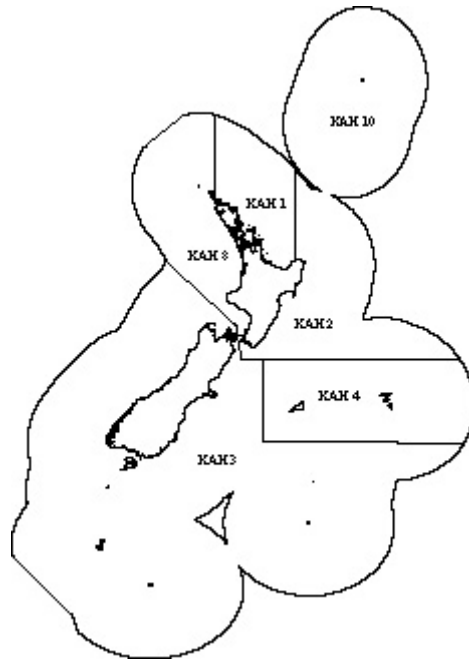


KAHAWAI (KAH)

Introduction into the QMS

- 1 Kahawai (*Arripis trutta* and *A. xylabion*) has been gazetted for introduction into the QMS on 1 October 2004. The Quota Management Areas (QMAs) for kahawai are outlined in Figure 1. The fishing year for kahawai will be from 1 October to 30 September in the following year and the total allowable commercial catch (TACC) and annual catch entitlement (ACE) are to be expressed in terms of kilograms greenweight.

Figure 1: Quota Management Areas for kahawai



Key Issues to be considered

- 2 MFish considers the key issues that relate to the decisions for setting sustainability measures for kahawai stocks are as follows:
 - a) There are two species of kahawai present in New Zealand waters, kahawai and northern kahawai. A stock assessment applies to kahawai and there is very little information available for the other species.
 - b) Kahawai biomass had declined to about 50% of the virgin biomass at the time of the assessment in 1996, however the current biomass is unknown. Nationwide combined estimates of recreational catch, customary catch and

reported commercial landings are currently just within the range of MCY estimates based on the 1996 stock assessment.

- c) Background information on catch by sector and method is outlined in Annex One. While primarily a purse seine fishery in QMAs 1, 2 and 3, kahawai is almost entirely taken as bycatch in QMA 8. Commercial catch limits (CCLs) apply to kahawai, with specific limits pertaining to purse seining.
- d) Since the imposition of CCLs catches, although fluctuating, have progressively declined principally in QMA 3. Declining catch in QMA 3 is associated with reduced purse seining in this area.
- e) Recreational catch is about 83% of commercial landings as estimated by recreational harvest surveys. Kahawai is one of the fish species most frequently caught by recreational fishers.
- f) The recreational sector believes that the number of kahawai available to them and the average size of kahawai has decreased over time.
- g) Kahawai supports important Māori customary fisheries but the size of the catch is unknown.

List of Management Options

- 3 MFish proposes that the s 13 management arrangements are appropriate for kahawai.
- 4 MFish proposes one option for setting TACS, TACCs and allowances for kahawai stocks as outlined below.

Table 1 Proposed TACs, TACCs, and allowances for kahawai (tonnes greenweight).

Stock	TAC	Customary allowance	Recreational allowance	Other sources of mortality	TACC
KAH 1	3 910	790	1 580	60	1 480
KAH 2	1 510	255	510	35	710
KAH 3	960	150	300	20	490
KAH 4	18	3	5	0	10
KAH 8	1 210	190	380	5	635
KAH 10	18	3	5	0	10

- 5 Additional management controls proposed include:
 - a) setting deemed values and application of differential deemed values;
 - b) amending reporting regulations, and
 - c) revoking certain fishing permit conditions. These conditions are redundant as they relate to the closing of the purse seine fishery once purse seine limits for kahawai have been reached.

TACs

TAC management strategy

- 6 Section 13 of the Act represents the default management option that is to be applied when setting a TAC for a QMS stock, unless the stock size is considered highly variable from year to year or it qualifies for management under the criteria outlined in s 14 or s 14A of

the 1996 Act. MFish does not consider that kahawai stock sizes are highly variable from year to year. In order for a stock to be added to the Third Schedule under the provisions of s 14, the biological characteristics of the species must prevent the estimation of B_{MSY} , the catch limit for any of the stock must form part of an international agreement, or the stock must be managed on a rotational or enhanced basis. Kahawai does not meet any of these criteria. Section 14A enables the Minister to set a TAC that maintains the stock at a level that ensures its long-term viability, while other inter-related stocks can be taken at TAC and TACC levels based on B_{MSY} . MFish does not consider that section 14A is applicable to kahawai fisheries because:

- there is no associated species that requires commercial fishing to that level;
 - there would be detrimental effects on non-commercial fishing interests; and
 - of the potential for adverse ecosystem effects.
- 7 MFish believes that the s 13 management arrangements are appropriate for kahawai. Under s 13 there is a requirement to maintain a fishstock at a target stock level, being at, or above, a level that can produce the MSY, having regard to the interdependence of stocks. MSY is defined, in relation to any fishstock, as being the greatest yield that can be achieved over time while maintaining the stock's productive capacity, having regard to the population dynamics of the stock and any environmental factors that influence the stock.
- 8 As outlined in the Statutory Obligations and Policy Guidelines section, there are guidelines for setting TACs for new species. Among the more important considerations for kahawai are the level of current utilisation, existing stock assessment information, the current commercial purse seine limits, the biological and fishery characteristics of the stock, implications for interdependent stocks, and whether the target level for the TAC can provide benefits that will improve utility from the available harvest. An overlying consideration is the importance of kahawai as a shared fishery between commercial and non-commercial fishing interests.

Rationale for proposed TACs

- 9 Policy guidelines have constructed an hierarchal approach in respect of the information for setting TACs and hence the weighting to be assigned to that information. Stock assessment information is afforded greater weight than a non-QMS catch limit set for the stock. A CCL may be afforded greater weight than information about historical and current catch levels.
- 10 Estimates of virgin and 1996 biomasses, and an estimate of maximum constant yield (MCY) for a single nationwide kahawai stock are available. MCY and its relevance to the setting of TACs are discussed in the Report from the Fishery Assessment Plenary¹.
- 11 A discussion of the stock assessment model for kahawai is provided in the Fisheries Assessment section in Annex Two. Given the history of exploitation, the kahawai stock is not likely to be at or near its virgin biomass (B_0). Modelling suggests that the fishery

¹ Guide to Biological Reference Points for the 2002-2003 Fisheries assessment Meetings in Report from the Fishery Assessment Plenary, May 2003: stock assessments and yield estimates Part 1: Albacore to Ling. . J Annala et al Comps and eds

was at approximately 50% of B_0 in 1996. The introduction of purse seine limits has been effective in limiting commercial catches since 1993-94 and the biomass may have stabilised since that time. However, trends in non-commercial catch during this period are unknown. Recreational catch is a significant proportion of the fishery.

- 12 There is uncertainty about the level of current biomass levels and the applicability, for setting current yields, of using the 1996 stock assessment. This is because the assessment is not only uncertain but also some seven years out of date.
- 13 For the 1990-91 fishing year, the Minister agreed that a total commercial catch limit should be 6 500 tonnes (based on a value derived from a compromise between the average commercial landings for 1983-86 of 5 000 tonnes and the average commercial landings for 1986-89 of 8 500 tonnes) with 650 tonnes of this total set aside for Māori. As an interim measure until introduction of kahawai into the QMS, the Minister decided to set specific limits pertaining only to purse seining. Commercial catch limits (CCL) were set by dividing the 5 850 tonne catch limit amongst the FMAs in proportion to the average purse seine landings relative to the other commercial fishing method landings reported during the period 1987-89: 1 666 tonnes for FMA 1, 851 tonnes for FMA 2, 2 339 tonnes for FMAs 3-8 and 0 tonnes for FMA 9.
- 14 While national catches decreased during 1991-92, landings in FMA 1 increased and for 1993-94 the competitive catch limit for purse seining in FMA 1 was reduced from 1 666 tonnes to 1 200 tonnes and any purse seine catches reported for FMA 9 were included in this catch limit. No changes have been made to the purse seine limit of 851 tonnes for FMA 2. The purse seine catch limit for FMAs 3-8 was reduced from 2 339 to 1 500 tonnes from 1995-96.
- 15 MFish does not support using the current CCLs as a basis for setting TACs. This is because the CCLs pertain only to purse seining, have no stock assessment as their basis, and are based on landings data.
- 16 In the instance of a commercial fishery that is stable, but variable, guidelines suggest criteria to set catch limits on the basis of either the current commercial catch or on average catches when landings have been stable in excess of three years. Commercial landings of kahawai declined between 1988 and 1998 and have stabilised thereafter, particularly in the important management areas QMA 1 and QMA 2. Accordingly, the proposed TACs have been calculated using average commercial landings for the period between 1997 and 2002 as MFish considers this relatively stable period provides the best available information on current levels of commercial utilisation.

It is also broadly consistent with the method for evaluating the current recreational utilisation.

- 17 The average of the two most recent estimates of recreational landings has been used to estimate current recreational utilisation of the fishery.
- 18 For species and stocks where there is some catch, but the stock is not considered of importance to customary Māori, then current utilisation may be estimated on the basis of half the recreational catch. Kahawai is of considerable interest to Māori in some areas,

- however there is no information on customary harvest. MFish considers that, even though it is important as a customary fishery, the level is unlikely to equal the level of the recreational fishery and proposes to use 50% of the current level of recreational utilisation as an estimate of current customary harvest.
- 19 Combined estimates of current utilisation for the non-commercial and commercial sectors are currently assessed to be about 7 600 tonnes.
 - 20 Another consideration for TAC setting is that recreational fishers value kahawai far greater than commercial fishers (see Social, Cultural and Economic factors in Annex Two). Current recreational perceptions are of a decline in the availability of kahawai. The current proposal to set TACs at the level of current utilisation assumes that these perceptions are associated with a reduction in the kahawai stock to a level at or above B_{MSY} and not below that level.
 - 21 Recreational interests are most likely best served by stocks that are maintained above B_{MSY} as size and availability of fish is increased in comparison to those available at a smaller biomass. The stock assessment is uncertain and outdated and targets above B_{MSY} are not proposed. In the absence of a stock assessment, the MFish preferred policy is to use current utilisation as a basis for determining both TACs and allocation. However, the shared nature of the fishery is relevant when considering the risks with respect to the uncertain information for setting sustainable yields for the stock.
 - 22 Recreational interests believe the overall reduction in kahawai schools might be having an effect on interdependent stocks of predators such as marlin and tuna. MFish notes that the factors influencing the distribution of highly migratory stocks of species such as marlin and tuna is complex and not well understood. While the availability of prey might be one important factor in the seasonal availability of these species, kahawai may provide only a component of any potential food source. Nevertheless, the importance of species such as kahawai as a food source suggests the need for caution when setting catch limits.
 - 23 In summary, MFish proposes that TACs be based on estimates of current utilisation. Although relevant, the stock assessment information is uncertain and dated. The CCLs pertain only to purse seining, are based on dated landings data and have no stock assessment basis. While commercial landings have been relatively stable, trends in non-commercial catch are unknown. Estimates of utility suggest that kahawai is much more greatly valued by the recreational sector. However, rather than suggesting alternative stock targets, MFish considers that the disparity in relative value between the sectors supports the need for caution in setting catch limits for the fishery.
 - 24 MFish notes that combined estimates of non-commercial and commercial utilisation for kahawai stocks are currently just within the range of the estimates for MCY (7 600-8 200 tonnes). MFish proposes setting TACs that coincidentally lie on the lower bound of the MCY estimate (ie, 7 600 tonnes).

KAH 1

- 25 MFish proposes a TAC for KAH 1 of 3 910 tonnes based on current utilisation of the fishery.

KAH 2

- 26 MFish proposes a TAC for KAH 2 of 1 510 tonnes based on current utilisation of the fishery.

KAH 3

- 27 MFish proposes a TAC for KAH 3 of 960 tonnes based on current utilisation of the fishery.

KAH 4

- 28 Only very small amounts of catch have been reported in FMA 4. MFish proposes a nominal TAC of 18 tonnes for KAH 4.

KAH 8

- 29 MFish proposes a TAC for KAH 8 of 1 210 tonnes based on current utilisation of the fishery. MFish notes that ACE will primarily be required to cover the bycatch of fishing for other species in KAH 8.

KAH 10

- 30 No catch has been reported in FMA 10. MFish proposes a nominal TAC of 18 tonnes for KAH 10.

Allocation of TAC

- 31 The TAC constitutes a composite of the respective stakeholder groups' catch allocations, plus any other fishing-related mortality. When setting any TAC, a TACC must be set, as well as allowances determined for the Māori customary and recreational fishing interests and for any incidental fishing related incidental mortality.

- 32 The 1996 Act stipulates a process by which the TAC is to be allocated. However, no explicit statutory mechanism provides guidance as to the apportionment of the TAC between sector groups either in terms of a quantitative measure or prioritisation of allocation.

- 33 There is information available for both catch history (current utilisation) and for utility value. In shared fisheries MFish has a policy preference in favour of the catch history

allocation model in the absence of clear information to the contrary. While the utility based model is not discounted altogether its application to kahawai is problematic as the information is uncertain.

- 34 MFish notes that current levels of utilisation for all sectors combined can be accommodated within the proposed TACs. This suggests that currently there is no scarcity within the fishery and therefore no clear-cut requirement to consider reallocating the fishery between sector groups on the basis of utility value or any other considerations.

- 35 Accordingly, the proposed allowances and TACCs have been calculated using average commercial landings for the period between 1997 and 2002 as MFish considers this relatively stable period provides the best available information on current levels of commercial utilisation. It is also broadly consistent with the method for evaluating the current non-commercial utilisation.
- 36 The Minister is required to make separate decisions on allowances and TACCs for each stock. MFish propose allowances and TACCs as shown in Table 1.

Recreational Allowance

- 37 The proposed recreational allowances in tonnes for each QMA are set out in Table 1.
- 38 The average of the two most recent estimates of recreational harvest has been used to estimate current recreational utilisation of the fishery. Because the recreational harvest surveys report on the fishstock codes an arbitrary amount (54 tonnes) was removed from the KAH 3 estimate and added to the KAH 9 estimate to account for area changes in establishing KAH 8.

Māori customary allowance

- 39 The proposed customary allowances for each QMA are set out in Table 1.
- 40 Policy guidelines provide several options for setting a customary allowance. Where estimates are not available, but there is known to be customary catch, a nominal allowance may be made. For stocks of importance to customary Māori the allowance may be based on the level of the recreational catch. For species and stocks where there is some catch, but the stock is not considered of importance to customary Māori, then the allowance may be based on half the recreational catch.
- 41 Exploitation of kahawai dates from the early settlement of New Zealand when they formed a substantial food source for Māori. In pre-European times large catches were often dried or smoked and stored for later use. Kahawai is a known target species for customary purposes especially on the seasonal runs around river mouths such as the Motu River in the Eastern Bay of Plenty. Large catches are still preserved for subsistence by smoking and bottling. Kahawai has a broad coastal distribution and can also be found in harbours, particularly in northern New Zealand. A significant level of customary catch could be anticipated in these areas. Māori have had an historic interest in kahawai and it is an important food source in some localities. MFish would welcome submissions, particularly from Māori customary fishers, that provide information about levels of customary kahawai catch.
- 42 No quantitative estimates of customary fishing for kahawai are available. It is unlikely that customary catch is at or near the level of the recreational catch. While kahawai is considered to be an important customary species, the numbers of recreational fishers taking this species is likely to significantly exceed the numbers of customary fishers. Further, a proportion of the customary catch is probably taken within the bounds of the daily recreational allowance of twenty kahawai per person.
- 43 In the absence of quantitative information MFish proposes a customary allowance set at 50% of the current level of recreational utilisation.

TACCs

- 44 Proposed TACCs in tonnes for each QMA are set out in Table 1.
- 45 The proposed TACC has been calculated using average commercial landings for the period between 1997 and 2002. This may understate or overstate current commercial utilisation in terms of the period chosen for some management areas. MFish notes that commercial landings of KAH 1, KAH 2 and KAH 3 were greater between 1988 and 1997 and accordingly extending the years used to calculate average commercial landings could potentially increase estimates of current commercial utilisation. Any potential impact from adopting different estimates of current utilisation can be measured as direct opportunity costs. A tonne of kahawai has a value and any reduction in tonnage for the commercial sector as a result of a lower TACC can be measured in terms of a forgone value. MFish considers that any such impacts can best be measured by forgone annual earnings as provided by the port price of kahawai (\$430 / tonne).
- 46 The commercial kahawai fishery is seasonal primarily because it is the off-season target of other species and subject to voluntary seasonal fishing arrangements. It is likely that within a QMS management regime this pattern of the fishery will not change. However, quota for kahawai will need to be retained to cover the bycatch of fishing for other species.

KAH 1

- 47 There is one TACC option proposed for KAH 1. Based on the average of the last five years commercial landings from this management area it is proposed that the TACC be set at 1 480 tonnes. This proposed TACC exceeds the current purse seine limit of 1 200 tonnes and provides for anticipated bycatch levels. MFish assesses there will be little if any socio-economic impact associated with adoption of this option because it is based on current levels of commercial utilisation.

KAH 2

- 48 There is one TACC option proposed for KAH 2. Based on the average of the last five years commercial landings from this management area it is proposed that the TACC be set at 710 tonnes. Although based on average landings, the proposed TACC is less than the current purse seine limit of 851 tonnes and the most recent years catch of 832 tonnes. MFish assesses there is likely to be little (\$52 030 forgone earnings on the 2001-02 catch) socio-economic impact associated with adoption of this option because it is based on current levels of commercial utilisation.

KAH 3

- 49 There is one TACC option proposed for KAH 3. Based on the average of the five years commercial landings from this management area it is proposed that the TACC be set at 490 tonnes. This proposed TACC is less than the current purse seine limit of 1 500 tonnes. MFish notes that declining catches in QMA 3 is associated with reduced purse seining in this area. MFish assesses there is likely to be little if any socio-economic impact associated with adoption of this option based on current levels of commercial utilisation.

KAH 4

- 50 There is one TACC option proposed for KAH 4. Based on a nominal value it is proposed that the TACC for this management area be set at 10 tonnes. MFish considers this TACC appropriately reflects the current level of use in this fishery.

KAH 8

- 51 There is one TACC option proposed for KIN 8. Based on the average of the five years commercial landings from this management area it is proposed that the TACC be set at 635 tonnes. This proposed TACC provides for current levels of bycatch. MFish assesses there will be little if any socio-economic impact associated with adoption of this option because it is based on current levels of commercial utilisation.

KIN 10

- 52 There is one TACC option proposed for KAH 10. Based on a nominal value it is proposed that the TACC for this management area be set at 10 tonnes. MFish considers this TACC appropriately reflects the current level of use in this fishery.

Allowance for other sources of mortality

- 53 There is no information on the current level of illegal catch. Accordingly, it is suggested that no allowance is made to cover illegal catch at this time.
- 54 The Report from the Fishery Assessment Plenary states that there is no information on other sources of mortality apart from juvenile kahawai, which may suffer from habitat degradation in estuarine areas. Nevertheless, MFish notes that the majority of kahawai is taken by purse seine (a bulk fishing method). There are a number of sets where the purse is set but no catches are recorded, possibly because of gear failure or other related factors. Some incidental fishing related mortality is likely especially in instances of gear failure. MFish proposes that a nominal allowance of 5% of the average purse seine reported landings for the last five years be set in accordance with the legislative requirement to provide for an allowance of other sources of fishing relating mortality.

Other Management Measures

Method Restriction

- 55 The recreational sector believes that there is conflict with commercial fishing for kahawai, particularly with purse seiners and set netters. These concerns are currently mitigated by voluntary agreements² and by an outcome of the set net review³.

² There are voluntary purse seine closures in place in Parengarenga Harbour, Rangaunu Bay, Doubtless Bay, Cavalli Island, The Bay of Islands, Rimariki Island to Bream Head, the Hauraki Gulf, the Bay of Plenty, Cape Runaway to East Cape, Waikahawai Point to Poverty Bay and Hawke Bay to spatially separate non-commercial and commercial sectors. In addition a voluntary moratorium was placed on targeting kahawai by purse seine in the Bay of Plenty between 1 December and the Tuesday after Easter.

³ An outcome of the set net review was that commercial set netting was prohibited by regulation from 26 locations.

56 There is currently no provision for considering spatial allocation within the process of setting sustainability measures and therefore continued voluntary arrangement between sectors to retain these measures for kahawai might be necessary with kahawai in the QMS.

Consequential amendment to regulation

57 As a consequence of the introduction of kahawai into the QMS, MFish proposes to revoke certain fishing permit conditions. These conditions relate to the closing of the purse seine fishery once purse seine limits for kahawai have been reached. In addition, MFish proposes to introduce a number of amendments to the reporting regulations to ensure the effective and efficient operation of the QMS. Details of the proposed amendments are set out in a generic section of this paper.

Schedule 5A

58 MFish does not propose to list any kahawai stock on Schedule 5A of the Act and proposes to allow under-fishing rights to be carried forward.

Deemed values and Over-fishing threshold

59 A separate section of this document sets out generic information on the setting of interim and annual deemed values.

60 Application of the policy framework for deemed values would mean kahawai falls within the “all others” fishstock category. The port price for kahawai is \$0.43 (early 2003 MFish port price survey). The standard factor of the port price for species in this category is 75%. The proposed annual deemed value would therefore be \$0.32, while the interim deemed value would be set at \$0.16.

61 MFish acknowledges, however, that overcatch of the kahawai TACCs will affect the interests of the non-commercial fishers in a fishery they highly value. MFish also notes the following influences upon the kahawai port price:

- Lower port prices reported by vertically integrated companies (those that catch, process and market).
- There are niche markets such as those for smoked kahawai that attract substantially more than average prices.

62 Accordingly, MFish recommends an additional option of applying a factor of 200% to the port price, which would derive an annual deemed value of \$0.86. Although a departure from the deemed values policy framework, this option would reinforce the importance of ensuring that catch of kahawai is not landed in excess of ACE (a statutory consideration) in light of the importance of kahawai to the non-commercial sector.

63 A provisional figure from the November/December 2003 MFish port price survey indicates that the port price for kahawai in areas 1, 2 and 3 could be as high as \$3.50. MFish will review the proposed port price in light of submissions on the IPP and any further port price information that becomes available.

64 MFish proposes to set differential deemed values for kahawai stocks. MFish does not propose to set an overfishing threshold for kahawai. MFish considers that the combination of the deemed values proposed and the proportionally increasing deemed

values for fishers who exceed their ACE should be an effective set of balancing provisions.

Statutory Considerations

- 65 In evaluating the management options the following statutory considerations have been taken into account.
- a) The management options seek to ensure sustainability of the stock by setting a TAC and other appropriate measures. Utilisation is provided by way of setting allowances for commercial, recreational and customary fishers.
 - b) While there is a national stock assessment available for kahawai, MFish considers it to be uncertain and outdated. Nonetheless this stock assessment suggests that the TACs proposed, based on current levels of utilisation, are likely to be at or above B_{MSY} .
 - c) There are social and economic consequences from setting the proposed TACs. Current recreational concerns with regard to the reduction in availability of kahawai to them are not addressed by setting TACs based on current levels of utilisation. These proposals assume that the decline in availability is associated with the fishing down of the stock to levels at or above B_{MSY} . While there might be a number of possible economic effects those that have been quantifiable are minor. Any opportunity costs needs to be weighed against the uncertainty in current stock status, the value of kahawai as a shared fishery and the importance of this species in an ecological context as both predator and prey.
 - d) Recruitment of kahawai is not known to be particularly variable at the current levels of stock biomass.
 - e) Kahawai fishing is not known to pose a risk to the long-term viability of any associated or dependent species. However, there are recreational concerns about the effect any reduction in kahawai schools might be having on interdependent stocks of predators such as marlin and tuna. Unfortunately, the factors influencing the distribution of highly migratory stocks of these species are complex and not well understood. They do suggest the need for caution in setting sustainability measures for the stock.
 - f) There are no known effects of purse seine fishing on the aquatic environment.
 - g) The purse seine method is not known to pose a risk to the maintenance of biodiversity of the aquatic environment. Habitats of particular significance for fisheries management have been identified for KAH 3 and these have been taken into account when preparing this advice. No other habitats of particular significance for kahawai management have been identified.
 - h) MFish considers issues arising under international obligations and the provisions of the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992 (s 5) are adequately addressed in the management options for kahawai.
 - i) MFish is not aware of any considerations in any regional policy statement, regional plan or proposed regional plan under the Resource Management Act 1991, or any management strategy or plan under the Conservation Act 1987, that are relevant to setting TACs for kahawai at this time (as required by ss 11(2)(a) and (b)). MFish is also aware of the provisions of the Hauraki Gulf Marine Park

Act 2000. The Hauraki Gulf is defined in that Act to include all coastal waters and offshore islands from near Te Arai Point offshore to the Moko Hinau Islands, and south to Homunga Point (north of Waihi Beach). This Act's objectives are to protect and maintain the natural resources of the Hauraki Gulf as a matter of national importance. Kahawai are known to occur within the boundaries of the Hauraki Gulf and MFish considers that the setting of sustainability measures for kahawai will better meet the purpose of the Act.

- j) Before setting any sustainability measure the Minister must also take into account any conservation services or fisheries services, any relevant fisheries plan approved under the Act, and any decisions not to require conservation services or fisheries services. Conservation and fisheries services apply to fisheries generally in order to assess and monitor the impacts of fishing on non-target fish and other species. No fisheries plans exist or are proposed for kahawai (s 11 (2A)).
- k) Sections 21(1)(a and b) and (21)(4)(i and ii) and (21)(5) require the Minister to allow for non-commercial fishing interests (recreational and Māori), and other mortality to the stock caused by fishing. The nature of the fishery and the interests of the respective fishing sectors have been influential in recommendations for the setting of the TACC. The commercial kahawai fishery is seasonal primarily because it is the off-season target of other species and subject to voluntary seasonal fishing arrangements. It is likely that within a QMS management regime this pattern of the fishery will not change. However, quota for kahawai will need to be retained to cover the bycatch of fishing for other species particularly in KAH 8. Allowances have been made for recreational and customary interests and for other sources of mortality to the stock caused by fishing. No mātaītai in the QMA applies in the area of the fishery. No area has been closed or fishing method restricted for customary fishing purposes in the QMA that is likely to affect fishing for this pelagic fishery. The voluntary restrictions that have been placed on commercial

fishing to protect recreational interests have been considered when making recommendations.

- l) The information used to develop proposals for kahawai refers to an assessment of the stock conducted in 1996. There is uncertainty about this assessment (and it is now some seven years out of date) however, uncertainty and the absence of information is not a reason for failing to provide for utilisation at levels considered to be sustainable, however MFish notes that caution is required in this instance.
- m) The level of non-commercial catch within New Zealand fisheries waters is uncertain with regard to setting allowances for recreational, customary Māori use and other sources of fishing-related mortality. MFish notes, however, that uncertainty in information is not a reason for postponing or failing to take any measure to achieve the purpose of the 1996 Act (s 10 Information Principles).

Preliminary Recommendations

66 MFish recommends that the Minister:

- a) **Agrees** to set a TAC of 3 910 tonnes for KAH 1 and within that TAC set:
 - i) A customary allowance of 790 tonnes;
 - ii) A recreational allowance of 1 580 tonnes;
 - iii) An allowance for other fishing-related mortality of 60 tonnes; and
 - iv) A TACC of 1 480 tonnes.

- b) **Agrees** to set a TAC of 1 510 tonnes for KAH 2 and within that TAC set:
 - i) A customary allowance of 255 tonnes;
 - ii) A recreational allowance of 510 tonnes;
 - iii) An allowance for other fishing-related mortality of 35 tonnes; and
 - iv) A TACC of 710 tonnes.

- c) **Agrees** to set a TAC of 960 tonnes for KAH 3 and within that TAC set:
 - i) A customary allowance of 150 tonnes;
 - ii) A recreational allowance of 300 tonnes;
 - iii) An allowance for other fishing-related mortality of 20 tonnes; and
 - iv) A TACC of 490 tonnes.

- d) **Agrees** to set a TAC of 18 tonnes for KAH 4 and within that TAC set:
 - i) A customary allowance of 3 tonnes;
 - ii) A recreational allowance of 5 tonnes;
 - iii) An allowance for other fishing-related mortality of 0 tonne; and
 - iv) A TACC of 10 tonnes.

- e) **Agrees** to set a TAC of 1 210 tonnes for KAH 8 and within that TAC set:
 - i) A customary allowance of 190 tonnes;
 - ii) A recreational allowance of 380 tonnes;
 - iii) An allowance for other fishing-related mortality of 5 tonnes; and
 - iv) A TACC of 635 tonnes.

- f) **Agrees** to set a TAC of 18 tonnes for KAH 10 and within that TAC set:
 - i) A customary allowance of 3 tonnes;
 - ii) A recreational allowance of 5 tonnes;
 - iii) An allowance for other fishing-related mortality of 0 tonne; and
 - iv) A TACC of 10 tonnes.

- g) **Agrees** to set an annual deemed value for kahawai of:

EITHER

i) \$0.32 /kg;

OR

ii) \$0.86 / kg.

- h) **Agrees** that differential deemed values apply
- i) **Agrees** to amend the Fisheries (Reporting) Regulations 2001 to outline the codes to be used by fishers when completing their statutory catch returns
- j) **Notes** that once kahawai becomes subject to the QMS fishing permit conditions applying purse seining catch limits and vessel restrictions on the taking of kahawai will no longer be applicable. Accordingly, the chief executive will need to revoke these fishing permit conditions.

ANNEX ONE

Removing redundant fishing permit conditions

- 67 It is proposed to amend the fishing permits of some permit holders to remove the schedule imposing purse seine catch limits for FMAs 1 and 9 combined, FMA 2 and FMAs 3-8.

Background

- 68 Since 1990-91 commercial catch limits have applied to kahawai, with specific limits pertaining to purse seining. The current purse seine catch limit is 1 200 tonnes for FMA 1 and FMA 9 combined, 851 tonnes for FMA 2, and 1 500 tonnes for FMAs 3-8. These catch limits are fished competitively. MFish monitors catches and closes each fishery if and when it is likely the catch limit has been reached.

Problem definition

- 69 The retention of purse seine catch limits under the QMS does not contribute to the sustainability of the stock, and would result in an unnecessary constraint on harvesting.

Preliminary consultation

- 70 There is a consensus among stakeholders that the long term sustainability of the fishery is the key issue and that management changes are overdue.

Options

Non-regulatory measures

- 71 There are no non-regulatory alternatives to revoking the purse seine catch limits.

Regulatory Measures

- 72 Revoking the fishing permit conditions removes a restriction that is no longer necessary under the QMS.

Costs and benefits of the proposal

- 73 Revoking the fishing permit conditions removes the requirement to enforce purse seine catch limits, and will result in improved harvest efficiency for commercial fishers.

- 74 There are no costs associated with revoking this regulation.

Administrative implications

- 75 There are no administrative implications associated with revoking these fishing permit conditions.

Conclusion

- 76 The retention of purse seine catch limits under the QMS for the kahawai fishery does not contribute to the sustainability of the stock, and unnecessarily restricts the efficient harvest of kahawai. The proposed revocation of the redundant permit conditions will result in benefits, but no costs.

Recommendation

- 77 It is proposed to amend the fishing permits of some permit holders to remove the schedule imposing purse seine catch limits for KAH 1 and 9 combined, FMA 2 and FMA 3.

ANNEX TWO

Species Information

Species biology

- 78 Kahawai (*Arripis trutta*) occurs throughout New Zealand, the Kermadec and Chatham Islands as far south as Foveaux Strait. They are most abundant around the North Island and northern South Island. *A. xylabion* (northern kahawai), although having a longer tail fin, can be difficult to distinguish from *A. trutta*. This species is commonly found at the Kermadec Islands and although rare around mainland New Zealand, is found in northern latitudes. *A. trutta* and *A. xylabion* is included in the QMS as a species assemblage.
- 79 Kahawai live in a variety of habitats, ranging from tidal intrusions into rivers, estuaries and coastal embayments, thought to open waters many miles offshore. Kahawai are most often found in surface schools of similarly sized fish often in association with schools of jack mackerels, blue mackerel and trevally. Schools of kahawai typically contain between 10-40 tonnes of fish.
- 80 Adult kahawai feed mainly on small pelagic fishes such as anchovies, pilchards and yellow-eyed mullet, but also on pelagic crustaceans, especially krill. Benthic species such as crabs and polychaetes are also eaten on occasion, especially during the summer months, when spawning takes place on the sea floor. Juvenile kahawai feed primarily on copepods.
- 81 Biological information suggests no differences in the growth rate, length weight relationship and onset of maturity between the sexes. The onset of maturity occurs at about 40 cm, which equates to ages of 3-5 years, growth rate is moderate and the maximum-recorded age of kahawai is 26 years. Natural mortality is unlikely to be higher than 0.2 and is likely to be close to this estimate.

Fisheries characteristics

Commercial catch

Catch and landing by QMA

- 82 Reported commercial landing summaries of kahawai for each QMA for the fishing years 1993–94 to 2002–03 are given in Table 3.

Table 3. Reported commercial landings (tonnes) of kahawai by QMA from 1993–94 to 2001-02.

Fishing Year	QMA						Total
	1	2	3	4	8	10	
1993-94	2 023	706	1 820	0	550	0	5 489
1994-95	1 788	1 063	1 014	0	465	<1	4 483
1995-96	1 570	1 072	1 882	0	452	<1	5 207
1996-97	1 884	1 084	1 391	0	389	0	4 965
1997-98	1 358	191	343	<1	572	0	2 674
1998-99	1 566	729	1 078	0	845	<1	4 468
1999-00	1 602	928	484	<1	725	0	3 921
2000-01	1 592	875	403	0	552	0	3 610
2001-02	1 287	832	152	<1	475	0	2 874

- 83 Between 1970-1975 the annual average commercial catch of kahawai was 500 tonnes, much for use as bait. However, fishing practices evolved to utilise this relatively low value commercial species. Since the mid 1970s purse seine vessels fish for skipjack tuna around the North Island over summer. For approximately five months of the year (December to May) the northern fleet, based in Tauranga, targets skipjack tuna (*Katsuwonus pelamis*). When skipjack is no longer available during the winter and spring months the fleet fish for a mix of species including kahawai, jack mackerels (*Trachurus* spp.), and blue mackerel (*Scomber australasicus*). These species are caught 'on demand' as export orders are received (to reduce product storage costs).
- 84 Reported landings of kahawai progressively increased from 1977-1980 stabilising at about 5 000 tonnes between 1980-1985 and increasing thereafter to peak at 9 800 tonnes during 1987-88. Commercial landings of kahawai declined between 1988 and 1998. Landings thereafter have stabilised particularly in KAH 1 and KAH 2.
- 85 For the 1990-91 fishing year, the total commercial catch limit for kahawai was set at 6 500 tonnes, with 4 856 tonnes set aside for purse seining. While national catches decreased during 1991-92, landings in KAH 1 increased and for the 1993-94 the competitive catch limits for purse seining in KAH 1 were reduced from 1 666 tonnes to 1 200 tonnes and purse seine catches reported for KAH 9 were included in this catch limit. Since, despite fluctuating between 1993-94 and 2001-02, purse seine landings reported for KAH 1 have averaged 1 200 tonnes.
- 86 No changes have been made to the purse seine limit of 851 tonnes for KAH 2. The KAH 2 purse seine fishery was closed early each year between 1991-92 and 1995-96. Apart from a reduced purse seine catch of 200 tonnes reported for 1997-98, landings have been consistently around 800 tonnes per year.
- 87 The purse seine catch limit for KAH 3 was reduced to 1 500 tonnes from 1995-96. In the past a southern fleet, based in Nelson, fished exclusively for the mackerels and kahawai when fishing in southern waters. With the transfer of some of these vessels to Tauranga the purse seine catch in KAH 3 has declined from landing 1 500 tonnes in 1995-96 to 150 tonnes in 2001-02.

Catch by fishing method

88 Total kahawai catch (tonnes) by main commercial fishing method for all QMAs combined from 1993-94 to 2002-03 is shown in Table 4.

Table 4: Total kahawai landings (tonnes) by main commercial method for all QMAs combined, for fishing years 1992–93 to 2001–02:

Method	Fishing Year								
	1994	1995	1996	1997	1998	1999	2000	2001	2002
Purse seine	4,089	3,423	3,931	3,563	1,530	3,152	2,753	2,590	1,886
Bottom trawl	118	157	289	317	420	622	561	365	348
Set net	412	372	400	704	354	187	192	261	240
Ring net	117	97	86	44	68	80	100	64	139
Bottom pair trawl	26	18	91	5	2	54	54	36	61
Bottom longline	73	106	83	70	54	79	43	64	56
Danish/Beach seine	181	46	12	9	11	19	18	18	6
Trolling	23	47	57	15	3	2	2	5	6
Unknown	59	44	27	22	23	23	15	19	4
Total	5,098	4,310	4,976	4,749	2,465	4,218	3,738	3,422	2,746

Note: Fishing year '1991' is fishing year 1990–91.

89 Over the past nine years, catches by purse seining account for 75% of reported landings. Despite purse seine catch limits, catches by purse seining have fluctuated largely because of variable fishing effort in KAH 3.

90 Trawling, set netting, ring net, bottom pair trawl, longlining, Danish seine/beach seine, and trolling each accounted for lesser amounts.

91 The annual landings of kahawai taken by trawling remained relatively stable with most of the catches in KAH 8. Set net landings have declined, as a result of set net area closures and changes in fishing patterns.

92 Most of the bottom longline kahawai landings are reported from KAH 1. Landings have remained relatively stable through time.

Targeted catch and bycatch

93 Kahawai commercial landings by nominated target species for all QMAs combined in fishing years 1993-94 to 2001-02 are provided in Table 5

Table 5: Total kahawai landings (tonnes) by nominated target species for all QMAs combined, for fishing years 1992–93 to 2001–02:

Method	Fishing year								
	1994	1995	1996	1997	1998	1999	2000	2001	2002
Kahawai	3 389	3 310	3 689	3 322	1 183	2 151	2 446	2 229	1 564
Jack mackerels	1 127	341	474	270	301	667	262	212	376
Trevally	159	215	262	700	482	461	483	332	319
Blue mackerel	0	1	0	20	83	344	120	174	7
Snapper	157	167	245	152	160	269	132	174	169
Grey mullet	94	100	102	83	106	93	113	130	154
Rig	56	54	41	26	23	20	21	26	18
Flatfish	31	28	38	20	50	22	22	23	24
Total	5 098	4 310	4 976	4 749	2 465	4 218	3 738	3 422	2 746

Note: Fishing year '1994' is fishing year 1993–94.

94 Most kahawai is taken as a target species almost entirely by purse seining apart from a small amount by setnet. Target fisheries for jack mackerels, trevally, snapper and grey mullet, and occasionally blue mackerel, report bycatches of kahawai.

Number of vessels catching and landing

95 The number of vessels reporting landings of kahawai by year is shown in Table 6.

Table 6: Number of landings of kahawai by vessel for fishing years 1993-94 to 2002-03

	Fishing year ^a								
	1994	1995	1996	1997	1998	1999	2000	2001	2002
Vessels	769	729	635	567	518	477	474	497	469

^aFishing year '1993' is fishing year 1993–94

96 The number of vessels reporting landings of kahawai decreased between 1993-94 and 1998-99, however since then the number of vessels reporting kahawai has stabilised. The eight purse seine vessels operating in the fishery always take the bulk of the commercial catch.

Recreational catch

97 Kahawai is one of the fish species most frequently caught by recreational fishers and the recreational catch estimate is 83% of the average commercial catch during the past five years. The size of the recreational fishery is restricted by the application of daily bag limits but there is no minimum legal size for kahawai.

98 A survey of the Value of New Zealand Recreational Fishing undertaken by the South Australian Centre for Economic Studies (SACES) compared kahawai fishers with other recreational fishers. Kahawai anglers are characterised as follows: they go fishing significantly more times per year and are more likely to fish for eating purposes. They are more likely to fish from jetty or land platforms and are slightly more likely to catch and keep additional fish. They have a lower average fishing expenditure, have a higher male participation and are more likely to be a member of a fishing club.

99 Obtaining estimates of the total recreational catch of kahawai is difficult. Recreational fishing surveys are designed to estimate the fish caught and killed by **adult** anglers. Many children target kahawai and kahawai is commonly used for live baiting when targeting other species. The survey estimates are likely to be an underestimate of the actual level of catch (and hence measure of fish available to the sector and the potential mortality associated with fishing). MFish considers that it is unlikely that survey estimates include all fish caught and landed, used as bait or released by the recreational sector. Since 1991 there have been four telephone and diary surveys conducted to estimate national landings by recreational fishers. Survey estimates for 1992-94, 1996 and 1999-00 are reported below. Preliminary results from the national survey undertaken in 2000-01 have been provided for KAH 2 and KAH 3 as the 1999-00 estimates are likely to be biased by a pool of diarists in those fishstocks that reported fishing much more extensively than any other fishers.

Table 7. Recreational landings of kahawai (number of fish and tonnes greenweight) by QMA for 1991–94, 1996, and 1999-2000.

Year	1991-1994		1996		1999-2000	
	Number	Tonnes	Number	Tonnes	Number	Tonnes
KAH 1	724 000	980	666 000	960	1 860 000	2 195
KAH 2	190 000	290	142 000	217	492 000	800#
KAH 3	223 000	200	222 000	134	353 000	570#
KAH 4	-	-	-	-	-	-
KAH 8	254 000	330*	199 000	204*	337 000	441*
KAH 10	-	-	-	-	-	-

- no estimate

Based on preliminary results from the 2001 national survey

* estimate pertains to FMA 9 only.

100 A national survey estimated annual recreational landings of kahawai during the 1991-94 period to be 1 800 tonnes. A national survey conducted in 1996 produced an estimate of 1 515 tonnes that was broadly consistent with the earlier estimate. However, the survey conducted in 1999-2000 produced an estimate of kahawai landings of 2 195 tonnes for KAH 1 (compared to 960 tonnes in 1996). There remains some doubt about the estimates from the 1996 and 1999-00 surveys. The uncertainty revolves around the participation rates of recreational fishers used in each survey. Those for 1999-2000 may be too high and those for 1996 may be too low. Assuming a common participation rate for both surveys will have the effect of lowering the 1999-2000 estimate and increasing the 1996 estimate.

101 The average of the two most recent estimates of recreational landings are proposed as the best basis for estimating current recreational utilisation. Because the recreational harvest surveys report on the fishstock codes an arbitrary amount (54 tonnes) was removed from the KAH 3 estimate and added to the KAH 9 estimate to account for area changes in establishing KAH 8.

102 Recreational groups have repeatedly expressed concern about the state of kahawai stocks. High percentages of respondents to readership surveys conducted by fishing magazines in 1989, 1990, 1993 and 1997 felt that the numbers of kahawai available to recreational fishers had declined in the years prior to each survey. In 1992 the Recreational Fishing Council (RFC) carried out a club/individual survey where 188 of 189 responses suggested this decline was at least 50%. In 1997 the RFC carried out a survey of recreational fishers in major fishing magazines. There were 2002 respondents of which 47% felt that kahawai stocks had 'declined significantly' and 32% felt that they had 'declined a little' over the previous five years. Recreational interests have expressed concerns about low kahawai catch rates seen in recreational fisheries. Boat ramp surveys conducted by MFish in 1991 and 1994 indicated that catch rates of kahawai by recreational fishers were <0.2 fish per hour, however, these values included trips targeting other species and therefore may be artificially low.

Customary catch

103 No quantitative estimates of customary fishing for kahawai are available. A substantial level of customary catch could be anticipated. Māori have had an historic interest in kahawai and it is an important food source in some localities. The report from the Fisheries Assessment Plenary notes that Māori have concerns with respect to declines in traditional fisheries.

Regulatory Framework

- 104 The recreational daily bag limit for all areas is 20 kahawai per fisher if the one species is taken, otherwise as a mixed bag of 20. The minimum mesh size for recreational set nets targeting kahawai is 100 mm. There is no minimum legal size for kahawai.
- 105 Since 1990-91 commercial catch limits have applied to kahawai, with specific limits pertaining to purse seining. The current purse seine catch limit is 1 200 tonnes for KAH 1 and KAH 9 combined, 851 tonnes for KAH 2, and 1 500 tonnes for KAH 3 (FMAs 3-8). These catch limits are fished competitively. MFish monitors catches and closes each fishery if and when it is likely to be over caught.
- 106 Trawling and Danish seining have been prohibited within two nautical miles of much of the shoreline of the Bay of Plenty, for much of the Hauraki Gulf, and within one nautical mile of much of the north-western coast of the North Island. The reasons for these closures include protecting juvenile fish that often tend to congregate in near-shore waters, and spatially separating commercial trawl and Danish seine vessels and non-commercial fishers.
- 107 MFish notes that there have been voluntary agreements to restrict the commercial take of kahawai.

Fisheries assessment

- 108 A stock reduction model was used in 1996 to obtain estimates of virgin and current biomasses and MCY for a single nationwide kahawai stock with constant recruitment. A single stock was assumed in the absence of information to suggest separate stocks.
- 109 A number of biological assumptions were used in the model and these are provided below in Table 8. The most sensitive input parameter is the natural mortality of kahawai. If the natural mortality of kahawai is assumed to lie between 0.15 and 0.25 the model estimates MCY ranging between 5 100 and 14 200 tonnes (refer Table 9). However, recent analysis suggests the natural mortality for kahawai is unlikely to be higher than 0.2 and is likely to be close to this estimate. MFish considers a natural mortality of 0.2 for kahawai to be the best available information and accordingly proposes that MCY estimates based on that value be considered best available information.
- 110 The coefficients for relations with both sexes combined are given because no significant difference with sex could be detected.

Table 8: Biological parameters used in the model

Parameter	Symbol	Value
Natural mortality	M	0.2 yr ⁻¹
Age of recruitment	A _r	4 yr
Gradual recruitment	S _r	3 yr
Age at maturity	A _m	5 yr
Gradual maturity	S _m	0 yr
Von Bertalanffy parameters	L _∞	60 cm
	K	0.3 yr ⁻¹
	t ₀	0 yr
Length-weight parameters	a	0.024
	B	2.91
Recruitment steepness	h	0.95
Recruitment variability (biomass cal'n)	σ _R	0
Recruitment variability (yield cal'n)	σ _R	0.6

111 Catch curves derived for purse seine fishing in KAH 2, KAH 3 and KAH 9 during 1991-92 suggested a maximum value for total mortality of 0.31. Therefore, adjusting the maximum fishing mortality in any year so that the average fishing mortality and natural mortality combined was 0.31 probably made the estimates conservative. The average fishing mortality was calculated over the years 1980-92. As mentioned, recent analysis suggests natural mortality for kahawai is unlikely to be higher than 0.2 and is likely to be close to this estimate. Results of the model for various values of M (natural mortality) are provided below.

Table 9 Estimates (tonnes greenweight) of virgin biomass (B₀) and biomass in 1996 (B₁₉₉₆) compared to B_{MSY}. F_{av} is the average fishing mortality between 1980 and 1992. Estimates are calculated for different values of natural mortality (M).

M	F _{av}	B ₀	B _{MSY} /B ₀	B ₁₉₉₆ /B ₀	MCY
0.25	0.063	152 000	13.9%	71.7%	12 600-14 200
0.20	0.112	106 000	16.1%	50.0%	7 600-8 200
0.15	0.162	93 000	17.8%	28.0%	5 100-5 700

112 The above estimates are uncertain and depend on the model assumptions and input data. They may be regarded as conservative estimates as the estimates of total mortality in the model are based on maximum observed values. The catch history is uncertain due to uncertainties in the commercial catch records, and the non-commercial catch history is based on the 1996 survey. Estimates of MCY were calculated for a single national fishstock. $MCY = pB_0$ where p is determined from a method where the biomass does not go below 20% B₀ more than 20% of the time.

113 The base case described for the above parameters provides the basis for the lesser MCY estimate. A sensitivity analysis was undertaken where the non-commercial catch was greater than that based on the 1996 harvest estimate. This has the effect of increasing estimates of B₀, B_{MSY}/B₀, B₁₉₉₆/B₀, and MCY and is the basis for the greater estimate of MCY provided in the range given in Table 9.

114 If the natural mortality of kahawai is assumed to lie between 0.15 and 0.25 the model estimates MCY ranging between 5,100 and 14,200 tonnes (refer Table 9). However, recent analysis suggests the natural mortality for kahawai is unlikely to be higher than 0.2 and is likely to be close to this estimate. MFish considers a natural mortality of 0.2 for kahawai to be the best available information and accordingly proposes that MCY estimates based on that value be

considered best available information. Accordingly, the best estimate of MCY is between 7 600 and 8 200 tonnes.

Table 10: Summary of yield estimates (tonnes greenweight), average reported commercial landings (t) for 1997–02 and recreational harvest (tonnes greenweight) as estimated by the average of the 1996 and 1999-00 harvest surveys.

Fishstock		FMA	MCY	Commercial landings	Recreational landings
KAH 1	Auckland	1		1 481	1 578
KAH 2	Central (East)	2		711	509
KAH 3	South-East, Southland, Sub-Antarctic, and Challenger	3, 4, 5		492	667
KAH 8	Central (West), Auckland (West)	6 & 7 8 & 9		634	354 323
KAH 10	Kermadec Is	10		0	0
Total			7 600-8 200	3 338	2 762

- 115 Combined estimates of recreational catch and reported commercial landings are currently within the range of MCY estimates.
- 116 There are two species of kahawai present in New Zealand waters, kahawai and northern kahawai. This assessment applies only to kahawai and nothing is known about the other species.

Associated fisheries

- 117 Kahawai swim in schools of similar sized fish and often mix with those of other pelagic species such as jack mackerels (*Trachurus spp.*), trevally, blue mackerel and kingfish. They are associated with pelagic prey species such as juvenile jack mackerels, pilchards, anchovies, sprats, yellow-eyed mullet, whitebait and pelagic crustaceans such as krill.
- 118 Kahawai are themselves predated by other species such as kingfish, tunas and billfish and might be an important factor in the seasonal availability of these species.

Environmental Issues

- 119 Kahawai, as predators, form an important ecological relationship with its prey, some seabirds, and possibly with some marine mammals. Kahawai circle and herd schools of prey when feeding and in doing so make available the prey species to other predatory species. There is no information on whether current kahawai fishing activities are detrimental to the long-term viability of any other species.
- 120 Juvenile kahawai may suffer from habitat degradation in estuarine areas.
- 121 Within KAH 3 the kahawai purse seine fleet has voluntarily agreed not to fish in a number of nearshore areas around Tasman and Golden Bays, the Marlborough Sounds, Cloudy Bay, and Kaikoura since the 1991–92 fishing year. The main purpose of these

agreements is to minimise both local depletion of schools of kahawai found inshore, and catches of juveniles. Similar areas outside KAH 3 have not been identified. There are no other known areas where biodiversity or habitats of significance to fisheries management are likely to be adversely affected by fishing for kahawai.

- 122 Kahawai is taken as a bycatch in trawl fisheries. The nature of trawling is that this method has an affect on the physical structure of the substrate and the benthic community structure. Most of the trawling where kahawai is taken as a bycatch is likely to occur in long-established existing trawl grounds where it is likely the original benthic community will have been modified. MFish does not anticipate that introducing kahawai into the QMS will result in new areas being trawled.

Current and Future Research

- 123 Current research has the objective of monitoring the status of the stock by surveying the length and age structure of the recreational catch over time.
- 124 The direct effects of purse seine fishing for kahawai on the environment has not been studied but are likely to be relatively minor. Research on the interrelationships between kahawai and other elements of the aquatic environment has been identified as an area for future consideration, however, this is a complex area of study and it is unlikely to be undertaken in the foreseeable future.
- 125 As mentioned, obtaining reliable estimates of recreational catch for kahawai has proved difficult. Further work to estimate, and to differentiate, recreational catches and landings are required.

Social, Cultural, and Economic Factors

- 126 The results of the SACES survey produced estimates of the value of the recreational fishery for kahawai based on non-market estimation techniques (contingent valuation to determine the willingness of a fisher to pay to catch a kahawai). These results were used to estimate the value of the recreational fishery based on the 1996 estimate of recreational catch of 1 515 tonnes.
- 127 The results estimate a total recreational expenditure of \$158 million in 1996. It is important to note that total expenditure is not a measure of the net benefit of the fishery and cannot be directly compared to the value of kahawai taken commercially. Also of note is the fact that estimates of expenditure and value are based on what is likely to be an under-estimate of current recreational landings.
- 128 MFish considers that the best comparative measure of recreational value is determined from the marginal willingness to pay (the change in willingness to pay with respect to a unit change in the amount of fish caught and kept). Using the estimates provided by SACES of a marginal willingness to pay of \$2 800 per tonne and capitalising this amount at rates of 5% and 10% provides a range of values from \$28 000 to \$56 000 per tonne.
- 129 Commercially caught kahawai is a relatively low value species although some is sold as a popular smoked product. Port price was \$0.44 per kilogram greenweight during 2001-02. This price is comparable with that received for QMS species such as blue mackerel (\$0.30) and trevally (\$0.67-\$1.27). In order to determine possible future quota value of kahawai MFish has assessed two comparable QMS species, blue mackerel and trevally.

While the fisheries differ in scale and characteristics, the port prices of these three species are comparable. Like kahawai, blue mackerel and trevally are taken by purse seine. Like kahawai some trevally is smoked and both species are popular in this processed form on the domestic market. The average traded price for these species in 2001-02 was \$1 700 and \$5 100 respectively per tonne. These average prices suggest a commercial value for kahawai in the range of \$1 700-\$5 100 per tonne, which is approximately one sixteenth to one eleventh of the estimated value of one tonne of kahawai caught by recreational fishers.

- 130 However, there is considerable uncertainty in information used to assess utility in the absence of a market for tradable rights between sectors. This uncertainty relates to ability to compare non-market values (willingness to pay) with market values (price of quota) and the static nature of the value estimate. The estimate of value is valid only for the time the survey was undertaken. Since that time social, cultural and economic values may have changed.