HARVEST MANAGEMENT MEASURES TO SUPPORT THE INTRODUCTION OF ATTACHED BLADDER KELP STOCKS (KBB3G, KBB4G) INTO THE QMS

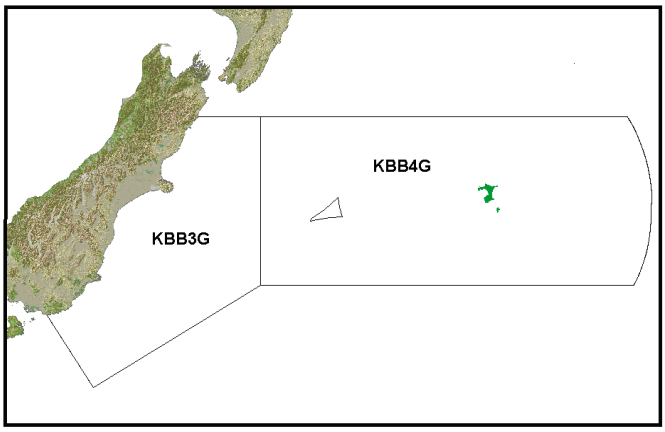

Figure 1. Quota Management Areas (QMAs) for attached bladder kelp seaweed.

Executive Summary

1 Attached bladder kelp stocks (KBB3G, KBB4G) will enter the Quota Management System (QMS) on 1 October 2010. The Quota Management Areas (QMAs) for KBB3G and KBB4G are shown in Figure 1.

2 The purpose of this document is to initiate a consultation process on behalf of the Minister of Fisheries (the Minister) regarding additional sustainability measures for the KBB3G and KBB4G which are designed to support the proposed Total Allowable Catches (TACs) and associated allowances that have been consulted on previously.

3 The options for additional sustainability measures (i.e. harvest management measures) are as follows:

Option 1

- Maintain the *status quo* and do not institute any additional harvest management measures.

Option 2

- Implement one or more of the following harvest management measures:

  i) **Maximum cutting depth -** Institute a maximum cutting depth of no more than 1.2 metres;

  ii) **Finer spatial scale reporting** – Require the latitude and longitude location of each harvested kelp bed to be reported

iii) **Maximum canopy removal –** Allow no more than 50% of any one kelp bed's canopy biomass to be harvested over a period of less than 6 months;

iv) **Maximum canopy harvesting frequency –** Require that no one area (i.e. kelp bed) may be harvested more than twice in one year; and

v) **Maximum canopy harvest width –** Constrain harvesting of the canopy biomass to strips no greater than 5 metres in width.

4 If the harvest management measures outlined under Option 2 are supported in full, or in part, then MFish proposes implementation of those measures via:

Option A

- Implement the harvest management measures by regulation, using s 190 and a *Gazette* Notice enacted under section 11 of the Fisheries Act 1996 (the Act).

Option B

- Implement the harvest management measures using voluntary industry mechanisms, such as a Memorandum of Understanding (MOU) or agreed-to Code of Practice (COP) agreed among all potential quota holders.

Option C

- Implement the harvest management measures using a combination of regulation and voluntary industry mechanisms.

5 The Ministry of Fisheries (MFish) requests feedback from tangata whenua and stakeholders on the proposed harvest management measures and implementation options. MFish is open to considering additional management measures to those listed above provided there is supportive rationale and an effective means of implementation to support monitoring and enforcement.

The Issue

6 MFish distributed an Initial Position Paper (IPP) on 4 March 2010 outlining the proposed TACs, sector allowances and regulatory proposals for KBB3G and KBB4G, which will enter the QMS on 1 October 2010.

7 In the IPP, MFish identified that management of the bladder kelp fisheries by output controls alone would not effectively manage potential adverse effects of harvesting[1]

[1] Adverse effects of harvesting are defined here as:
- localised depletion of kelp beds;
- reduced growth rates of kelp plants;
- negative impacts on associated and/or dependent species (e.g. kina, butterfish, mullet) that utilise kelp forests a food and shelter source (potential for increased competition);
- opportunistic establishment of invasive algae (e.g. *Undaria* sp.);
- cascading trophic effects from kelp plant removal; and
- effects on wave and current action that facilitate the recruitment of planktonic larvae to kelp ecosystems.

on localised kelp beds or associated and/or dependent species across smaller spatial and temporal scales. Serial localised depletion of kelp beds could also lead to increased QMA-level sustainability risks. MFish considers these risks could be mitigated to some extent by the level of harvesting allowed, which was reflected in the IPP. The absence of harvest management measures and the lack of information on bladder kelp abundance in KBB3G and KBB4G precluded proposing higher levels of utilisation. MFish requested feedback from stakeholders on the future development of harvest management measures, once rights allocations were distributed, to mitigate potential adverse effects from bladder kelp harvest.

8 Stakeholder submissions highlighted concerns about the lack of a harvest management measure or measures to manage potential adverse harvesting effects at any TAC level. Submitters considered that even a small TAC could still have adverse impacts if additional harvest management measures were not in place.

9 Some industry submissions considered that formal establishment of agreed-to harvesting protocols would significantly reduce the potential adverse effects of harvesting presented in the IPP and allow for a more balanced assessment of higher TAC options by the Minister.

10 A number of management measures were proposed in submissions to reduce the potential risks to the stocks, associated and/or dependent species, and overall ecosystem functioning (Appendix 1). Some of these measures are currently utilised in other countries where kelp harvesting is well established (e.g. restricting harvest to the canopy). This paper focuses on harvest management measures only and MFish considers that other proposed measures should be addressed after QMS introduction.[2]

11 Based on stakeholder submissions, MFish is proposing that a selection of the suggested management measures relating to harvesting be formally adopted when KBB3G and KBB4G enter the QMS. The proposed harvest management measures seek to ensure the functioning of localised bladder kelp areas is maintained while providing opportunity for the cautious development of the fishery given the ecological role of bladder kelp and the uncertainty with respect to the effects of harvesting. [3]

12 The harvesting management measures presented in this IPP are considered the most useful in mitigating potential sustainability risks without compromising utilisation opportunities or harvesters' abilities to further develop a commercial harvesting strategy once quota rights have been allocated. However, MFish considers that a number of these measures may be more effective if instituted by industry rather than regulated by the Crown. MFish seeks the views of stakeholders on how these measures could be effectively implemented without unduly restricting utilisation.

[2] MFish considers that it is premature to address some of the other management strategies proposed (e.g. annual stock assessments, establish a research programme). These strategies are also better linked with TAC reviews and can be addressed following introduction to the QMS. Additionally, some strategies are industry-based and not for MFish to direct (e.g. establishment of industry councils, shelving of TACC).

[3] Investigations on the impacts of harvesting bladder kelp in New Zealand (Ibid, no. 9) have assessed short-term impacts of small-scale removal in one location. There are no assessments on the implications of timing or frequency of removal, large-scale harvest, or response of beds to harvest across large spatial scales. Investigation on associated and/or dependent species has focused on a few native fauna and invertebrate species. There has been no investigation on potential impacts on fish or other marine species.

MFish notes that some or all may be better implemented by the adoption of formal voluntary codes of practice, with suitable governance and reporting arrangements.

13 This IPP is not final advice for the Minister; rather it gives tangata whenua and stakeholders an opportunity to comment on the management proposals and provide supplementary information relevant to the discussion presented here. This step is in accordance with section 12 of the Act.

Background

14 *Macrocystis pyrifera* (bladder kelp) is a large seaweed species that can form extensive undersea forests in coastal waters around southern North Island, the South Island, Chatham Islands, Stewart Island, and the sub-Antarctic islands.

15 Individual plants can grow up from depths of 30 metres to reach the sea surface where they form a floating canopy. The canopies themselves can be extensive, reaching many metres in length along the sea surface. In older plants, over 50% of the plant biomass can be within 1 metre of the sea surface.

16 Bladder kelp typically occurs in dense stands and is the predominant habitat forming species in many coastal systems. This seaweed undergoes annual and seasonal cycles of abundance, with canopy growth rates generally highest between autumn and spring. Canopy biomass is typically greatest during winter and lowest during summer (due to die-off from higher water temperatures and lower nutrient levels). Storm events substantially contribute to a decline in surface-canopy biomass. A significant proportion of the annual kelp production becomes free-floating and beach-cast as a result of storm events, seasonal mortality, or senescence.

17 Bladder kelp is one of the fastest growing seaweed species and the fronds of plants have been recorded as growing up to 300 mm per day in length in the Northern Hemisphere.[4] In New Zealand, however, growth rates have been estimated at significantly lower levels (approximately 1 – 15 mm per day).[5][6] Growth rates and peaks in biomass can vary significantly over very short distances (i.e., a few kilometres apart) in response to changes in currents, light, nutrient levels, and other environmental factors. Kelp beds experience decline and regeneration over different spatial and temporal scales, ranging from metres to kilometres, and days to years, respectively.

18 Bladder kelp forests are characterised as being amongst the most productive marine communities in New Zealand. MFish considers the following key issues affect the setting of harvest management measures for attached bladder kelp:

a) Bladder kelp plays a highly significant ecological role within the marine ecosystem because of its:

[4] North, WJ (1971) Growth of individual fronds of the mature giant kelp, *Macrocystis pyrifera*. Nova Hedwigia 32: 123-168.
[5] Brown, MT, Nyman, MA, Keogh, JA, and NKM Chin (1997) Seasonal growth of the giant kelp *Macrocystis pyrifera* in New Zealand. Marine Biology 129: 417-424.
[6] Ibid no. 4.

i) Ecological characteristics, productivity and forest-like structural form that provide significant habitat, food, and shelter for many marine species of high social, cultural and economic value (e.g. paua, kina, butterfish);

ii) Modification of wave and tidal action, which affects species living in and around kelp beds, as well as coastal physical processes such as erosion, siltation, and sunlight penetration (affecting sheltered and shaded understory species); and

iii) Significant contribution to ecosystem function by driving primary production and energy cycling, which contributes to other near-shore systems, including sandy beaches and deepwater ecosystems.

b) Bladder kelp beds are susceptible to localised depletion if fishers use inappropriate harvest practices (i.e., whole plant is removed), and naturally experience large biomass fluctuations both spatially and temporally.

c) Kelp beds are sensitive to changes in environmental factors (e.g. light, nutrients), vulnerable to habitat disturbance, exposure (open wave-exposed coastlines versus sheltered regions), and may experience different rates of productivity. Because of this variability, the response of kelp forests to fishing pressure is unlikely to be the same along the coasts within a stock or between KBB3G and KBB4G.

Summary of Proposed Management Options

19 MFish is considering the following management options with regard to the introduction of KBB3G and KBB4G to the QMS:

Option 1

- Maintain the *status quo* and do not institute any additional harvest management measures.

Option 2

- Implement one or more of the following harvest management measures:

i) **Maximum cutting depth -** Institute a maximum cutting depth of no more than 1.2 metres;

ii) **Finer spatial scale reporting** – Require the latitude and longitude location of each harvested kelp bed to be reported

iii) **Maximum canopy removal -** Allow no more than 50% of any one kelp bed's canopy biomass to be harvested over a period of less than 6 months;

iv) **Maximum canopy harvesting frequency –** Require that no one area (i.e. kelp bed) may be harvested more than twice in one year; and

v) **Maximum canopy harvest width -** Constrain harvesting of the canopy biomass to strips no greater than 5 metres in width.

20 If the harvest management measures outlined under Option 2 are supported in full, or in part, then MFish proposes implementation occur under one of the following ways:

Option A

- Implement the harvest management measures by regulation, using s 190 and a *Gazette* Notice enacted under section 11 of the Fisheries Act 1996 (the Act).

Option B

- Implement the harvest management measures using voluntary industry mechanisms, such as a Memorandum of Understanding (MOU) or agreed-to Code of Practice (COP) agreed among all potential quota holders.

Option C

- Implement the harvest management measures using a combination of regulation and voluntary industry mechanisms.

Sustainability Measures

21 The Minister may set or vary any sustainability measure for one or more stocks or areas under section 11(4)(b)(i) of the Act by notice in the *Gazette*. Relevant matters to consider in adopting or varying a sustainability measure include the:

- Effects of fishing on any stock and the aquatic environment;
- Existing management controls that apply to the stock or area concerned; and
- Natural variability of the stock.

22 Each of these matters is considered under the assessment of each proposed sustainability (i.e. harvest management) measure.

23 Implication of sustainability measures under section 11 of the Act via publication of a *Gazette* Notice is the quickest available regulatory instrument that would allow bladder kelp harvest management measures to be introduced by 1 October 2010.

24 In terms of other relevant statutory considerations:

a) MFish is not aware of any statement and plans under the Resource Management Act 1991, or any management strategy or plan under the Conservation Act 1987, that are contradictory to the proposed sustainability measures outlined here. MFish notes the existence of Pohatu (Flea Bay) marine reserve on the south east of Banks Peninsula. MFish does not consider that the proposed sustainability measures will detract from the intent of any existing or future marine reserve.

b) MFish is not aware of anything in the proposed strategies for relevant conservancies that would be affected by these proposals.

c) MFish is not aware of any fisheries or conservation service decisions, or any decisions not to require fisheries or conservation services that are relevant to the sustainability measures proposed.

d) MFish considers the proposed options are consistent with the obligations relating to the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992. All proposals seek to maintain good fishing opportunities, or improve stock health and therefore fishing opportunities, for all sectors including commercial and customary Maori.

Assessment of Sustainability Measures

25 Section 10 of the Act sets out information principles, which require that decisions be based on the best available information, taking into account any uncertainty in that information, and applying caution when information is uncertain, unreliable, or inadequate. Available information has been considered (e.g. both peer-reviewed and non-peer reviewed papers, international regulatory measures) and the best available information has been used to evaluate the sustainability measures presented.

26 Uncertainties in information make it difficult to accurately quantify costs and benefits of access to the fishery and stakeholder value; these uncertainties are identified and discussed. MFish has included matters relating to uncertain information to provide opportunities for discussion with fishery stakeholders and receive additional information and supporting evidence where available.

***Option 1* – Status quo**

Sustainability and environment

27 Maintaining the *status quo* would result in no additional harvest management measures for the bladder kelp fisheries being implemented prior to setting of the TAC for the 2010/2011 fishing year. Under this option, the TAC becomes the sole management tool for ensuring sustainability of each stock, and management of potential adverse effects of harvesting on localised kelp beds, and associated and/or dependent species.

28 In the IPP outlining the proposed TACs for KBB3G and KBB4G MFish considered that none of the proposed TACs posed a sustainability risk to the attached bladder kelp stocks across the QMAs, based on likely abundance. However, potential adverse effects from harvesting were identified for each option with respect to localised depletion, post-harvest recovery of kelp beds, and consequential adverse effects on associated and/or dependent species.

29 In the absence of controls to restrict harvest in finer spatial scales within a QMA, there is a risk that a large TAC could result in localised depletion of beds within the QMA (and potential localised ecosystem impacts) given the importance of the species to near shore ecosystems.

30 Localised depletion could result in adverse environmental impacts if depletion of beds occurs in area where they form a habitat of significance for fishery management

and/or leads to impacts on associated species. MFish notes that serial localised depletion of kelp beds could lead to increased QMA-level sustainability risks.

31 As assessed in the IPP, higher levels of utilisation increase the sustainability risks to the stocks, which are exacerbated by the lack of harvest management controls. MFish's initial view is that none of the TAC options proposed in the 4 March IPP created a risk to the sustainability of the bladder kelp stock at the QMA level. The risk of localised adverse effects on kelp beds and associate and/or dependent species arising from poor harvesting practices or lack of harvest management measures is dependent on the level of TAC chosen for each stock however. Risks of localised adverse effects are greatest if TACs are set at the higher levels without harvest management measures in place.

32 MFish's initial view is that under the *status quo* harvesting impacts will be small in the short-term, but may become significant in the medium term.

Utilisation Value

33 Maintaining the *status quo* provides the greatest amount of flexibility for commercial harvesters to develop their own harvesting strategies and undertake sustainable commercial harvest as they see fit to maximise utilisation benefits and value. Commercial stakeholders have indicated the potential for the bladder kelp fishery to develop significantly within the next 10 years, and consider that entrance of bladder kelp into the QMS provides opportunities to fast track the development of seaweed harvesting into a significant export dollar earner.

34 The bladder kelp fishery is small (with currently only one active participant) and allocation of commercial harvesting rights will not occur until the stocks enter the QMS. Consequently, MFish are not able to identify all of the potential industry harvesters, nor how quickly the fishery may develop. MFish considers the level of risk of harvesters not following best practice to be low in the short-term, but largely dependent on the number of harvesters that enter the fishery following introduction into the QMS on 1 October 2010.

35 Poor harvesting practices can result in reduced yield from the kelp beds, poor regrowth, and negative impacts on other economically important commercial species (e.g. paua, kina). Without additional management controls there is a risk, albeit low in the short-term, of localised depletion on kelp beds or associated effects on commercially important associated and/or dependent species. These potential impacts may affect utilisation potential of the bladder kelp stocks and on other important fisheries.

Credibility and acceptance

36 MFish considers the *status quo* impedes the management goals for the bladder kelp fishery. Using TAC setting as the primary tool for ensuring the functioning and sustainability of the kelp bed habitats does not mitigate potential localised depletion and post-harvest recovery risks, and constrains utilisation opportunities, thereby reducing the potential economic, social and cultural benefits from the resource.

37 The lack of formalised harvest management measures (either regulatory or under an agreed-to harvesting strategy among commercial stakeholders) puts both the stocks, associated species, and the potential utilisation benefits from the bladder kelp fisheries at risk from misuse or unsustainable harvesting practices. This risk is considered low in the short-term but the level of this risk is largely dependent on the TAC set for each stock.

38 Most submitters did not consider introducing KBB3G and KBB4G to the QMS without some additional harvest management measures in place prior, the most effective way to mitigate potential sustainability risks and potential adverse effects from harvesting, or maximise utilisation benefits. Submitters commented that even a low level TAC could have adverse impacts without additional harvest management measures in place.

***Option 2* – Adoption of Harvest Management Measures**

39 Under Option 2 MFish proposes to mitigate potential risks to the ecological function of bladder kelp habitat, health of the bladder kelp stocks/beds, associated and/or dependent species, and maximise utilisation opportunities, by implementing one or more of the following harvest management measures.

40 Practical issues relating to the implementation and enforcement of each of these measures is discussed in further detail in the *Implementation Framework* section. MFish invites feedback from stakeholders on each of the proposed measures and how they could be implemented.

Maximum cutting depth

Sustainability and environment

41 Constraining the harvest of attached bladder kelp to the upper canopy retains much of the structure and ecological benefits of kelp beds, compared with uprooting whole plants (should this occur as part of harvesting), and protects against invasions of other kelp species to the same habitat. Canopy harvest protects the base of the plant where constant replacement of lost and dying fronds by shorter juvenile fronds of the plants (that are still growing) occurs, and enables partially harvested plants to continue to reproduce as their reproductive structures (located at their base) are preserved. Canopy removal increases light penetration to the juvenile bladder kelp fronds on each plant which can aid their growth to the surface.

Utilisation Value

42 Constraining harvest to the canopy would safeguard harvesters' utilisation opportunities of the attached bladder kelps as this will enable regrowth and protect reproductive capacity to maximise recovery of the beds post-harvest. This will involve minimal short-term cost as the bulk of the biomass in any kelp bed is located in the canopy.

Credibility and acceptance

43 Regulated cutting depths are used by the two largest and longest-running bladder kelp fisheries (in California and Mexico). This practice is directly related to the protection of reproductive structures and increased growth of smaller fronds exposed to increased light penetration to renew the beds. Restricting cutting depth to 1.2 metres (or 4 feet) is consistent with the location of the bulk of the canopy biomass (i.e. within 1 metre of the sea-surface).

44 Restricting harvest to the canopy has been highlighted by a number of submitters as the key management principle that should be formally adopted by all harvesters to ensure sustainable utilisation.

Finer spatial scale reporting

Sustainability and Environment

45 Requiring harvesters to report the latitude and longitude of each harvested kelp bed will help identify spatial variation in abundance and distribution across QMAs and enable monitoring of the distribution of harvesting effort. This information is important when assessing biological productivity, growth, mortality and potential interactions with associated and/or dependent marine species.

46 Fine spatial scale reporting is useful in the development of stock assessments, particularly where spatial structure of a stock is quite patchy and there is significant heterogeneity in productivity. The development of models and assessments that are accurate and more robust enables greater confidence in the assessment of kelp stocks, particularly when considering the significant temporal and spatial population dynamics that occur.

Utilisation Value

47 Fine scale reporting provides industry with useful information to assess potential yield across spatial various scales and develop harvesting strategies, which may include rotational harvesting programmes to maximise benefits in areas where the beds are most productive.

Credibility and acceptance

48 Fine spatial scale reporting is useful in the development of a number of management strategies, both industry and government led. Reporting at finer spatial scale enables MFish to assess different management strategies to ensure that kelp stocks are sustained at levels that provide for current and future use to maximise benefits, as well as maintain their role in the marine environment supporting associated and/or dependent species.

Maximum canopy removal

Sustainability and environment

49 Limiting the removal of a kelp bed canopy to 50% over a period of less than 6 months preserves some of the surface canopy, which is used by other marine species for food

and shelter. This also allows for natural reseeding between beds as whole plants can dislodge in storms to raft away and reseed distant beds.

Utilisation Value

50 Limiting maximum canopy removal is unlikely to limit harvesters' utilisation opportunities. Submissions received during consultation on the proposed TAC setting IPP indicated that rotational harvesting strategies are likely to be developed by commercial harvesters, which would complement a restriction on canopy removal as harvesters would rotate their collections across multiple large dense beds.

Credibility and acceptance

51 Restricting the amount of canopy biomass that can be removed within a 6 month period was highlighted by a number of stakeholders (including commercial) as a management principle that should be formally adopted by all harvesters to ensure sustainable utilisation.

52 Similar harvesting restrictions are used in California where the government can, as terms of lease agreement between a commercial harvester and specific kelp bed area, restrict that only half (or less) of a bed (or beds) may be taken during a given period. The retention of at least half of the structure of the bed protects the species while biological information and the effects of harvesting are still being evaluated.

Maximum canopy harvest frequency

Sustainability and environment

53 Restricting the harvest of any kelp bed to no more than twice in one fishing year is a precautionary measure because of the lack of information available on the effects of bladder kelp harvesting in New Zealand outside of the limited work that has been conducted in Akaroa Harbour. Recovery from harvesting is dependent upon the growth-rates of the beds. Biomass production within kelp beds is known to be affected by over-harvesting, and growth rates are known to vary over small spatial and temporal scales.

Utilisation Value

54 Repeated harvesting can result in reduced yields over time and slow the growth rates of a plant. Restricting how often a bed is harvested allows for beds to recover post-harvest and reach larger potential yields before harvest occurs again. This will improve utilisation opportunities for harvesters and enable maximum benefits to be realised.

Credibility and acceptance

55 Some commercial submissions supported limiting harvest of a bed to no more than twice a year. Combined with a control on how much of the canopy can be removed at any one time (e.g. 50% of the canopy biomass of any one bed) this would restrict the amount of harvest that should occur in any one bed over a period of six months or less.

56 Although there are no formal regulations in the California fishery limiting the number of times a kelp bed can be harvested, general industry practice shows that they are harvested usually twice and no more than three times per year. The California bladder kelp beds have significantly higher growth rates than those here in New Zealand (i.e. up to 30 cm per day versus 1 – 15 mm on average, respectively). Faster growth rates enable a quicker recovery after harvesting, and are unlikely to be the same in New Zealand. In Norway, where growth rates are likely more similar to those in New Zealand, the coastline is divided into sections that are harvested on a rotational basis every 4 – 5 years to enable recovery of the beds in each zone. Some protection against overharvesting may also be provided by the maximum cutting depth, i.e. harvesting will be most economically rewarding when canopies are maximal, providing incentives to allow full recovery of the canopy between harvests.

57 On this basis, MFish is proposing to limit harvest of any one bed to no more than twice a year until more information on bed recovery and regrowth post-harvest is available.

Maximum canopy harvest width

Sustainability and environment

58 Constraining the width of harvesting strips is considered an useful strategy to limit potential harvesting effects on bladder kelp beds; harvesting sections that are too wide compromises new growth in the kelp bed through competition with understory algae.[7]

59 There are no studies that explicitly test the effect of different harvesting widths on growth of kelp beds. A 20 m width has been suggested as necessary to eliminate shading by the surrounding canopy in California. In New Zealand many of the kelp beds are found in waters much shallower (e.g. the Akaroa Harbour sites are ~ 5 m deep) compared to the Californian sites (e.g. 15 – 18 m[8]), therefore narrower strips would likely be necessary to retain shading to prevent opportunistic settlement and growth of competing algal species (e.g. *Undaria* sp.).

60 In the absence of better information MFish suggests Pirker's recommendation[9] of harvesting in strips a maximum of 5 m wide, and leaving alternating 5m strip unharvested; this logically provides some level of insurance against undue understory competition.

Utilisation Value

61 Constraining harvest width limits operators in term of the type of equipment they may use to harvest attached bladder kelp. In California the harvesting vessels are

[7] Kimura, RS and MS Foster (1984) The effects of harvesting *Macrocystis pyrifera* on the algal assemblage in a giant kelp forest. Hydrobiologia 116/117: 425-428.
[8] Ibid no. 7.
[9] Pirker, J, Schiel, DR, and H Lees (2000) Seaweed Products for Barrel Culture Paua Farming. Foundation for Research Science and Technology's Technology for Business Growth Programme Development Project; and Pirker, JG (2002) Demography, Biomass Production and Effects of Harvesting Giant Kelp *Macrocystis pyrifera* (Linnaeus) in Southern New Zealand. PhD Thesis, University of Canterbury, New Zealand.

approximately 8 metres wide and the number of adjacent swatch cut is highly variable. [10]

62 Implementing a harvest width limit is unlikely to impact on current utilisation opportunities or reduce harvesters' abilities. Up until now commercial harvest has been restricted to hand-gathering methods. MFish does not consider the purchase of equipment or tools utilised to develop complementary harvesting technologies to meet this harvesting requirement to be restrictive in terms of maximising utilisation benefits. MFish invites feedback from stakeholders on potential utilisation constraints from this proposed harvest management measure.

Credibility and acceptance

63 This harvesting approach would allow for some protection of the kelp beds from the potential effects of harvesting without compromising utilisation opportunities for harvesters.

64 The single harvester currently operating in KBB3 and other potential quota holders have indicated their support of this measure as part of sustainable utilisation strategies for bladder kelp fisheries.

Implementation Framework

65 Each of these harvest management measures provides a means to: mitigate localised depletion risks and potential impacts on associated and/or dependent species; reduce potential QMA-level risks if serial localised depletion occurs; and account for natural variability (e.g. large fluctuations in abundance and growth) of kelp forests.

66 Implementation of all the proposed measures would provide the most comprehensive framework to mitigate and monitor the potential adverse effects from harvesting identified. The implementation of maximum cutting depth and fine scale reporting are considered the primary measures required for sustainable utilisation. Instituting a maximum canopy harvest frequency is contingent on the availability of fine scale reporting records.

67 Controlling maximum canopy removal and maximum harvest width are considered secondary measures. They are strongly linked together, as both influence post-harvest recovery and reseeding, however they require the sizes of the various kelp beds to be known. Additionally, the effectiveness of these secondary measures would be dependent on having the primary measures implemented first. Without controlling the frequency of kelp removal from a bed, controlling how much of a bed can be taken at any one time becomes ineffective.

***Option A* – MFish Regulation**

68 Under Option A MFish would regulate the harvest management measures under section 11(4)(b)(i) of the Act by notice in the *Gazette*. MFish considers some of the measures cannot be effectively enforced at this time because there is insufficient information available regarding location and size of kelp beds.

[10] Ibid no. 7.

Maximum cutting depth

69 MFish considers the regulation of depth of harvest to be a core requirement for the sustainable management of the bladder kelp fisheries, and should be regulated. Options for implementation are as follows:

a) MFish could regulate harvest to no more than 1.2 m below sea surface similar to the regulation used in the California fishery. Under this more generic approach, MFish would work with industry using the 'inform and assist' approach to develop the best way to implement the regulation and ensure compliance.

b) An alternative approach would be more prescriptive and could constrain how kelp is harvesting by hand-gathering and mechanical methods. For example, constraint harvest by hand-gathering to the cutting of plants from the sea-surface only. Where harvesters choose to use mechanical equipment, regulation could require that no cutting tool penetrate the sea-surface more than 1.2 m. Monitoring would focus on examining gear to determine its maximum cutting depth.

70 MFish recognises that restricting the fishing method may unnecessarily constrain harvesters in the development of the fishery. MFish requests feedback from stakeholders on how this measure may best be implemented under a regulatory framework.

Fine Spatial Scale Reporting

71 Instituting a fine spatial scale reporting requirement would support the monitoring of *Maximum Canopy Harvest Frequency*, as well as provide additional information useful to MFish in the development of stock assessments, monitoring of biological productivity, and identifying trends in the abundance and distribution of kelp beds.

72 This reporting requirement may be instituted using s 190 of the Act, where the chief executive may, in any particular case, require accounts, records, returns, and other information additional to those specified in regulations made under this Act to be kept and provided to the chief executive.

Maximum Canopy Harvest Frequency

73 MFish considers protection of bed structure by limiting how often a bed may be disturbed is an important measure to protect the health of the beds and the associated and/or dependent species that utilise them. The ability to effectively implement this measure is contingent on fine scale reporting noted above.

Maximum Canopy Removal and Maximum Canopy Harvest Width

74 MFish considers the protection of bed structure by limiting how much of a bed is disturbed to be an important measure to protect the health of the beds and the associated and/or dependent species that utilise them.

75 The nature of these controls would make enforcement difficult given current information on bed size, potential variability in harvesting methods, future development of harvesting technologies, and natural variability in kelp bed structure.

It may be possible to implement such measures via regulation and work with industry on compliance. We seek views of stakeholders on the importance of these measures and how they might be implemented under a regulatory framework.

***Option B* – Industry-Driven Voluntary Mechanism**

76 Submissions from commercial stakeholders suggested development and implementation of a commercial harvesting strategy to manage the risks associated with harvest of attached bladder kelp; the potential measures for inclusion in such a strategy are discussed under *Assessment of Sustainability Measures* and outlined in Appendix 1. As noted under Option A, there are practical issues associated with MFish implementing a number of these measures under a regulatory framework.

77 An alternative to regulation is the development of a formal voluntary agreement among commercial harvesters that outlines a commercial harvesting strategy. Therefore, MFish invites commercial stakeholders to develop a formal agreement among likely rights-holders in both KBB3G and KBB4G to be presented to the Minister that outlines proposed voluntary harvest management measures. Such a strategy should outline how various measures will reduce the potential impacts on the health of the bladder kelp stocks, associated and/or dependent species, and maintain the physical protection the beds provide to the coastline.

78 An industry-driven harvesting strategy may be developed as a formal Memorandum of Understanding (MOU) or Code of Practice (COP) (for example) among likely rights-holders that incorporates the harvest management measures proposed here and any other potential measures commercial stakeholders considered appropriate. MFish invites feedback from stakeholders on additional means of implementing voluntary harvest management measures. Any voluntary strategy put forward would need to outline governance, monitoring, and enforcement capabilities of an industry-driven strategy, such that MFish could advise the Minister around the effectiveness of such an approach.

79 MFish notes that in submissions received on the IPP for TAC setting and allocation of allowances, a number of commercial stakeholders outlined what they considered to be required management controls to ensure sustainable utilisation of the bladder kelp fisheries. Many of these recommendations are consistent with what is proposed here, and are standard harvesting practices used in other countries where bladder kelp harvesting is well established.

80 MFish also notes the receipt of a MOU between Hokotehi Moriori Trust, Ngati Mutunga o Wharekauri Iwi Trust and Chatham Island Enterprise Trust (three of the four likely quota holders in KBB4G). This MOU outlines a proposed commercial harvesting strategy to ensure sustainability of the stock and reduce potential impacts on associated and/or dependent species, which is inclusive of most of the harvest management measures proposed under Option 2 in addition to a number of other proposals (e.g. pilot areas, research, TACC shelving).

***Option C* – Combination of MFish Regulation and Voluntary Mechanisms**

81 Option C proposes combining an industry-driven voluntary strategy with regulation of the measures determined to be most important (e.g. regulation of cutting depth,

changes to reporting requirements) to maximise effectiveness of management, improve utilisation opportunities, and reduce the potential adverse effects associated with attached bladder kelp harvesting.

82 MFish invites stakeholders to comment on such an approach and discuss the harvest management measures they see fit best under a regulatory versus voluntary framework.

Conclusion

83 MFish's initial view is that all the harvest management measures proposed in Option 2 should be adopted. MFish considers that the preferred means of implementing these measures should be through Option C, a combination of regulatory and voluntary industry mechanisms.

84 Such an approach would maximise effectiveness of the management framework and result in a risk management approach for sustainable utilisation of the bladder kelp fisheries regardless of the Minister's decisions on TAC settings and allocation allowances.

85 MFish invites stakeholders to provide additional information on the proposed harvest management measures, implementation framework proposed, and any other potential measures (and associated implementation options) stakeholders consider important for deliberation.

Appendix 1.

86 The following management strategies were proposed in submissions on the IPP concerning proposed TAC, sector allowances, deemed values and regulatory measures for bladder kelp fisheries entering into the QMS on 1 October 2010:

- A maximum cutting depth of no more than 1.2 m
- Only harvest 50% of the canopy at any one time
- No more than 50% of any one forest's canopy biomass should be harvested over a period of less than 6 months
- No one area may be harvested more than twice in one year
- Harvesting the canopy biomass in strips no greater than 5 m wide
- Annual stock assessments of proposed kelp forests – potentially using both aerial photography and in situ biomass estimates
- Development of a research programme or request for a "pre-commercial harvesting" study to assess biomass, distribution, and harvesting effects on kelp and dependent/associated species
- Seasonal controls
- Shelving of TACC/ACE
- Protection of areas of outstanding ecological and/or cultural significance
- Develop smaller scale management areas
- Development of an industry council and area based management companies (e.g. Macrocystis Industry Council and Macrocystis Management Companies – MacroMAC)