997	1978	7283
1998	0	17
1999	0	0
2000	0	0
2001	0	55
2002	7	391

Catch and landing by region

Table 16: Data from the "*Pterocladia*" seaweed landings database shows that the "*Pterocladia*" came from 4 stocks over the period 1991-2002 with the vast majority collected from PTE2

Stock	PTE1	PTE2	PTE3	PTE9
harvest total	2312	30451	175	793

177 Data from the "*Pterocladia*" seaweed estimates database has entries for harvest of "*Pterocladia*" from 12 fishing areas, with the majority of the harvest coming from the southern Wairarapa coastline. There is confusion in the use of the statistical codes as several different systems are being used. From these data it is not possible to interpret how codes 1-3 have been used. Area "1" must be referring to QMA1 harvest area given that area "1" is to the north east of the North Island and is not a coastal region and thus not an area where *Pterocladia* harvest is possible. Regions 2 and 3 could be QMA 2 and 3 or could be referring to regions around the northeastern North Island.

The use of 14-16 refers to regions along the south east of the North Island as does "914" a rock lobster fishing return statistical area.

Table 17:

Fishing area	Total harvest (1991-2002)
1	870
2	164
3	7502
11	7
14	800
15	97727
16	37930
19	30
26	240
34	74
46	6095
914	2119

Catch by method

178 Five codes have been assigned in the database for method of harvest - BLL (bottom long lining), BSS (beach seining), D (dredging), DI (diving) and H (hand). The first three of appear unlikely as methods of harvest/collection.

179 The *Pterocladia* harvest was composed of ca. 69-75% drift or beach-cast weed and 25-31% picked attached thalli in the 1980s (Nelson 1986, Luxton & Courtney 1987). The proportions of the harvest that are drift or picked vary significantly in different regions. Schiel & Nelson (1990) reported that 96% of the harvest in the sheltered and warm waters of the Bay of Islands was from attached thalli whereas on the exposed coasts of the Wairarapa area 95% was harvested from shore cast thalli. Gerring *et al*. (2001) found only negligible quantities of beachcast *Pterocladia* during the two years of their study in the Waihau Bay area (Bay of Plenty).

180 Although recent reports (Gerring *et al*. 2001) suggest that only 15% of the total harvest is taken by diving, it is not possible to conclude that the remainder is drift. There are three collection methods that are not distinguished in the statistics collected:

- handpicking attached thalli from the shore,
- diving to hand-pick from deeper populations, and,
- collection of beachcast material.

181 From the seaweed estimates database it is not possible to distinguish whether drift or attached thalli were collected.

General Issues

182 Populations of *Pterocladia lucida* and *Pterocladiella capillacea* have been sustainably harvested for more than 60 years. Because of the patchy distribution of these species there is potential for over-harvest and resource damage in the areas where hand-picking predominates as the collection method, unless a locally focussed management regime is in place.

183 Management of these two species as a single stock is unlikely to succeed, given that they occupy different habitats, and relatively little is known about *P. capillacea* in New Zealand. Management at a population level is limited also by the absence of data, but in the short-term would be the most effective approach to decisions on resource access and quantities to be harvested. This would require quantitative field observations on biomass, productivity, distribution, and seasonality.

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Ecklonia radiata – (ECK)

Species

184 The brown kelp *Ecklonia radiata* belongs to the family Alariaceae, order Laminariales.

185 An endemic New Zealand species *Ecklonia brevipes* is considered by some authors to be distinct from *E. radiata* although there is the suggestion that it is a growth form, restricted to areas of low water movement and illumination (Adams 1994).

Biological Summary

Distribution

186 In New Zealand waters *Ecklonia radiata* is the ubiquitous kelp, found from the Three King Islands in the north (Adams & Nelson 1985) to Stewart Island in the south (Adams 1994). It is not found on the subantarctic islands nor on the Chatham Islands, although individuals have been found east of the South Island on the Mernoo Bank at 100 m (WELT, Te Papa). *Ecklonia radiata* is also found in southern Africa, in the cold water upwelling zones of Oman, western and southern Australia, Tasmania and on the east coast to northern New South Wales.

187 *Ecklonia radiata* grows subtidally on rocky shores from moderate shelter through to exposed coasts and from the low intertidal zone to depths greater than 25 m (Schiel & Nelson 1990). In the northern North Island *Ecklonia radiata* has a bimodal distribution forming stands around 5 m depth, sharing the 2-8 m depth with fucalean species, and often dominant at 10-20m depth except in sheltered waters (Choat &

Schiel 1982, Schiel 1990). The echinoid dominated intermediate depth is rare south of East Cape (Schiel & Nelson 1990).

Reproduction

188 This species has a diplobiontic, hetermorphic life history in which the large conspicuous kelp phase (sporophyte) alternates with a microscopic, dioecious gametophyte phase. Sori are produced on basal sporophylls. The gametophyte phase of *Ecklonia radiata* is very much reduced relative to other members of the Laminariales (Jennings 1967, Novaczek 1984b).

189 The fertility of thalli and the appearance of recruits are seasonal. *Ecklonia* is winter fertile and in the north-eastern North Island shallow populations have sori from May to November (Novaczek 1984b) and recruits appear from September to late December (Schiel 1981). Schiel observed that recruitment in *Ecklonia* is temporally limited and closely linked to reproductive periodicity suggesting that the microscopic phase does not remain viable for very long. He also observed a spatial element to recruitment success, as canopy species are the ones most likely to recruit into cleared patches. Schiel (1981) found that in the north-eastern North Island, 75% of recruits of *Ecklonia radiata* occurred within 8 m distance from adult thalli.

Age and growth

190 Adult *Ecklonia* thalli can be large and as few as 20 adult thalli per m^2 may form a closed canopy (Trenery 1985). In north-eastern New Zealand thalli from depths 2-7 m have high lamina growth rates (5.4 +/- 0.4 cm per month) during December and January whereas at 15m depth in the same period growth rates were lower and differences between sites were apparent (Trenery 1985). Wave action at shallow sites reduces lamina length. In areas that have been harvested, recruitment, growth and survival were much greater than in control plots except at very shallow depths. High light intensity inhibits the growth of recruits and/or enables other algal species to take over the available space (Trenery 1985, Schiel 1988).

191 In southern New Zealand in Doubtful Sound Miller (pers.comm.) has recorded growth rates of 0.06-0.45 cm d^{-1}, with a temporal pattern of high growth rate from September to February, low rates from April through to June, with increases beginning again in August. Miller found significant inter-annual variation in the timing and amount of growth recorded. Low inorganic nitrogen concentrations in the seawater and C:N ratios indicate that in Doubtful Sound E. radiata is in N-limited year round. Density of individuals is also low in Fiordland with 2.5-10 thalli m^{-2} (Miller pers. comm.).

Relationship with other species

192 The importance of *Ecklonia radiata* to marine communities is well documented and the phenology of this species indicates that the ecological consequences of harvesting could be significant (Schiel 1988, Schiel & Nelson 1990 and authors therein). Jones (1984, 1988) showed that reef fishes such as wrasses and monocanthids recruit, some exclusively, among the fronds of *E. radiata* and feed exclusively on small invertebrates there. Choat & Ayling (1987) showed that the presence of *Ecklonia* beds affects the character of the fish fauna throughout northern New Zealand. Sea urchins do not recruit or survive well as juveniles in *Ecklonia* beds (Andrew & Choat 1985).

193 Interactions between *Ecklonia* and fucoid algae and the effects of canopy removal on recruitment have been studied by Schiel (1981, 1988). When *Ecklonia* canopy was removed in summer *Sargassum* and *Carpophyllum* species recruited first, although *Ecklonia* recruited six to nine months later.

Biomass Estimates

194 Trenery (1985) observed that stipe length, stipe diameter and wet weight are highly correlated and that lamina length is independent of stipe length. Biomass, plant size and plant density vary with locality and depth, with the maximum biomass (3.6 +/- 0.2kg.m^{-2}) and plant density (15.6 +/- 0.5 m^{-2}) recorded by Trenery at 7 m depth. Mean thallus size was greatest at deepest sites.

195 Research on the standing stock and production of *Ecklonia radiata* has been carried out in Australia (e.g. Kirkman 1984).

Table 18: A summary of studies reporting quantitative abundance of *Ecklonia radiata* at various locations in New Zealand.

Reference	Location	Measure of abundance	Factors considered
Andrew & Choat 1985	Leigh, northeastern NZ	density/m^2	Site
Andrew & MacDiarmid 1991	Leigh, northeastern NZ	density/m^2	Site
Babcock et al. 1999	northeastern NZ	density/m^2	Site, habitat, time
Choat & Schiel 1982	Three Kings northeastern NZ (x4) Owhiro Bay, Wellington	density/m^2	Depth, site
Davidson & Chadderton 1994	Nelson region	density/m^2	Site, substrate
Kotua-Dickson 1984	northeastern NZ	% cover, density/m^2	Depth, exposure, site
Novaczek 1984	northeastern NZ	density/m^2	Site, depth
Schiel 1982	northeastern NZ	density/m^2	Depth
Schiel & Hickford 2001	Kaikoura Banks Peninsula	% cover density/m^2	Site, coast, depth
Schiel & Hickford 2001	Fiordland	% cover, density/m^2	Site, depth
Shears & Babcock 2002	Northeastern NZ	% cover	Site, time, urchin removal

Recommended Fishstock Boundaries

196 Fishstock boundaries must take into account several key principles in the 1996 Fisheries Act which promote sustainability.

- Management areas should be based principally on the biological characteristics of the stock. Given the local distribution of spores/recruits, management should occur on a population basis.
- The stock boundaries should take into account the existing characteristics of the fishery (known fisheries, relevant fisheries management issues).
- Where practicable, QMAs for species taken together in the same fisheries should be aligned.

- Where practical, the same QMAs should be set for different species.
- A separate QMA should be set for the waters surrounding the Chatham Islands if the stock can be managed effectively as a unit. *Ecklonia* does not occur on the Chatham Islands.
- QMAs with new boundaries may be appropriate for species with populations whose distributions do not align with existing QMA boundaries.
- Subject to the principles noted above QMAs should be as large as possible.

Assessment and catch summary

Previous assessments

197 No data available.

Catch history and landing by region

Table 19: Seaweed Estimates Database: weight (kgs) by year and fishing area

	1996	2001	2002
11			710
13	100*		
15		773	10,172

*single entry target SUR, method DI, species ECK

Table 20: Seaweed Landings Database: green weight (kgs) by year and landing point

	1996	1997	1998	1999	2000	2001	2002
ECK1							590
ECK2	160	50				2	120
totals	160	50				2	710

ECK1 = Cape Runaway
ECK2 = Tatapouri, Emerald Pearls, Cape Runaway

Catch by method

198 All entries except one in Seaweed Estimates Database are by 'H'.

General Issues

199 *Ecklonia* may be harvested for biomass or for its constitutent compounds. Schiel & Nelson (1990) recommend that harvesting should occur in the winter-spring. Yields of extractable compounds such as alginate, mannitol, and laminarin, however, vary seasonally (Trenery 1985), and there may be pressure for harvests to occur at times that maximise yields of these compounds. For example, yields of alginate in April are 1.5 times that obtained in September, and yields of laminarin in May 10 times that obtained in September.

200 Because of the logistic difficulties in collecting attached stipitate laminarians such as *Ecklonia*, large scale hand collection seems unlikely unless there is a high value product associated. If SCUBA or dredge equipment is used then it is critical that only

relatively small patches of *Ecklonia* are removed in order to assure recolonisation, and to minimise negative harvest impacts on associated fauna and flora.

201 Within the past 15 years there have been several episodes of mass die back of *Ecklonia* in north eastern New Zealand (e.g. Cole & Babcock 1996).

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SKIPJACK TUNA (SKJ)

Summary of Proposals

1 MFish proposes that:

a) Skipjack tuna (SKJ) is introduced into the quota management system (QMS) on 1 October 2005;

b) The quota management area (QMA) be SKJ 1 (Fisheries Management Areas 1-10 combined);

c) The fishing year is 1 October to 30 September; and

d) The unit of measurement is greenweight.

OR

e) The entry of skipjack into the QMS is deferred, and

f) The decision in principle to set catch history qualifying years for skipjack from 1 October 1999 to 30 September 2002 is set aside and catch history qualifying years would be future years to be determined at the time a decision is made to bring skipjack into the QMS.

Assessment of Legislative Criteria

Ensuring Sustainability

Harvest of species

2 MFish do not consider there is a concern with harvest of skipjack with the New Zealand Exclusive Economic Zone.

3 Skipjack tuna (*Katsuwonus pelamis)* is a member of the family Scombridae, which includes nine other tuna and mackerel species known in New Zealand waters: albacore, bigeye, yellowfin, southern bluefin, Pacific bluefin, skipjack, slender, and butterfly tuna, and blue mackerel.

4 Skipjack are a pelagic and oceanic species with a wide distribution, being found in tropical and subtropical waters of the major oceans. They occur from the surface to about 260 metres in depth.

5 Skipjack in New Zealand waters are part of a single western Pacific stock that extends between lines of latitude 40^{o} N and 40^{o} S. Such a distribution roughly corresponds to within the 20^{o}C isotherm. Skipjack tagged in New Zealand are caught throughout the Western Pacific Ocean, but are caught predominantly in Fiji, and fish are known to migrate to New Zealand from Australia and Fiji.

6 The maximum-recorded fork length for skipjack is 108 cm and they mature at about 45 cm fork length. They spawn in batches throughout the year in equatorial waters, and from spring to early autumn in subtropical waters. Females of 41–87 cm fork

length spawn between 80 000 and 2 million eggs per season. Juveniles from the equatorial region migrate north and south. Estimates of longevity vary between eight and 12 years.

7 In New Zealand waters, skipjack are targeted and caught mostly by purse seine with a very small amount taken by surface longline. The length distribution for skipjack tuna caught on tuna longlines shows a size range from 31–84 with a mean of 60 cm. These fish are estimated to be two to three years old.

8 Reported landings of skipjack are shown in Table 1. Landings ranged between 3 726 and 11 071 tonnes during the last five fishing years (Table 1). In addition captures by New Zealand fishing vessels have been recorded from other EEZs or the high seas in recent years (Table 1, column 6).

Table 1: Reported commercial landings and discards (t) of skipjack from CELRs and CLRs (mainly purse seine fisheries), and TLCER (tuna longline fishery), and LFRRs (processor records) by fishing year.

	CELR and CLR		Total		Other EEZs or
Fishing year	Landed	Discarded	reported	LFRR	High seas
1988-89	0	0	0	5 769	
1989-90	6 627	0	6 627	3 972	
1990-91	7 408	0	7 408	5 371	
1991-92	1 000	0	1 000	988	
1992-93	1 189	0	1 189	946	
1993-94	3 215	0	3 216	3 136	
1994-95	1 113	0	1 113	861	
1995-96	4 214	0	4 214	4 520	
1996-97	6 303	0	6 303	6 571	
1997-98	7 325	0	7 325	7 308	
1998-99	5 690	0	5 690	5 347	
1999-00	11 071	0	11 071	10 561	
2000-01	3 839	859	4 698	4 020	280
2001-02	3 726	0	3 726	3 487	7 565
2002-03*	3 868	0	3 869	-	9 103

*incomplete

9 Skipjack is listed as a highly migratory species in Annex 1 of the United Nations Convention on the Law of the Sea (UNCLOS) and by reference in the Western and Central Pacific Fisheries Convention (WCPFC). Participating countries in the Preparatory Conference establishing the Western and Central Pacific Fisheries Commission (the Commission) have urged states to exercise reasonable restraint in respect of any increase in fishing effort and capacity with regard to the reported status of highly migratory stocks. As yet there are no specific international obligations with regard to management of skipjack tuna in the central and western Pacific, apart from access agreements. These access agreements relate to the entry of foreign flag vessels to the EEZs of participating states in the Western and Central Pacific. Currently up to 70% of the purse seine fishery for tuna in the central and western Pacific occurs within these waters.

10 Once the Commission is formed, decisions on short and long term management arrangements for skipjack will be required. A range of options is likely to be

considered including both capacity and catch limits. Any long-term option will have consequences for allocation between participating states. The option of a catch limit for skipjack, if implemented is likely to be some time away.

11 The Preparatory Conference has charged a scientific coordinating group with providing interim scientific advice on the status of Pacific tuna species. This group has reported that skipjack is currently exploited at a modest level relative to its biological potential. Recent modelling suggests that the skipjack population in the western and central Pacific, in comparison to the past 30 years, is at an all time high. However, for this species, recruitment variability, influenced by environmental conditions will continue to be the primary influence on stock size and fishery performance.

Adverse effects on the aquatic environment

12 On balance MFish do not consider there is an adverse environmental impact from the harvesting of skipjack tuna. However, we note the following points.

13 Harvesting of tunas may have impacts with regard to predator/prey interactions and trophic dynamics, as tunas feed on a variety of fish and other marine species. Skipjack is an opportunistic feeder, eating fish, crustaceans and molluscs.

14 Understanding of food web relationships is still at an early stage, but MFish considers that, if evidence emerges of impacts on biodiversity from harvesting of skipjack, this can be managed at that time based on international cooperation where appropriate.

15 In New Zealand waters, skipjack tuna is primarily taken by purse seining. There are few environmental impacts associated with this fishing method. However, some non-QMS species and non-fish species are taken as bycatch.

16 A very small amount of the skipjack catch is taken by surface longline (around 1–9 tonnes per year in recent years). Environmental issues are common to the fishing method rather than specific to fishing for this species. A large number of fish species are taken as bycatch of surface longline fishing but many of these are only rarely taken. The main fish bycatch species associated with the surface longline fishery within the EEZ have been introduced into the QMS. This will provide the mechanisms for sustainability actions as required.

17 There is also a non-fish bycatch associated with the surface longline fishery. Fishing vessels sometimes capture seabirds that are chasing baited hooks, and the seabirds drown as the lines sink. Seabirds are also caught in trawl and other fisheries, but longliners are considered to be one of the main threats to several vulnerable albatrosses and other seabird species. The risks of seabird capture vary geographically and by species. An active programme is underway to mitigate and monitor the capture of seabirds in surface longline fisheries. In northern waters the potential for turtle bycatch will require monitoring and potentially mitigation.

18 MFish has established standard environmental controls on line and trawl target fisheries to mitigate the impact of these fishing methods on marine mammals and seabirds. These include prohibitions on net sonde monitor cables and compulsory reporting of bycatch of protected species. New Zealand surface longline vessels are

required to use tori lines of a specified standard. Vessels are using a variety of practices to reduce seabird bycatch including the use of artificial baits and the practice of setting longlines at night.

19 MFish and the Department of Conservation have developed a National Plan of Action for Seabirds (NPOA) that will result in the development of voluntary codes of practice that will specify mitigation measures.

Providing for Utilisation

Access is prevented or inhibited

20 Albacore tuna are currently managed under an open access fishery management regime whereby fishers can obtain access to the fishery via issue of a fishing permit. MFish do not consider that the current management framework inhibits access to the fishery.

Providing for Well-being

21 MFish consider the critical issue for the Crown in managing skipjack tuna is creating a management framework that promotes and enables development and therefore provides the best opportunity for people to provide for their social, cultural and economic wellbeing.

22 Currently skipjack is managed using an open access management regime. The only barriers to entry are the requirement to obtain a permit and capital costs associated with fishing. Skipjack is most efficiently taken by purse seine. The capital costs of entry into this fishery are therefore higher than other tuna fisheries. The value in harvesting skipjack means that an open access regime will predictably result in increasing competition between fishers and new entrants coming into the fishery.

23 The purse seine fishery for skipjack in New Zealand fisheries waters relies on fishing surface schools of fish. The availability of skipjack to the fishery is influenced not only by the abundance of skipjack, which migrates annually to New Zealand fisheries waters, but also the prevailing environmental conditions during the course of the season. These environmental conditions influence both the appearance of skipjack on the surface (and hence its availability to the fishery) and the ability of surface schools to be sighted and fished.

24 In years where abundance of skipjack is less, increased competition between fishers will occur for available catch. An open access environment is not likely to enable people to provide for their wellbeing in these circumstances. Introduction into the QMS will not in and of itself resolve issues of competition between vessels when abundance of skipjack is low. However, allocation of rights does provide the opportunity and creates incentives for rights holders to act to collectively to improve utilisation outcomes. Within the QMS, commercial fishers have the certainty and security of tenure, allowing for long-term planning of operations and investments. This provides a means of capitalising the value of future harvesting rights in the fishery. The tradability of rights makes this capital value an asset that holders will wish to enhance.

25 The QMS provides the best opportunity for commercial fishers to pursue economic wellbeing by allowing quota to be purchased by the most efficient users of the resource. Because quota is divisible, fishers can match quota holdings with their landings through buying and selling of quota or ACE. Similarly, the transferability of quota allows less efficient users to exit a fishery and receive a return on their investment. Lastly, quota's tradability provides the means for inter-generational transfers. The QMS allows for a smooth re-allocation of access rights, via quota trading, from one generation to the next without requiring government intervention.

26 There is some development opportunity in the skipjack fishery. New Zealand vessels have only sporadically fished the west coast of the North Island in the past. A significant amount of catch from foreign licensed vessels has come from this area. With the introduction of New Zealand-owned super seiners, large catches have recently been taken from the West Coast by New Zealand vessels. MFish considers that the level of capital investment that may be necessary to expand catch of skipjack would be best supported by allocation of secure tradeable property rights within the framework of the QMS.

27 MFish is aware of industry views that further management measures for skipjack should not be implemented until regional agreement on management measures, and in particular national allocations is reached. Industry considers that introduction into the QMS before this time may impact on their wellbeing by ultimately restricting the amount of allocation New Zealand interests will receive when any national allocations are agreed. MFish does not agree. There is no requirement following introduction of a stock or species into the QMS that requires setting of a constraining catch limit if there are no sustainability concerns. The QMS provides a better and more secure framework for development of the fishery (and therefore provide for wellbeing) to promote New Zealand's interests.

28 MFish preferred option given the rationale noted above is to introduce skipjack into the QMS because property rights provide a more secure basis investment in development of the fishery. However, a further period of open access is a "least cost" entry option for new participants. The incentive of fishing for catch history may encourage fishers to enter and develop the fishery. The lack of any restriction on the fishery would allow domestic capacity to increase and expand into off shore waters if desired. Deferral of introduction is a valid option for consideration by stakeholders. Although there are costs associated with this option as noted above.

29 MFish consider that if introduction of skipjack into the QMS were deferred then we would recommend the deferral of the catch history years previously agreed in principle by the Minister in 2003. There would seem little point in allowing further development of the fishery if this development could not in turn translate into catch history and subsequently quota.

Determination about Current Management

30 MFish consider that while there is no rationale on sustainability grounds to introduce skipjack into the QMS, the existing management framework is not efficiently enabling people to provide for their well being given the desire by fishers to develop and improve value from the fishery.

Use of Section 11 Sustainability Measures

31 As noted in the introductory section of this document, s 11 measures on their own cannot effectively manage the utilisation issues identified above. Specifically, MFish considers that introduction to the QMS will provide better opportunity to manage environmental effects and enable utilisation through allocation of rights than use of measures under s 11 on their own. Allocation of rights will provide better incentives that exist currently for rights holders to collectively manage the skipjack fishery. Allocation of transferable rights also provides the best opportunity to enable social, cultural and economic well-being in the fishery

32 Accordingly, MFish do not consider that the purpose would be better met by setting, on their own, one or more sustainability measures under s 11 when compared to the benefits of introduction to the QMS.

Highly Migratory Species Considerations

33 Skipjack is a highly migratory stock. However, MFish is not proposing to introduce the species outside the EEZ into the QMS at this time.

Conclusion

34 There are no sustainability concerns or known adverse effects of fishing that would promote introduction of skipjack into the QMS. Any obligation to provide access to the resource is being met currently by the open access management regime.

35 MFish considers that allocation of rights provides a better opportunity to incentivise stakeholder management to provide for utilisation of the skipjack fishery. Collective action provides the opportunity for rights holders to identify the most efficient solutions for mitigating adverse effects and thereby creating the best opportunity to enable their social, cultural and economic well-being.

36 MFish notes that there may be development opportunity in the skipjack fishery. In this situation, the existing management framework fails to produce an environment conducive for investment or development, and as such does not adequately enable well-being. MFish does not consider the existing management framework to best promote, orderly development of the fishery, which is in the best long-term interests of both New Zealand and the fishers.

37 Although it is not MFish preferred option we note that development could also occur outside the QMS and that this option would be least cost for industry. If the fishery were to remain outside the QMS MFish propose that the catch history period be reconsidered (and likely set at some future point when skipjack is proposed for introduction) to provide recognition of further development of the fishery.

Stock and Areas

38 Skipjack tuna that occur in New Zealand fisheries waters are part of a central and western Pacific Ocean stock. NIWA has recommended a single QMA for New Zealand fisheries waters for stock boundaries for skipjack tuna based on the biological distribution of this species.

Proposed Quota Management Areas

39 The Fisheries Act 1996 (the Act) defines two statutory obligations that must be considered when defining QMAs:

- As far as practicable, the same QMAs should be maintained for different species – s 19(2); and
- A separate QMA may be set for the waters surrounding the Chatham Islands if the stock can be managed effectively as a unit – s 19(3).

40 The Act requires that, as far as practicable, the same QMAs are maintained for different species. In this case it is most relevant to consider management arrangements that apply to other highly migratory species. In the absence of regional management measures, MFish has decided not to propose including the high seas in the QMAs for other highly migratory species at this time (an exception is southern bluefin tuna). In effect, New Zealand fisheries waters are being used to define a unit for the purpose of management. A single QMA for New Zealand fisheries waters applies to other tuna (other than southern bluefin tuna) and related bycatch that is taken by surface longline. MFish's initial view is that the QMA for skipjack should be the same as for these related species.

41 A single QMA for all of New Zealand fisheries waters would be efficient in that it would allow fishers to take their annual catch entitlement wherever the fish were most abundant and/or fishing costs were lowest. MFish policy principles indicate that stock boundaries should take into account the existing characteristics of the fishery (known fisheries, relevant fisheries management issues). The potential for competitive effects in the fishery might suggest an alternative QMA option for skipjack in which there is separation between east and west coast. However, on balance MFish considers that, given the management arrangements for other tuna and highly migratory bycatch species a single QMA is preferred. The competitive effects in the fishery can be addressed by other mechanisms.

42 Skipjack tuna are not regularly caught around the Chatham Islands, and there is no reason to consider this area as a separate management unit. MFish concludes that this area can not be effectively managed as a unit

Proposal

SKJ 1 (FMAs 1, 2, 3, 4, 5, 6, 7, 8, 9, 10)

43 This proposed QMA encompasses all New Zealand fisheries waters, including the Kermedec FMA (refer Figure 1).

Fishing Year

44 The current fishing year for skipjack tuna is from 1 October to 30 September. The alternative fishing year is 1 April to 31 March.

45 A 1 October fishing year applies for these other tuna species, and MFish considers that skipjack should be aligned with them.

46 Accordingly, should skipjack tuna be introduced into the QMS, MFish proposes that the fishing year be from 1 October to 30 September.

Unit of Measure

47 Greenweight has been used historically for management purposes in the tuna fisheries. MFish considers there is no reason to change this unit of measure should skipjack tuna be introduced into the QMS, and accordingly proposes that greenweight be retained as the unit of measure.

Figure 1: Proposed QMA for skipjack tuna

TUATUA (TUA)

Summary of Proposals

1 The Ministry of Fisheries (MFish) proposes that:

a) Tuatua be introduced into the quota management system (QMS) on 1 October 2005;

b) The quota management areas (QMAs) be TUA 1 (FMA 1), TUA 2 (FMA 2), TUA 3 (FMA 3), TUA 4 (FMA 4), TUA 5 (FMA 5 and 6), TUA 7 (FMA 7), TUA 8 (FMA 8), and TUA 9 (FMA 9);

c) Alternatively, that the QMAs in FMA 1 be TUA 1A and TUA 1B;

d) The fishing year be 1 October to 30 September; and

e) The unit of measurement be greenweight.

Assessment of Legislative Criteria

Schedule 4C

2 Tuatua (*Paphies subtriangulata*) is listed on Schedule 4C. While on Schedule 4C no new fishing permits can be issued for the commercial harvest of the species. The species on Schedule 4C were identified as having potential sustainability risks in an open access management regime for species not managed under the QMS. The purpose of Schedule 4C is to provide an interim measure to limit access until a decision is made about whether to introduce the stock or species into the QMS or to provide for open access and to manage through the use of sustainability measures under s 11.

3 Tuatua is a common wedge-shaped bivalve shellfish belonging to the same family that includes toheroa, deepwater tuatua, and pipi. Tuatua is widespread throughout New Zealand in suitable sandy and soft-bottom habitats, and is more common on North Island beaches. The species is generally found in the intertidal zone and upper subtidal zone, where it can form discrete bands. Tuatua commonly occurs in areas mixed with other surf clam species.

4 There is limited stock assessment information to determine the stock status of tuatua. An MFish commissioned survey of the tuatua population at New Brighton Beach (Pegasus Bay) in 2001 produced an estimate of maximum constant yield for the fishery.

5 The majority of commercial catches are taken in fisheries management area (FMA) 9, and are mainly restricted to the Kaipara Harbour entrance and previously along specified parts of Dargaville beach. Annual commercial catches in FMA 9 increased through the early 1990s, and have substantially declined in recent years (Table 1). Most recent catches were taken in the Kaipara Harbour dredge fishery (FMA 9). Annual catches have always been substantially lower than the maximum catch limit

(based on a maximum daily catch limit[1] of 600 kg of tuatua for fishing activity conducted by dredge, and 200 kg for handgathering).

6 The decline in catch in FMA 9 is a result of several permit holders discontinuing fishing activities on Dargaville Beach in response to decreasing stock abundance, and concurrently, many of the permit holders retiring from the fishery. The permit holder with a method authorisation to participate in the dredge fishery at the Kaipara Harbour has discontinued fishing, and recent dredge activity has been more intermittent in recent years as a result of this permit being worked on behalf of the permit holder. In addition, the economics of being restricted to only 600 kg per day, and greater emphasis on when tuatua may be harvested from a food safety perspective (following heavy rainfall or flood conditions) has further reduced the viability of existing operations. Commercial activity would have been affected in FMA 9 (and other areas) by the implementation of the Ministry of Health prohibitions on taking shellfish given the risk of consuming biotoxins.

7 Since 1990, it is thought that the number of active fishers has reduced from ten to four fishing permit holders, although some of the active fishers have very limited activities. It is not known whether commercial catches in FMA 9 are sustainable, but the anecdotal view of fishery interests in the area is that available tuatua resources along the coast are unlikely to sustain a commercial fishery given the current use of the resource by non-commercial interests. On-going commercial use of the subtidal beds in the Kaipara Harbour entrance is probably feasible. Very minor commercial catches of tuatua were taken in other FMAs in the early 1990s.

Table 1: Estimated catches (tonnes) of tuatua by FMA for fishing years 1989–90 to 2002-03. Catches based on data extracted from MFish databases by NIWA.

FMA/Year	1	7	8	8/9	9
1989-90	0.8		0.1	0.1	69
1990-91	0.3	0.2	0.4		63
1991-92	0.6	2.1	0.5		77
1992-93	0.2	0.1	0.2	0.2	107
1993-94	0.5				175
1994-95	0.4				173
1995-96					93
1996-97					62
1997-98					73
1998-99					73
1999-00					44
2000-01					15
2001-02					5
2002-03					10

8 Tuatua are an important resource for recreational and customary Maori fishers, especially in the northern part of New Zealand. Tuatua resources in north-eastern New Zealand are subjected to high levels of fishing pressure by non-commercial fishers and are also subject to environmental effects from urbanisation and land management practices.

[1] Regulation 22A of the Fisheries (Auckland and Kermadec Areas Commercial Fishing) Regulations 1986

9 Tuatua may be taken as a bycatch in the target cockle, pipi, and surf clam fisheries, although the numbers involved are most likely to be small given the differing habitat preferences for each species, and the discrete nature of concentrated beds for cockle, pipi and tuatua in particular. Changes to fishing patterns in these target fisheries (including development of new and existing harvest areas) are likely to influence catches of tuatua.

10 Tuatua, like other sedentary species, form localised populations in open and sheltered soft-bottom habitats. These populations are likely to demonstrate spatial and temporal fluctuations in stock size and structure due to the influence of environmental factors on population dynamics. These factors include water temperature, exposure rates, water currents, sand movement, food availability, and predation. In addition, fishing pressure by commercial and non-commercial fishers may have an impact of population dynamics, as fishers generally harvest large tuatua. The biological attributes of tuatua suggest this species is vulnerable to the effects of fishing and habitat disturbance, and is particularly susceptible to localised depletion.

11 If a decision is made not to introduce tuatua into the QMS, then it will be removed from the Schedule and the moratorium on issuing commercial fishing permits will be removed. Commercial fishing effort for tuatua is likely to increase under open access in both existing harvest areas (particularly in northern beaches of the North Island), as well as new areas if market demand increases. This risk arises because there is the potential for tuatua to be a marketable shellfish species and the cost of entry into the tuatua fishery would be relative low (ie, it can be a beach-based fishery). Given the localised nature of tuatua, an increase in unconstrained fishing effort could give rise to sustainability concerns in both existing and new harvest areas. It would also lead to potential conflicts between fishing sectors over access to the resource.

12 The potential risk of overfishing by commercial fishers at present in an open access environment may be mitigated if it proves uneconomic to harvest tuatua; hence the level of interest in tuatua may be quite low. However, MFish does not have information as to the potential opportunity for development of the tuatua fishery. Commercial operation might well prove viable if not constrained by the current limitation of 600kg per day. A decision could be made to re-consider introducing tuatua based on new information indicating some change had occurred in the fishery. However, the benefits of introducing the species on the basis of catch history will remain available only until 1 October 2009.

13 Tuatua are an important food source for harbour and estuarine fish (particularly juvenile fish), crabs, and seabirds. Tuatua are also likely to play an important role in stabilising sandy beaches and banks by reducing the transport of finer sediment material. The species may also assist in maintaining water quality through their filter-feeding activity within estuarine and harbour environments. A reduction in tuatua biomass may have implications on associated and dependent species, and on the physical aquatic environment, particularly if localised depletion of discrete tuatua populations occurs.

14 Commercial fishers are permitted to use dredges[2] within a defined area of the Kaipara Harbour entrance to harvest tuatua beds at water depths of about 20 m. MFish has no

[2] Regulation 4A(3) of the Fisheries (Auckland and Kermadec Areas Commercial Fishing) Regulations 1986

information on the physical impacts of dredging for tuatua on the benthic environment within the harbour, although sand extraction activities nearby are also of significance, and it is apparent that natural sand movement occurs to such a degree that the regular removal of approximately 500 cubic metres of sand is largely unnoticeable on depth sounders in the days following removal by suction pump. Dredging is restricted to the harbour entrance, which is a very dynamic environment characterised by strong tidal flows and continual movement of sand and other material across the seabed. MFish considers the effects of commercial tuatua dredging at current levels on the benthic environment are likely to be of the same nature as the effects of sand extraction activities.

15 With the exception of the Kaipara Harbour dredge fishery, all commercial and non-commercial harvesting for tuatua is restricted to hand gathering. This is a low impact method that essentially has no discernable effect on the environment where harvesting occurs.

Use of Section 11 Sustainability Measures

16 There is a potential sustainability risk in an open access environment. The extent of that risk is difficult to ascertain, as for example, the current catch limit for northern stocks may constrain activity from an economic perspective. At present, there is limited commercial catch of tuatua. The level of catch has declined significantly in the major fishery (FMA 9). There may be limited interest in the utilisation of the species by commercial fishers. However, there is the potential for fishing effort to increase in an open access environment in both existing and new tuatua harvest areas. MFish is unable to predict the extent of the potential interest in developing tuatua, although commercial interests may not find significantly sized beds that would support year round economic activity, or areas that are presently not highly valued by non-commercial interests in northern New Zealand. The current level of catch may not necessarily be reflective of the future potential given the opportunity for new entrants in the fishery. Increased effort in the associated shellfish fisheries such as cockle, pipi and surf clams, may also result in an increase in bycatch of tuatua, but this is not thought to be of a scale that would result in sustainability concerns.

17 The species is sedentary in nature and forms discrete, localised beds in coastal and estuarine areas. These biological attributes suggest that tuatua is vulnerable to the effects of fishing, particularly localised depletion. Unconstrained fishing effort could have an adverse effect on associated and dependent species, and the physical coastal environment.

18 An increase in catch levels could lead to utilisation issues between commercial and non-commercial users. Unconstrained fishing may lead to localised depletion of beds that are shared between different sectors, and this could create conflict of access issues due to the reduced availability of tuatua for non-commercial fishers. There is also the potential that the current management of tuatua is not meeting the interests of non-commercial fishers in northern New Zealand. Population growth may in the future place greater demand on the resource for non-commercial purposes. MFish concludes that tuatua requires active management to ensure the sustainability of the tuatua stocks and avoid potential allocation problems.

19 There is the potential that the sustainability measures available under s 11 of the Act could manage the sustainability of the resource, for example, by the setting of a catch limit or commercial catch limit. The observed decline in commercial catch is partly the result of the fishery being uneconomic to commercially harvest, and the commercial fishers retiring from the fishery over a decade ago, but could be reflective of a general reduction in the populations found on beaches within FMA 9. The decline in catch could also amount to a sustainability problem that a Catch Limit or Commercial Catch Limit could potentially manage.

20 Tuatua is readily available in many areas throughout New Zealand and is commonly taken by non-commercial fishers. There are unlikely to be allocation issues between commercial and non-commercial fishers under current harvest levels, in recognition that effectively little or no shore-based commercial activity has occurred in the last decade. In the Kaipara Harbour fishery there are unlikely to be allocation issues given the commercial tuatua beds occur in depths of 20 m and alternative tuatua beds within the harbour are available for non-commercial fishers. There is no information about whether tuatua within the sub-tidal beds play a role in supporting tuatua beds elsewhere in the harbour. However, MFish is not aware of any concerns being raised about availability of tuatua to non-commercial fishers within the harbour. An increase in commercial catches of tuatua in the Kaipara Harbour may potentially have implications for non-commercial tuatua beds through the loss of spat that recruit into intertidal beds.

21 There is some evidence of both inefficient and under utilisation of the existing commercial harvest areas, including the Kaipara Harbour dredge fishery. Commercial catches no longer occur in areas outside Kaipara Harbour, and catches within the harbour have declined significantly since the mid-1990s. The number of permit holders has also declined from ten in 1991–92 to four in the current fishing year. The decline in both commercial catch levels and fisher participation is largely attributable to a combination of reductions in the abundance of tuatua populations, restrictions on harvest following heavy rain or flood events, and increasing catching costs relative to the maximum daily catch limits.[3]

22 Retaining tuatua indefinitely on Schedule 4C is not a strategy that best meets the purpose of the Act. Nor would retention of the permit moratorium on a long term basis be necessary to achieve the purpose of the Act. The options are to manage the species under the QMS or to use s 11 sustainability measures.

23 The s 11 measures on their own do not provide an effective means of addressing the utilisation of the resource, either by commercial fishers, or in allocating the resource between sectors. The existing regulatory areas specifying the few areas in northern New Zealand where commercial fishing may occur inhibits access to the fishery. Nevertheless, these areas require review given that most of these areas reflect limited commercial usage undertaken during the 1980s. These areas may no longer be suitable as commercial fishing areas. In addition, the specification of areas where commercial fishing may occur does not necessarily constrain catch within these areas. The use of a CCL may lead to the closure of the fishery and, subject to the method of

[3] In addition to the 600 kg daily catch limit that applies to the Kaipara Harbour commercial dredge fishery, a 200 kg daily catch limit applies to the commercial handgathering fisheries in FMA 9 (Regulation 22A of the Fisheries (Auckland and Kermadec Areas Commercial Fishing) Regulations 1986)

harvest, could in practice, due the effect of s 241, result in the effective closure of associated sedentary shellfish fisheries.

24 In comparison to s 11 measures on their own, the QMS enables people to invest in, and develop, a fishery when they choose to do so. Although, there is no immediate commercial interest in the species, it is preferable that any development of the fishery occurs within the context of the QMS. Unlike an open access regime, the QMS provides greater incentives to fishers to develop and manage the fishery sustainably through the provision of secure property rights. In addition, the QMS provides the most effective means of providing for the utilisation interests of all sectors, through the setting of a TAC, allocating the resource between sectors, and application of measures that effectively constrain commercial catch. It is acknowledged that management under the QMS could also include use of s 11 measures, such as retention of method restrictions.

25 The conclusion is that, in the case of tuatua, the s 11 measures on their own do not, compared to the QMS, better meet the purpose of the Act.

Highly Migratory Species Considerations

26 Tuatua is not a highly migratory species, so this consideration is not applicable.

CITES Listing

27 The species is not listed on CITES – hence there is no requirement to consult with the Minister of Conservation when considering introduction of tuatua into the QMS.

Stock and Areas

28 Tuatua is found widespread on sandy and soft-bottom beaches and banks around the North Island, at more scattered locations in northern South Island and Stewart Island, as well as the Chatham Islands.

29 Tuatua demonstrate morphodynamic differences between areas. Individuals generally attain larger sizes and abundance on reflective beaches than on more shallow-sloping, dissipative beaches.

30 NIWA advises the boundaries of individual stocks of tuatua are likely to be the continuous lengths of exposed sandy beaches between geographical features (rivers, headlands etc) on which tuatua occur. NIWA suggests that stock boundaries for management purposes can be encompassed within the general statistical area subdivisions of FMAs.

Proposed Quota Management Areas

31 The Act sets out two statutory obligations that must be considered when defining QMAs:

- As far as practicable, the same QMAs must be maintained for different species (s 19(2)); and

- A separate QMA may be set for a stock in the waters surrounding the Chatham Islands if the stock in that area can be managed effectively as a unit for fisheries management purposes (s 19(3)).

32 In addition to the above matters, MFish has developed a set of principles to assist in defining practicable QMAs, which is set out in the introductory section of this paper. In considering these statutory matters and principles, MFish considers the following are key factors in defining QMAs for tuatua.

a) Tuatua beds are common throughout New Zealand, although populations may be more localised in their distribution where suitable habitat is lacking;

b) Tuatua resources in north-eastern New Zealand are subjected to high levels of fishing pressure by non-commercial fishers and are also subject to environmental effects from urbanisation and land management practices;

c) It would be impractical and administratively costly to manage tuatua based on small statistical reporting areas;

d) Tuatua are often found in areas with other sedentary shellfish species such as cockle, pipi and surf clams, although the overlap in local distribution is less likely for species like cockle that prefer sheltered environments. The management of tuatua needs to be closely aligned with these associated fisheries; and

e) Tuatua are found in the Chatham Islands. Given the likelihood that this population is quite distinct, and is likely to form its own biological stock, it is appropriate to establish a separate QMA for this area.

Proposals

33 MFish proposes that tuatua should be managed within eight or nine QMAs (refer to Figure 1 below). The proposed QMAs are aligned with the QMAs for the various surf clams (other than an option proposed for FMA 1, where incidentally, surf clam stocks are not typically associated with tuatua populations in significant numbers), as well as the proposed QMAs for the cockle and pipi fisheries to reflect the close association between these fisheries.

34 There is unlikely to be any development of a tuatua fishery within FMA 10 given the isolation of the FMA from the mainland, lack of potential habitat, and the presence of a marine reserve. Consequently, it is appropriate to retain FMA 10 outside the QMS.

35 For FMA 1, two options are proposed – the first option being a single QMA. A larger QMA may provide greater flexibility to provide for all types of fishing interests within the QMA. There is the ability to provide for finer scale management through other measures, including fisheries plans. Smaller QMAs may be affected by a variety of spatial measures, including marine farming areas, mātaitai, and marine reserves. However, in this instance a QMA based upon the existing FMA may not accurately reflect the circumstances prevalent in the fishery.

36 The alternative option is for two QMAs. The north-east coast of the North Island is a heavily populated area, with many people having a degree of dependence on the tuatua resource for subsistence purposes. In comparison to other areas, comparatively, there are likely to be a greater number of beds in the northeast coast

than in other areas of New Zealand, and correspondingly sufficient economies of scale in managing at a level beneath an area based on an arbitrary Fishery Management Area. The Northland tuatua beds are likely to be in a better state than the beds found in the Hauraki Gulf/Bay of Plenty area given differences in size of beds, intensity of use, and the environmental pressures prevalent.

37 In addition, the considerable use of the resource in both areas has, and will continue to, attract representatives of the community with an interest in contributing to the management of local beds. The QMAs then proposed, as TUA 1A and TUA 1B, still offer considerable flexibility to fishery interests in the respective areas to discuss the basis for management at a smaller scale. A description of the features of these two proposed QMAs, and the others proposed, follows.

TUA1A (part FMA 1 north of Te Arai Point, Pakari Beach)

38 This proposed QMA extends from North Cape to Te Arai Point, Pakari Beach, incorporating the east coast of Northland. TUA1A includes Whangarei Harbour, noting that the main tuatua resource is found at the harbour entrance near Mair Bank, but separate from the pipi population. The proposed QMA includes many northern harbours and coastal embayments where the tuatua resource is well utilised by fishery interests in the area. The southern boundary for this proposed QMA is also the same as that used for rock lobster, sea urchin, and sea cucumber fisheries. There is no significant tuatua population known to exist at or immediately adjacent to the proposed boundary of Te Arai Point, Pakari.

39 Small commercial catches of tuatua were taken on occasion from specified Northland beaches over a decade ago.

TUA1B (part FMA 1 south of Te Arai Point, Pakari Beach)

40 This proposed QMA covers an extensive area extending from Te Arai Point, Pakari Beach to Cape Runaway, incorporating the Hauraki Gulf and Bay of Plenty. The QMA is characterised by dispersed tuatua populations of relatively low to moderate densities, with only a few concentrated beds. The number of beds and their respective densities are generally much lower than observed in Northland.

41 The tuatua resource has been subject to considerable fishing pressure given its localised nature within some areas of this proposed QMA, and environmental degradation may be a feature affecting the status of several other beds (eg, Hauraki Gulf).

TUA2 (FMA 2)

42 This proposed QMA extends from Cape Runaway to the coast adjacent to Porirua. There is no data on reported catches for tuatua in FMA 2. Tuatua populations are generally quite modest throughout this area.

TUA3 (FMA 3)

43 This proposed QMA extends from the Clarence River mouth (Marlborough) to Slope Point on the Catlins coast (Southland). An MFish commissioned survey of the tuatua

population at New Brighton Beach (Pegasus Bay) in 2001 indicated that only a small proportion of the tuatua population considered to be above a harvestable size are accessible to recreational fishers. The researchers also noted that in their view the recruitment of juvenile larvae are quite likely to stem from existing tuatua beds given the counter-clockwise eddy of the Southland Current within Pegasus Bay, rather than populations north of Dunedin. This observation may need to be factored into harvesting strategies for respective beds at either end of the proposed QMA.

TUA4 (FMA 4)

44 This proposed QMA encompasses the Chatham Islands and the eastern Chatham Rise. There is no data on reported catches for tuatua in FMA 4.

TUA5 (FMAs 5 & 6)

45 MFish notes there is unlikely to be any development of a tuatua fishery within FMA 6. In such areas, MFish usually sets larger QMAs to reduce management costs. MFish proposes to combine FMAs 5 and 6 for this species. The proposed QMA extends from Slope Point on the Catlins coast to Awarua Point, Westland, and includes all southern waters of New Zealand and the sub-Antarctic islands.

TUA7 (FMA 7)

46 This proposed QMA extends from Awarua Point, Westland around the top of the South Island to the Clarence River on the east coast of the South Island. Commercial catches of tuatua have been taken in Cloudy and Clifford Bays.

TUA8 (FMA 8)

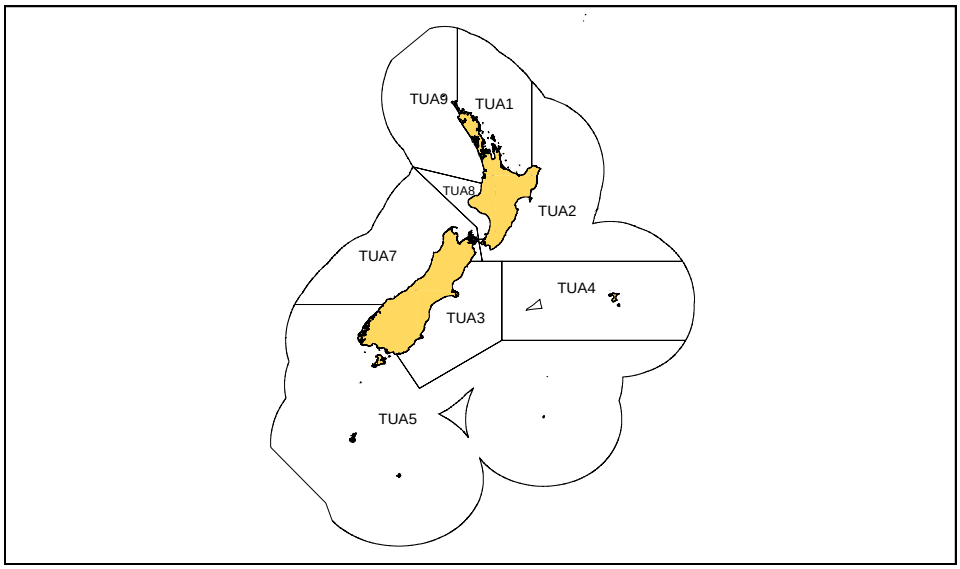
47 This proposed QMA extends from the Porirua coast north to Tirua Point, south of Kawhia Harbour. Small commercial catches of tuatua have been taken from Taranaki beaches over a decade ago. The area is not known for any particular concentrated beds of tuatua, although some non-commercial harvest occurs on the Kapiti coast.

TUA9 (FMA 9)

48 This proposed QMA extends from Tirua Point to North Cape. This is the main area for catches of tuatua. MFish considers it appropriate to manage tuatua within FMA 9 as a separate management area to enable the principal commercial fisheries to be managed as a unit. The principal commercial fishery is based on the dredge fishery within the Kaipara Harbour entrance.

49 Previous commercial fishing activity on the north Kaipara beaches ceased over a decade ago as commercial fishers felt that the resource had significantly diminished, and coincidently, permit holders began to retire from the fishery. The resource continues to sustain an important non-commercial fishery from Ninety Mile Beach to the North Kaipara beaches. Previous populations of tuatua at more southern beaches within this proposed QMA have largely disappeared, perhaps in response to changing environmental conditions. A regulatory closure to shellfish gathering applied at Karekare Beach (west Auckland) in the early 1990s has not led to resettlement of tuatua at this site.

Figure 1 Quota Management Areas for tuatua



Note that Figure 1 illustrates FMA 1 with a single QMA. An alternative proposal is to have 2 QMAs – TUA 1A (Northland) and TUA 1B (Hauraki Gulf/Bay of Plenty).

Fishing Year

50 The fishing year for tuatua is from 1 October to 30 September. This is consistent with the fishing year that applies to the associated cockle and surf clam QMS fisheries. Accordingly, should tuatua be introduced into the QMS, the proposed fishing year is 1 October to 30 September.

Unit of Measure

51 MFish considers that the unit of measurement should be greenweight. Greenweight has been used historically for management purposes in the tuatua fishery. This unit of measure also applies to all the associated cockle and surf clam QMS fisheries. There does not appear to be any rationale for changing this unit of measure should tuatua be introduced into the QMS.