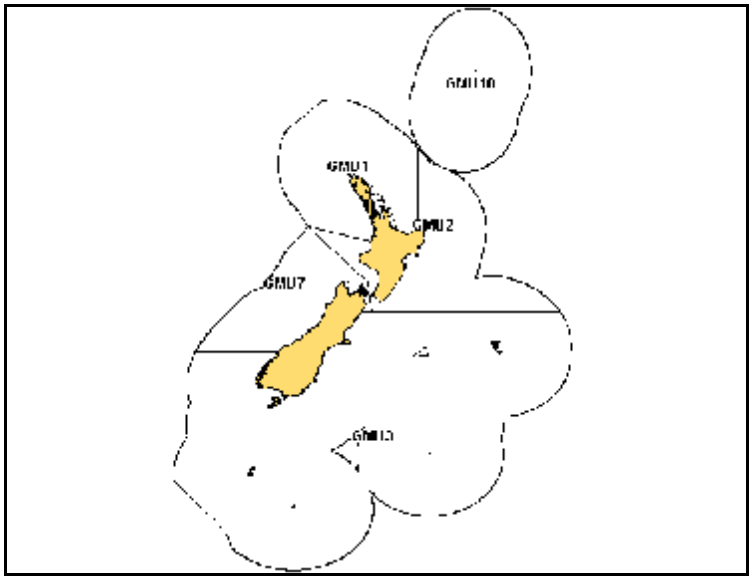
GREY MULLET (GMU 1)

Figure 1: **Location of boundaries of the grey mullet (*Mugil cephalus*) Quota Management Areas**



Key Issues to be Considered

1 The key issues to be considered for the northern grey mullet stock (GMU 1) are as follows:

a) The Minister of Fisheries requested a review of catch limits for the GMU 1 stock, after concerns were raised about the sustainability of current catches and possible local depletion of various harbour stocks;

b) The Ministry of Fisheries (MFish) lacks clear information about where the stock is in relation to the level that would produce the maximum sustainable yield (MSY);

c) Catch-per-unit-effort indices indicate a decline in the relative abundance of the west coast substock (ie, GMU 1-west) where most (~75%) grey mullet have been caught in recent years. The index is generally stable for the east coast substock (ie, GMU 1-east);

d) Since introduction to the Quota Management System (QMS) in 1986, commercial catches have been below the current total allowable commercial catch (TACC) of 925 tonnes;

e) Proposed total allowable catch (TAC) options are presented that reduce the total removals from the GMU 1 stock by 5, 10 or 15 %;

f) Within each TAC option, an allowance for other sources of fishing-related mortality is proposed to be set for the first time;

g) Two approaches are proposed for setting the recreational allowance – a proportional reduction in line with the reduction to the TACC, and secondly a non-proportional approach where preference is given to the recreational sector based on their use and value of the resource.

List of Management Options

2 The following management measures proposed for GMU 1 for the 2005-06 fishing year are set out in Table 1.

Table 1: The proposed TACs (tonnes), TACCs (tonnes), and allowances (tonnes) for GMU 1 under each option for the 2005-06 fishing year

Option	Approach to setting recreational allowance & TACC	Proposed TAC	Customary allowance	Recreational allowance	Other sources of fishing-related mortality	Proposed TACC
1a	Proportional	1 101	100	90	33	878
1b	Non-proportional	1 101	100	100	33	868
1c	Non-proportional	1 101	150	150	33	768
2a	Proportional	1 043	100	80	31	832
2b	Non-proportional	1 043	100	100	31	812
2c	Non-proportional	1 043	150	150	31	712
3a	Proportional	985	100	70	30	785
3b	Non-proportional	985	100	100	30	755
3c	Non-proportional	985	150	150	30	655

3 The proposal is to vary the existing TAC of 1 125 tonnes, the allowances for non–commercial catch, and the TACC of 925 tonnes for the GMU 1 stock to one of the options listed in Table 1.

4 It is also proposed to set an allowance for other sources of fishing-related mortality for the GMU 1 stock.

Rationale for Management Options

Total Allowable Catch

5 A TAC for a quota management stock needs to be set under s 13 or s 14 of the Fisheries Act 1996 (the Act). MFish is proposing to vary an existing TAC for the GMU 1 stock under s 13 of the Act because the biological characteristics of grey mullet allow MSY to be estimated; a national allocation for New Zealand has not been determined as part of any international agreement, the GMU 1 stock is not managed on a rotational or enhanced basis, nor is the stock comprised of one or more highly migratory species.

Current stock status

6 It is not known whether the size of the stock is at a level that can produce MSY. The biological reference point of maximum constant yield is one way in which MSY can be viewed. An estimate of maximum constant yield for the commercial grey mullet fishery was calculated in 1986 (see Annex One), and revised in April 2005. However, estimates of maximum constant yield based on Method 4 from the Report from the Stock Assessment Plenary are no longer considered reliable, and cannot be used directly to determine a TAC with confidence. Apart from flaws inherent to the method, the necessary assumption of constant abundance also appears to have been violated. As such, estimates of sustainable yield are likely to be over-estimated.

7 Commercial catch has not reached the TACC set for the stock in any year since 1986. The fishery had intensive use before being introduced into the QMS. The stock has been fished down from its virgin state over a century ago, with commercial catches reaching a peak in the early 1980s. The historical use of the commercial fishery suggests the size of the stock has undergone a significant reduction.

8 The gradual decline observed in the catch-per-unit-effort index (1989–90 to 2001–02) for much of the GMU 1 commercial fishery suggests that recent catches on the west coast are unlikely to be sustainable. The observation that catch from the west coast sub-stock may be unsustainable is of consequence to the status of the whole stock. Approximately three–quarters of the commercial catches have been taken from the west coast of the GMU 1 stock in recent times. MFish considers the level of removals from the west coast is likely to reflect the relative distribution of the GMU 1 stock between west and east coasts, although some shifting of fishing effort back to the east coast is likely.

9 Further, a large part of the commercial catch from the west coast is taken from the Kaipara and Manukau Harbours. Both of these areas are showing declines in catch-per-unit-effort. For the remainder of the commercial fishery on the east coast, the catch-per-unit-effort index is relatively stable, although some evidence of a local decline is evident in the Hauraki Gulf over much of the index (see Annex One).

10 Although there is no estimate of sustainable yield available for the GMU 1 stock, MFish considers there is a sustainability risk to the stock. The catch-per-unit-effort indices for the commercial fishery support the view that relative abundance has declined in many parts of the stock. Without sufficient information to make an assessment of the stock in accordance with s 13 of the Act, MFish considers that a more cautious approach to the setting of catch limits is warranted. The available information suggests the present use of the fishery may be exposing the stock to some sustainability risk, and it is reasonable to consider options to reduce this risk.

11 MFish considers it appropriate to propose a range of options that vary the TAC below the level that may be harvested at present as a step to ensuring sustainability in the absence of an estimate of sustainable yield. Adopting one of these options may slow down or halt the observed decline in relative abundance, until further information indicates where the stock size is relative to levels that can produce MSY.

Choice of management approach for varying TAC

12 The 2005 stock assessment for the GMU 1 stock concluded that it was not known whether the GMU 1 stock or the composite biological stocks are above, or below, the level that can produce MSY. Similarly, the research conducted in 1999 proved inconclusive (see Annex One). This research assessed the status of the stock through a modelling approach. More recent research on the GMU 1 stock has not clarified the status of the stock relative to the level that can produce MSY. Consequently, insufficient stock assessment information is available to form the basis of proposed TAC options.

13 MFish considers the present TAC does not accurately reflect recent use of the fishery. Commercial catch is typically lower than the TACC. Since the beginning of the 1998–99 fishing year, the average level of commercial undercatch was 14.5%, although undercatch was only 5% in the 2003–04 fishing year. Conversely, MFish considers the non–commercial catch may have been underestimated when setting the TAC in 1998–99. The existing TAC also fails to adequately take into account other sources of fishing-related mortality that occur in the GMU 1 stock.

14 In the absence of an estimate of sustainable yield, information on recent use of the fishery together with the catch-per-unit-index helps inform the proposed TAC options. A degree of caution is considered appropriate when proposing TAC options in the absence of more definite information on the status of the stock relative to the level that can produce MSY. Adopting a cautious approach should assist in reducing any sustainability risk to the stock.

15 Three TAC options are proposed for consultation, although the Minster may elect to decide on an alternative option within the range of potential options proposed. Each option is likely to have social, cultural and economic implications. Having regard to these factors is necessary when considering the way in which the size of the stock is moved towards a level that can produce MSY. The three options are:

EITHER

Option 1

a) A TAC that is 5% less than the sum of the existing TAC and an estimate of other sources of fishing-related mortality. The rationale for this option is that it more accurately reflects recent use of the fishery, and there is no definite information to suggest that the size of the stock is below a level that can produce MSY;

OR

Option 2

b) A TAC at 10% less than the sum of the existing TAC and an estimate of other sources of fishing-related mortality. The rationale for this option is that the catch-per-unit-effort index has continued to decline in the western part of the stock, and a reduction of catch from existing levels would reduce the risk of further sustainability concerns;

OR

Option 3

c) A TAC at 15% less than the sum of the existing TAC and an estimate of other sources of fishing-related mortality. This option further reduces the risk of sustainability concerns.

Option 1

16 The existing TAC for the GMU 1 stock is 1 125 tonnes. However, the existing TAC did not, in a quantitative sense, take into account what tonnage of the fishery was lost to 'other sources of fishing-related mortality'. It is important that all sources of fishing-related mortality are included in the TAC. The TAC should reflect the total annual amount that can be taken from a fishery on a sustainable basis over the longer term. Sources of fishery–related loss include mortality of fish that escape during retrieval of fishing gear, high–grading where fish of an undesirable market size are returned illegally to the water, mis-reporting, and poaching. Some of these losses are specific to one sector, but others apply to all sectors.

17 Stock assessments have previously assumed that under-reporting of grey mullet by commercial fishers may have been as high as 20% prior to 1986, and around 10% every year since then. The 10% figure has been used in other inshore fisheries in earlier years, but the basis for a figure of 10% is yet to be demonstrated.

18 The scale of underreporting is likely to be influenced by the opportunities for non-compliance. For the commercial sector, this might reflect:

a) The low level of detection of illegal activity as a result of fishing activities occurring in isolated or enclosed areas (often at night);

b) The use of small mobile vessels, and the range of launching ramps available;

c) The likelihood that catch is landed enmeshed in nets for sorting at a later time; and

d) The likelihood that enmeshed fish fall out of the nets on retrieval, or whether damaged fish may be dumped – this is illegal for most stocks within the QMS.

19 Compliance with reporting obligations may also be affected by the fisher's ability to acquire annual catch entitlement (ACE) to cover his or her catch. This factor may influence the likelihood of dumping activities, taking into account the distribution of quota shares amongst the industry. A few individuals hold a relatively large portion of quota shares, and there are a greater number of fishers with smaller parcels of quota shares for the stock (see Annex One for distribution of quota shares and ACE).

20 MFish has prosecuted several people involved in blackmarket or poaching operations in this fishery over a long period of time. The quantity of grey mullet involved is probably modest in comparison to the available catch under the TAC.

21 MFish considers that the level of offending occurring in the recreational and customary sectors is relatively low. Ghost fishing and stalling of nets, leading to fish wastage, may be issues more likely to be associated with recreational fishers in the GMU 1 stock.

22 MFish recommends setting an allowance for other sources of fishing-related mortality in recognition that the various sources described above. Without specific information on the level of mortality associated with these sources, MFish proposes to derive an

initial estimate at a level approximating 3% of the existing TAC. This equates to 34 tonnes, and brings the overall estimate of removals from the stock to 1 159 tonnes. This assumes that 1 159 tonnes has been taken from the stock, and despite the on-going undercatch of the TACC by the commercial sector.

23 The nominal level of 34 tonnes recognises the likelihood that incidental mortality is likely to be greater for this species than others netted in similar environments (eg, flatfish). Similarly, MFish considers it better to set an allowance for other sources of fishing-related mortality, even if it cannot be precisely quantified, than to have no allowance as at present. This initial figure can be adjusted in the future should further information be received.

24 Under option 1, MFish proposes a TAC for the GMU 1 stock equivalent to a reduction of 5% of the total removals (ie, 1 159 tonnes) from the stock. Accordingly, a TAC of 1 101 tonnes is proposed. This is a slight decrease of 24 tonnes from the existing TAC of 1 125 tonnes.

25 A TAC at this level recognises that other sources of fishing-related mortality contribute to the total removals from the stock. A TAC at this slightly lower level, and having explicitly factored in the other sources of fishing-related mortality for the stock, may provide a better foundation on which sustainability outcomes can be judged in future years.

26 Conversely, the proposed TAC of 1 101 tonnes may not actively address the existing sustainability concerns for the west coast portion of the GMU 1 stock, because recent effort and catch trends for each sector may not alter significantly. There would be relatively few short-term socio-economic impacts associated with this TAC option, because use of the resource would remain largely unchanged. Similarly, there may be little noticeable benefit for the stock over the longer term.

Option 2

27 MFish proposes to use the same basis for estimating the total removals from the GMU 1 stock as outlined in option 1. The sum of the existing TAC and the estimate of other sources of fishing-related mortality (at 3% of the TAC) is 1 159 tonnes.

28 Under option 2, MFish proposes a TAC for the GMU 1 stock equivalent to a reduction of 10% of the total removals (ie, 1 159 tonnes) from the stock. The proposed TAC is intended to better address sustainability issues identified for much of the stock, while minimising the socio-economic impacts. The proposed TAC of 1 043 tonnes is 82 tonnes less than the existing TAC of 1 125 tonnes. The nominal figure of 10% in option 2, and 15% in the subsequent option, provides a reasonable range of options to reduce the overall catch, and therefore reduce sustainability risk to the stock, in light of the information available.

29 A TAC of 1 043 tonnes allows a lower level of potential removals from the stock than at present. Reducing the TAC beneath recent catch levels may assist in slowing the declining trend in catch-per-unit-effort in the western substock, while further serving to stabilise the trend in catch-per-unit-effort in the eastern substock. This assumes that the distribution of fishing effort will remain largely the same over the short to medium term, as it generally has for all sectors in total over recent years.

30 This option places greater weight on sustainability concerns that may be present than under the TAC proposed for option 1. Option 2 should reduce the likelihood that the stock is exposed to a sustainability risk in the near future, while ongoing efforts are made to assess whether the stock is at, above, or below a size that can produce MSY, having regard to the biological characteristics of the stock.

31 There are no apparent environmental conditions known that might affect the rate at which the stock size moves towards MSY. Similarly, because the grey mullet fishery is generally target specific, any interdependent stocks are unlikely to be substantially affected.

32 Socio-economic impacts are likely to be more than that expected with the proposed TAC in option 1, but less than that expected in the proposed TAC for option 3. The impacts are likely to be negative in the short term, but positive in the longer term as more certainty around estimates of MSY is achieved.

Option 3

33 MFish proposes to use the same basis for estimating the total removals from the GMU 1 stock as outlined in option 1. The sum of the TAC and the estimate of other sources of fishing-related mortality (at 3% of the TAC) is 1 159 tonnes.

34 Under option 3, MFish proposes a TAC for the GMU 1 stock equivalent to a reduction of 15% of the total removals (ie, 1 159 tonnes) from the stock. The proposed TAC intends to address sustainability issues identified for much of the stock, although the socio-economic impacts may be of greater consequence. The proposed TAC of 985 tonnes is 140 tonnes lower than the existing TAC of 1 125 tonnes.

35 A TAC of 985 tonnes is less than the estimated quantity of grey mullet removed from the stock at present. Reducing the TAC beneath existing catch levels is more likely than the other options to address the sustainability concerns evident for the majority of the stock. The reduction in catch available at the proposed TAC is more cautious than the approach proposed for the TAC in either option 1 or 2. The proposed TAC in option 3 seeks to address the observed sustainability concerns for the majority of the stock with more certainty.

36 Adopting a more cautious approach to the proposed TAC should reduce the risk that the stock size declines below a level that can produce MSY, or continues to decline below that level. Adopting the option 3 TAC would provide a greater degree of assurance that sustainability risks had been avoided, while ongoing work continues to assess whether the stock is at, above, or below a size that can produce MSY, having regard to the biological characteristics of the stock.

37 Furthermore, if the stock size is below the size that can produce MSY, the rate of rebuild required and the associated TAC required to achieve that, would potentially be less onerous to adopt starting from the proposed TAC under option 3, than either option 1 or 2. The timeframe for improvements in the status of the stock, relative to the size that can produce MSY, is unknown at the proposed TAC of 985 tonnes. Nevertheless, it is possible that any improvements would become evident sooner under option 3.

38 Option 3 focuses more on obtaining sustainability outcomes desired by many fishery interests over a shorter timeframe than the other options. However, there are likely to be some significant short-term socio-economic impacts as a result. Fewer fish will be able to be taken and this may affect different users of the resource in a variety of ways. The effects will depend on fishers' level of commitment and dependence on the resource, and how much they value it as part of their broader social, cultural and economic well-being. Conversely, setting a TAC under option 3 is likely to provide, in comparison to TACs under either option 1 or 2, the most beneficial impact to the stock over the longer term.

Setting Allowances

39 After choosing a TAC option, the Minister is required to make separate decisions on allowances and a TACC for the GMU 1 stock. MFish proposes allowances and TACCs within each of the three TAC options as shown in Table 1.

40 MFish has set out a list of factors that it considers relevant to any allocation decision in the Statutory Considerations and Policy Guidelines section of the Initial Position Paper. In addition, MFish has been guided by judicial decisions that consider the issue of allocation of the TAC. In particular, case law has identified that:

a) All stakeholders' demands for a stock need to be considered;

b) The needs of any particular sector do not need to be fully provided for when specifying an allowance;

c) The existing ratio between commercial and recreational interests can be varied;

d) Where commercial landings are reduced for sustainability reasons, reasonable steps should be taken to avoid the reduction being made less effective because of increased fishing by non-commercial stakeholders; and

e) It is not unreasonable for commercial and recreational fishers to share some of the "pain" from a reduction in the TAC.

41 To help develop advice on kingfish – also a shared fishery – MFish categorised the broad range of issues the Minister could consider into two basic allocations frameworks. Both approaches are consistent with the Act, and are not necessarily mutually exclusive. Detailed information on each approach is contained in the statutory interpretation section of the Initial Position Paper. In summary the broad approaches are as follows:

a) A claims-based approach, where allowances are set on the basis of a consideration of the legitimacy of claims to the resource. Generally these claims are based on some form of present or historical association with the resource, giving rise to expectations on the part of fishers (or classes of fishers) with respect to on-going future involvement.

b) A utility-based approach, where allowances are based on the utility (or level of well being) that would flow from the allowance made to a particular fishing sector. This approach tends to give a higher priority in allowance setting to those sectors that value the resource most. As such it tends to have a focus on future, rather than past, uses and values that sectors have placed on a species or stock.

42 The Minister may adopt elements of both approaches in reaching a decision on allowances. Two options are available for grey mullet:

a) A proportional approach where allowances are reduced proportionally based on existing shares of the TAC; or,

b) A non-proportional approach where preference is given in the allowance to one sector.

43 Grey mullet is a shared resource. Non-commercial removals contribute approximately 18% percent of the existing TAC. Recreational catch makes up approximately 9% of the TAC. MFish generally supports a proportional approach to allocation of shared fisheries on the basis that all stakeholders should contribute to the rebuild of the resource. This position assumes that all sectors are to a lesser or greater degree responsible for the present state of the fishery. Further, it assumes the level of catch reduction achieved from each contributing sector is of some consequence to the overall reduction required. However, the Act allows the Minister broad discretion. A preference may be provided to one sector over another when making a determination on the allowances that should be set before a decision on the TACC.

44 In kingfish and kahawai fisheries, MFish has used relative value information to provide some guidance to allocation decisions. There is no quantitative information on the value recreational fishers place on the harvest of grey mullet that would assist in determining allocation. For the commercial sector, information is available on quota share and ACE value, as well as port price information (see Annex One). This information indicates that the species is generally of a low commercial value.

45 In the absence of quantitative information on value, the Minister could decide to place greater weight on historical information. For example, there may be some reliance on the existing allowances for the stock, which would support a proportional approach to allocation.

46 Alternatively there is a range of other qualitative matters the Minister could consider. In particular, qualitative information on value suggests that grey mullet are valued highly by non-commercial fishers (both customary and recreational). In some Northland communities, grey mullet form an important food source. In addition, non-commercial interests in various parts of the stock have noted difficulties in acquiring a reasonable share of the resource due to perceived unsustainable levels of commercial fishing. Targeting methods (set net) in the area where grey mullet are found (in particular estuaries) are largely species specific which means that there are few other species for non–commercial fishers to target when there is reduced abundance of grey mullet.

47 MFish note that this information is anecdotal and there is no quantifiable information to support this assertion. However, there is some evidence, based on national recreational diary surveys to suggest that the recreational catch exceeds the current allowance of 100 tonnes. This means that the allowance may not be fully meeting the needs of the recreational sector. The Minister will need to decide whether to fully meet those needs, and the socio-economic impacts of the decision taken in the sectors involved.

48 There is an ongoing obligation under the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992 to give recognition to the use and management practices of Maori in the exercise of non-commercial fishing rights. In view of the obligations

under the Settlement Act, and the requirement to act consistently with that Act when making decisions under the Fisheries Act, MFish proposes that customary harvest allowances for the GMU 1 stock should not be reduced from their present level of 100 tonnes when a proportional approach to setting allowances is applied. The exercise of fishing rights in accordance with traditional customs is seen as the most important element of non-commercial fishing rights for Maori. Accordingly, in the allowance option where a proportional reduction is applied, the proportional reduction required from the non-commercial sector (to balance that of the commercial sector), will be borne solely by the recreational sector.

49 The allowances section outlines the two broad approaches of proportional or non–proportional reductions to the recreational and commercial sectors, following the consideration of allowances for other sources of fishing-related mortality and customary Maori interests. MFish notes that the options outlined essentially form a range from least impact to greatest impact, particularly for the recreational and commercial sectors. The Minister is free to choose an alternative combination of allowances and TACC from the range of options presented.

Making allowances for other sources of fishing-related mortality

50 For a TAC set under option 1, MFish proposes an allowance of 33 tonnes for other sources of fishing-related mortality. This allowance is a nominal level, approximating 3% of the proposed TAC of 1 101 tonnes.

51 For a TAC set under option 2, MFish proposes an allowance of 31 tonnes for other sources of fishing-related mortality. This equates to a nominal level approximating 3% of the proposed TAC of 1 043 tonnes.

52 For a TAC set under option 3, MFish proposes an allowance of 30 tonnes for other sources of fishing-related mortality. This equates to a nominal level approximating 3% of the proposed TAC of 985 tonnes.

Making an allowance for Maori customary fishing interests

53 There are no estimates of customary take of grey mullet in the GMU 1 stock, but the species are known to be of importance to the customary practices of Maori (see Annex One for details), particularly in northern New Zealand where tikanga or customs are still practiced in rural areas. The species is found in habitats adjacent to many marae, and Maori tikanga is still observed in many of the communities within the stock boundary. More Maori people live in the upper North Island than anywhere else in New Zealand. Many rural communities in Northland have a high percentage of Maori people, and a strong bond to their customary practices. Customary catches have been assumed to approximate recreational catches, given the importance of the species for customary Maori activities.

54 As noted in the earlier section outlining the general considerations for setting allowances, MFish has not proportionally reduced the customary Maori allowance for options 1a, 2a and 3a presented. The ‘a’ options (1a, 2a, and 3a) otherwise represent the proportional approach to the setting of an allowance for the recreational sector and the TACC. The existing customary Maori allowance is retained for these options at 100 tonnes. The reduction that would have been required from the customary Maori

sector in the 'a' options is borne by the recreational sector. Retention of the customary Maori allowance at 100 tonnes, when the catch available the recreational and commercial sectors are proposed to be proportionally reduced, recognises that grey mullet is considered of high importance to Maori, and still contributes to the exercise of customary practices in many rural parts of the GMU 1 stock.

55 The non-proportional approach to the setting of allowances and the TACC is presented in options suffixed with 'b' or 'c'. Under the 'b' and 'c' options, the customary Maori allowance proposed is equivalent to the proposed recreational allowance. Option 'b' maintains the customary Maori allowance at its existing level of 100 tonnes, whereas option 'c' increases the proposed allowance to 150 tonnes.

56 An option of increasing the customary Maori allowance is provided because the existing allowance may be an underestimate. The existing allowance was first set in 1998–99, based on the recreational survey information held at that time. MFish does not believe that customary Maori catch of grey mullet has markedly increased since 1998–99. However, MFish considers it appropriate to better reflect the more probable level of customary catch, while not necessarily fully satisfying it, under the reduced TAC options proposed. Increasing the customary Maori allowance to 150 tonnes is more likely to be within the range of mid-point values estimating recreational catch.

57 MFish considers it prudent to reassess the customary Maori allowance in future years when better information on the nature and extent of recreational harvest of grey mullet is available, in addition to customary catch information collected under the Fisheries (Kaimoana Customary Fishing) Regulations 1998.

Making an allowance for recreational interests

58 MFish considers that the recreational harvest of the GMU 1 stock is more likely to be in the order of 150 tonnes than 100 tonnes, as provided by the existing allowance. As previously stated, the Minister needs to consider whether to partially or fully satisfy the needs of recreational interests. In considering alternatives, the Minister would need to weight the relative importance of the resource to each sector, and consider the socio-economic impact of adopting any particular option. MFish have provided three options for managing this issue, including:

a) A proportional approach where the existing allowance for recreational interests is reduced;

b) A non-proportional approach that maintains the existing allowance for recreational interests, and therefore partially satisfy the needs of recreational interests;

c) A non-proportional approach that increases the existing allowance for recreational interests, and therefore satisfies the needs of recreational interests based on the best available information.

Recreational allowance for a TAC set under option 1

59 Three options for setting the recreational allowance under the option 1 TAC of 1 101 tonnes are presented. Under option 1a, a proportional approach to the existing recreational allowance is applied, having considered the allowance required for other sources of fishing related mortality (3% of proposed TAC), and the maintenance of

the customary Maori allowance at 100 tonnes. The resulting proposed allowance for recreational interests is 90 tonnes.

60 A proportional reduction in the allowance for recreational interests is a valid option to consider. This recognises that commercial fishers would no longer have the flexibility to increase their catch to the level of the existing TACC of 925 tonnes. Similarly, while commercial interest as a whole have not fished to the existing TACC level at any time in the past, there may be some individuals who have fully used their quota shares in any one year.

61 Under the non-proportional approach to the setting of the recreational allowance, option 1b looks to retain the existing allowance at 100 tonnes, and option 1c looks to increase the allowance to 150 tonnes.

62 Recreational fishing surveys in 1992–94, 1996, 1999–00, and 2000–01 provide estimates of the recreational harvest of grey mullet in the GMU 1 stock (see Annex One). There is a reasonable amount of uncertainty associated with these estimates. The estimate from the 2000–01 survey, at a mid-point of 388 tonnes, is much higher than the estimates (mid-points of 100 and 150 tonnes) used for the setting of the 100 tonne allowance in 1998–99. However, the estimate of 388 tonnes is unlikely to be realistic. This would be at a level approaching half of the commercial catch. MFish does not consider that the level of effort or catch made in the recreational sector is comparable to commercial activity for this stock.

63 For option 1c, MFish considers that an allowance of 150 tonnes is more likely to better reflect the actual level of recreational catch in recent years. Earlier estimates of recreational catch in the 1990s were likely to have been underestimated, as well as being unreliable. The latest estimate of 388 tonnes is considered implausibly high. A figure of 150 tonnes may sit better within the range of possible estimates of recreational catch, as derived from survey information.

64 It is possible that a recreational allowance based on recent estimates of recreational catch could be retained (ie, 100 tonnes for option 1b), or increased (ie 150 tonnes for option 1c) without a significant or unreasonable socio-economic impact on the proposed TACC, where this is consequentially reduced. The commercial sector has undercaught the TACC by an average 14.5% since 1998–99, other than the most recently completed fishing year, when there was only a 5% undercatch.

65 However, given the uncertainties in the estimates of recreational catch, it may similarly be appropriate to adopt a recreational allowance of either 90 tonnes under option 1a, or 100 tonnes under option 1b. MFish does not consider that additional management measures would need to be implemented to ensure that recreational catch was kept within a reduced allowance of 90 tonnes. The best approach for future management would be to better gauge the recreational use of the GMU 1 stock. Estimates of recreational catch need to be improved, such that the recreational allowance is set with more certainty.

Recreational allowance for a TAC set under option 2

66 MFish proposes to make a recreational allowance of 80 tonnes for option 2a (proportional approach), or either a 100 or 150 tonnes recreational allowance (non-

proportional approach) for options 2b and 2c respectively. The same assessment of recreational catch information outlined in the preceding section applies.

67 MFish notes the non-proportional approach to maintaining the allowance at its existing level (ie, option 2b) would reflect the desire by various recreational interests to see their interests in the stock at least maintained at recent levels, even though some reduction in overall removals from the stock is considered desirable in the short to medium term. Adopting the allowance at 100 tonnes (option 2b) may nonetheless reflect a reduction on recent recreational catch.

68 MFish does not consider that other management measures need to be adopted to ensure that recreational catch is constrained to the adopted allowance, in the event that the tonnages proposed in options 2a or 2b are less than actual recreational catch. The potential benefits of adopting other management measures are not outweighed by the significant costs that would be incurred.

69 Average recreational catch for an individual is likely to be more a function of net length than the fishing experience or control of the individual, because of their schooling behaviour. Grey mullet were not introduced into the mixed finfish bag limit of 20 fish for this reason. Changes to gear specifications would take some time to implement, given existing net supplies. Existing nets may not be able to be used in other inter-related fisheries. Application of such measures may only lead to increases in other sources of fishing-related mortality for the GMU 1 stock, and the need for increased compliance activity. MFish does not have the compliance capacity to both educate and enforce any additional measures required at short notice.

70 In addition, the quantity of fish involved may only be in the order of no more than 70 tonnes (the difference between the proposed allowance of 80 and 150 tonnes) – being approximately 6% of the current TAC. Changing the rules applicable to the recreational sector in the short term would cause considerable disruption. MFish does not consider that such a disruption would be warranted given the uncertainties associated with the recreational catch estimates. Achieving more reliable estimates of recreational catch would be valuable when considering alternative management options for the recreational sector. Further, MFish considers it prudent to reassess the recreational allowance in future years, when better information on the nature and extent of recreational harvest of grey mullet is available.

Recreational allowance for a TAC set under option 3

71 MFish proposes to make an allowance of 70 tonnes for option 3a (proportional approach) or either a 100 or 150 tonnes recreational allowance (non-proportional approach) for options 3b or 3c. The same assessment of recreational catch information outlined in the section discussing allowance options for a proposed TAC set under option 1 applies.

72 MFish notes the non-proportional approach to maintaining the allowance at its existing level (ie, option 3b) would reflect the desire by various recreational interests to see their interests in the stock at least maintained at recent levels, even though some reduction in overall removals from the stock is considered desirable in the short to medium term. Adopting the allowance at 100 tonnes (option 3b) may nonetheless reflect a reduction on recent recreational catch.

73 MFish does not consider that other management measures need to be adopted to ensure that recreational catch is constrained to the adopted allowance, in the event that the tonnages proposed in options 3a or 3b are less than actual recreational catch. This is for the same reasons as noted in the preceding section discussing recreational allowances proposed under option 2. Other than the uncertainties in the estimates of recreational catch (which should be addressed), there would be a number of practical difficulties associated with implementation of other controls.

Total Allowable Commercial catch

74 The commercial sector has taken a significant portion of the available catch since the early 1980s, and has continued to experience relatively easy access to the fishery. This is because commercial catch limits implemented since 1986 have been largely above the level of commercial catch. Accordingly, the sustainability and utilisation benefits that can be derived from the QMS have yet to be fully realised for this stock.

75 The reduction of the commercial catch limit from 1 006 tonnes to a TACC of 925 tonnes in 1998–99 had no noticeable effect on the commercial fishery. Subsequent commercial catch, port price and market price for quota shares/ACE do not appear to have been affected by the TACC reduction made (see Annex One).

76 The average commercial catch taken from the GMU 1 stock for the 14 consecutive fishing years 1990–91 – 2003–04 is 798 tonnes (from Table 2 in Annex One). Since the 1998–99 fishing year, the commercial catch has been on average 14.5% less than the TACC. The commercial catch reached 95% of the TACC in the 2003–04 fishing year.

77 MFish observes that the proposed TACC options will have varying degrees of potential economic impact that are difficult to anticipate. These are likely to be of consequence for options that vary the level of the TACC below recent levels of commercial catch (ie, mainly elements of options 2 and 3). Given the fact that commercial fishers have not caught up to the TACC, it is conceivable that the economic impact of the proposed TACC for several of the options might not be significant.

78 The impact of a TACC reduction is moderated by one factor – the Crown holds quota shares for the GMU 1 stock that generate about 19.7 tonnes of ACE. This figure equates to 2% of the existing TACC of 925 tonnes. Legislation provides that in the event of a TACC reduction, any Crown quota shares are divided up and distributed among the other quota holders before the reduction takes effect. The impact of the reduction for quota shareholders will be lessened by the amount that the Crown transfers to those people.

TACC under option 1

79 Under option 1a, a proportional approach is applied, so that the recreational and commercial sectors catches are reduced. The resulting TACC proposed is 878 tonnes – just under the commercial catch made in the 2003-04 fishing year (ie, 882 tonnes), but higher than the average commercial catch experienced over the fourteen year period 1990–91 – 2003–04. MFish does not envisage that commercial fishers will be materially affected by a TACC at this level – some 47 tonnes below the existing

TACC (or 5%). A TACC at this level may result in some quota shareholders or commercial fishers curtailing or rationalising their existing operations, but it is possible that the change in TACC could be absorbed without noticeable effect.

80 Under option 1b, using the non-proportional approach to the setting of non-commercial allowances, the proposed TACC is 868 tonnes, a difference of 57 tonnes from the existing TACC. A TACC at this level is still higher than the average commercial catch experienced over the fourteen year period between 1990–91 and 2003–04.

81 The TACC proposed for option 1c (ie, 768 tonnes) is below the average commercial catch level noted. Should a TACC be adopted based on option 1c, some commercial rationalisation may be expected. This may improve the manner in which the commercial fishery is used. Possible impacts might include an increase in the price of ACE, as a result of the reduced availability of ACE. However, given the target nature of the fishery, and the fact that grey mullet are generally not taken as a bycatch in other fisheries, commercial overcatch should be avoidable.

82 In general, MFish considers a relatively small 'opportunity cost' is likely for commercial fishers should a TAC be adopted based on options 1a or 1b. Commercial fishers would not be able to catch as much grey mullet as they have in the most recently completed fishing year (ie, 2003–04). However, there is no more detailed information to suggest that the trends in commercial catch will necessarily depart from the average commercial catch experienced for the fourteen year period 1990–91 – 2003–04 in the foreseeable future. Accordingly, the impact of adopting either option 1a or 1b is considered insignificant.

83 Although option 1c is only 30 tonnes below the average commercial catch over the fourteen year period 1990–91 to 2003–04, the impact associated with option 1c is likely to be of some consequence. The impact would be greatest on those commercial fishers who use most or all of their quota shares and associated ACE for the GMU 1 stock in any given fishing year.

TACC under option 2

84 MFish proposes a TACC of 832 tonnes for option 2a (proportional approach) or, either a TACC of 812 or 712 tonnes (non-proportional approach) for options 2b or 2c respectively. Options 2a and 2b are above the average commercial catch experienced over the fourteen year period 1990–91 to 2003–04 (ie, 798 tonnes). Option 2c is 86 tonnes below that level.

85 A reduction in the TACC for options 2a, 2b, and 2c will mean an 'opportunity cost' for commercial fishers, who will no longer be able to catch up to the existing TACC. Because the TACC has never been caught, it is probably more meaningful to compare the opportunity cost between the average commercial catch over the fourteen year period 1990–91 to 2003–04 and the proposed TACC, where it is below that level. A simplified expression of the opportunity cost value for option 2c, based on a difference of 86 tonnes and using the 2004 port price of $2.41 per kg, is $207 260.

86 Quota shares are broadly distributed amongst commercial fishers (see Annex One). Commercial fishers have a variable level of dependence on the fishery. Commercial

fishers holding an appropriate portfolio of quota shares are less likely to incur additional transaction costs when attempting to balance catch against ACE. Furthermore, greater emphasis might potentially be placed on improving returns (ie, catch quality), and therefore profitability, for the ACE held. However, commercial fishers taking grey mullet as a bycatch would still need to hold small parcels of ACE, although the quantity involved is small.

87 Adoption of either option 2a, 2b, or 2c is likely to still allow those commercial fishers with a dependence on the fishery to operate profitably, while not unduly affecting the domestic market for smoked fish or bait. The social implications arising from option 2c in particular include the prospect that market prices may rise for smoked fish or bait products, as supply may not be able to meet demand, assuming similar patterns of consumer behaviour. This is particularly the case where the market is almost entirely based around domestic sales, and there may be limited substitutes of similar value. The potential for cost increases may be offset by improvements in catch rates over time and greater operating efficiency.

TACC under option 3

88 MFish proposes a TACC of 785 tonnes for option 3a (proportional approach), or a TACC of 755 or 655 tonnes (non-proportional approach) for options 3b or 3c respectively. Option 3a is just below (13 tonnes) the average commercial catch experienced over the fourteen year period 1990–91 to 2003–04. Options 3b and 3c are 43 and 143 tonnes, respectively, below that level.

89 A reduction in the TACC will mean an 'opportunity cost' for commercial fishers, who will no longer be able to catch up to the current commercial catch limit. Because the TACC has never been caught, it is probably more meaningful to compare the opportunity cost between the average commercial catch over the fourteen year period 1990–91 to 2003–04 and the proposed TACC for the relevant options. The opportunity cost value for option 3a, based on a difference of 13 tonnes and using the 2004 port price of $2.41 per kg is $31 330. The equivalent figures of opportunity cost value for options 3b and 3c, based on a difference of 43 tonnes and 143 tonnes respectively, are $103 630, and $344 630.

90 Adoption of option 3b or 3c is likely to have greater short-term socio-economic implications than does option 2. Efficiency gains that commercial fishers may make in adjusting to the new commercial catch level under option 3b or 3c may not be enough to maintain their individual viability. Many of the operators involved in the grey mullet fishery may not be able to easily diversify into other fisheries, given the need for investment in bigger boats and alternative fishing equipment. Industry members would need to consider whether it was viable to maintain their interest in the commercial fishery. However, there may be greater longer term benefits for those commercial fishers who see improvements in the stock.

91 The reduced supply of grey mullet products onto the domestic market under options 3b or 3c in particular may give rise to a greater emphasis on selling higher value grey mullet products (eg, smoked fish), and less viable returns for bait products. Other less desirable fish species may fill any shortfall as bait products. Should market price increase, returns to the commercial fisher may increase. If catch rates improve over

the medium term, any increased value in the fishery is likely to be reflected in the price paid for quota shares and ACE.

Future Management

Sub-division of stock quota management area

92 As discussed in Annex One, for stock assessment purposes the GMU 1 stock is considered to be made up of two substocks, one on the west coast, and one on the east coast. Assessing each sub-stock and applying catch limits and other relevant management measures to each substock may be more effective to meet the purpose of the Act. In this way, the smaller fishery for grey mullet on the east coast is not unduly compromised by the relative performance of the larger grey mullet fishery on the west coast.

93 It may be possible to apply management measures less bluntly where the stock is better defined. Conversely, a smaller stock may require greater administration for MFish and/or fishery interests. In the future, further work could be directed towards better definition of the stock. This would be a large undertaking, probably taking at least two years to develop and implement. Nonetheless, if such an initiative were considered appropriate for better management of the resource, its value would probably become apparent in the medium term.

94 A potential outcome of such work could be the division of the present quota management area for the GMU 1 stock at North Cape. This location is an existing administrative boundary for management of other fishstocks. This would allow grey mullet issues on the west coast between North Cape and Tïrua Point (south of Kawhia) – which have some commonality – to be addressed independently from east coast issues. Should a plan be developed to sub-divide the existing quota management area, then new TACs, allowances, and other management measures (eg, deemed values) would need to be determined based on the characteristics of the new stocks.

Monitoring of catch and use of deemed values

95 There is a need to better assess the nature and extent of the non-commercial catch, so that there is more certainty with the allowances set. Further surveys to assess recreational catch should assist, particularly where methods used to estimate this use are further refined. In addition, as the Fisheries (Kaimoana Customary Fishing) Regulations 1998 are implemented over the medium term, a better idea of the quantity of grey mullet taken for customary purposes will be possible, independent of the estimate of recreational catch presently used to derive the estimate of customary catch.

96 For the commercial fishery, the use and trading of ACE, and the payment of deemed values when catch entitlements are exceeded, can be monitored (see Annex One). MFish has not proposed to alter the deemed values for the GMU 1 stock as a result of implementing any possible decision to reduce the TACC from its present level as part of the current review. The present annual deemed value of $1.21 is considered sufficiently high to remove any incentive to exceed ACE.

97 Deemed values can be proposed for adjustment in two to three years time in the event that commercial catch exceeds the TACC in the intervening period. A period of two to three years will enable MFish to collect information on the value of ACE trades, and port prices paid to commercial fishers. Collection of this information would assist with calculating any new deemed value proposed. Any future proposal would need to consider whether the existing quota management area for the stock would be retained, or sub-divided over the medium term.

Research activity

98 Should a TAC be adopted based on option 1 (ie, recent catch levels), it is possible that a further review of the TAC may need to be undertaken, perhaps as early as 2007. At that time, MFish may have research results from the catch-per-unit-effort index for the fishing years up to 2005–06. The index will provide an indication of the stock's relative abundance. However, these results would only show whether any downward trend in catch-per-unit-effort had continued in various parts of the stock, and not necessarily whether the trend had changed as a result of management action taken for the beginning of the 2005–06 fishing year.

99 Other research avenues also need to be given greater emphasis in the future (see research section in Annex One). Research initiatives that use catch-per-unit-effort indices, shed sampling to characterise the commercial catch, and net selectivity information to further derive a stock assessment, should provide a means of assessing the status of the stock relative to the biomass that can produce maximum sustainable yield.

Codes of practice

100 Fishery interests have been exploring codes of practice to improve their use of the fishery, and their interrelationship with other fishery interests. Codes of practices could be usefully formalised and implemented where they complement existing management measures and address concerns of a range of fishery interests. To be successful, codes of practices need the support of all participants, and need regular review to ensure that all parties are adhering to any agreed code. Further, the implementation of sustainability measures or other formal management initiatives may have some bearing on the use or currency of codes of practice.

Statutory Considerations

101 In forming the management options, the following statutory considerations have been taken into account:

a) The TAC set under s 13 should be set at the level that can produce MSY, or it should move the stock towards that level. As noted, there is some uncertainty about where the GMU 1 stock is in relation to the level that can produce MSY. There are concerns about the sustainability of recent catch levels, and the potential for higher catch levels if the TACC was fully caught in consecutive years. In addition, non-commercial catch estimates are uncertain. Because of this uncertainty, three options for a TAC have been put forward that should reduce the risk exposure of the stock from a sustainability perspective. All

three options propose to set a TAC at a level beneath the existing TAC, in order to ensure a greater probability of the stock moving towards the level where the MSY can be produced. Further, the TAC includes an estimate of other sources of fishing-related mortality – something that was not previously included.

b) The proposed TAC options have also taken into account the following factors:

   i) No specific *environmental* conditions have been identified that would affect the movement of the stock towards a level that will support the maximum sustainable yield (as discussed in s 13(2)(b)(ii) of the Act).

   ii) The *biological* characteristics of grey mullet have been considered when proposing options for the TAC (as required under s 13(2)(b)(ii) of the Act).

   iii) Section 13(2) notes that, when setting a TAC, the Minister shall have regard to the interdependence of stocks. Most grey mullet is caught in target set net fisheries, along with a range of other bycatch species. A reduced TAC is unlikely to impact on the fishing of other interdependence stocks, as the fishery is reasonably target specific. Grey mullet are not taken in significant quantities in other fisheries.

c) Social and economic consequences are a relevant factor when the Minister considers how a stock should be moved towards or above a level that can produce maximum sustainable yield (s 13(3)). The port price of grey mullet and the markets for quota shares and ACE have been assessed as part of this analysis (see Annex One). The social value placed upon grey mullet has also been considered. The three TAC proposals take into account differing assessments about the social and economic consequences of altering the TAC.

d) Section 9 sets out three environmental principles that must be taken into account when exercising duties, functions, or powers under the Act. The first of those principles (ie, s 9(a)) is that associated or dependent species should be maintained above a level that ensures their long-term viability. Associated or dependent species are any non-harvested species – including seabirds and marine mammals – that are affected by the harvesting of grey mullet.

e) Measures have already been taken within part of the GMU 1 stock to protect Maui's dolphins from accidental entanglement in commercial and amateur set nets. None of the options proposed here is likely to increase current catches of these associated species. MFish, therefore, does not consider that further protection measures would need to be considered as a result of the proposals to adjust catch limits and allowances from the GMU 1 stock.

f) The second environmental principle is that biological diversity of the aquatic environment should be maintained (s 9(b)). Grey mullet are primarily caught in target set net fisheries. The use of set nets can potentially impact on species diversity, because set nets may catch a wide range of inshore species. Because no increase in fishing effort is anticipated, it is not expected that any of the proposed TAC options would have any additional impact on biological diversity.

g) Section 9(c) sets out the third environmental principle to take into account – that habitat of particular significance to fisheries management should be

protected. Many harbour and estuarine areas where grey mullet are targeted are recognised as important habitat for the species.

h) Set netting is unlikely to impact on seabed habitat. However, juveniles of a number of species may be caught in set nets. The minimum mesh size limit is considered to provide some protection for juveniles. The proposals outlined in this paper are not likely to increase the impacts of fishing on habitats of particular significance to fisheries management.

i) Natural variability is a relevant factor to consider when setting or altering a sustainability measure (s 11(1)(c)). Grey mullet populations do not have high levels of natural variability. MFish considers that the variability of grey mullet populations should not alter the proposed approach to varying the TAC.

j) Existing control measures have been considered when making recommendations for any change to measures used to control the GMU 1 fishery (as outlined in s 11(1)(b)). Annex One contains a list of specific controls.

k) No relevant fisheries plan has been approved under s 11(2A)(b) of the Act.

l) As discussed in Annex One, this paper has considered whether there are any relevant conservations services or fisheries services (as outlined in s 11(2A)(a and c)). No suggestion is made to alter any decision about whether such services are required. A research plan for the stock identifies the expected research activities over the short term, and no additional research is planned for the 2005–06 fishing year.

m) Relevant provisions about the coastal marine area are not known to occur in any policy statement or plan under the Resource Management Act 1991, or any management strategy or plan under the Conservation Act 1987 (as outlined in s 11(2)(a) and (b) of the Fisheries Act).

n) As required under s 11(2)(c), MFish has considered how the proposals for GMU 1 meet the requirements of sections 7 and 8 of the Hauraki Gulf Marine Park Act 2000. This Act's objectives are to protect and maintain the natural resources of the Hauraki Gulf as a matter of national importance. MFish considers that reviewing sustainability measures for grey mullet will meet the purpose of the Hauraki Gulf Marine Park Act.

o) The nature of the fishery and the interests of each fishing sector have been considered in proposing the TACC, allowances for recreational and customary interests, and for other sources of fishing-related mortality. There are currently no mätaitai within the GMU 1 stock. Areas have been closed for customary fishing purposes in the GMU 1 stock (most notably at Tinopai in the Kaipara Harbour), but none are currently in place. No restrictions have been placed on recreational fishing in any area within the QMA under s 311 of the Fisheries Act. These factors are relevant considerations under s 21(1)(a and b), 21(4)(i and ii), and 21(5) of the Act.

p) A wide range of international obligations relate to fishing, including use and sustainability of fishstocks; and maintaining biodiversity. When making decisions and interpreting the Act MFish must do so in a manner consistent with New Zealand's international obligations in relation to fishing (s 5(a) and (b)). MFish considers that the management options for the GMU 1

stock are consistent with these international obligations. MFish also considers that the proposed management options for the GMU 1 stock are consistent with the provisions of the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992. There is ongoing work within the area covered by the GMU 1 stock to promote policies that help to recognise customary use and management practices. This paper has assessed the importance of grey mullet fisheries to customary fishers in GMU 1. Further information on this topic from submitters would also be welcomed.

q) The purpose of the Act (as provided in s 8) is to provide for the use of fish stocks, within the bounds of what is sustainable. Because information about recent catches indicates a sustainability concern, MFish has outlined three options to ensure that management of the stock is consistent with the purpose of the Act. The options are based on different assessments about the level of risk associated with a TAC set at different levels. The allowances for commercial, recreational and customary fishers are all intended to provide for use of the grey mullet fishery.

r) Section 10 sets out information principles that are to be taken into account when setting TACs. The best available information on the status of GMU 1 is the revised catch-per-unit-effort analysis that was presented to the MFish convened inshore stock assessment working group on 25 May 2005. The report supplements information in the Report from the Fishery Assessment Plenary, as convened by MFish. These reports cannot directly state whether the GMU 1 stock is at, above or below the level that can support the maximum sustainable yield. There are nonetheless sufficient signals to suggest that the stock, the majority of which is found on the west coast of the North Island, may be exposed to potential sustainability concerns. Such indications suggest that a more cautious approach is warranted to ensure sustainability of the stock, until greater certainty is achieved.

s) The best available source of information on recreational catches is considered to be the surveys of marine recreational fishing carried out since the 1990s. Limitations are acknowledged with the use of these surveys. However, in the absence of other information on recreational catches, the surveys are nonetheless considered the best available information.

Conclusion

102 Fishery interests have held concerns about the status of the GMU 1 stock for several years. There have been concerns about the relative abundance of the species, particularly in west coast harbours and estuarine areas. Much of the concern has been directed towards the impacts of commercial fishing. The fishing industry has always undercaught the commercial catch limits applied to the GMU 1 stock. Relative abundance is acknowledged as a key factor contributing to this undercatch. In addition, some quota holders have elected not to use their ACE for marketing or other reasons. Accordingly, it is likely that the benefits of applying an appropriate catch limit under the QMS to ensure sustainability have yet to be fully realised.

103 The GMU 1 catch limits have only been reviewed once since its introduction into the QMS in 1986. This review in 1998 established a TAC of 1 125 tonnes, allowances

for non–commercial fishing interests (100 tonnes each), and a TACC of 925 tonnes. No allowance for other sources of fishing-related mortality was made.

104 It is not known whether the stock size is at or above a level that can produce MSY. The GMU 1 stock was fished intensively up until introduction to the QMS in 1986, and had been exploited for over a century. Further research undertaken in recent years has indicated that the relative abundance of the west coast sub-stock may be declining, as indicated by trends in catch-per-unit-effort indices for the commercial fishery. The west coast substock comprises approximately 75% of the commercial fishery for the overall stock in recent years. Although this may undergo some change, it is evident that the west coast fishery has been the main area where commercial fishing has occurred. The catch-per-unit-effort index for the east coast substock is relatively stable. A decline in the index for the Hauraki Gulf fishery is evident over the longer term, but the trend in the index had partly recovered by the 2001–02 fishing year.

105 MFish considers that in the absence of information about the relative position of the stock to a level that can produce MSY; the TAC should be set at a level that reduces the risk of further sustainability concerns.

106 Three options for varying the existing TAC have been proposed to address the sustainability concerns for the stock, with the aim of reducing risk of further concerns becoming apparent. The TACs proposed may slow down the decline in the relative abundance of the stock. Reducing the risk exposure of the stock to sustainability concerns is considered appropriate until a better idea is obtained about the size of the stock, relative to the size that will produce maximum sustainable yield.

107 Option 1 proposes to adopt a TAC of 1 101 tonnes, being 5% less than total removals (or potential removals) from the stock. Total removals from the stock (at 1 159 tonnes) are calculated by summing the existing TAC of 1 125 tonnes with an estimate of other sources of fishing mortality (34 tonnes at 3% of existing TAC). Options 2 and 3 seek to vary the TAC to a level 10 and 15% below the total removals from the stock (ie, 1 043 and 985 tonnes respectively). Option 3 potentially has greater socio-economic impacts than the second, yet potentially reduces the risk of an adverse sustainability outcome in a shorter timeframe.

108 In view of the obligations under the Settlement Act, and the requirement to act consistently with that Act when making decisions under the Fisheries Act, MFish proposes that customary Maori harvest allowances for the GMU 1 stock should not be reduced from their present level of 100 tonnes should a proportional approach to setting allowances be applied. In addition, MFish has proposed that a nominal level, approximating 3% of the proposed TAC, should be used as the basis for setting an allowance for other sources of fishing-related mortality. This equates to 33, 31 or 30 tonnes for each of the TAC options.

109 Two alternative approaches are proposed to set an allowance for recreational interests. One approach is to proportionally reduce the recreational allowance from its existing level of 100 tonnes (options 1a, 2a, and 3a). The outcome from this approach is an equivalent contribution from the non-commercial sector and the commercial sector, where the combined catch from these sectors does not exceed the TAC when added to

the other allowances. As a result, the proposed recreational allowance may be reduced to 90, 80, or 70 tonnes, depending on the TAC adopted.

110 The alternative approach is to adopt a non-proportional approach, based on recognition of relative value of grey mullet to the various sectors, and a reassessment of the estimates of recreational catch based on new survey information. Grey mullet is a relatively low value species on a commercial basis. MFish does not have quantitative information on the relative value of grey mullet to the recreational sector. However, MFish is aware that the GMU 1 stock is important to inland and coastal communities as a source of food, particularly in Northland. Options 1b, 2b, and 3b maintain the proposed recreational allowance to 100 tonnes, whereas options 1c, 2c, and 3c increase the allowance to 150 tonnes. A recreational allowance of 150 tonnes is more likely to reflect the annual recreational use of the stock over the last decade.

111 No other management measures are considered necessary at this time to ensure that recreational catch is constrained to reduced levels of use provided by options that proportionally reduce or maintain the existing allowance (ie, options 1a, 1b, 2a or 2b). MFish considers it prudent to await further survey work before reassessing the allowances provided.

112 The proposed TACC for options 1a, 1b, 2a, 2b, although lower than the existing TACC of 925 tonnes, are higher than the average commercial catch experienced over the fourteen year period between 1990–91 to 2003–2004 (ie, 798 tonnes). The majority of quota holders and commercial fishers for the GMU 1 stock may be able to accommodate the reduced catch opportunities within their normal business practices, should either option 1 or 2 be adopted. Some adjustment in quota shareholdings amongst the participants is likely as a consequence of reducing the TACC. A greater level of rationalisation of participants in the fishery may be an outcome should alternative options be adopted for the TACC, although this may only be of consequence for options 2c or 3c.

113 In addition, Crown held quota shares for the GMU 1 stock would be transferred to GMU 1 shareholders before a TACC reduction is given effect. This would moderate the impact of a significantly lower proposed TACC by an equivalent of 19.7 tonnes of ACE. This figure is equivalent to 2% of the existing TACC. Lower TACC options (eg, 3c) are also likely to impact more on consumers and bait suppliers in New Zealand.

114 MFish does not propose to adjust deemed values for the commercial sector should a TACC reduction be made. MFish considers that it would be appropriate to monitor the commercial catch over two to three years, and the relevant economic information, before considering a review of existing deemed values. The target nature of the fishery means that significant overcatch can be avoided.

Preliminary Recommendations

115 MFish proposes that for GMU 1:

EITHER

Option 1a

a) Set a TAC of 1 101 tonnes for GMU 1, and within that TAC set:

i) a customary allowance of 100 tonnes;
ii) a recreational allowance of 90 tonnes;
iii) an allowance of 33 tonnes for other sources of fishing-related mortality; and
iv) a TACC of 878 tonnes.

OR

Option 1b

b) Set a TAC of 1 101 tonnes for GMU 1, and within that TAC set:

i) a customary allowance of 100 tonnes;
ii) a recreational allowance of 100 tonnes;
iii) an allowance of 33 tonnes for other sources of fishing-related mortality; and
iv) a TACC of 868 tonnes.

OR

Option 1c

c) Set a TAC of 1 101 tonnes for GMU 1, and within that TAC set:

i) a customary allowance of 150 tonnes;
ii) a recreational allowance of 150 tonnes;
iii) an allowance of 33 tonnes for other sources of fishing-related mortality; and
iv) a TACC of 768 tonnes.

OR

Option 2a

d) Set a TAC of 1 043 tonnes for GMU 1, and within that TAC set:

i) a customary allowance of 100 tonnes;
ii) a recreational allowance of 80 tonnes;
iii) an allowance of 31 tonnes for other sources of fishing-related mortality; and
iv) a TACC of 832 tonnes.

OR

Option 2b

e) Set a TAC of 1 043 tonnes for GMU 1, and within that TAC set:

i) a customary allowance of 100 tonnes;
ii) a recreational allowance of 100 tonnes;
iii) an allowance of 31 tonnes for other sources of fishing-related mortality; and

iv) a TACC of 812 tonnes.

OR

Option 2c

f) Set a TAC of 1 043 tonnes for GMU 1, and within that TAC set:

i) a customary allowance of 150 tonnes;
ii) a recreational allowance of 150 tonnes;
iii) an allowance of 31 tonnes for other sources of fishing-related mortality; and
iv) a TACC of 712 tonnes.

OR

Option 3a

g) Set a TAC of 985 tonnes for GMU 1, and within that TAC set:

i) a customary allowance of 100 tonnes;
ii) a recreational allowance of 70 tonnes;
iii) an allowance of 30 tonnes for other sources of fishing-related mortality; and
iv) a TACC of 785 tonnes.

OR

Option 3b

h) Set a TAC of 985 tonnes for GMU 1, and within that TAC set:

i) a customary allowance of 100 tonnes;
ii) a recreational allowance of 100 tonnes;
iii) an allowance of 30 tonnes for other sources of fishing-related mortality; and
iv) a TACC of 755 tonnes.

OR

Option 3c

i) Set a TAC of 985 tonnes for GMU 1 and within that TAC set:

i) a customary allowance of 150 tonnes;
ii) a recreational allowance of 150 tonnes;
iii) an allowance of 30 tonnes for other sources of fishing-related mortality; and
iv) a TACC of 655 tonnes.

ANNEX ONE

Fishery Information

Biological Characteristics

116 Grey mullet (*Mugil cephalus*) belong to the family Mugilidae. Grey mullet occur in coastal, estuarine and river systems internationally between latitudes of 42 degrees north and 42 degrees south.

117 Grey mullet live to a maximum age of between 14-17 years, although the commercial fishery is based primarily on five to nine year old fish (fish aged three to 11 have been recorded). Both sexes mature at age three at an average size of 33 cm fork length for males and 35 cm fork length for females. Female grey mullet generally have a faster growth rate than males, and attain larger sizes. Grey mullet reach an average size of 30-40 cm, and reach 60 cm in length in New Zealand.

Natural variability

118 Grey mullet are not known to undergo significant changes in relative abundance from year to year. Despite this general observation, there are indications from catch sampling that periodically a year class may dominate the catch in the fishery. The five-plus year class seems to have been evident in samples taken in 1997–98 and 2003–04 in west coast harbours, although its dominance in the catch may be related to the selectivity of the set net fishing method.

Position in foodchain

119 Adult grey mullet typically feed on diatom algae and small invertebrates that are gulped along with surface scum or with detrital ooze on the seafloor and sifted by fine teeth and gill rakers.

Distribution

120 Grey mullet are mainly found in the Auckland Fishery Management Area, although their range extends south to the northern areas of the South Island. They are most abundant in the northern waters of the Kaipara and Manukau harbours, and the Firth of Thames. Movement patterns of adult grey mullet may be quite variable. Some schools remain in one locality, while others move almost continuously. Tagging work undertaken in the Manukau and lower Waikato River in the 1980s indicate that some fish can move relatively large distances in a relatively short time period. Observations of grey mullet moving 160 kilometres within a few weeks of release were not uncommon.

121 The movement of grey mullet is influenced by the season. During spring and summer sexually mature grey mullet move to the coastal waters for breeding purposes. They are seen in the surf zone off west coast beaches. At other times of the year, grey mullet are often found in estuarine and freshwater habitats. They are found up the Waikato River to the Karapiro Dam.

122 GMU 1 has been divided into two substocks for fisheries stock assessment. These substocks are the west and east coasts on either side of North Cape. Some commercial fishers have previously noted their observations of a 'blue shouldered silver mullet' on the east coast, while the colouration of grey mullet on the west coast is more in line with their common name. The presence of two distinct stocks is therefore possible. Catch-per-unit-effort analyses have been undertaken at the sub-stock level, in addition to the finer scale at the level of a harbour or relatively discrete stretch of coast.

Catch Information

Commercial fishery

123 The commercial fishery for grey mullet dates back to the late 1880s. The fishery is harvested for domestic use, principally for smoked fish and bait products. Grey mullet was also cured and canned up until the 1920s. Commercial catch in the Auckland Fishery Management Area (upper North Island) increased through the 1970s, particularly from the west Auckland coast. The estimated annual commercial catch experienced between 1974 through to 1981 averaged 456 tonnes. Commercial catch since the 1983–84 fishing year is presented in Table 2.

124 An increase in commercial catch of grey mullet became particularly obvious in the early 1980s. Reasons advanced for this increase include:

- The development of an export market (for a range of species) during the 1970s removed the limit of local demand on catches;
- Local demand increased among ethnic groups in the Auckland area;
- The rapid price increase received by commercial fishers;
- The corresponding decline in catches of other species traditionally caught by set net, such as rig, snapper and trevally.

125 During the three fishing years ending 1985–86, commercial fishers reported a decline in the average size of grey mullet, and local depletion in the areas that were traditionally fished. An early assessment of catch-per-unit-effort information from the commercial fishery undertaken in 1990 indicated that the catch rate index noticeably declined in 1979. This occurred when total commercial catch from the Auckland Fishery Management Area exceeded 700 tonnes. Given some limitations with interpretation of the catch-per-unit-effort information available at the time, it was inferred that annual yields in excess of 900 tonnes would represent considerable risk to the fishery. Nevertheless, annual estimated commercial catch exceeded 900 tonnes between 1981 and the 1984–85 fishing year. The commercial catch peaked at approximately 1 200 tonnes in the 1985–86 fishing year.

126 Commercial catch declined over the mid to late 1980s. Commercial fishers attributed declining catches partly to a lack of abundance. Commercial fishers with a greater dependence on the fishery began to travel more widely at this time rather than continue to fish local fisheries.

127 Establishment of a commercial catch limit for the stock was sought to address the sustainability concerns of MAF Fisheries and commercial fishers. Average annual

landings for the fishery (ie, the Auckland Fishery Management Area) in 1981, 1982 and 1983 were used to derive a commercial catch limit on introduction into the QMS. On introduction of the stock into the QMS in October 1986, a commercial catch limit of 900 tonnes was introduced. This represented a 19% reduction from commercial catch levels experienced in 1983.

128 However, the commercial catch limit gradually increased each year to a total of 1 006 tonnes by the 1991–92 fishing year due to successful quota appeals. It remained at this level until the 1998–99 fishing year. Despite this increase in available commercial catch, commercial catch remained relatively constant at approximately 800 tonnes.

129 The Ministry of Fisheries reviewed catch limits for the GMU 1 stock in time for the 1998–99 fishing year. The review came about as a result of a number of factors including:

- Further expressions of concern from fishery interests about the sustainability of the fishery, and the inability to access sufficient grey mullet for marae functions;
- The detection and prosecution of a commercial fisher who failed to report significant landings of grey mullet over an extended period;
- Concerns expressed by non-commercial fishers about a trial of a new beach-seining fishing method for targeting coastal grey mullet by a commercial fisher;
- The commercial catch limit of 1 006 tonnes was greater than the accepted estimate of maximum constant yield for the stock of 825 tonnes, and commercial catches continued to under-catch the commercial catch limit;
- Consideration of new research findings commissioned by the Ministry of Fisheries on catch-per-unit-effort, and an assessment of length and age composition of the two sub-stocks.

130 In August 1998, the Ministry of Fisheries recommended to the Minister of Fisheries a phased reduction in the TACC towards the level of the estimated maximum current yield for the commercial fishery. The Minister set a TACC of 925 tonnes, acknowledging that a further amendment to the TACC may be necessary, subject to the results of current research. There was no corresponding reduction in commercial catch, after the TACC was set at 925 tonnes. The new research findings were inconclusive, so the TAC and TACC were not reviewed in the following fishing year.

131 Further research work was subsequently commissioned. The Kaipara Harbour commercial fishery was characterised in 2003 (Hartill 2004). Further, a standardised catch-per-unit-effort analysis of the GMU 1 commercial fishery was updated and published in April 2005.

132 After the Minister of Fisheries' decision in August 2004 to formally review the status of the GMU 1 stock, a further report was commissioned to review the TACC. The report used updated indices of abundance, as well as re-considering estimates of maximum constant yield using more recent commercial catch information (see subsequent 'Stock Assessment' section). The outcome of the latter work was presented to the Inshore Stock Assessment Working Group in May 2005.

133 Commercial catch has increased in the 2003–04 fishing year. It is now within approximately 5% of the TACC. A similar trend is evident in the first six months of the 2004-05 fishing year, although the main part of the fishing season for this stock has yet to start. The commercial catch reached 588 tonnes for the seven month period up to the end of April 2005.

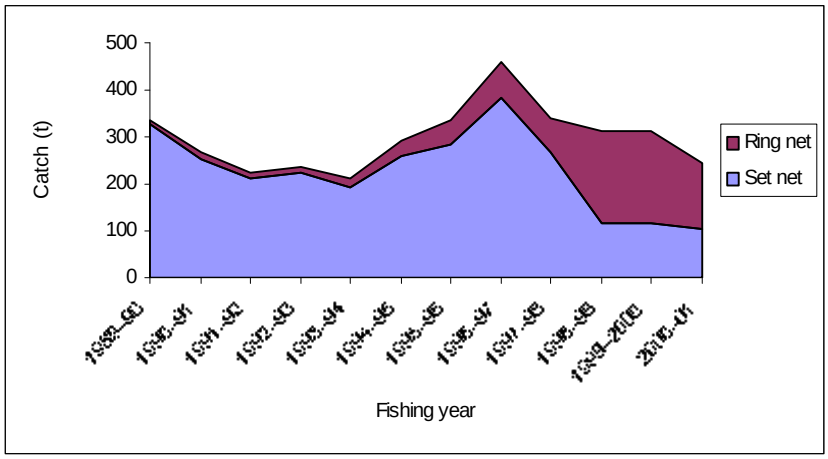
Table 2: Reported landings (t) of grey mullet by fishstock from 1983–84 to 2003–04 and actual TACs (t) for 1986–87 to 2003–04.

Fishstock	GMU 1		GMU 2		GMU 3		GMU 7		GMU 10		Total	
QMA (s)	1 & 9		2 & 8		3, 4, 5 & 6		7		10			
	Landings	TAC	Landings	TAC	Landings	TAC	Landings	TAC	Landings	TAC	Landings	TAC
1983–84*	1142	–	6	–	5	–	7	–	0	–	1160	–
1984–85*	1069	–	5	–	0	–	15	–	0	–	1089	–
1985–86*	881	–	10	–	0	–	10	–	0	–	901	–
1986–87†	595	910	3	20	<1	30	0	20	0	10	598	990
1987–88†	751	941	3	20	0	30	0	20	0	10	754	1021
1988–89†	792	963	3	20	0	30	0	20	0	10	795	1043
1989–90†	907	990	2	20	0	30	4	20	0	10	913	1070
1990–91†	875	994	2	20	1	30	<1	20	0	10	879	1073
1991–92†	848	1006	1	20	2	30	1	20	0	10	852	1086
1992–93†	711	1006	<1	20	<1	30	0	20	0	10	712	1086
1993–94†	743	1006	<1	20	<1	30	0	20	0	10	706	1086
1994–95†	776	1006	0	20	<1	30	10	20	0	10	787	1086
1995–96†	866	1006	0	20	<1	30	<1	20	0	10	866	1086
1996–97†	870	1006	<1	20	1	30	<1	20	0	10	872	1086
1997–98†	730	1006	<1	20	<1	30	<1	20	0	10	730	1086
1998–99†	750	925	<1	20	<1	30	<1	20	0	10	750	1005
1999–00†	749	925	<1	20	0	30	<1	20	0	10	750	1005
2000–01†	797	925	1	20	0	30	<1	20	0	10	798	1005
2001-02†	781	925	2	20	<1	30	<1	20	0	10	784	1005
2002–03†	797	925	1	20	<1	30	0	20	0	10	798	1005
2003–04†	882	925	<1	20	0	30	<1	20	0	10	792	1005

* FSU data., † QMS data.

134 Set netting has traditionally been the main method used to target grey mullet. An increasing proportion of the catch is now taken by ring netting (see Figure 2 as it relates to the Kaipara Harbour). Very little grey mullet is taken as bycatch in other fisheries.

Figure 2. Relative estimated catches of grey mullet from the Kaipara Harbour by set net and ring net.



135 Grey mullet is caught year round, although a seasonal peak in commercial catch usually occurs from July to September.

136 Grey mullet is mostly commercially harvested from the Kaipara and Manukau harbours, the lower Waikato River, east Northland and the Firth of Thames (Figure 3). As fishing effort has gradually reduced in the Kaipara and Manukau harbours over the last decade, more recently there is a slight increase in fishing effort in the lower Waikato and Hauraki Gulf. The level of fishing effort expended by commercial fishers across the stock is presented in Figure 4.

Figure 3: **Recorded trip green weights in each zone (groomed data scaled to annual catch) of grey mullet in GMU 1 from 1989-90 to 2003-04.**

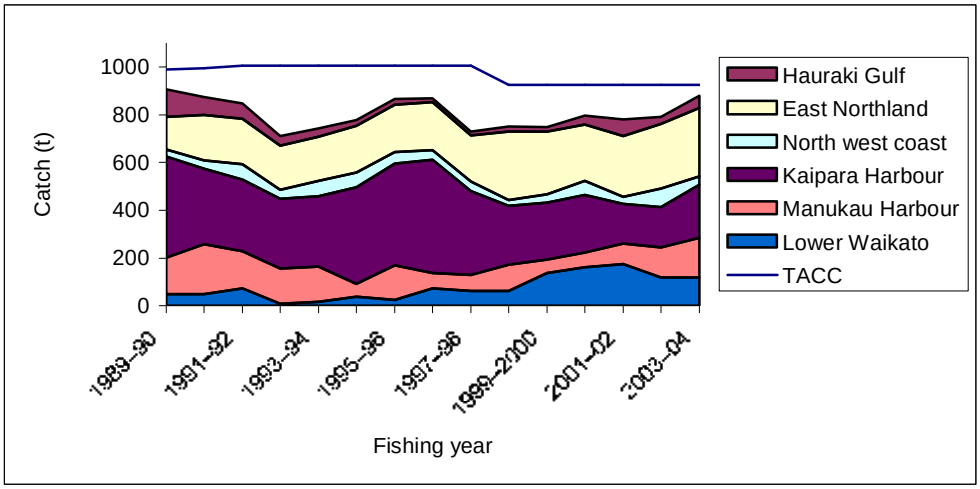
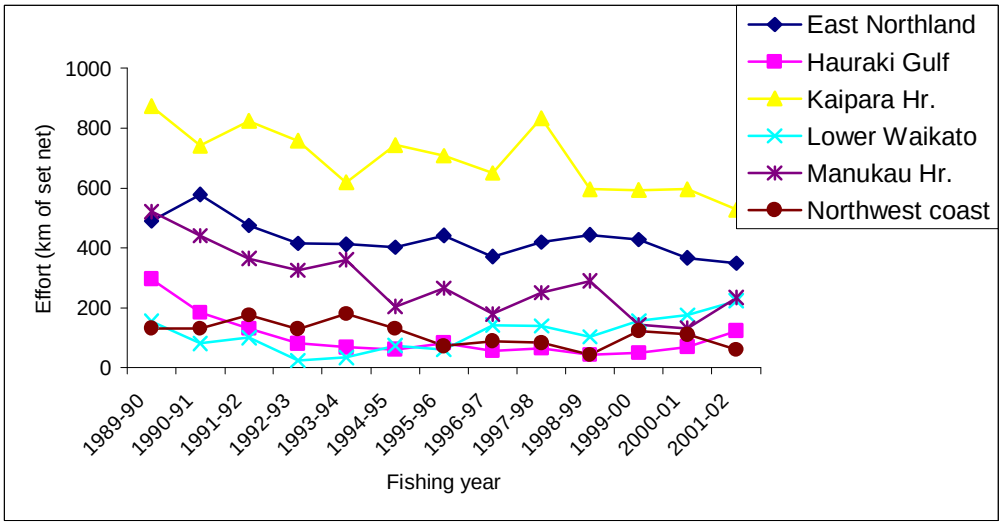


Figure 4. **Effort in the set net target GMU 1 fishery for each zone between 1989–90 and 2001–02.**



Recreational fishery

137 Grey mullet are a popular species for recreational fishers particularly in the relatively sheltered harbour and coastal environments of the Auckland Fishery Management Area. They are taken for smoking, or used as bait. Some limited tagging work undertaken in 1987 indicated that the recreational use of the species in the Manukau Harbour and lower Waikato River was relatively high. Table 3 shows more recent recreational harvest estimates.[1]

Table 3: **Estimated number and weight of grey mullet harvested by recreational fishers in GMU 1. Surveys were carried out in the North region in 1993–94 (Teirney *et al.*, 1997) and nationally in 1996 (Bradford, 1998), 1999-00 (Boyd & Reilly, 2002) and 2000-01 (Boyd, Gowing & Reilly, 2004). Survey harvests are presented as a range to reflect the uncertainty in the estimates.**

Fishstock	Survey	Number	c. v.%	Harvest Range (t)	Point estimate (t)
1993-94	North	170 000	19	90-210	150
1996	National	110 000	25	80-130	106
1999-00	National	110 000	33	68-136	102
2000-01	National (roll over survey)	417 000	58	163-613	388

138 The current allowance for recreational interests is 100 tonnes, based on the 1993–94 and 1996 survey results. This allowance was set for the commencement of the 1998–99 fishing year, when the GMU 1 catch limit was reviewed.

Maori customary fisheries

139 Quantitative information on the current level of Maori customary take is not available. Some Maori representatives have noted their concern that they unable to provide sufficient grey mullet on marae for customary functions such as hui.

140 The current customary allowance of 100 tonnes was set for the commencement of the 1998–99 fishing year.

Illegal catch

141 Quantitative information on the level of illegal catch in the GMU 1 stock is not available at the level of the stock. There have been periodic prosecutions of

[1] In December 2003, technical members of the Recreational Working Group (RWG) examined the methodologies used for the 1996, 1999-00 and 2000-01 surveys. The RWG considered that the 1996 results should not be used as absolute estimates of recreational catch, because the results were considered to be substantially under-estimated. More recently, the 1996 estimates are reported to contain methodological errors and are considered unreliable. Technical members of the RWG have advised more recently that the estimates of recreational catch from the 1999-00 and the 2000-01 surveys may be implausibly high for some important fisheries, and have cautioned against their use.

commercial fishers for failing to report catch. In each annual stock assessment review, annual under-reporting of 20% was assumed for the period before 1986, and 10% thereafter. The 10% figure was commonly assumed for other inshore species, but is largely unfounded.

Other sources of fishing-related mortality

142 Quantitative information on the level of other sources of fishing-related mortality is not available. These sources could include incidental mortality of fish that escape during retrieval of fishing gear, high-grading where fish of an undesirable market size are returned illegally to the water, mis-reporting and poaching.

143 The number of fish that may be subject to high-grading by commercial fishers depends on the fishing methods used and what size fish are taken. As set netting can be quite selective for a particular size range, the level of mortality associated with this factor may be relatively low for both commercial and non-commercial fishers. Recreational fishers are not as likely to be as selective over what catch to retain – because they can use less desirable catch as bait rather than as food.

144 The level of mis-reporting and other illegal catch by commercial fishers has not been assessed sufficiently. However, it is reasonable to consider that, annually, an appreciable quantity is taken and either not recorded or taken outside of the commercial fishing regime, that would warrant inclusion in an estimate of other sources of fishing related mortality.

145 No allowance is currently set for other sources of fishing related mortality and illegal catch.

Stock Assessment Information

Substocks for stock assessment

146 The GMU 1 fishstock is divided into two sub-stocks for stock assessment: GMU 1-east and GMU 1-west. GMU 1-east includes the inshore statistical areas (001-010) off the northeast coast of the North Island. Important fisheries for grey mullet occur around the northeast coast in harbours (statistical areas 002-003) and the Firth of Thames (statistical areas 007). The GMU 1-west sub-stock includes the coastal inshore statistical areas (042-048) off the west coast of the North Island, with locally important fisheries at the Kaipara (statistical area 044) and Manukau Harbours (statistical area 043), and the lower Waikato River (statistical area 042).

Catch-per-unit-effort indices

147 The general trends in the catch-per-unit-effort indices are important. The index is considered to reflect the actual trends in abundance, even though there may be some disparity between the indices in different parts of each substock (eg, the Hauraki Gulf is in decline whereas East Northland is stable in the GMU 1-east substock (Figure 5). Nevertheless, the indices for the majority of the stock, and the majority of the commercial catch within the stock, are showing a declining trend.

148 The declining trend is potentially of more concern because there has been an increase in the use of ring netting, a more efficient method, in recent years. One might expect an artificial increase in the index as a result of an increasing catch rate associated with a more effective fishing method. In any case, the use of the ring net method in the catch-per-unit-effort index does tend to violate the assumption that fishing effort is randomly directed. The resulting risk is that the index lags behind the true level of abundance, such that the relative abundance is a lot less than initially indicated by the index. Consequently, a declining index over several years gives cause for some concern.

149 A declining trend in an index may not necessarily be interpreted as a problem, depending on the level of use of the fishery. The absolute biomass of a relatively unexploited fishery will decline, along with its catch-per-unit-effort index, as fishing activity increases. Over time, the sustainable yield will be maximized. However, the grey mullet fishery was intensively fished in the early to mid 1980s. The commercial catch limit introduced in 1986 (as adjusted over time by quota appeals, and the reduction in 1998–99) has not constrained the commercial use of the fishery to what is considered a sustainable catch level.

150 Accordingly, MFish considers that the declining trend in catch-per-unit-effort for the main part of the GMU 1 stock suggests that further adjustment to the TAC and TACC is warranted. While it is not known if the recent sub-stock catches are sustainable or at levels that will allow the substocks to move toward a size that will support the maximum sustainable yield over the entire stock, it is considered appropriate to reduce the risk of a sustainability concern becoming apparent.

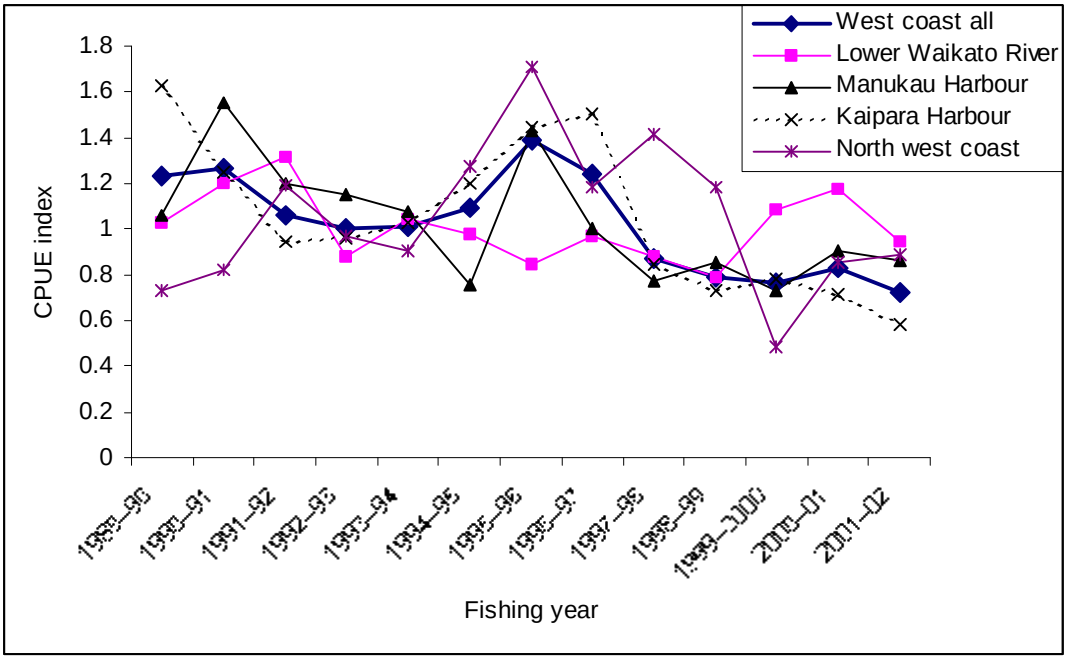
Maximum constant yield estimates

151 A maximum constant yield of 825 tonnes was calculated for the commercial fishery over the entire stock in 1986. The estimate of average yield used in this calculation relied on the fishing years from 1983–84, 1984–85 and 1985–86, however, catch was not stable in these years, as catch was declining from a relatively high level in the lead-up to the stock's introduction into the QMS.

152 The maximum constant yield estimate was revisited in recently reported research (2005). A more recent and longer period of time of commercial catch was used to derive an estimate of average yield (1995–96 through to 2002–03), better reflecting the assumptions associated with calculations of maximum constant yield (Figure 6). The revised estimate of average yield was 790 tonnes and the revised estimate of maximum constant yield for the commercial fishery was calculated as 555 tonnes (revised natural variability factor of 0.7, previously 0.8).

Figure 5. Grey mullet standardised CPUE indices by zones within GMU 1 for fishing years 1989–90 to 2001–02 (from Watson et al. 2005).

a). West coast



b) East coast

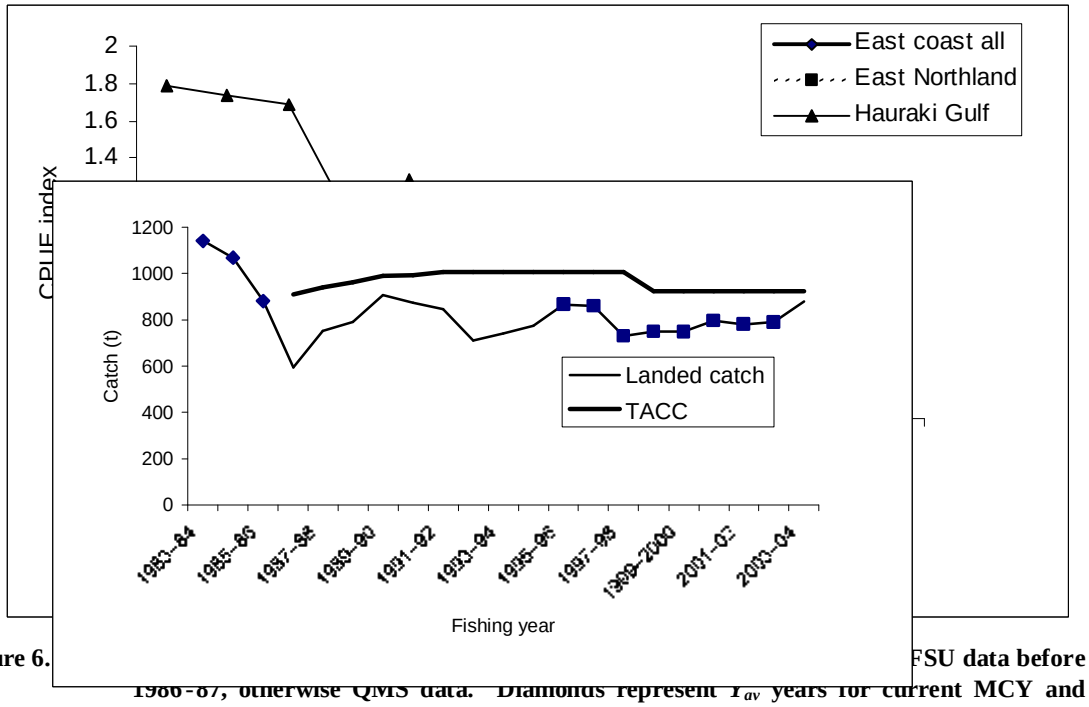


Figure 6. FSU data before 1986–87, otherwise QMS data. Diamonds represent Y_{av} years for current MCY and squares Y_{av} for revised MCY.

153 However, calculating maximum constant yield using the formula provided in the Stock Assessment Plenary (Method 4) is not considered robust when applied to the GMU 1 stock. While commercial catch may have been relatively stable in more recent years, the trends in commercial catch-per-unit-effort has not – in general the indices have declined on the west coast, and remained relatively stable on the east coast. This further supports the observation that the two sub-stocks should be treated separately for stock assessment purposes, and thereafter fisheries management purposes.

154 Further, a maximum constant yield would not be able to be maintained in reality as a declining catch-per-unit-effort index indicates that the absolute abundance is undergoing a decline that would eventually show up as a reduction in catch. Nevertheless, the revised estimate of maximum constant yield is illustrative of the need for a more conservative approach to setting the TAC and TACC.

Stock assessment model

155 An attempt in 2000 to model the status of the GMU 1 stock to gauge the current biomass level relative to its virgin status was inconclusive, due to insufficient data. The model used the catch-per-unit-effort index, and two years of estimated age frequencies from aging studies combined with length frequency analysis. CPUE data, when used alone, and the age frequency data, when used alone, gave different interpretations of the present state of the stock.

Impacts of fishing

156 The fishery for grey mullet takes place in mainly estuarine and sheltered harbour environments. The diversity of species encountered when fishing for grey mullet is likely to be relatively low. Commercial fishers use the active method of ring netting more commonly in recent years. Ring netters are in attendance of their nets, and the set is completed and retrieved over a short period. Ring netting is increasing used because of higher catch rates and improved efficiency. Recreational fishers typically still use the more passive method of set netting.

157 Set netting is likely to have greater impacts because the net is left in the water for longer (ie, soak time). Nets are also left unattended for periods of time, thus increasing the risk of taking other species not intended as a target catch.

158 There is a risk that the critically endangered Maui's dolphin on the west coast may be found in part of the areas where set netting for grey mullet occurs. For example, there have been recent sightings of Maui's dolphins in the Manukau Harbour beyond the entrance area where a prohibition on set netting by commercial and recreational fishers applies. Further, any nets lost in the lower Waikato River delta, and swept out to sea, pose a risk to Maui's dolphin on the adjacent coast. MFish is continuing its active review of assessing risk to Maui's dolphin and separate measures may be necessary to address this issue.

Existing controls

159 Existing controls relevant to grey mullet fishing include area closures, method restrictions in certain areas, a minimum set net mesh size, soakage time limits, and an amateur daily bag limit. There is no minimum legal size.

160 Concerns about the risk of incidental catch of the 'critically endangered' Maui's dolphin have resulted in a ban on the use of set nets by amateur and commercial fisher between Maunganui Bluff and Pariokariwa Point (out to 4 nautical miles)[2]. The ban also includes the Manukau Harbour entrance area in a line from Puponga Point to a position 0.5 nm north of Kauri Point (at the eastern end of Big Bay)[3]. Amateur set netting has been excluded from these areas since 2001, and commercial fishing since 2003. The closures have not had a significant impact on commercial fishers targeting grey mullet, as their activities are based in the harbours along the west Auckland coast. Some impact on amateur fishing for grey mullet would have occurred, principally in the entrance to the Manukau Harbour.

161 Other existing controls include:

- Various areas are closed to the taking of finfish;[4]
- Set netting is prohibited in certain waters (mostly in areas where grey mullet is unlikely to be found);[5]
- Inside specified harbour waters, no commercial fisher may use in total more than 1,000 m in any combination of net lengths;[6]
- There are restrictions on net fishing in the Bay of Islands;[7] and net and longline fishing around Mayor (Tuhua) Island;[8]
- Drag netting is prohibited in defined harbours;[9] and restricted in other areas;[10]
- There are restrictions on commercial fishing in the Manukau Harbour at certain times of day;[11] and other restrictions on amateur fishing at all times;[12]
- Grey mullet fishing is not permitted in the Inner Hauraki Gulf from 01 October to 31 March;[13]
- Stalling is not permitted,[14] except in the Kaipara Harbour;[15]

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[2] Regulation 15A(l)(iii) and (iv), Fisheries (Auckland and Kermadec Areas Commercial Fishing) Regulations 1986; Regulation 6C(l)(iii) and (iv), Fisheries (Auckland and Kermadec Areas Amateur Fishing) Regulations 1986; and Regulation 7D, Fisheries (Central Area Commercial Fishing) Regulations 1986.
[3] Regulation 15A(l)(iii) and (iv), Fisheries (Auckland and Kermadec Areas Commercial Fishing) Regulations 1986; and Regulation 6C(l)(iii) and (iv), Fisheries (Auckland and Kermadec Areas Amateur Fishing) Regulations 1986.
[4] Regulations 19, 23, 23(5) of the Fisheries (Auckland and Kermadec Areas Commercial Fishing) Regulations 1986.
[5] Regulation 15A, Fisheries (Auckland and Kermadec Areas Commercial Fishing) Regulations 1986.
[6] Regulation 10A, Fisheries (Auckland and Kermadec Areas Commercial Fishing) Regulations 1986.
[7] Regulation 19A, Fisheries (Auckland and Kermadec Areas Commercial Fishing) Regulations 1986.
[8] Regulation1 18AA, Fisheries (Auckland and Kermadec Areas Commercial Fishing) Regulations 1986.
[9] Regulation 11, Fisheries (Auckland and Kermadec Areas Commercial Fishing) Regulations, 1986.
[10] Regulation 12, Fisheries (Auckland and Kermadec Areas Commercial Fishing) Regulations 1986.
[11] Regulation 18, Fisheries (Auckland and Kermadec Areas Commercial Fishing) Regulations 1986.
[12] Regulation 4, Fisheries (Auckland and Kermadec Areas Amateur Fishing) Regulations 1986.
[13] Regulation 4F, Fisheries (Auckland and Kermadec Areas Commercial Fishing) Regulations 1986.

- Commercial fishers must service their nets within 18 hours;[16]
- The minimum mesh size for grey mullet is 90 mm in the Auckland and Kermadec Fisheries Management Areas;[17]
- A daily bag limit of thirty grey mullet may be taken by recreational fishers in the Auckland and Kermadec Fisheries Management Areas;[18]
- Amateur set netting is prohibited in defined areas;[19] and restricted in parts of the Bay of Islands;[20]
- Various controls apply to amateur net fishing in the Auckland FMA, including a limit of one net per person; nets to be hauled by hand; nets not to extend across more than one-quarter of the width of any channel; stranding is not allowed; net must not exceed 60 m in length; nor be set within 60 m of another net.

162 All fishing is prohibited in marine reserves at the Poor Knights Islands; Cape Rodney-Okakari Point; Long Bay-Okura; Pollen Island (Motu Manawa); Cathedral Cove (Whanganui-a-Hei); Mayor Island; and Te Matuku Bay (Waiheke Island).

Social, Cultural and Economic Factors

Customary importance

163 Grey mullet remains an important species for Maori customary purposes (eg, traditional hui, tangi). The importance of the species for customary purposes is evident in rural communities where tikanga or customs are still practiced on a regular basis, particularly in areas adjacent to harbours or embayments (eg, Hokianga and the Kaipara). However, the use of grey mullet at customary Maori occasions has probably reduced over the last several decades, as the use of the resource for other purposes increased (ie, commercial and recreational), and the relative abundance declined. Given its importance for customary Maori purposes, an allowance of 100 tonnes, equivalent to the estimate of recreational use of the GMU 1 stock, was made at the start of the 1998–99 fishing year.

164 Grey mullet is one of the species listed in a Protocol between Te Uri o Hau and the Ministry of Fisheries, which covers a large portion of the Kaipara Harbour. The Protocol was established as part of a Deed of Settlement, and recognizes Te Uri o Hau's interest in all species of fish, aquatic life or seaweed that exist within the Te Uri o Hau Fisheries Protocol area.

165 Tangata kaitiaki have been appointed in several areas within GMU 1. Tangata kaitiaki are individuals or groups who can authorize customary fishing within their rohe moana, in accordance with tikanga Maori. In the Tauranga Moana area

[14] Regulation 61, Fisheries (Commercial Fishing) Regulations 2001.
[15] Regulation 14, Fisheries (Auckland and Kermadec Areas Commercial Fishing) Regulations 1986.
[16] Regulation 66, Fisheries (Commercial Fishing) Regulations 2001.
[17] Regulation 5F, Fisheries (Auckland and Kermadec Areas Commercial Fishing) Regulations 1986; Regulation 3B, Fisheries (Auckland and Kermadec Areas Amateur Fishing) Regulations 1986.
[18] Regulation 3A, Fisheries (Auckland and Kermadec Areas Amateur Fishing) Regulations 1986.
[19] Regulation 6C, Fisheries (Auckland and Kermadec Areas Amateur Fishing) Regulations 1986.
[20] Regulation 6B, Fisheries (Auckland and Kermadec Areas Amateur Fishing) Regulations 1986.

(Tauranga), 55 have been appointed. Eight kaitiaki have been appointed at Raukokere in the Bay of Plenty, and 11 in Aotea Harbour on the West Coast. A mataitai application has been submitted at Raukokore, Bay of Plenty (Te Whanau Maru-haere-muri).

166 There are taiapure at Waikare Inlet and Maketu on the east coast, and Kawhia-Aotea on the west coast. The Kawhia-Aotea taiapure includes the Kawhia and Aotea Harbours and 1nm around Gannet Island (approximately 137 km).

Social importance

167 Grey mullet have long been used to provide sustenance and an income. The species' use in historic times has contributed to a community's socio-economic development, notably on the Kaipara Harbour where curing factories were established. In more modern times, grey mullet are one of several inshore species that support commercial fisheries for a number of owner-operators living in rural areas. Recreational fishers continue to use grey mullet, whether they are resident to an area, or as holiday-makers making annual or regular visits to coastal communities or towns.

168 From a customary Maori perspective, grey mullet also have an intrinsic value associated with their relationship to a tribe's cultural values and customs, including their whakapapa (as observed in the Hokianga). In west coast areas in particular, Maori communities have noted their concern that fisheries resources, including grey mullet, have declined to the extent that they can no longer regularly take kaimoana in the quantity that they enjoyed in the past.

Economic

169 Recent port prices for GMU 1 are shown in **Error! Reference source not found.**4. National exports of grey mullet are relatively small, at tens of tonnes in comparison to the amount taken from the stock (Table 5). The main market for the fishery is domestic. Fish are retailed at fishshops, roadside stalls, and supermarkets. The relatively small quantities exported in 2004, at a value of $79 673, were mainly provided to the United States of America.

Table 4: Port price for GMU 1 ($/kg) – the figure for 2005 is provisional

	2002	2003	2004	2005
GMU 1	1.6580	2.6741	2.4114	2.23

Table 5: **National exports of grey mullet in the calendar years of 2003, and 2004 (provisional). GMU 1 accounts for approximately 99% of national landings.**

Grey mullet exports	2003		2004	
Type	**kg**	**$**	**kg**	**$**
Chilled headed and gutted	86	402	-	-
Chilled whole	81,949	163.195	12,151	67,071
Frozen headed and gutted	1,236	4.164	1,000	2,521
Frozen whole	3.515	9.163	3,200	10.081
Total	86,786	$176.924	16,351	$79,673

170 GMU 1 quota shares have generally traded for between $2.50 and $4.00 per kg over the last four years, approximating up to $0.04 a quota share (note that each stock has 100 000 000 shares) (Figure 7). ACE prices generally range from $0.25 to $0.50 per kg (Figure 8), below the interim deemed value of $0.61.

Figure 7: **Quota trade prices ($ per share) for GMU 1 (1 October 2001 – 30 September 2004). Larger dots represent a greater number of shares sold in the one transaction. Note there are 100,000,000 shares in the GMU 1 stock.**

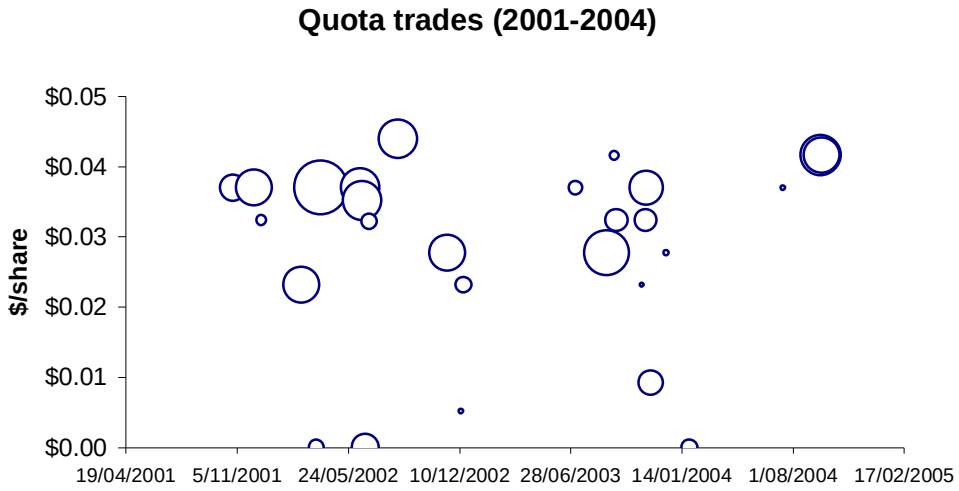
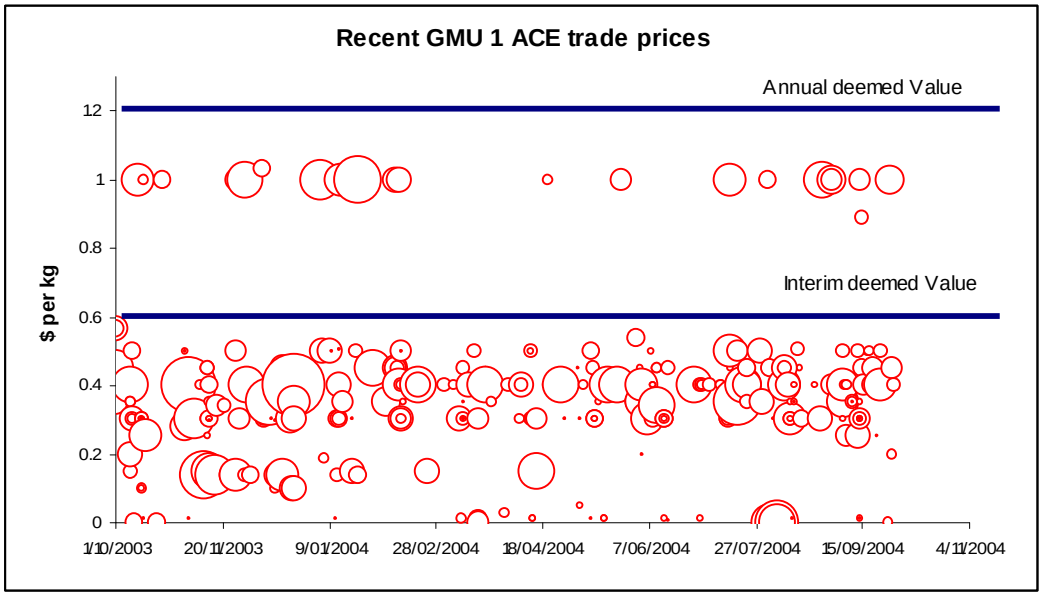


Figure 8: **ACE trade prices ($ per kg) relative to interim deemed value for GMU 1 (2003-04 fishing year). Larger dots represents a greater number of ACE sold in the one transaction.**



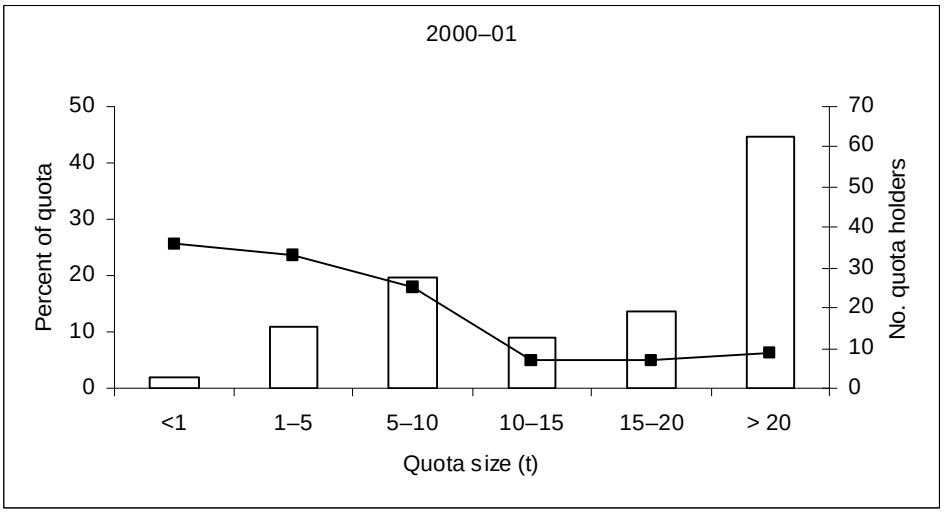
171 ACE trading data suggests that there is an active ACE market (Figure 8), with ACE available for most fishers to cover their catch. Similarly, there is a relatively low amount paid in deemed values in recent years (Table 6). Despite the relatively low ACE price, there are still a small number of fishers who incur deemed value payments. These payments have fluctuated between $11 238 and $19 297 for the last three completed fishing years. Figure 8 shows that the interim deemed value is set above the level of most ACE sales, although sales do occur above the interim deemed value level. ACE has not been sold above the annual deemed value rate in the 2003–04 fishing year.

Table 6: **Deemed value payments in GMU 1 2001-02 to 2004-05 (fishing year incomplete), and proportion of total allowable commercial catch, assuming all deemed values were paid at $1.21 rate.**

Fishing year	Deemed Value paid	Quantity of fish (kg)	% of TACC
2001-02	$19 297.62	15 948.5	1.7
2001-03	$11 238.82	9 288.3	1.0
2003-04	$14 754.11	12 193.5	1.3
2004-05	$ 4 920.87	4 066.8	0.4

172 There are approximately 107 quota shareholders in GMU 1 (as at May 2005), compared to approximately 117 in the 2000–01 fishing year. Quota is generally held in small parcels, with some individuals holding reasonably significant quantities (Figure 9).

Figure 9: **Percent of total GMU 1 quota shares (bars) and number of quota shareholders (line) in six size categories for the 2000-01 fishing year. The number of quota shareholders was**



117.

173 The fishery is largely carried out by ACE fishers, rather than quota shareholders fishing their own quota shares. **Error! Reference source not found.**10 shows that by the end of the 2003–04 fishing year, most major quota shareholders had sold their ACE holdings. Figure 11 show that many of the fishers with the largest ACE holdings at the end of the 2003–04 fishing year did not own quota shares.

Figure 10: **Quota holdings of top 30 quota shareholders in GMU 1 for the 2003-04 fishing year, and end of year regular ACE held by each quota shareholder. Where the quota share and ACE values are not the same, ACE trading has occurred.**

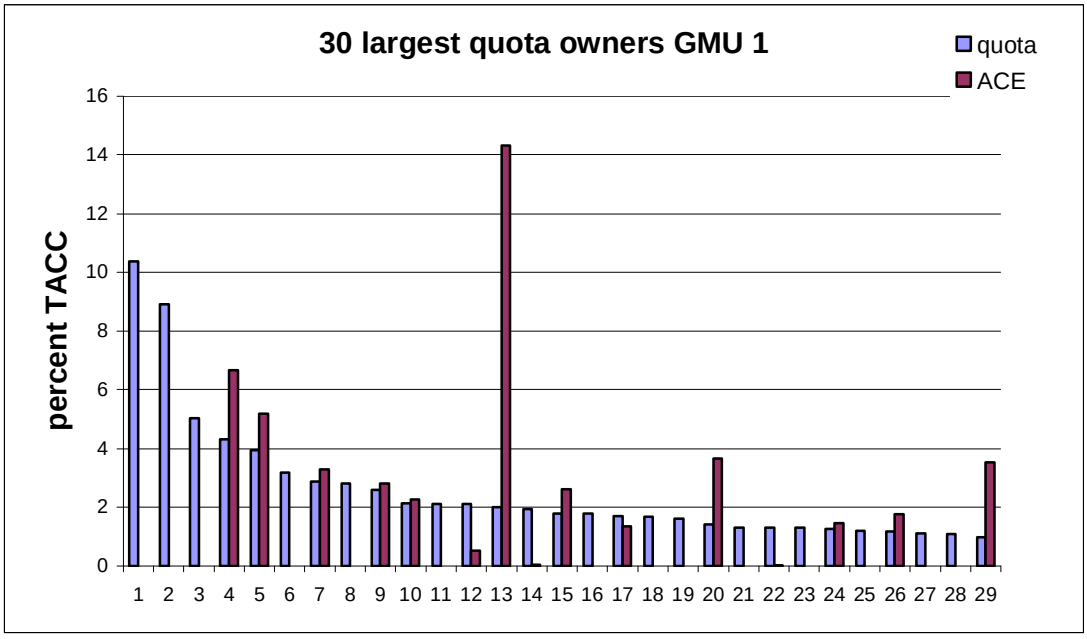
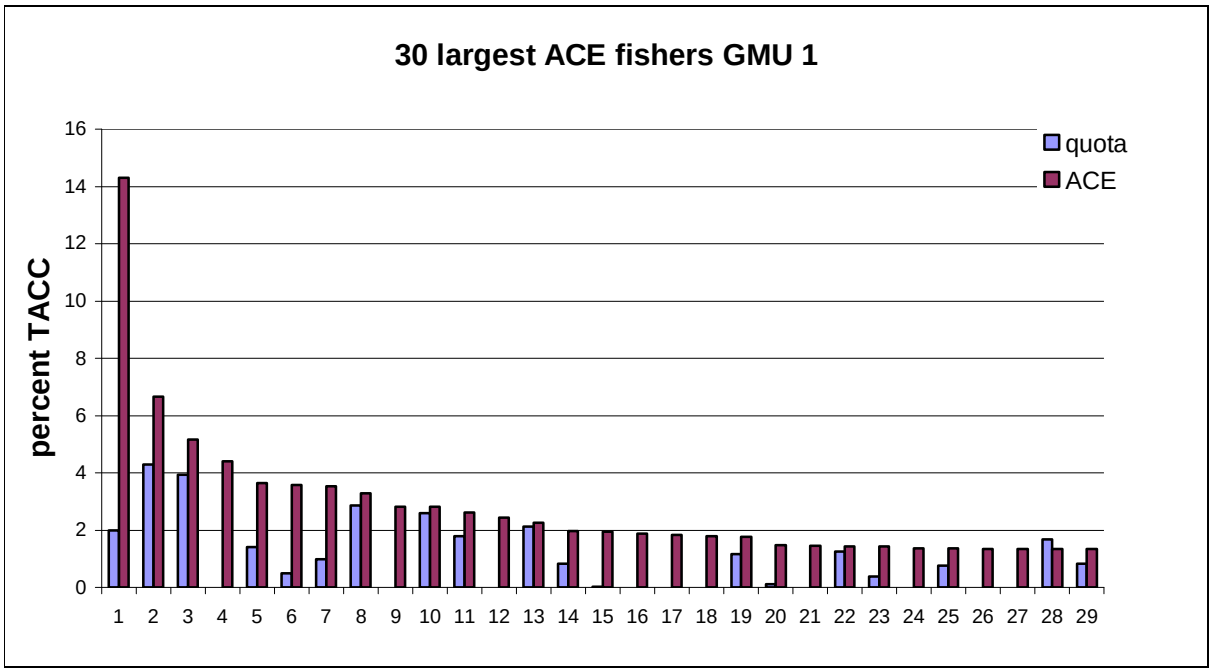


Figure 11: **Holdings of top 30 ACE holders in GMU 1 for the 2003-04 fishing year, and quota shares**

held by each ACE holder. Where the quota shares and ACE values are not the same, ACE trading has occurred.



Relevant Plans and Other Matters

174 Before setting or varying any sustainability measure, the Minister must take into account:

- Any conservation or fisheries service;
- Any decision not to require such services;
- Any relevant fisheries plan approved under Part III of the Act;
- Any provisions of any regional policy statement, regional plan, or proposed regional plan under the Resource Management Act 1991; and
- Any management strategy or plan under the Conservation Act 1987.

175 MFish does not consider that existing or proposed fisheries services materially affect this proposal for GMU 1. No decision has been altered about whether such services are required.

176 No fisheries plans made in accordance with s 11A of the Act have been submitted or approved that suggest management measures relevant to GMU 1. MFish is not aware of any relevant statements in regional policy statements or plans, or in any Department of Conservation conservation management strategies.

177 The Minister also needs to consider relevant provisions in the Hauraki Gulf Marine Park Act 2000. This Act's objectives are to protect and maintain the natural resources of the Hauraki Gulf as a matter of national importance. Grey mullet occur within the

boundaries of the Hauraki Gulf. MFish considers that reviewing sustainability measures for grey mullet will better meet the purpose of the Act.

Research Plan

178 The fishstock is monitored by comparison of annual landings with TACC, and review of standardised catch-per-unit-effort. The most recent analysis updates the series to the 2003–04 fishing year, using standardised catch-per-unit-effort. MFish intends to periodically update the standardised catch-per-unit-effort index every few years – the next update is scheduled for the 2006–07 year.

179 Grey mullet fisheries in the Kaipara Harbour have been examined in a characterisation study. The fishery in the Manukau Harbour and lower Waikato River has also been assessed in the past (Anon 1989). Further characterisations may be required in future years, possibly directed towards greater delineation of substocks.

180 The development of an age-structured model in 1999 for stock assessment showed promise, but was inconclusive because of insufficient data. Further fishery independent length and age sampling would be desirable as inputs into the model, as well as better assessing the boundaries of substocks. Some further length and age composition data from the commercial fishery has been collected in the 2003–04 fishing year. In addition, information on the selectivity of a range of mesh sizes used in the fishery would be useful in deriving selectivity functions – a further input into the model.

181 No research has been proposed for the forthcoming 2005–06 fishing year.

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