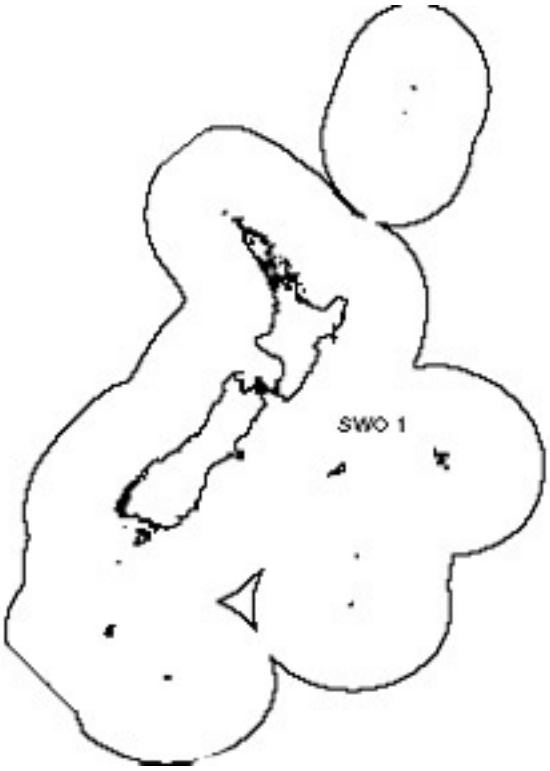
SWORDFISH (SWO)

Introduction into the QMS

1 Swordfish (*Xiphias gladius*) has been gazetted for QMS introduction on 1 October 2004. The Quota Management Area (QMA) for swordfish is outlined in Figure 1. The fishing year for swordfish will be from 1 October through to 30 September in the following year, and total allowable commercial catches (TACCs) and annual catch entitlements (ACE) are to be expressed in kilograms greenweight.

Figure 1: Quota Management Areas for swordfish



Key Issues to be considered

2 MFish considers the key issues that relate to the decisions for setting sustainability measures for the swordfish stock are as follows:

a) Swordfish is a highly migratory species and swordfish found in New Zealand fisheries waters are probably part of a central western Pacific stock.

b) Background information on catch by sector and method is outlined in Annex One. First utilised by foreign fleets, swordfish is now primarily taken as bycatch by the domestic tuna longline fishery. Domestic landings

of swordfish have increased rapidly since 1994–95, peaking during 2000-01. Since 2001 landings have progressively declined.

c) The commercial targeting of swordfish is prohibited in New Zealand waters, but fishers can land and sell any incidental bycatch. Reported landings of swordfish, and catch per unit effort rose dramatically during 1995-1998 suggesting that swordfish is being targeted by some commercial longliners.

d) There are no estimates of non-commercial take, but swordfish is an occasional and highly prized catch of the recreational big game fishery. Recreational fishers are concerned that any further development of their interests in the fishery might be effected by localised depletion caused by commercial fishing.

e) There has been no assessment of swordfish in New Zealand waters. MSY cannot be estimated, as the fish in New Zealand are part of a wide-ranging stock.

f) Large swordfish are thought to have long residence times in New Zealand fishery waters, which may make them vulnerable to over fishing.

g) MFish considers that the purpose of the Act will be better achieved by setting a TAC for swordfish under s 14 of the 1996 Act.

h) Swordfish catches are considered to be sustainable at current levels of utilisation.

i) An MFish analysis suggests setting TACCs at current levels of utilisation is unlikely to constrain the target fisheries or result in widespread discarding of swordfish.

List of Management Options

3 It is proposed to include swordfish on the Third Schedule and set a TAC pursuant to s 14 of the 1996 Act.

4 MFish proposes one option for setting a TAC, TACC and allowances for the swordfish stock as outlined in Table 1 below.

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

Stock	TAC	Customary allowance	Recreational allowance	Other sources of mortality	TACC
SWO 1	919	10	20	4	885

5 Additional management controls proposed include:

a) setting deemed values and the application of differential deemed values; and

b) amending reporting regulations.

6 Other management options proposed for discussion include:

a) returning small swordfish to the water; and

b) undertaking a review of voluntary area restrictions sometime in the future.

TACs

TAC management strategy

7 It is proposed that swordfish be listed on the Third Schedule to the 1996 Act and a TAC be set pursuant to s 14. This section provides for the setting of alternative TACs for stocks specified in the Third Schedule where the Minister is satisfied that the purpose of the 1996 Act would be better achieved by setting a TAC otherwise than in accordance with s 13(2). One of the criteria for inclusion of stocks on the Third Schedule is where it is not possible, because of the biological characteristics of the species, to estimate maximum sustainable yield (MSY). Swordfish is listed as a highly migratory stock (HMS). Therefore, because of the biological nature of the species, it is not possible to estimate the MSY for the species within New Zealand waters.

8 While any TAC must be set in a way that ensures use of the stock is sustainable, there is no requirement to take into account or be guided by the need to manage in accordance with MSY. MFish believes that a TAC set under the provisions of s 14 of the Act can better provide for utilisation (conserving, using, enhancing, and developing fisheries resources to enable people to provide for their social, economic, and cultural wellbeing) for stocks whose range extends beyond the bounds of New Zealand fisheries waters while still ensuring sustainability.

9 Another criteria for inclusion on the Third Schedule is that a catch limit has been determined as part of an international agreement. The formation of an effective regional fisheries organisation is yet to be achieved. Nevertheless, countries involved with establishing the Western and Central Pacific Fisheries Commission (WCPFC) have urged states to exercise reasonable restraint in respect of any increase in fishing effort and capacity. International voluntary agreements to manage swordfish within the western and central south Pacific are at least five years into the future. Nevertheless, New Zealand is committed to playing an active role in the WCPFC. New Zealand can further enhance its role in the WCPFC by setting a TAC for swordfish.

10 Further, s 14 provides for an in-season review of the TAC to take advantage of available yield beyond any pre-determined target stock level.

Rationale for proposed TACs

11 There has been no assessment of swordfish in New Zealand waters and unless it can be shown that New Zealand swordfish are largely self recruiting, management of the New Zealand fishery alone will be unable to ensure the sustainability of the fishery. This is because the status of the stock will be, to a large extent, be determined by the size of catches taken outside the EEZ.

12 Stock structure, longevity and productivity of the stock are uncertain and little is known of the biology and ecology of swordfish in the New Zealand region. Nevertheless the wide distribution of swordfish, large reproductive capacity and high growth rates amongst juveniles probably contribute to resilience of swordfish stocks to intensive harvesting, at least in the short to medium term.

13 Nevertheless, swordfish, particularly large swordfish have at best moderate productivity and may have long residence times which may make them vulnerable to over fishing.

14 MFish notes that estimates of yield are available for the wider Pacific stock (refer to paragraph 102 in Annex Two). Landings of swordfish Pacific wide are currently greater than estimates of MSY, however both the accuracy of reported landings and the estimates of MSY are very uncertain. Nevertheless, setting a TAC at current levels of utilisation of swordfish would clearly signal New Zealand's willingness to actively manage highly migratory species and meet its international obligations with regard to the exercise of reasonable restraint.

15 Within New Zealand waters, swordfish is principally a bycatch of the surface longline fishery and in general landings of swordfish reflect the number of hooks placed in the water. The total number of hooks was stable between 1985 and 1995 but increased between 1995 and 2000 with the effort progressively levelling off.

16 Policy guidelines suggest that the opportunity for development and the extent of utilisation provided for needs to be assessed on a stock-by-stock basis having regard to risk based on the following factors:

17 **Sustainability to the stock,** for swordfish the risk is considered moderate to high. There are sustainability concerns relating to the wider Pacific stock and while catch rates within New Zealand waters appear stable, recently reported landings are declining. New Zealand has international obligations to exercise reasonable restraint in the development of its HMS fisheries.

18 **Biology of the stock and potential for local depletion,** while the wide distribution of swordfish, large reproductive capacity and high growth rates amongst juveniles probably contribute to resilience of swordfish stocks, larger swordfish within the New Zealand fishery have at best moderate productivity and may have long residence times making them vulnerable to over fishing.

19 **Impacts of fishing on the aquatic environment including bycatch**, for swordfish this is a factor of moderate to low risk. Swordfish is taken in conjunction with other large tuna species including bigeye tuna and southern bluefin tuna and any increase in catch creates some risk that swordfish may be caught over and above the catch limit set for this species. The current swordfish fishery is a bycatch of the bigeye tuna target fishery. Prospective catch limits are proposed for bigeye tuna. However, as noted in Annex Two, at paragraph 92 there is considerable potential for swordfish catch rates to be managed by fishers depending on the adoption of fishing practices. There are also unquantified risks to associated and dependent species associated with the method of tuna longlining.

20 **Socio economic and cultural issues,** there is high risk of an interaction between commercial and non-commercial fishing unless this is managed. Both sectors are wishing to expand their interests in the fishery but recreational fishers have expressed concern about the potential impact the current level of commercial catch of swordfish might be having on their fishery. While there are limited direct gear conflicts, spatial conflict exists between the sectors particularly in light of the current assumption that large swordfish may have long residence times, which make them vulnerable to over fishing. This is a highly relevant consideration with respect to any potential for development of the swordfish fishery and may require inter-sectoral spatial agreements if expansion for any or all sectors in the fishery is to occur.

21 On balance, the risks associated with an increase in catch of swordfish are considered to be moderate to high. MFish therefore does not propose at this time to set a prospective TAC for swordfish but rather set a TAC for swordfish based on the best available information of current utilisation.

22 In the instance of a commercial fishery that is stable, but variable, guidelines suggest criteria to set catch limits on the basis of either the current commercial catch or on average catches when landings have been stable in excess of three years. Neither criterion is directly applicable to swordfish because landings over the last six years have increased, peaked and have since declined. Nevertheless, the TACC has been calculated using average commercial landings for the period between 2000 and 2003. This period includes the two years of peak catches as well as the more recent year of a reduced level of catch. MFish considers this period provides the best available information on current levels of commercial utilisation of swordfish (the average of these commercial landings is 885 tonnes).

23 MFish notes that there is provision for an in season increase in TAC if the abundance of swordfish in any fishing year suggests that more may be taken. Any in season increase is given effect through the creation of ACE pursuant to s 68 of the 1996 Act.

24 There is no estimate of the recreational catch of swordfish from recreational harvest surveys. Recreational catches to date have been relatively small (the known recreational catch has averaged seven swordfish per year since 1987–88 with a maximum of 36 fish in 1992–93). Game fishing records and allowing a small nominal amount for unknown catches and for recreational catches other than from game fishing has provided the basis for an estimate of current utilisation (20 tonnes).

25 There is no estimate of customary catch and the stock is considered to be of no particular importance to Mäori. Therefore, in accordance with guidelines, MFish is proposing that an estimate of customary utilisation be based on half the estimate of recreational utilisation (10 tonnes).

26 MFish proposes a TAC for SWO 1 of 919 tonnes based on current utilisation of the fishery.

Allocation of TAC

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

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

29 There is information available for catch history (current utilisation) but only anecdotal information for utility value. In shared fisheries MFish has a policy preference in favour of the catch history allocation model in the absence of clear information to the contrary. While the utility based model is not discounted altogether its application to swordfish is problematic as there is no current information available to explicitly value swordfish to the recreational sector.

Recreational Allowance

30 The Recreational sector has an historical involvement with the swordfish fishery and wishes to retain access to trophy-sized fish. As indicated in Annex Two, there is no estimate of the recreational catch of swordfish from recreational harvest surveys. Known recreational catches to date have been relatively small (records suggest that that proportion of the recreational catch attributed to gamefishing has averaged seven swordfish per year since 1987–88 with a maximum of 36 fish in 1992–93). Based on these records and allowing a small nominal amount for unknown catches and for leisure fishing provides the basis for the proposed recreational allowance.

31 The proposed recreational allowance is 20 tonnes (set out in Table 1 above). MFish notes the potential for further recreational development of the swordfish fishery.

Customary Mäori Allowance

32 Policy guidelines provide several options for setting a customary allowance. Where estimates are not available, but there is known to be customary catch, a nominal allowance may be made. For stocks of importance to customary Mäori the allowance may be based on the level of the recreational catch. For species and stocks where there is some catch, but the stock is not considered of importance to customary Mäori, then the allowance may be based on half the recreational catch.

33 It is possible there has been customary harvest, however, swordfish is not considered to be of importance to customary Mäori. MFish considers that customary fishers make less use of swordfish than recreational fishers and proposes to use 50% of the current level of recreational utilisation as the basis for the proposed customary allowance.

34 The proposed Customary Mäori allowance is 10 tonnes (set out in Table 1 above).

Allowance for other sources of mortality

35 The proposed allowance for other sources of incidental fishing related mortality is four tonnes (set out in Table 1 above).

36 Swordfish smaller than about 25 kg and badly damaged swordfish have little or no commercial value. It is assumed discards are damaged and unmarketable fish. Commercial discard rates appear to be small (about 0.44% on average) with most (57%) of the discarded swordfish dead upon their return to the sea. Discarding will be illegal once the species enters the QMS. Accordingly, a nominal allowance for incidental mortality of 4 tonnes is proposed for fish that are lost before they are landed on board the vessel.

TACC

37 The proposed TACC is 885 tonnes (set out in Table 1 above).

38 MFish notes the potential for further commercial development of the swordfish fishery both in terms of a target fishery and associated with increased tuna longlining. However it assesses there are medium to high risks in terms of sustainability and of localised depletion of swordfish of increased fishing for this species. MFish assesses any risk of overcatching swordfish is moderate to low, even though further development of tuna fishing is proposed. This is because, as noted in Annex Two, at paragraph 92 there is considerable potential for swordfish catch rates to be managed by fishers depending on the adoption of appropriate fishing practices.

39 MFish notes the uncertainty in this assessment and that research on the stock structure of swordfish is proposed. MFish notes that as new information comes to hand there is provision for the possibility of an in-season review of the TAC to take advantage of available yield beyond any pre-determined target stock level.

40 On this basis MFish considers that the TACC be based on the average of the recorded landings of the last three completed fishing years. Accordingly there is one TACC option proposed for SWO 1. Based on the average of the last three years commercial landings from this management area it is proposed that the TACC be set at 885 tonnes.

41 MFish assesses there will be limited socio-economic impact associated with adoption of this option because it is based on current commercial utilisation. The proposed TACC has been calculated using average commercial landings for the last three years of fishing. This may understate or overstate current commercial utilisation in terms of the period chosen. MFish notes that commercial landings of swordfish peaked in 2000-01 and has since declined. Accordingly changing the years used to calculate average commercial landings could potentially increase or decrease estimates of current commercial utilisation. Any potential impact from adopting different estimates of current utilisation can be measured as direct opportunity costs. A tonne of swordfish has a value and any reduction in tonnage for the commercial sector as a result of a lower TACC can be measured in terms of a forgone value. MFish considers that any such impacts can best be measured by forgone annual earnings as provided by the port price of swordfish ($6,460 / tonne).

Other Management Measures

42 Specific measures are proposed for providing for inclusion of swordfish on the Third Schedule, as a species for which is not possible to estimate MSY.

43 Current fishing practice is for all sectors to release small swordfish. MFish has evaluated introducing an MLS and/or including swordfish on the Sixth Schedule. MFish notes the potential for a matrix of possible combinations of these options.

44 Specific measures are proposed for setting deemed values and amending fisheries reporting regulations.

45 The issue of reviewing voluntary area restrictions is a matter that could be undertaken in the future.

Inclusion of swordfish on the Third Schedule

46 MFish proposes that swordfish be added to the Third Schedule of the 1996 Act to allow the TAC for swordfish to be set pursuant to s 14. Section 14 of the 1996 Act provides for

alternative TACs when the Minister is satisfied that the purpose of the 1996 Act is better achieved than otherwise setting a TAC under s 13(2). One of the criteria for inclusion of stocks on the Third Schedule is where it is not possible to estimate MSY, because of the biological characteristics of the species.

47 Swordfish is a highly migratory species and those caught in New Zealand waters are probably part of a stock that includes the central south Pacific. In this context it is not possible to estimate MSY for that part of the stock that is found within New Zealand fisheries waters. Species managed under s 14 must be listed on the Third Schedule to the Act by an Order in Council. Details of this proposal are set out in Annex One at the end of this section.

Return swordfish to the water

48 Current fishing practice is to release small swordfish because they have little market value and some fishers believe they are optimising yield per recruit by releasing lively small fish in the hope they will be recaptured when larger.

49 One way of allowing release of small fish is to implement a minimum legal size (MLS). The rationale for any minimum MLS in the swordfish fishery is to reduce wastage and to optimise yield per recruit. In general, there is more benefit to the fishery by delaying recruitment to the fishery until fish have passed through the most rapid phase of their growth. Swordfish grow rapidly during the first year until they reach about 1 metre in lower jaw to fork length (LJFL).

50 MFish notes that the Billfish Memorandum of Understanding of October 1996 imposed a voluntary recreational minimum size no smaller than 90 kilograms or less than 2.4 metres LJFL. From published length / weight / age curves for swordfish a 2.4 metre LJFL fish weighs about 175 kilograms and is about 10 years of age (by comparison a 90 kilogram fish is about 1.9 meters LJFL and about six years of age).

51 MFish notes that the International Commission for the Conservation of Atlantic Tunas (ICCAT) recommends a minimum size of 1.25m LJFL for commercial fishing within the Atlantic Ocean. Such a fish is estimated to weight about 25 kilograms and be two years of age.

52 Swordfish grow most rapidly during their first year of age and probably the greatest benefit in terms of optimising yield per recruit is by protecting swordfish less than 1 meter LJFL. Accordingly, if a MLS were to be implemented, MFish would suggest an MLS of 1 meter LJFL.

53 Any benefit to the fishery from an introducing a MLS cannot be quantified with certainty. Age and growth of swordfish is currently uncertain, and no yield per recruit analysis has been undertaken. In addition, MFish assesses from observer data that only about 43% of swordfish are brought to the fishing vessel alive and would survive release to the water after capture by longline. The benefits of imposing an MLS are reduced because longline caught swordfish have a low survival rate. That is, there is little benefit in returning small dead fish to the sea. Any benefit of an MLS from increased yield per recruit is likely to be offset by increased wastage in the fishery because all undersized fish (of which 57% are likely to be dead) must be returned to the water. Accordingly, if this measure were to be adopted and resulted in changes from current fishing practices, the allowance for

fishing related mortality would need to be increased. MFish does not support imposition of an MLS for swordfish because of the potential for wastage in the fishery.

54 As an alternative to the implementation of an MLS, swordfish could be placed on the Sixth Schedule of the Act to provide fishers' flexibility to control catches of small fish. The Sixth Schedule provides a means for a commercial fisher to return fish to the water subject to stated requirements set out for that stock.

55 In general, most stocks subject to the QMS are required to be retained by commercial fishers, and are therefore not listed on the Sixth Schedule. The requirement to retain fish taken provides an incentive for commercial fishers to ensure that their fishing activities are in line with the harvesting rights held, and reduces the potential for high grading of the catch. Therefore, ensuring compliance with the Sixth Schedule provisions in order to prevent discarding of dead swordfish is potentially problematic, especially where a high deemed value relative to port price is proposed (as is the case with swordfish).

56 As mentioned previously, in the absence of an MLS, introduction of swordfish into the QMS would require that the current fishing practise of releasing any small swordfish that are alive would no longer be legal. However, in circumstances when the fish is less than a certain size and the fish are likely to survive, the Sixth Schedule could provide flexibility to maintain current fishing practises that might be improving yield per recruit.

57 MFish considers that there would be benefits to the stock in not landing small swordfish as long as there is a high likelihood of survival. The MFish's initial view is that the proposal to use the Sixth Schedule provides most benefit to the stock.

58 MFish proposes introducing swordfish onto the Sixth Schedule of the Act with the following stated requirements for SWO 1:

i) only fish that are smaller than 1 metre LJFL; and

ii) are likely to survive and can be returned to the sea as soon as is practicable after being taken.

Deemed values and overfishing thresholds

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

60 The port price for swordfish is $6.46. Given this high value, the best fit for swordfish would seemingly be the category of high value single species fisheries fishstocks for which the deemed value would be set at 200% of port price. However, as swordfish is primarily a bycatch of the tuna longline fishery, it does not satisfy the second part of this category – that a species is taken with little, if any, bycatch. MFish therefore proposes two options for setting the swordfish deemed value:

a) Set the deemed value at 200% of the port price, ie, an annual deemed value of $12.92;

b) A second option would be to place swordfish in the "All Others" category, ie, apply a 75% factor to the port price of $6.46, deriving a deemed value of $4.85.

61 MFish would welcome stakeholder comment on these two options.

62 It is further proposed that differential deemed values apply. MFish does not propose to set an overfishing threshold for swordfish unless monitoring of catch against the TACC suggests that this is required in the future.

Consequential amendments to regulation

63 As a consequence of the introduction of swordfish into the QMS, MFish proposes to introduce a number of amendments to the reporting regulations to ensure the effective and efficient operation of the QMS. Details of the proposed amendments are set out in a generic section of this document.

Area restrictions

64 In the past domestic commercial tuna longline fishers agreed to avoid fishing certain areas to reduce conflict over recreational access to swordfish. However, since 1993 the commercial domestic fleet has grown much larger and no longer observes these area agreements.

65 The New Zealand Big Game Fishing Club have suggested revised areas of spatial separation of sectors fishing for swordfish (refer Annex Two). MFish considers that, while the potential for local depletion is a matter that is relevant to allocation between fishing sectors, the detail of spatial allocation to address local depletion is a matter for resolution between the sectors. Current legislation requires dispute procedures to be followed before regulatory measures can be considered to provide for spatial separation between fishing sectors. Accordingly no area restrictions are currently proposed.

Statutory Considerations

66 In evaluating the management options the following statutory considerations have been taken into account:

a) The management options seek to ensure sustainability of the stock by setting a TAC and other appropriate measures. Utilisation is provided by way of setting allowances for commercial, recreational and customary fishers. The proposed TAC for swordfish is set on the basis of current utilisation.

b) Setting a TAC for swordfish clearly signals New Zealand's willingness to actively manage highly migratory species and meet its international obligations with regard to the exercise of reasonable restraint. MFish considers issues arising under international obligations and the provisions of the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992 (s 5) are adequately addressed in the management options for swordfish.

c) The current fishery for swordfish is primarily a bycatch fishery. It is likely that within a QMS management regime swordfish will become a target fishery. Nevertheless, quota for swordfish is likely to be retained to cover the bycatch of fishing for bigeye tuna and become more part of a tuna longline mix of species.

d) A wide range of fish species are taken as bycatch of tuna longline fishing. Catch levels vary but many of these species are only rarely taken. The main fish bycatch species associated with the surface longline fishery within the EEZ are to be introduced into the QMS. The QMS will provide the mechanisms for sustainability actions as required

e) There are however a suite of species that are unlikely to enter the QMS in the short term. Our knowledge of these species is limited. There is a risk that the tuna longline fishery will affect the long-term viability of these species. Tuna longline fisheries also occasionally catch fur seals, cetaceans and turtles within New Zealand fisheries waters. There are therefore potential impacts on associated and dependent species, biodiversity and protected species that will require monitoring and possibly future management action. The entry of swordfish into the QMS will improve our ability to address these issues by requiring the incorporation of new information as it comes to hand in the process of determining catch limits for the fishery.

f) Surface longline fishing is a fishery with known seabird interactions. MFish and the Department of Conservation are currently evaluating submissions on a draft National Plan of Action to Reduce the Incidental Catch of Seabirds in New Zealand Fisheries. This draft plan sets out a strategy to reduce the incidental catch of seabirds.

g) Existing controls that apply to swordfish are outlined in Annex Two. Recruitment of swordfish is not known to be variable at the current levels of stock biomass.

h) Before setting any sustainability measure the Minister must have regard to any provisions of any regional policy statement, regional plan, or proposed regional plan under the Resource Management Act 1991, and any management strategy or management plan under the Conservation Act 1987 that applies to the coastal marine area and is considered to be relevant by the Minister. MFish is not aware of any provisions in any strategy or planning document under the Resource Management Act or Conservation Act that are relevant to the setting of sustainability measures for swordfish.

i) MFish notes that the setting of a sustainability measure (ie, a TAC) for swordfish is consistent with s 7 and s 8 of the Hauraki Gulf Marine Park Act 2000. The Minister is required to have regard to these provisions. This Act's objectives are to protect and maintain the natural resources of the Hauraki Gulf.

j) Before setting any sustainability measure the Minister must also take into account any conservation services or fisheries services, any relevant fisheries plan approved under the Act, and any decisions not to require conservation services or fisheries services. There is no relevant fishery plan approved that would have any bearing on the setting of TACs for swordfish, and similarly no decision has been made not to require conservation services or fisheries services relevant to swordfish.

k) The nature of the fishery and the interests of the respective fishing sectors have been considered in setting the TACC and allowances for recreational and customary interests and all other mortality to the stock caused by fishing. No existing mätaitai is likely to effect commercial fishing for swordfish given the offshore nature of the surface long line fishery. Similarly no area closed for customary fishing is known to affect commercial fishing for swordfish. Voluntary restrictions agreed to under the Billfish Moratorium on commercial fishing within SWO 1 to protect recreational interests are no longer observed.

l) The information used to develop proposals for swordfish relies on biological information and life history parameters derived for swordfish overseas. There is uncertainty in asserting these are applicable to swordfish in New Zealand waters.

m) The level of the non-commercial catch for swordfish within New Zealand fisheries waters is uncertain with regard to setting allowances for recreational and customary Mäori use. MFish notes however that uncertainty in information is not a reason for postponing or failing to take any measure to achieve the purpose of the 1996 Act.

Preliminary Recommendations

67 MFish recommends that the Minister:

a) **Agrees** to achieve the purpose of the 1996 Act by setting a TAC otherwise than in accordance with s 13(2) by setting a TAC of 919 tonnes for SWO 1 and within that TAC set:

i) A customary allowance of 10 tonnes;

ii) A recreational allowance of 20 tonnes;

iii) An allowance for other fishing-related mortality of 4 tonnes; and

iv) A TACC of 885 tonnes.

b) **Agrees** to set a deemed value for swordfish of either:

i) $12.92 / kg or

ii) $4.85/kg

c) **Agrees** that differential deemed values apply;

d) **Agrees** to listing swordfish on the Third schedule and set a TAC pursuant to s 14 of the 1996 Act

e) **Agrees** to amend the Fisheries (Reporting) Regulations 2001 to outline the codes to be used by fishers when completing their statutory catch returns

f) **Agrees** to introduce swordfish onto the Sixth Schedule of the Act with the following stated requirements for SWO 1

i) only fish that are smaller than 1 metre LJFL; and

ii) are likely to survive and can be returned to the sea as soon as is practicable after being taken.

ANNEX ONE

Amendment to regulations

Sixth Schedule: return of swordfish to the water

Background

68 Current fishing practice is to release small swordfish because they have little market value and some fishers believe they are optimising yield per recruit by releasing lively small fish in the hope they will be recaptured when larger.

Problem definition

69 The introduction of swordfish to the QMS will change the management rules for this fishery. As a quota species any swordfish that is caught must be retained and landed. The current practice to release small lively fish will no longer be possible.

Proposal

70 The Sixth Schedule provides a means for a commercial fisher to return fish to the water subject to stated requirements set out for that stock. The conditions proposed are that the swordfish be smaller than 1 metre LJFL, and that the fish returned are likely to survive.

Options

71 The alternative option is to rely on the incentives within the QMS to ensure that catch and ACE are matched on an annual basis or imposition of an MLS.

Costs and benefits of the proposal

72 There are benefits that swordfish of lower size and value can be released if alive and the value of the catch optimised. The measure provides flexibility to maintain current fishing practises that might be improving yield per recruit. There is theoretically no increased wastage of fish associated with adoption of this option in contrast to implementing an MLS.

73 There is some risk that fishers will not comply with the requirement that only live fish are returned. This risk (high grading or discarding) is the same whether Sixth Schedule provisions are available or not, particularly given the significant variation in value associated with swordfish condition and to a degree size.

Administrative implications

74 There are no specific administrative implications associated with this proposal other than those associated with its implementation.

ANNEX TWO

Species Information

Species Biology

75 Swordfish *(Xiphias gladius*) is a surface and midwater (primarily midwater) dwelling, highly migratory species found in all tropical and temperate oceans and large seas. Genetic studies suggest that swordfish in the Pacific Ocean comprise several semi-independent stocks: a western stock, a northeastern stock, a southeastern stock and a central south stock that includes New Zealand waters.

76 Swordfish do not form schools or dense aggregations. They move with prevailing currents and are associated with convergence zones, strong thermoclines or underwater features such as seamounts and shelving banks. Male and female swordfish have different geographical and seasonal distributions depending on size. In New Zealand waters there is progressive increasing of the average size of swordfish for increasing latitude beginning at latitude 40 degrees south.

77 Adult swordfish are visual predators. Relying on their highly developed eyes to detect prey in water where light is poor. They use their rostrum (sword) to stun prey. They are diurnal feeders, spending daylight hours near the seafloor feeding on demersal fish, they move to the sea surface at night to feed on squid and pelagic fish.

78 Within Pacific waters, spawning takes place in tropical waters of the western Pacific Ocean and to a lesser extent the equatorial waters of the central Pacific Ocean. Swordfish are batch spawners, perhaps as frequently as every few days over several months. Eggs are spawned in the upper layers of the ocean and like the protracted larval phase are pelagic. Swordfish have a large reproductive capacity with egg production estimated to range from 1 to 29 million (68–272 kg females respectively).

79 Estimates of growth rate indicate very rapid growth during the first year to between 0.9-1 metre in lower jaw to fork length (LJFL) and 10-15 kilograms of weight, with growth rate progressively slowing with age. The differences in growth parameters between males and females are significant with females growing faster than males. Asymptotic length for males is 2.13 metres while asymptotic length for females is about 3.00 metres LJFL. The maximum size reported for a swordfish is 4.45 metres total length (includes the bill and furthest extension of the tail) and about 540 kilograms (Nakamura 1985). Swordfish reach sexual maturity at 5-6 years of age. Ward and Elscot (2000) report that Australian swordfish are moderately long-lived but apparently not beyond 25 years of age.

Fisheries Characteristics

Commercial catch

80 Two types of swordfish fisheries have been characterised:

a) Convergence fisheries; and

b) Topographic fisheries.

81 The swordfish fisheries of the North Pacific, the South Pacific off Chile and the South Atlantic are convergence fisheries. These fisheries are broadly distributed and associated with currents and fronts in the open ocean. In general, convergence fisheries are highly productive although productivity can be variable depending on local environmental conditions, such as the southern oscillation in Pacific waters.

82 Examples of topographic swordfish fisheries include Florida, Hawaii and Australia. Fishing occurs on particular features such as continental slopes, banks and seamounts. As they develop topographic fisheries are characterised by the fleet progressively expanding to new grounds. Initially these new grounds have high catch rates but local depletion can occur when swordfish are removed at a greater rate that that at which growth and immigration can replace them. It is not known for how long individual swordfish "reside" around underwater features. However, mixing throughout swordfish populations probably takes months if not years.

83 New Zealand has many of the characteristics of a topographic type swordfish fishery. The North Island blocks the eastwards extension of the South Pacific's western boundary current. Consequently, the subtropical convergence zone is not as productive as elsewhere in the Pacific. In addition, as discussed further in paragraph 89, the New Zealand fishery has had to expand in area to increase swordfish catches.

84 The commercial landings of swordfish are presented in Table 2.

Table 2: Reported landings (tonnes greenweight) of swordfish by FMA for fishing years 1979-80 to 2002-03

Fish Yr	FMA1	FMA2	FMA3	FMA4	FMA5	FMA6	FMA7	FMA8	FMA9	FMA10	?	Total
Foreign licensed vessels (Japan and Korea)												
1979/80	51.4	306.1	1.9	1.6	0.4				23.4	1.1	9.7	**386**
1980/81	45.3	311.7	0.9	1.8					384.6	18.1	5.9	**762**
1981/82	124.7	357.4	0.5	1.0				0.2	239.4	12.2	2.7	**738**
1982/83	50.3	184.3		0.8					188.7	12.9	4.2	**436**
1983/84	73.0	163.9	0.1	0.4					142.7	9.2	2.0	**389**
1984/85	76.3	117.5	1.2	0.3	0.1				104.7	6.9	4.9	**320**
1985/86	51.8	235.5	0.1						373.6	17.1	7.9	**679**
1986/87	43.8	231.8		1.4					273.0	24.3	29.0	**578**
1987/88	15.9	258.8		1.3					3.9	10.1	0.7	**290**
1988/89	1.0	175.8	0.8	0.6					0.5	2.1		**182**
1989/90	0.3	172.2	0.3	1.5						16.6	2.1	**194**
1990/91	0.1	192.5	1.3	0.4			3.6			9.3	12.5	**212**
1991/92	2.4	172.1					6.5			0.6		**195**
1992/93		31.1										**31**
NZ Domestic & Charter fleets												
1991/92	11.0	16.6				3.7			0.7	1.2	0.3	**227**
1992/93	27.3	12.2		0.1		5.4			1.7	0.1		**110**
1993/94	51.6	18.8	0.1			1.9			6.9	8.8	0.1	**102**
1994/95	54.6	22.1		0.1		10.5	0.1	0.1	1.9	1.7	0.4	**102**
1995/96	69.0	64.6				5.9			5.8	2.3	1	**187**
1996/97	98.4	85.7		1.8		5.3	0.1	0.1	30.8		1.2	**283**
1997/98	162.0	106.1		0.9		6.1	1.2	1.2	99	0.1	4.3	**534**
1998/99	253.7	208.8		19.7		24.8	12.4	12.4	139.5	15.7	4.5	**939**
1999/00	220.1	355.3	0.1	4.8		29.2	3.3	3.3	147.9	14.9	2.4	**925**
2000/01	273.7	399.0	0.2	22.7		12.2	3.2	3.2	152.9	37	0.5	**1014**
2001/02												**972**
2002/03												**669**

85 Before the start of any domestic fishery, distant water longline fleets were granted foreign license access to fish for southern bluefin and bigeye tuna (Japan) and albacore (Korea). The swordfish bycatch by the Japanese foreign licensed fishery averaged 388 tonnes per year between 1979-80 and 1992–93 with peak landings of 761 tonnes in 1980–81 and 681 tonnes in 1985-86. The Korean foreign licensed fishery reported only small catches of swordfish (0 to 7 tonnes per year). Most of the Japanese swordfish catch (85%) was from FMA 2 and FMA 9 while the Korean swordfish catch was mostly (79%) from FMA 9 and FMA 10.

86 Declining catches of striped marlin in the early 1980s led to the implementation of the "Billfish Moratorium in Northern Waters" in 1987. These regulations prohibited domestic commercial fishers from taking any billfish. In addition, fishing by foreign licensed tuna longline vessels was prohibited in the waters of the Auckland Fisheries Management Area (FMAs 1 and 9). As part of the regulatory provisions any billfish

taken as bycatch could be tagged and released. The terms of the moratorium on billfish for domestic fishers were varied in 1993. The prohibition on taking swordfish in FMAs 1 and 9 was removed and the prohibition on taking marlin species was extended to include all NZ fisheries waters. At that time domestic commercial fishers agreed to avoid fishing certain areas to reduce conflict over recreational access to swordfish. However, since 1993 the commercial domestic fleet has grown much larger and no longer observes these area agreements.

87 In general, landings of swordfish reflect the number of hooks placed in the water for these species. The total number of hooks was stable between 1985 and 1995 but increased between 1995 and 2000 with the effort progressively levelling off. Landings of swordfish by domestic vessels have increased rapidly since 1994–95 peaking in landings of 1 014 tonnes in 2000-01. Since, landings have progressively declined to 669 tonnes during 2002-03.

Catch by region

88 Swordfish can be caught in most FMAs although most catches are from waters north of latitude 40º S. Most domestic landings (86%) are reported from FMA 1, FMA 2 and FMA 9.

89 Pelagic and Tuna stakeholders group undertook analysis of the distribution of broadbill swordfish catch during 1989 and 2001. From 1989-2001 most swordfish was taken along the edge of the continental shelf off the east coast of the North Island. Highest catches were reported off East Coast, Gisborne, in the Bay of Plenty, and the Poor Knights shelf. Since 1995-96 the development of the domestic tuna fishery resulted in a level of catch and an extension of the geographic range where swordfish has been caught. In the subsequent years, the fishery expanded northwards and down the central east coast of the North Island. The fishery also expanded to the northern west coast of the North Island.

Targeted catch and bycatch

90 In New Zealand waters, swordfish are primarily caught in the tuna longline fishery as a bycatch when targeting bigeye, southern bluefin tuna and to lesser extent albacore. For the domestic fleet 75% of hooks are reported as targeting bigeye, 16% as southern bluefin tuna, 7% as albacore and the remaining 2% other tunas.

Table 3: Estimated catches (tonnes greenweight) of swordfish reported by target species for fishing years 1994-95 to 2002-03

	Fishing year[a]								
Target species	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Bigeye	40	63	82	196	371	423	518	418	266
Southern bluefin	10	16	41	62	93	105	116	132	130
Albacore	2	7	9	46	54	74	40	63	57

[a]Fishing year '1995' is fishing year 1994–95

91 Swordfish have occasionally been observed as a bycatch of the skipjack tuna purse seine fishery (Habib et al. 1982) and in trawl fisheries for jack mackerel (Anderson et al. 2000) and hoki (Clark et al. 2000).

92 It is known that swordfish catch rates can be increased by choice of longline gear, longline setting strategy such as setting at night and the using of lightsticks, hence there is considerable potential for swordfish catches to increase or decrease depending on the adoption of fishing practices[1].

93 Based on MFish observer data, discard rates are about 0.4% of the reported landings with most (57%) of the discarded swordfish dead upon their return to the sea.

Number of domestic vessels catching and landing

94 The number of domestic vessels reporting landings of swordfish by year is shown in Table 4.

Table 4: Number of vessel reporting landings of swordfish for fishing years 1996-97 to 2002-03

	Fishing Year						
	1997	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Vessels	48	57	77	122	122	152	128

[a]Fishing year '1997' is fishing year 1996–97

95 The numbers of vessels that catch and report landing swordfish reflect the development of an important surface longline fishery for bigeye and southern bluefin tuna since 1996-97. There is a relatively large number of vessels reporting landings of swordfish, consistent with the largely bycatch nature of the fishery. The number of vessels reporting swordfish landings decreased in 2002-03 since peaking in 2001-02. This is associated with the decline in catch for that year.

Recreational and customary catch

96 The recreational fishery for billfish pre-dates the development of a commercial fishery for large pelagic species by many years. This recreational fishery is dominated by striped marlin but there has always been a considerable recreational interest in swordfish.

97 Angling for swordfish involves floating baits near the surface while drifting at night further from the coast that is routinely fished by recreational vessels. Recreational swordfish fishing can therefore be an uncomfortable experience in exposed oceanic waters with the additional dangers of navigating at night. Accordingly, recreational catches to date have been relatively small (if most of the recreational catch is attributed to gamefishing, the recreational catch has averaged seven swordfish per year since 1987–88 with a maximum of 36 fish in 1992–93). Nevertheless, the recreational sector's interests and aspirations are similar to those of commercial fishers in that it sees potential for a recreational swordfish fishery to expand.

98 Recreational fishers place considerable value on the retention of trophy-sized swordfish within areas that are of particular interest to them. Recreational fishers have expressed concern about the potential impact the current level of commercial catch of swordfish might be having on their fishery. While there are limited direct gear conflicts, spatial conflict exists between the sectors

[1] Factors affecting swordfish (*Xiphias gladius*) catch rate in the New Zealand tuna longline fishery Murray and Griggs.

particularly in light of the current assumption that as in Australian waters large New Zealand swordfish may have long residence times (in preferred habitats within the EEZ), which make them vulnerable to over fishing[2].

99 MFish is not aware of any current customary Mäori fishery for swordfish, however it is known that swordfish have been harvested in the past.

Regulatory framework

100 From 1991 swordfish became subject to regulations that restricted catch to bycatch only, except for those existing target fishers who had received a fishing permit in previous years. This meant swordfish could be legally landed only as bycatch of target fishing for another species.

101 No specific regulatory measures apply to the swordfish fishery with the exception that regulations apply to the operation of foreign owned vessels registered to fish within New Zealand fisheries waters. These regulations include a provision excluding the use of foreign owned tuna longline vessels in the Auckland Fisheries Management Area from 1 October to 31 May in the following year.

Fisheries Assessment

102 In the Pacific other fleets catch swordfish and the Japanese in particular have a long history of longlining for swordfish and other tunas. During the 1980s, two studies assessed Pacific swordfish stocks by applying equilibrium production models to Japanese data. These studies provided similar results by suggesting a MSY for Pacific swordfish to be about 20 000 tones per year (range 18 000-28 000 tonnes). These assessments suggest that the Pacific stock was under exploited until the early 1980s. More recent assessments have been inconclusive and the condition of the Pacific stock remains uncertain.

103 Stock structure, longevity and productivity of the central south stock are uncertain and little is known of the biology and ecology of swordfish in this area. However, it is often assumed that swordfish, particularly large swordfish, may have long residence times which may make them vulnerable to over fishing.

104 Since 1998, swordfish landings in New Zealand have been stable and for the most recent two years decreasing. However, there is no evidence of declines in catch per unit of effort or in the average swordfish size taken within New Zealand fisheries waters that suggests that swordfish abundance is in decline or that stock status is changing. (This conclusion is based on analysis of catches up to 2001-02. Catch rates since the fishery peaked in 2001-02 have yet to be analysed). There is some anecdotal information from recreational and commercial fishers that swordfish are not as abundant in some areas as they once were.

Associated Fisheries

105 The catch composition of surface long lining suggests distinct associations between swordfish and a set of pelagic species. The main species associated with long lining include: bigeye tuna, blue shark, albacore tuna, Ray's bream, southern bluefin tuna, porbeagle/mako shark, dealfish, moonfish, oilfish, and deepwater dogfish.

106 Sharks and marine mammals such as sperm whales, false killer whales and killer whales are known to predate swordfish. Sharks, particularly mako and blue shark, attacking swordfish hooked on longlines are a source of wastage in the fishery.

[2] Swordfish – environmental - fishery interactions off eastern Australia Campbell and Hobday, 2003

107 As mentioned, swordfish is primarily caught in the tuna longline fishery as a bycatch when targeting bigeye and southern bluefin tuna. Bigeye tuna and southern bluefin are being introduced into the QMS at the same time as swordfish. MFish has considered economic implications of setting TACCs for associated species starting at paragraph 117 below.

Environmental Issues

108 Swordfish, as high-level predators, form an important ecological relationship with their prey, and possibly with some marine mammals. The effect on the ecosystem of large-scale removals of a single species is unknown.

109 In New Zealand waters swordfish is primarily taken by surface longline. Environmental issues are common to the fishing method rather than specific to fishing for swordfish. Long lining is not considered to have any direct effects on swordfish habitats.

110 A wide range of fish species are taken as bycatch of surface longline fishing. Catches of these species vary but many of these are only rarely taken. The main fish bycatch species associated with the New Zealand surface longline fisheries are being considered for introduction into the QMS. This will provide the mechanisms for sustainability actions as required.

111 There is also a non-fish bycatch associated with the surface longline fishery. Fishing vessels sometimes capture seabirds that are chasing baited hooks, and the seabirds drown as the lines sink. Seabirds are also caught in trawl and other fisheries, but longliners are considered to be the main threat to several vulnerable albatrosses and other seabird species. The risks of seabird capture vary geographically and by species. An active programme is underway to mitigate and monitor the capture of seabirds in surface longline fisheries.

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

113 MFish and the Department of Conservation are currently evaluating submissions on a draft National Plan of Action (NPOA) for Seabirds that is expected to result in additional measures that will apply to all fishing vessels fishing for swordfish. Surface longlining is identified by the NPOA as having known interactions with seabirds. Therefore, stakeholders will need to develop an effective code of practise for this method by 2004.

Research

114 Information on the New Zealand fishery (catch per unit of effort) is routinely contributed to the international status reports for the central southern Pacific swordfish stock. Factors affecting CPUE have been evaluated for the New Zealand longline fishery. Age and growth and the stock structure of New Zealand swordfish are currently being investigated.

115 Research on the interrelationships between swordfish and other elements of the aquatic environment has been identified as an area for future consideration, however, this is a complex area of study and it is unlikely to be undertaken in the foreseeable future.

116 As mentioned, obtaining reliable estimates of recreational catch for swordfish has proved difficult. Further work to estimate, and to differentiate, recreational catches and landings are required.

Social, Cultural, and Economic Factors

117 Swordfish is a medium value species that is an important component of the domestic tuna longline fishery in New Zealand. MFish considers introduction of swordfish into the QMS has economic benefits for commercial fishers by allowing fishers to fish for swordfish in a way that optimises the value of the catch.

118 However, there will be short-term impacts arising from introducing swordfish into the QMS associated with the need for individual fishers to acquire quota to reflect their current fishing operations. Swordfish landings in the criteria years for catch history were substantially smaller than they are currently.

119 Two other socio economic factors have been considered:

a) Are there any socio economic implications of the proposed TACC in comparison to recent landings of swordfish?

b) Are there any socio economic implications of setting the proposed TACC for swordfish with respect to anticipated levels of bycatch under proposed TACCs set for its main target species?

120 The proposed TACC is based on the average of the most recent years landings and therefore no direct socio-economic impact is predicted.

121 The main target species of swordfish are being introduced into the QMS at the same time as swordfish. There could be important implications for fishing for bigeye tuna or southern bluefin tuna if the proposed TACC for swordfish impacts on the ability of fishers to target species in fisheries where swordfish is taken as a bycatch.

122 To address this issue, MFish has analysed the level of bycatch recently reported for swordfish in greater detail. As mentioned, there have been changes in fishing practise that has resulted in the proportion of swordfish bycatch increasing in some target fisheries. MFish considers that the bycatch reported over the past six years provides the best point of comparison for comparing TACC options and ascertaining whether fishing for associated species might be affected.

Table 5: **Target landings of Bigeye tuna (BIG), southern bluefin tuna (STN) and albacore tuna (ALB) and bycatch landings of swordfish (SWO) with ratios of the landings by weight.**

Year	BIG	SWO	RATIO	STN	SWO	RATIO	ALB	SWO	RATIO
1997-98	213	196	0.92	234	62	0.27	286	46	0.16
1998-99	267	371	1.39	286	93	0.32	219	54	0.25
1999-00	370	423	1.14	240	105	0.44	205	74	0.36
2000-01	374	518	1.39	258	116	0.45	181	40	0.22
2001-02	210	418	1.99	336	132	0.39	374	63	0.17
2002-03	135	266	1.96	271	130	0.48	643	57	0.09

123 Swordfish bycatch is associated with target fishing for bigeye tuna and southern bluefin tuna. The level of swordfish bycatch reported from each of the bigeye and southern bluefin tuna fisheries and the ratio of bycatch species to target species weights has been increasing over the past six years. The albacore fishery and its associated bycatch of swordfish is more stable. However, MFish does not consider that recent reported commercial swordfish landings necessarily represent a minimum level in terms of a manageable bycatch. It is known that swordfish catch rates can be increased by choice of longline gear, longline setting strategy such as setting at night and the using of lightsticks, hence there is considerable potential for swordfish catches to increase or decrease depending on the adoption of fishing practices. In a largely unrestrained management environment it is to be expected that some fishers have attempted to optimise the level of bycatch of swordfish as suggested by the data in the above table.

124 Fishery characteristics (particularly the relationship between swordfish and other target fisheries) indicate that the TACC proposed will provide a manageable level of bycatch without detrimentally affecting the targeting of associated fisheries. In some circumstances changes in fishing practices might be necessary. As discussed, bycatch levels of swordfish can be substantially reduced with a concomitant reduction in the risk of any economic impact associated with constraints on fishing imposed by any of the current proposals.

125 Though not a common catch of recreational fishers swordfish is highly prized when caught. Mäori probably does not consider swordfish to be a species of particular importance.