Ministry for Primary Industries
Manatū Ahu Matua

Review of sustainability and other management controls for snapper 1 (SNA 1)

MPI Discussion Paper No: 2013/31

Prepared for the Ministry for Primary Industries
by the Inshore Fisheries Management Team

ISBN No: 978-0-478-41482-0 (online)
ISSN No: 2253-3907 (online)

July 2013

Disclaimer

The information in this publication is not government policy. While every effort has been made to ensure the information is accurate, the Ministry for Primary Industries does not accept any responsibility or liability for error of fact, omission, interpretation or opinion that may be present, nor for the consequences of any decisions based on this information. Any view or opinion expressed does not necessarily represent the view of the Ministry for Primary Industries.

Requests for further copies should be directed to:
Publications Logistics Officer
Ministry for Primary Industries
PO Box 2526
WELLINGTON 6140

Email: brand@mpi.govt.nz
Telephone: 0800 00 83 33
Facsimile: 04 894 0300

This publication is also available on the Ministry for Primary Industries website at http://www.mpi.govt.nz/news-resources/publications.aspx

Contents

SUSTAINABILITY REVIEW OF FISH STOCKS 2013

This Initial Position Paper (IPP) provides the Ministry for Primary Industries' (MPI's) initial views on proposals for sustainability measures and other management controls for SNA 1 for the October 2013/14 fishing year.

MPI has developed this IPP for the purpose of consultation as required under the Act 1996 (the Act). MPI emphasises the views and recommendations outlined in the paper are preliminary and are provided as a basis for consultation with stakeholders.

In August 2013, MPI will compile the Final Advice Paper (FAP) to summarise MPI's and stakeholder's views on the SNA 1 review, and provide final advice and recommendations to the Minister for Primary Industries. A copy of the FAP and the Minister's letter setting out his final decisions will be posted on the MPI website as soon as these become available. Hard copies will be available on request.

DEADLINE FOR SUBMISSIONS

MPI welcomes written submissions on the proposals contained in the IPP. All written submissions must be received by MPI no later than 4pm on Friday, 23 August 2013.

Written submissions should be sent directly to:

Inshore Fisheries Management
Ministry for Primary Industries
P O Box 2526
Wellington 6011

or emailed to FMsubmissions@mpi.govt.nz

OFFICIAL INFORMATION ACT 1982

All submissions are subject to the Official Information Act and can be released (along with the personal details of the submitter) under the Act. If you have specific reasons for wanting to have your submission or personal details withheld, please set out your reasons in the submission. MPI will consider those reasons when making any assessment under the Act.

1 EXECUTIVE SUMMARY

BACKGROUND

1 The Ministry for Primary Industries (MPI) is seeking tangata whenua and stakeholder information and views to inform a review of catch limits and other management controls for snapper in Quota Management Area 1 (SNA 1).

2 The SNA 1 fishery is New Zealand's most valuable inshore finfish fishery. The fishery is both highly valued and fully utilised by the customary Māori, recreational, and commercial sectors. The SNA 1 fishery management area encompasses a large proportion of the New Zealand population, with over two million people estimated to be living near its boundaries.

3 SNA 1 is made up of two separate biological stocks; east Northland and Hauraki Gulf–Bay of Plenty. The stocks are currently managed within a single Total Allowable Catch (TAC).

4 The TAC for the SNA 1 stock was last reviewed in 1997. Using the best available information at the time, the SNA 1 stock was estimated at 15% B_0, and had a management biomass target level of 23% B_0. The Minister's decision in 1997 was to rebuild the stock to 23% B_0, and a TAC reduction was implemented to achieve the rebuild over a twenty year period.

5 The management actions were effective. The recently completed 2013 stock assessment shows that in just sixteen years the stock has increased in size to reach between 24% B_0 and 19% B_0 depending on the sub-stock being measured. This rebuild has broadly achieved the 1997 targets. Moreover, projections show that the stock is likely to continue to increase slowly for the next five years.

6 The success of the rebuild of SNA 1 is supported by anecdotal information on the increased abundance of snapper. Fishers from the commercial, recreational, and customary Māori sectors have reported an increase in abundance and availability of snapper compared with previous years. Reports of the increase in abundance and availability are attributed to a substantial increase in biomass over the last ten years, linked to a period of higher than average recruitment.

7 The rebuild of the stock, and the projections showing (slow) continued growth provides an opportunity to consider current management measures. MPI is seeking stakeholder feedback on potential TAC options, and inviting any further options that stakeholders may have.

8 However, to frame this consultation, MPI notes that the 1997 targets have been superseded by better information on how to manage fish stocks such as snapper. The fisheries science working group responsible for undertaking the 2013 assessment adopted an “interim” biomass target level of 40% B_0. This interim target is based on the Harvest Strategy Standard (HSS) for stocks with similar productivity to snapper where no formal target has been specified. During 2013/14 a science project will outline the costs and benefits of alternative long term biomass target levels specific to snapper, following input by stakeholders on preferred management approaches.

9 MPI consider that determining a formal target, which addresses both sustainability and utilisation objectives for SNA 1, is best achieved by working with stakeholders. Nonetheless, while the final target may be higher or lower than the interim target level of 40% B_0, MPI is confident that any likely target will be considerably higher than the current levels of biomass (possible range 33-40% B_0).

TAC OPTIONS

10 Using the stock assessment and interim target, projections of what SNA 1 stock size will look like over the short and longer term under a range of scenarios were modelled. Short term projections using levels of recent average recruitment indicate that the stock will continue to rebuild, albeit very slowly, or remain at about the current biomass level over the next five years. Projections based on long term average recruitment levels suggest that under the same range of scenarios the biomass level will decline.

11 MPI has a preference for use of the short term projections in developing options for this review. This is because MPI considers the value of this fishery warrants regular review (every two to five years) of management settings to provide greatest utilisation benefits to all sectors (active management). Maximising benefits from this management approach will require careful consideration of information needs and closer engagement and partnership with tangata whenua and stakeholders.

12 Using information from the short term projections for the stock, this paper focuses on three TAC options. The options consider TAC levels of 7050 tonnes, 7550 tonnes (the current TAC), and 8050 tonnes. These options reflect the choices about how the rebuild of SNA 1 is managed in the short term. While the rebuild timeframes are similar under all the options proposed, they provide for different short term outcomes while ensuring that the SNA 1 stock continues to rebuild over the coming five years.

13 These options are not exhaustive, and MPI invites feedback on any additional options that stakeholders may have.

ALLOCATION APPROACH

14 Under the three options considered in this paper, there are different allocation options open to the Minister. MPI's preference is to adopt a proportional approach to allocation of the TAC between the recreational and commercial sectors while longer term shares of the fishery are considered as part of a long term management strategy. However, this approach does not fetter the Minister's discretion as to how he may choose to allocate the TAC.

SPLITTING CUSTOMARY AND RECREATIONAL ALLOWANCES

15 A combined non-commercial allowance of 2600 tonnes was made in 1997. As required under the Fisheries Act 1996 (the Act), MPI proposes to separate out the allowance for recreational and customary fishers.

16 While there is limited customary reporting, MPI considers customary take is in the order of 50 tonnes. It is important to note the customary allowance does not act as a cap on customary catch; it is based on the best available information about the current level of catch. MPI invites comment from tangata whenua about customary catch.

RECREATIONAL CATCH

17 Recreational catch is not managed on an annual basis. The allowance reflects a year to year variation in recreational catch. Recreational catch is known to vary in response to a combination of factors, including changes in availability and abundance of snapper, and the participation rate and fishing effort of the recreational sector. However, the average recreational catch should fluctuate around the allowance that has been set by the Minister.

18 The best available information suggests average levels of recreational catch in recent years are well in excess of the combined non-commercial allowance. This paper explores possible changes to the daily bag limit and/or the minimum legal size (MLS) that can help ensure the recreational allowance is not exceeded on average.

MANAGEMENT APPROACH AND INFORMATION NEEDS

19 Initial analysis suggests that the amount of snapper available for harvest could be roughly 12 000 tonnes, or 4500 tonnes greater than the current TAC if the fishery was rebuilt to the interim target level. Therefore there are significant benefits from a fully rebuilt fishery that are being foregone by all sectors while the stock remains below optimal levels.

20 MPI acknowledge that in place of more active management of the fishery that maximises utilisation while providing for long term growth toward a target, a more passive

long term management approach could be adopted for SNA 1. Under such an approach, the Minister could decide to rebuild the stock towards the interim target of 40% B_0 as fast as possible. This would likely mean significant reductions (in the order of 3500 tonnes) to the current TAC in the near term, and include stringent controls of recreational harvest. However, this approach would provide for fewer reviews of the fishery, more stable TAC settings and less active management. Such an approach would come at the expense of short and medium term utilisation opportunities as the stock rebuilds. MPI welcomes stakeholder feedback on the most appropriate management approach to SNA 1.

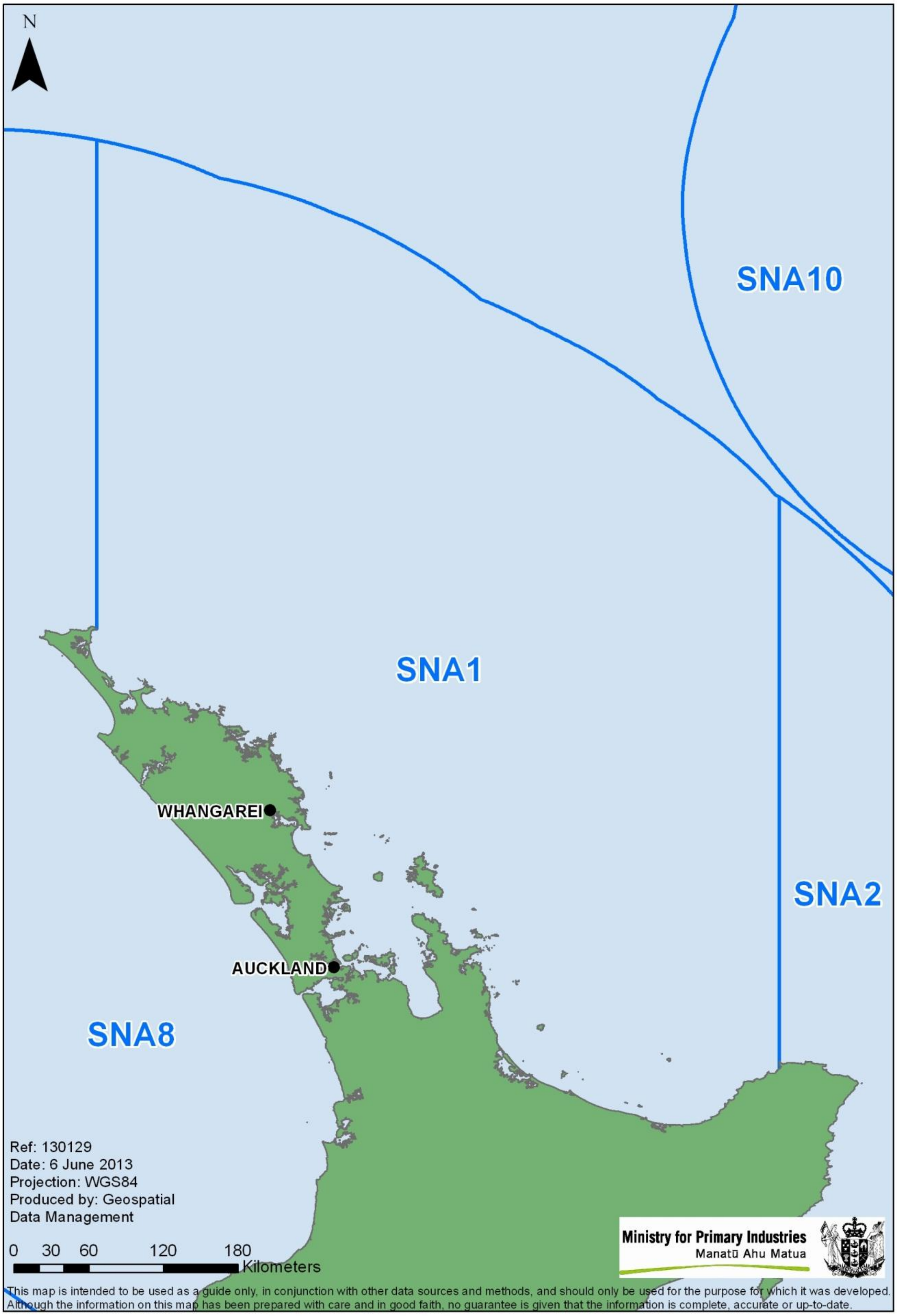
ONGOING ENGAGEMENT

21 MPI supports the desire of tangata whenua, commercial and recreational stakeholders to work alongside government to determine how best to maximise the benefits from the SNA 1 fishery. MPI's support for collaboration is independent of whether the stock is more or less actively managed and what options the Minister may decide for the 2013/14 TAC and allocation for SNA 1. A determination of how to best maximise the benefits of the SNA 1 fishery will include consideration of the following:

- The most appropriate management target(s).
- The information needs to achieve the management target(s).
- The frequency and detail of future reviews of the SNA 1 fishery.
- The overall SNA 1 management framework.

22 The objective of this long term management strategy, which will be developed within the next five years, will be to best manage New Zealand's most important and valuable inshore fin fishery.

Figure 1.1: Snapper (SNA 1) Fishery Management Area (FMA)



2 SNA 1: BIOLOGY

2.1 GROWTH AND PRODUCTIVITY

23 Snapper is a long-lived species that may live up to 60 years or more and has a very low natural mortality.[1] These biological characteristics (high longevity and low natural mortality) indicate that snapper is a low productivity stock.

24 Snapper spawning usually occurs in November and December, with large schools of snapper congregating and moving onto spawning grounds. The spawning season may extend to January-March in some areas and years before the fish disperse, often inshore to feeding grounds. Areas likely to be important for snapper spawning include the Hauraki Gulf (Cradock Channel, Coromandel Harbour to the Firth of Thames, and between the Noises, Tiritiri Matangi and Kawau Islands), Rangaunu and Doubtless Bay, the Bay of Islands, and the eastern Bay of Plenty.

25 Males and females are thought to mature around three to four years of age and lengths between 20 and 28 centimetres. Growth rate varies geographically and from year to year, however snapper in SNA 1 grow the slowest of all the snapper stocks in New Zealand.

2.2 TROPHIC INTERACTIONS

26 Snapper are able to thrive in a wide variety of environmental conditions; occupying nearly every coastal marine habitat less than 200 metres deep (the highest abundance occurs between 15 and 60 metres deep).

27 The diet of snapper is diverse and opportunistic, largely feeding on crustaceans, polychaetes, echinoderms, molluscs and other fish. As snapper increase in size, harder bodied and larger diet items increase in importance. There is some evidence to suggest a seasonal component to snapper diet, with high proportions of pelagic items.

28 There is some evidence to suggest that snapper have the ability to influence the environment that they occupy. On some rocky reefs, recovery of predators inside marine reserves (including snapper and rock lobster) has led to the recovery of algal beds through predation exerted on herbivorous urchins.

29 Snapper compete with other species, so overlap in diet is likely with a number of other demersal predators (e.g. tarakihi, red gurnard, trevally, rig, and eagle ray). The wide

[1] The Plenary considers natural mortality rate, M, is unlikely to be great than 0.1

range of prey consumed by these species and differences in diet preference and habitat occupied is likely to reduce the amount of competition overall. The importance of snapper as a food source for other predators is poorly understood.

2.3 ROLE OF SNAPPER IN THE ECOSYSTEM

30 Snapper are one of the most abundant demersal generalist predators found in the inshore waters of northern New Zealand, and as such are likely to be an important part of the coastal marine ecosystem. Localised depletion of snapper probably occurs within key parts of the fishery; this has unknown consequences for ecosystem functioning in those areas.

2.4 NATURAL VARIABILITY

31 Changes in environmental conditions can influence the timing and success of spawning and subsequent recruitment.

32 Water temperature appears to play an important part in the success of recruitment. Generally strong year classes in the population correspond to warm years and weak year classes correspond to cold years.

33 In unfished populations, snapper biomass is likely to be relatively stable, but the current stock status of SNA 1 (refer to 4.2 *Status of the SNA 1 stock*) suggests the biomass could be more variable in relation to variable recruitment because there are fewer age classes in the fished population.

3 SNA 1: FISHERY

3.1 COMMERCIAL FISHING

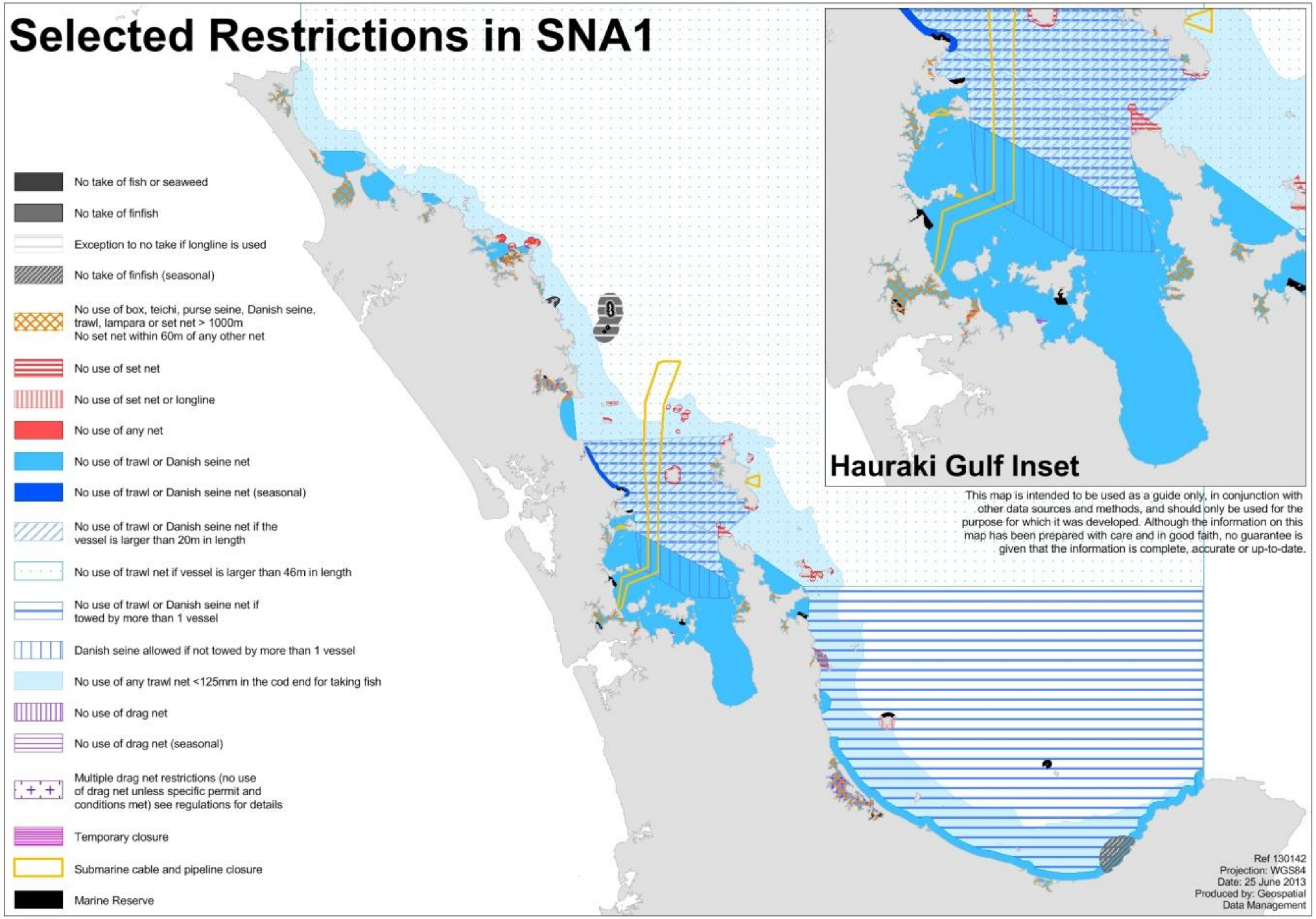
3.1.1 Area, method, and other controls on commercial fishing

34 A range of commercial fishing restrictions apply over large areas of the inshore zone within SNA 1, detailed in Table 3.1. These restrictions are mostly in place to protect juveniles and spawning aggregations from the impacts of fishing and to reduce inter-sector conflict. A map showing commercial fishing method restrictions in SNA 1 is shown in Figure 3.1.

Table 3.1: List of commercial fishing restrictions in SNA 1

Area	Restriction
All Areas	MLS of 25 centimetres
All Areas (Harbours and estuaries)	Closure of all harbours to bulk fishing methods to remove a hazard to navigation
Hauraki Gulf	Trawl and Danish seine restrictions within the Hauraki Gulf
Inner Hauraki Gulf	Seasonal closures that prohibit most commercial fishing within the Inner Hauraki Gulf from 1 October to 31 March the following year
Mayor (Tuhua) Island	Prohibitions on the use of commercial set nets and long lines within one nautical mile of Mayor (Tuhua) Island
Bay of Plenty	One nautical mile trawl closure around the coastline
Motu river	Seasonal closure
Mimiwhangata Marine Park	All commercial fishing excluded
All Areas	Restrictions on anchoring and fishing over marine cables
All Areas	Restrictions over the size, placement and mesh size of nets
All Areas	Trawl mesh has a minimum size of 125 millimetres
Bay of Islands	Prohibitions on the use of commercial set nets from specified areas. Depending on the location, this restriction may be seasonal

Figure 3.1: Commercial fishing method restrictions in SNA 1



3.1.2 Deemed values

35 Under the Act, overfishing is controlled in the first instance by the application of graduated monetary payments, known as interim and annual deemed values. The deemed value framework provides an incentive for fishers to acquire sufficient Annual Catch Entitlement (ACE) to balance against catch. Changes to the deemed value schedule for SNA 1 were made in 2012. The current and previous deemed values set for SNA 1 are shown in Table 3.2. Standard ramping provisions apply to all snapper stocks.

Table 3.2: Deemed value rates for SNA 1

Year	Interim deemed value ($/kg)	Annual deemed value ($/kg)
2012-13	8.00	22.00
2001-02 to 2011-12	13.00	26.00

36 Table 3.3 shows the deemed value payments made, the catch as a proportion of the Total Allowable Commercial Catch (TACC), and the amount of ACE available at the end of the fishing year (30 September) for SNA 1.

Table 3.3: Deemed value payments and catch as a proportion of the TACC and available ACE for SNA 1

Year	2007/08	2008/09	2009/10	2010/11	2011/12
Deemed value payments	$27 459	$227 154	$422 912	$2 152 350	$82 411
Catch as a proportion of the TACC	101.07%	100.96%	99.22%	100.36%	102.54%
Proportion of ACE available on 30 September	1.94%	1.07%	1.83%	1.88%	1.33%

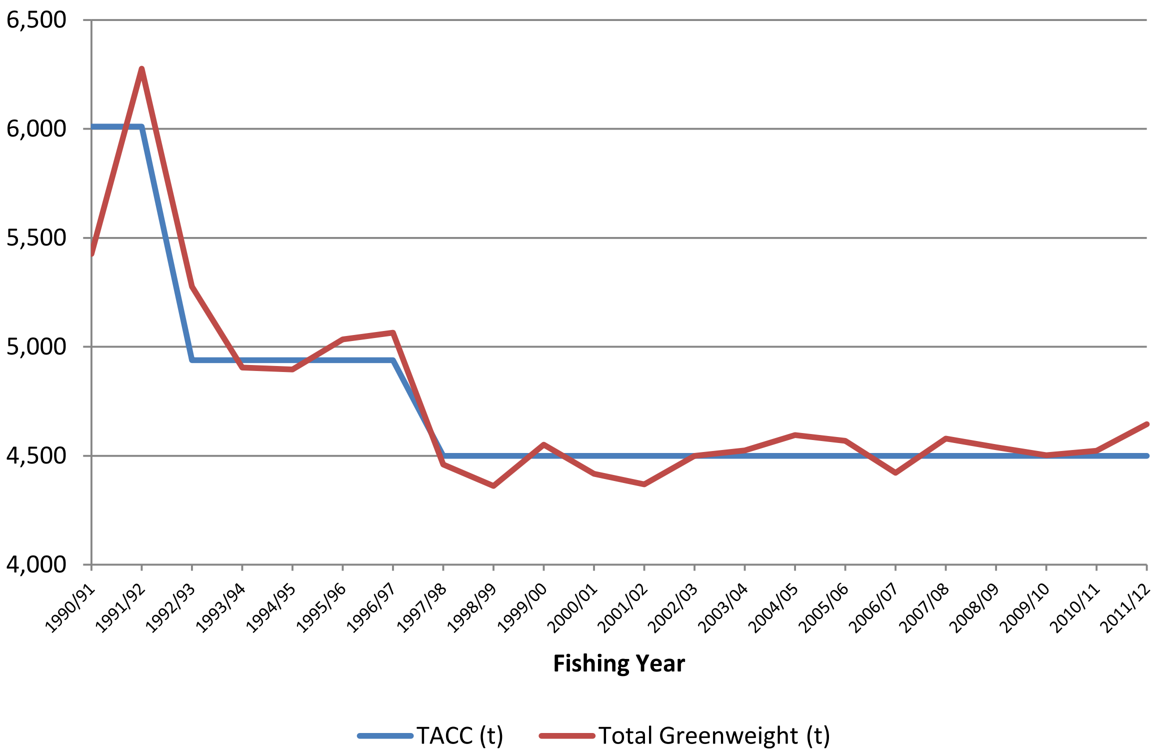
37 Table 3.3 shows deemed value payments are incurred despite there being ACE available for commercial fishers. MPI considers that if ACE were more effectively distributed the deemed value amounts would be substantially less. MPI considers the 2010/11 year is an outlier[2].

3.1.3 Commercial Catch

38 The commercial fishing sector harvests the greatest proportion of the SNA 1 catch. Total reported landings of snapper by the commercial sector are shown in Figure 3.2.

[2] The deemed value amount for the 2010/11 year was inflated significantly because of the ACE trading practice of a single fisher. MPI has since taken steps to reduce the risk of the fisher behaviour occurring again.

Figure 3.2: Reported catch landings and TACC for SNA 1 from 1990/91 to 2011/12



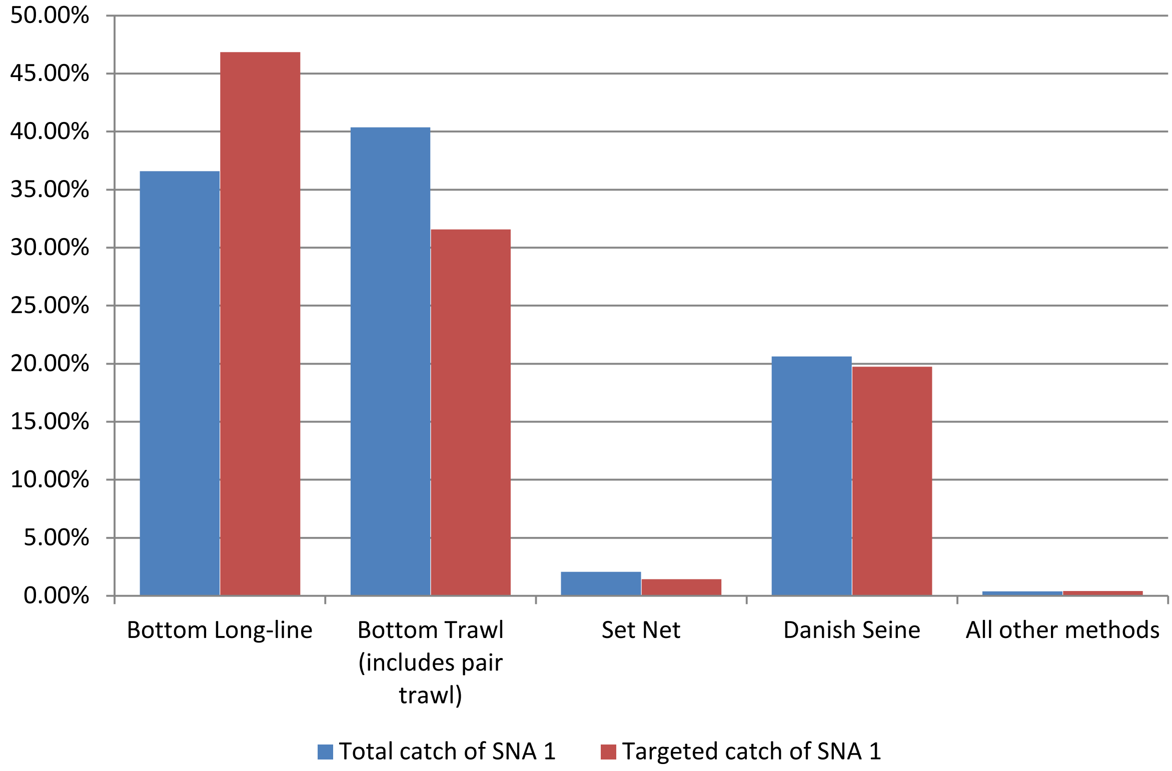
39 The number of vessels reporting SNA 1 catch increased from around 400 in the 1980s to a peak of around 800 vessels in 1993. This number subsequently declined to around 200 vessels in 2011/12.

40 The increase in the number of vessels between the 1980s and 1993 was due to the doubling in number of lining vessels in response to developing niche markets. Since the demise of those markets in the 1990s, along with reductions in quota holdings, the economic viability of small long-line vessels diminished and many dropped out of the fleet. This change prompted an increase of the catch of snapper by trawlers and Danish seiners. These vessels sought the efficiency of larger landings since the price advantage of higher quality fish was reduced. In recent years there has been a slight trend towards Danish seining. This is thought to indicate a response to changing market forces and efficiency advantages offered by the method that can catch substantial volumes while maintaining a quality that is generally better than trawling, and requiring less power.

41 The decline in the number of vessels catching snapper since 1993 is broadly consistent with changes for the national inshore fleet, and is thought to be a trend in response to the introduction of the quota management system.

42 Snapper is primarily taken by bottom long-line and bottom trawl methods, although more snapper is targeted using bottom long-line. The proportion of SNA 1 caught by method is shown in Figure 3.3.

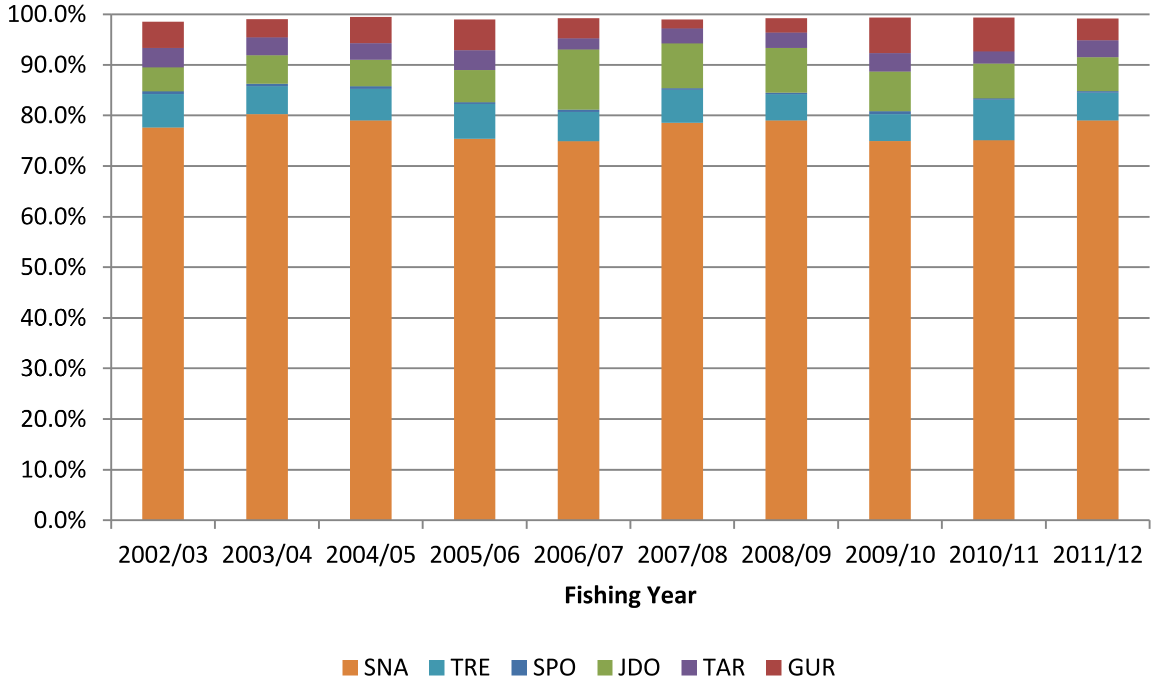
Figure 3.3: SNA 1 catch by method from 2002/03 to 2011/12



43 For the last ten fishing years, around 77% of SNA 1 catch was reported as being targeted, with less than a quarter reported as bycatch. While reported levels of bycatch are variable from year to year, there has been an increasing trend in reported levels of snapper bycatch in other target fisheries since the 1990s. Bycatch levels of SNA 1 in trevally, gurnard, John dory, tarakihi and rig fisheries ranged from 0.2% to 3.4% of catch volume between 1991 and 1996. The bycatch levels increased to range from 18.7% to 24.3% of catch volume between 2002 and 2012. Figure 3.4 shows the snapper catch as proportions of target fisheries from 2002/03 to 2011/12.

44 Landings of trevally, gurnard, John dory and tarakihi are currently at levels well below their respective TACCs in FMA 1. If commercial effort in these fisheries increased to catch a greater proportion of the respective TACCs, then a greater level of snapper bycatch could be expected.

Figure 3.4: SNA 1 landings separated into reported target and bycatch, 2002/03 to 2011/12



3.1.4 Value of the commercial fishery

45 Snapper is a high value commercial fishery. Estimates of the asset value for snapper stocks in 2009 assessed the asset quota value for SNA 1 as being $186 million[3], making SNA 1 the fifth most valuable stock by quota asset value in the quota management system.

46 The average quota value for the 2011/12 fishing year was $47 049 per tonne for SNA 1. The average ACE value (the earnings quota owners receive when selling their ACE) for the 2011/12 fishing year was $4130 per tonne for SNA 1. The average port price (the gross price that fishers receive) for the 2012/13 fishing year is $5770 per tonne for SNA 1.

47 The export value for all snapper exported in 2011/12 was $36.8 million. The average unit export value for 2011/12 was $8325 per tonne for snapper. While SNA 1 makes up 71% of the combined snapper TACCs, the proportion of export value that it contributes is uncertain. 98% of snapper is exported as chilled whole or frozen whole. The two product forms command different prices, and the export value of the chilled product ($10 500 per tonne) in comparison to the frozen product ($7900 per tonne) is reflected by a range in export values.

[3] From the Fish Monetary Stock Account: 1996 – 2009 published by Statistics New Zealand (2010). The value of SNA 1 quota has been extrapolated from the total snapper value based on the size of the SNA 1 commercial fishery as a proportion of the total commercial snapper fishery.

48 The possible effects of a growing SNA 1 stock size, the potential for greater effort in other target fisheries, and the ability of fishers to avoid SNA 1 is unknown. However, many commercial operators hold the view that managing bycatch of SNA 1 using ACE made available for that purpose is becoming increasingly difficult.

3.2 RECREATIONAL FISHING

3.2.1 Management controls on recreational fishing

49 The combined recreational and customary allowance is 2600 tonnes. This allowance was set in 1997, and was based on diary estimates from 1994 and 1996 telephone diary surveys.

50 The current daily bag limit of nine snapper has been in place for the Auckland and Kermadec Fishery Management Areas since 1997. The first substantial restrictions on snapper catches were introduced in 1986. These regulations set a maximum daily catch of 30 fish for each of 13 specified species nationally including snapper. The daily bag limit for recreational fishers was reduced from 30 to 20 snapper in 1993 and to 15 in 1994. The last change from 15 to 9 was made in 1997. The 1997 reduction was assessed by the snapper stock assessment working group in 1998 to have reduced the recreational catch by about 8% for one year.

51 Snapper has a MLS of 27 centimetres for recreational anglers in the Auckland and Kermadec Fishery Management Areas.

52 Other recreational fishing controls in this area that impact on snapper include:

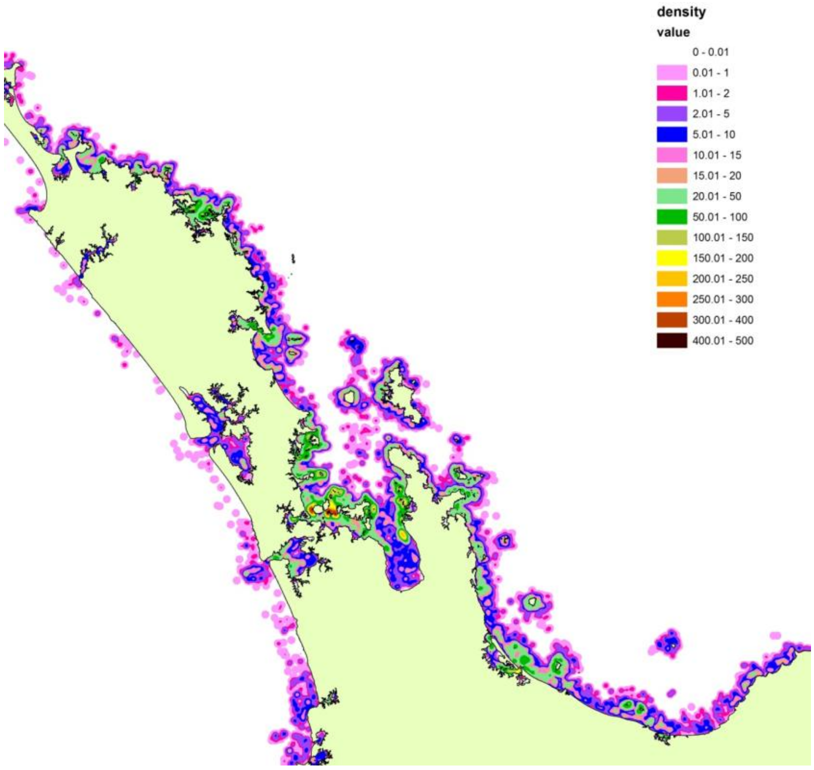
- One line per person and two per boat (other than handlines or rod and reel lines).
- Number of hooks (no more than 25 per line).
- One net per person.
- Restrictions over the size, placement and mesh size of nets.
- A minimum net mesh size of 125 mm for set net and 100 mm for drag net applies in SNA 1 (for both commercial and recreational fishers).

3.2.2 Recreational catch

53 Most recreational catch for SNA 1 is taken by boat-based fishers (about 85%) using hook and line methods (over 90%), but there is also targeting of snapper by land-based fishers using surfcasting and kontiki (long-line) methods. Snapper are considered a prized target for spear fishers, although there is little information about the level of take by them.

54 The recreational catch in SNA 1 is taken mainly from the coastal margin along the north-eastern coast and around adjacent offshore islands. Hot spots exist near major urban centres, with the inner Hauraki Gulf and Waitemata Harbour being the site of the highest concentration of recreational snapper fishing effort. The relative density of observed recreational fishing boats in SNA 1 from a 2004/05 aerial survey is shown in Figure 3.5. Most boats are believed to have been targeting snapper. The initial data from the 2011/12 aerial survey data show a broadly similar pattern. The daily levels of fishing effort and catch are highly variable, according to season, day of the week, weather, and other factors.

Figure 3.5: Relative density of recreational fishing vessels from the 2004-05 aerial access survey (estimated number of vessels fishing per 1000 m^2 per year).



55 There are two broad approaches to estimating recreational fisheries harvest: the use of onsite methods, where fishers are interviewed and counted at the point of fishing or access to their fishing activity; and offsite methods where phone interviews and/or diaries are used to collect data from fishers.

56 Given that snapper is the dominant target species for recreational fishers in the FMA 1 area, and that the core of the area is within easy reach of a major proportion of the New Zealand population (the Hauraki Gulf near Auckland and the Bay of Plenty near Tauranga), it is not surprising that the catch in this area is significant. To inform management, various

survey techniques have been applied over the years to better understand the recreational snapper fishery and quantify catch.

57 Through the 1980s, 1990s, and early 2000s, various onsite and offsite methods were used to estimate recreational snapper catch and catch rates.[4] These results are now dated and considered unreliable for some surveys. Surveys and results from 2004-05 onwards are considered robust and are discussed below.

Aerial access method

58 The aerial access survey method is an onsite approach which combines data collected concurrently from two sources: a survey of recreational fishers returning to a sub-sample of boat ramps throughout the day; and a concurrent area-wide aerial count of vessels observed to be fishing at the approximate time of peak fishing effort on the day.

59 This aerial access method was first employed in the Hauraki Gulf in 2003/04 and was then extended to survey the wider SNA 1 fishery in 2004/05. The most recent aerial access survey was conducted in FMA 1 in 2011/12 to independently provide harvest estimates for comparison with those generated from a concurrent national panel survey.

60 The estimated SNA 1 catch from the 2004/05 and 2011/12 aerial access surveys are given in Table 4.5. Note that neither of these estimates includes catch taken on recreational charter vessels, or recreational catch taken under the Act using section 111 general approvals.

National panel survey (or Large-scale Multi-species (LSMS) survey)

61 The national panel survey is an offsite approach to estimating recreational fisheries harvest. The panel survey uses data collected from two phases: a recruitment phase where a random sample of the population is interviewed to recruit a panel of participants; and a one year longitudinal survey of the panellists to record harvest. The catch of the random sample of panellists is scaled to the New Zealand population. As harvest is recorded by panellists in numbers, a concurrent onsite survey to collect fish weight data is required so that numbers harvested can be scaled to weight harvested.

62 The national panel survey method was first employed in 2011/12. Approximately 30 000 fishers were randomly selected from New Zealand households and interviewed face to face to recruit a panel of fishers and non-fishers for the full year. The panel members were contacted regularly during the year about their fishing activities and catch information collected using standardised phone interviews.

[4] For more detail, refer to the Plenary (direct link now available)

Quality of estimates

63 The aerial access method has been published in the primary scientific literature. The 2011/12 aerial access and national panel surveys have been the subject of independent international peer review. Both surveys appear to provide plausible results that corroborate each other, and are therefore considered to be broadly reliable. Harvest estimates provided by these survey methods are given in Table 3.4. The Marine Amateur Fisheries Working Group has concluded that both approaches provide reliable estimates of recreational harvest for SNA 1 in 2011/12.

Table 3.4: Recreational catch estimates for SNA 1. These estimates do not include charter boat catch or reported catch using section 111 of the Act

Stock (substocks)	Method	Number of fish (thousands)	Mean weight (grams)	Total weight (tonnes) (CV)
East Northland (2004-05)	Aerial access	-	-	557
Hauraki Gulf (2004-05)	Aerial access	-	-	1 354
Bay of Plenty (2004-05)	Aerial access	-	-	516
SNA 1 Total (2004-05)	**Aerial access**	**-**	**-**	**2 419**
East Northland (2011-12)	Aerial access	-	-	718 (0.14)
Hauraki Gulf (2011-12)	Aerial access	-	-	2490 (0.08)
Bay of Plenty (2011-12)	Aerial access	-	-	546 (0.12)
SNA 1 Total (2011-12)	**Aerial access**	**-**	**-**	**3 754 (0.06)**
East Northland (2001-12)	Panel survey	686	1 266	869 (0.13)
Hauraki Gulf (2011-12)	Panel survey	2 215	1 022 / 987	2 254 (0.12)
Bay of Plenty (2011-12)	Panel survey	691	956 / 1 003	669 (0.12)
SNA 1 Total (2011-12)	**Panel survey**	**3 592**	**1 025**	**3 792 (0.08)**

3.2.3 Other recreational catch

64 Recreational charter fishing vessels are required to register with MPI and report snapper fishing activity. In 2011/12, 152 vessels reported fishing in FMA 1. The snapper catch from recreational charter vessels is not available because catch reporting of snapper is currently not required.

65 Recreational catch using amateur-fishing methods is allowed under certain circumstances on commercial vessels. The catch must be reported. In 2011/12, 13.2 tonnes of SNA 1 was reported as being caught on commercial vessels under the recreational allowance.

66 Information collected during the national panel survey suggests the catch on charter vessels could be in the order of 200 tonnes in 2011/12. However the survey was not designed to provide a robust estimate of charter vessel catch.

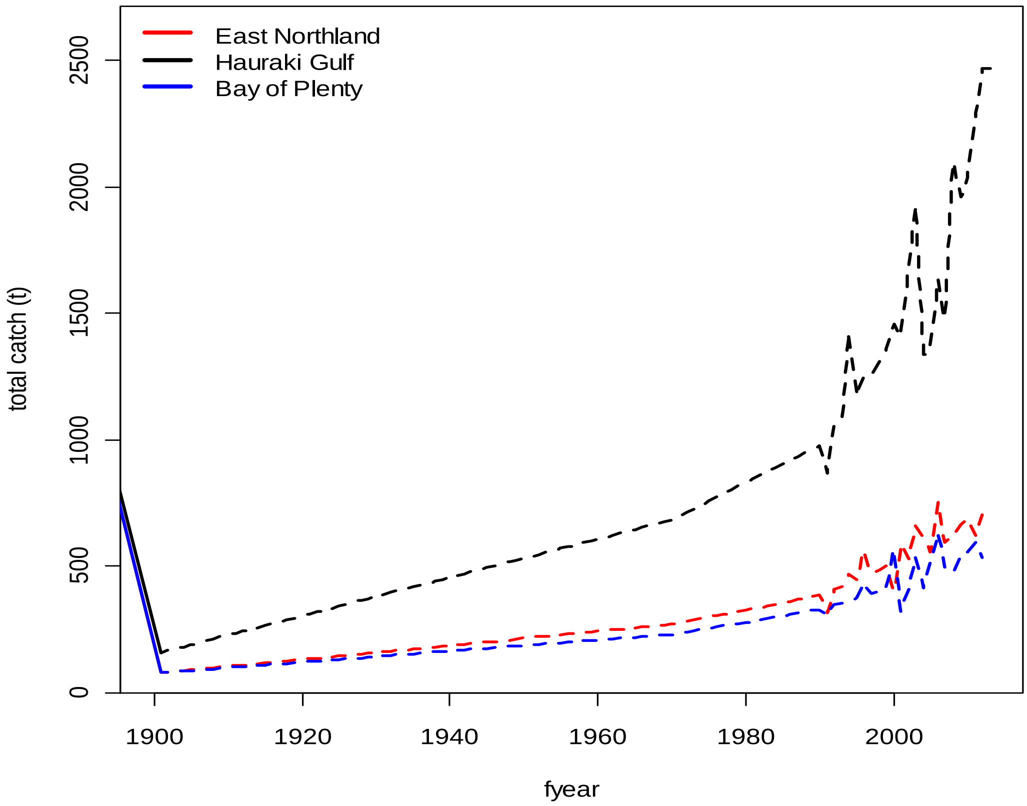
3.2.4 Recreational catch history for the stock assessment

67 Recreational catch history in SNA 1 is a necessary input for the stock assessment. The recreational catch history used in the stock assessment model is based on an alternative creel survey kilogram per trip index, which is used to interpolate between the 2004/05 and 2011/12 aerial access harvest estimates.

68 Recreational catch rate data are available for many of the years since 1991, especially since 2001. The recreational harvest in 1970 was assumed to be 70% of the 1989/90 estimates in each area (east Northland, Hauraki Gulf, and Bay of Plenty).

69 Recreational catch histories for each area for the period 1900 to 1970 were based on the average of two expert opinions of the harvest in 1900. This averaged estimate was used to generate a linearly increasing recreational catch history for the period 1900 to 1970, shown in Figure 3.6.

Figure 3.6: Assumed and derived recreational catch histories for the period 1900 to 2013, that were used in the 2013 SNA 1 assessment model.



3.2.5 Value of the recreational fishery

70 A 2000 survey indicated snapper is the most important target species for finfish anglers caught in New Zealand.[5] Snapper are highly sought after by recreational fishers who employ a range of shore and boat-based fishing methods. Recreational fishers account for a large proportion of the total snapper catch, making SNA 1 one of only a few fisheries that have this characteristic.

71 Snapper are fished mostly for the table although trophy sized fish are especially prized. The value of recreational fishing is difficult to estimate because of the paucity of data on recreational fishing in New Zealand. Research on recreational fishing has tended to concentrate on producing harvest estimates instead of seeking participation rates or value estimates. The only project that provides information about the value of recreational fishing in New Zealand was carried out by the South Australian Centre for Economic Studies (SACES) in 1998.[6]

72 Snapper was assessed as the most valuable of five key New Zealand recreational species evaluated by SACES. The SACES assessment was based on non-market estimation techniques. The methodology employed produced what remains the best available information on non-market values for the species covered by the assessment. However, there is considerable uncertainty in this information arising from the assumptions used to generate the value measure.

73 The total recreational value per snapper trip was estimated at $136 and the marginal value per kilogram of kept fish has been estimated between $3.50 and $7.50 in $2010.[7]

74 The two different values, total trip value and marginal value of fish, address different ways of defining what is meant by the value of recreational fishing. If a fixed number of recreational fishing trips is assumed, then the marginal value of fish measures how much an additional kilogram of fish adds to the fishing experience. If the overall loss in value is required when, for example, a circumstance arises where recreational fishing is banned, then the total value of fishing trips is the relevant measure.

[5] Motivations and perceptions of seawater recreational fishers in New Zealand. Walshe, K, Ackroyd, J March 2000.

[6] Value of New Zealand Recreational Fishing REC9801 The South Australian Centre for Economic Studies 1999.

[7] See Cutting the Cake in a Shared Fishery with a Minimally Managed Non Commercial Sector Economic Research Associates.

3.3 MĀORI CUSTOMARY FISHING

75 Māori customary fishing for snapper in SNA 1 is both a historic and contemporarily important fishery. Currently, Māori customary fishing occurs using either the customary fishing regulations, [8] or regulations 27 and 27A of the Fisheries (Amateur Fishing) Regulations 1986. For those tangata whenua groups operating under the customary fishing regulations, Tangata Tiaki/Kaitiaki are required to provide MPI with information on customary harvest of fish. This includes information about customary fishing authorisations granted and the species/quantities of fisheries resources taken under those authorisations. However, for those tangata whenua groups still operating under regulations 27 and 27A of the Fisheries (Amateur Fishing) Regulations 1986, reporting is not mandatory.

76 Information on customary Māori catch of SNA 1 is incomplete and uncertain. There have been numerous permits issued for the harvest of snapper in SNA 1 since 2007. While this indicates that tangata whenua application of Māori customary harvesting rights is significant, some Iwi (or Māori) state that much customary take is taken under amateur fishing regulations rather than customary permits.

77 Iwi fisheries forums, and the plans they develop, provide for iwi input and participation into fisheries planning processes. The SNA 1 stock is a part of various iwi fisheries management plans as follows:

- The Te Hiku o Te Ika Fisheries Management Plan (the Te Hiku Plan). The Te Hiku Plan was ratified in March 2012 by iwi representatives of the Te Hiku Fisheries Forum[9]. For Te Hiku o Te Ika, snapper is identified as a taonga species.

- The Mai i Nga Kuri a Wharei ki Tihirau Forum Fisheries Plan. The Mai i Nga Kuri a Wharei ki Tihirau Forum Fisheries Plan was ratified in 2012 by iwi representatives of the Mai i Nga Kuri a Wharei ki Tihirau Iwi Fisheries Forum. For Mai i Nga Kuri a Wharei ki Tihirau, snapper is identified as a taonga species.

[8] Fisheries (Kaimoana Customary Fishing) Regulations 1998 and Fisheries (South Island Customary Fishing) Regulations 1999.

[9] Te Hiku o Te Ika Fisheries Forum comprises mandated representatives from: Ngati Kuri Trust Board Inc., Te Urungi o Ngati Kuri Ltd, Te Runanga Nui o Te Aupouri Trust, Te Aupouri Fisheries Ltd, Nga Taonga o Ngai Takoto Trust, Ngai Takoto Holdings Lltd, Te Runanga o Te Rarawa and Te Waka Pupuri Putea Ltd.

3.4 OTHER SOURCES OF FISHING RELATED MORTALITY

78 Other sources of fishing related mortality is an allowance within the TAC designed to encompass mortality associated with harvesting, i.e. burst nets, illegal fishing, mortality of fish legally required to be returned to the sea. Other sources of mortality include discarding at sea.

79 Estimates for incidental mortality were based on data using from long-line, trawl, seine, and recreational fisheries. In SNA 1, estimates of incidental mortality for the year 2000 from long-line fishing were less than 3%. Estimates for trawl, seine and recreational fisheries were between 7% and 11%.

80 In SNA 1, recreational fishers release a high proportion of their snapper catch, most of which is less than the MLS of 27 cm for recreationally caught snapper. A 2006/07 study recorded snapper release rates of 54.2% of the catch by trailer boat fishers and 60.1% of the catch on charter boats. Incidental mortality estimated from condition at release was 2.7% to 8.2% of total catch by weight, depending on assumptions used.

81 In the absence of quantitative estimates of other sources of mortality in SNA 1, an allowance is currently set at 450 tonnes or 10% of the TACC.

4 SNA 1: 2013 STOCK ASSESSMENT

82 A quantitative assessment of the SNA 1 stock was completed in 2013 and reviewed by the Plenary. The assessment was given a high quality rating by the Plenary. The assessment results are suitable as a basis for informing management.[10]

83 The 2013 assessment approach differed from previous assessments in two key aspects: the inclusion of a stock-recruitment relationship, and the use of a model that allowed movement between biological populations. Both aspects were introduced to better replicate the dynamics of the snapper populations in SNA 1.

84 Previous SNA 1 stock assessments in 1996 and 2000 assumed that there was no relationship between the biomass of spawning fish and the number of juvenile snapper entering the population. As this is an erroneous assumption the 2013 assessment included an appropriate relationship between spawner stock biomass and recruitment to the fishery.

85 SNA 1 is believed to be comprised of three separate biological sub-stocks: east Northland, Hauraki Gulf, and the Bay of Plenty. Tagging studies demonstrate that there is limited exchange between sub-stocks, with the greatest exchange occurring between Hauraki Gulf and the Bay of Plenty. SNA 1 was assessed using two separate models, one for east Northland and the other for the combined Hauraki Gulf–Bay of Plenty in the 2000 assessment. A disadvantage of this approach is that it does not account for movement between sub-stocks, and does not allow the use of key information on the stock status of fish in the Bay of Plenty (e.g. indices of abundance and the age composition of the catch and growth rates). The 2013 assessment was based on a single spatial model that allows for movement between sub-stocks/biological stocks, and also the inclusion of Bay of Plenty data. However, owing to uncertainty in the relationship between the Hauraki Gulf and Bay of Plenty biological populations, the results for these areas are combined and reported as a single stock.

86 Based on the movement patterns of tagged fish the spatial model assumes that while all fish spawn within their ‘home’ area, some individuals move to adjacent areas outside of the spawning season. As a result it is possible to report either the biomass of fish in an area during the spawning season (termed ‘by stock’) or the biomass in that area during the remainder of the year (i.e. ‘by area’). MPI considers it more appropriate to base management decisions on the ‘by stock’ results as these are more consistent with stock assessment conventions.

[10] For more detail, refer to the Plenary (available online here).

87 The 2013 SNA 1 assessment provides results, such as stock status and yield, for two sub-stocks. Yield estimates can be combined to form a total for the SNA 1 stock, assuming that the past spatial patterns of catch and effort continue. Current biomass and unfished biomass for the total SNA 1 stock are obtained by summing results for individual sub-stocks. However, the assessment does not provide an estimate of stock status relative to B_0 for the overall SNA 1 stock, as it is comprised of more than one biological stock.

88 The four most important potential sources of uncertainty in model results are:

- The stock structure and degree of exchange between the Bay of Plenty and Hauraki Gulf. This uncertainty was addressed by combining the results for these two areas.
- A conflict between catch-at-age and tagging data. In terms of model results the tagging data was consistent with lower current biomass levels, while the age-structure information was consistent with higher biomass levels.
- The relationship between standardised long-line CPUE and abundance, as the methodology may not account for perceived changes in fishing behaviour. The commercial sector assert that some long-line fishers have been attempting to decrease their snapper catch rates and increase catch of bycatch species (particularly gurnard) because they do not have sufficient SNA 1 ACE. Snapper is still recorded as the target species, as it dominates catches made using the modified behaviour. The result is that the CPUE modelling does not account for changes in behaviour and may therefore underestimate relative abundance of SNA 1 in recent years. The prevalence of such behaviour amongst vessels used to calculate CPUE was investigated by examining trends in the catch rate of gurnard. While some vessels did show an increase in the proportion of gurnard on long-line sets made in recent years, others did not. The slight differences observed suggest the change in behaviour demonstrated by some vessels is unlikely to have had a marked impact on model outcomes. This conclusion is further supported by the fact that increasing the number of vessels and amount of data used in the CPUE standardisation had little influence on the CPUE trends in each of the three regions.
- Temporal trends in the growth rate of snapper. The growth rate of snapper appears to have declined over the last fifteen years.

4.1 INTERIM BIOMASS TARGET

89 Determining a value for B_{MSY} depends on the biology of snapper and the management approach taken. Previous assessments of SNA 1 used a deterministic estimate that relies largely on the biological productivity of the species and relies on perfect information and management responses. The 1997 management review of the SNA 1 fishery used the deterministic estimate of B_{MSY} for the target biomass. The SNA 1 stock was assessed again in 2000, and deterministic B_{MSY} estimates of 21% B_0 for east Northland and 23% B_0 for Hauraki Gulf–Bay of Plenty were used. In 2000, the east Northland stock was assessed as being at about the B_{MSY} level and expected to exceed it at the end of a 20 year projection period (i.e. by 2020). The Hauraki Gulf–Bay of Plenty stock was assessed as being below the B_{MSY} level, and expected to exceed that level by 2020.

90 As part of the 2013 assessment, the deterministic B_{MSY} (as % B_0) was calculated as 25-26% B_0 for east Northland and 30% B_0 for the combined Hauraki Gulf–Bay of Plenty. There are several reasons why B_{MSY}, as calculated in this way, is not a suitable target for management of the SNA 1 fishery. First, it assumes a harvest strategy that is unrealistic in that it involves perfect knowledge including perfect catch and biological information and perfect stock assessments (because current biomass must be known exactly in order to calculate target catch), a constant-exploitation management strategy with annual changes in TACs (which are unlikely to happen in New Zealand and not desirable for most stakeholders), and perfect management implementation of the TAC and catch splits with no under- or over-runs. Second, it assumes perfect knowledge of the stock-recruitment relationship, which is actually very poorly known. Third, it would be very difficult with such a low biomass target to avoid the biomass occasionally falling below 20% B_0, the default soft limit according to the HSS.[11] Thus, the actual target needs to be above this theoretical optimum; but the extent to which it needs to be above has not been determined.

91 The HSS provides guidance on determining more realistic estimates of B_{MSY} that better align with the practical realities of fisheries management. For a stock such as SNA 1 (regarded as a low productivity stock), the HSS suggests a suitable analytical proxy for B_{MSY} is 40% B_0. For the 2013 assessment, an interim target biomass of 40% B_0 was assumed.

92 Determining an appropriate target, which addresses both sustainability and utilisation objectives for SNA 1, is best done by working with stakeholders. MPI intends to collaborate with tangata whenua and stakeholders to develop a harvest strategy for SNA 1, including a management target and research and monitoring strategy. The aspects of determining a target are discussed in more detail in the proposed response (section 6).

[11] The Harvest Strategy Standard for New Zealand Fisheries is available online: http://fs.fish.govt.nz/Doc/16543/harveststrategyfinal.pdf.ashx.

4.2 STATUS OF THE SNA 1 STOCK

4.2.1 Biomass changes since 1900

93 The 2013 assessment model estimated spawning stock biomass (SSB) since 1900. The east Northland sub-stock biomass was estimated to have experienced a long steep decline from about 1960 to 1985, and has fluctuated without trend since then. The biomass in the Hauraki Gulf–Bay of Plenty sub-stock experienced a long steep decline from about 1960 to about 1988, after which it gradually increased to 2010 and then declined slightly.

94 The biomass trajectories show substantial reductions from 1900 to the lowest levels in 1999 for east Northland, or about 1988 for other stocks, and then some increase in spawning biomass thereafter.

Figure 4.1: Historical stock status and current status. Dotted lines indicate interim target (40%B_0), soft limit (20%B_0) and hard limit (10%B_0).

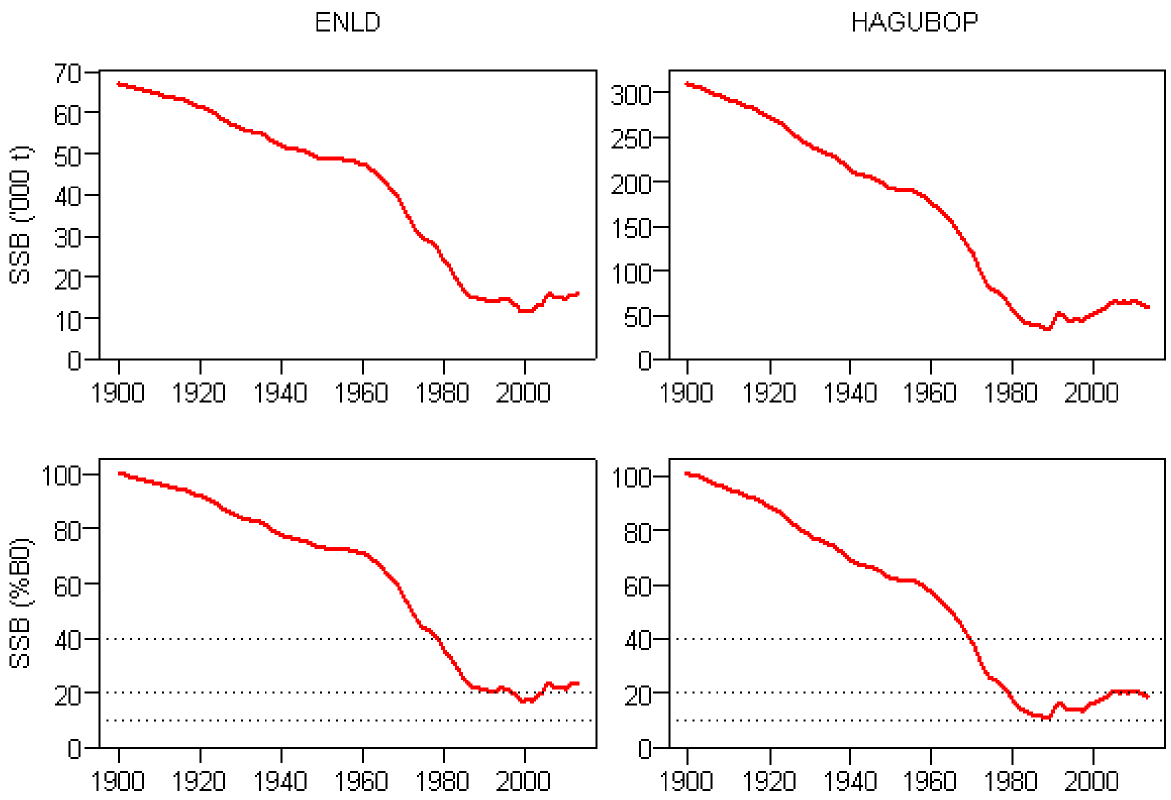
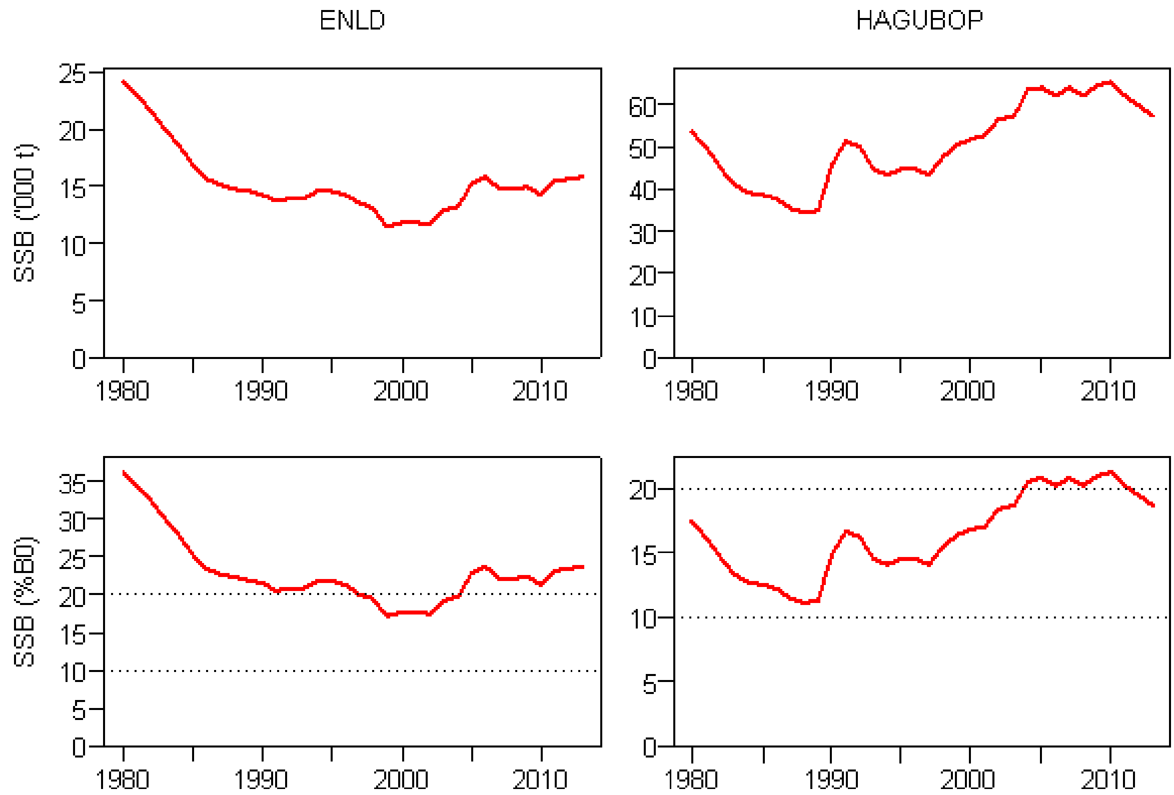


Figure 4.2: SSB by stock for the period since 1980. Dotted lines indicate soft limit (20%B_0) and hard limit (10%B_0)



4.2.2 Current stock status

95 Table 4.1 shows the estimated B_0, and the estimated biomass in 2013 as a proportion of B_0, for the east Northland and Hauraki Gulf–Bay of Plenty sub-stocks.

Table 4.1: Base model estimates of B_0 and current biomass (B_{2013} as % B_0). 95% confidence intervals are displayed in brackets.

Sub-stock	B_0 (thousand tonnes)	B_{2013} as % B_0
East Northland	66 (53– 79)	24 (18 – 30)
Hauraki Gulf–Bay of Plenty	306 (288– 325)	19 (15 – 23)

96 Both sub-stocks are estimated as ‘Very Unlikely’ (less than 10% probability) to be at or above the interim 40% B_0 target; and ‘About as Likely as Not’ (40% to 60% probability) to be below the soft limit (20% B_0). The model probabilities relating biomass to the interim target and limits are set out in Table 4.2.

Table 4.2: Probabilities relating current biomass to the interim target and limits

	East Northland	Hauraki Gulf–Bay of Plenty
At or above target ($40\%\ B_0$)	0.00	0.00
Below soft limit ($20\%\ B_0$)	0.12	0.74
Below hard limit ($10\%\ B_0$)	0.00	0.00

97 The Plenary report defines ‘overfishing’ as a situation where the estimated fishing mortality or exploitation rates exceed the level required to maintain, or rebuild the stock to the target biomass level (in this case $40\%\ B_0$). The 2013 SNA 1 Plenary reports that overfishing is ‘Likely’ (greater than 60% probability) to be occurring in both sub-stocks. This indicates that estimates of current exploitation rates (the proportion of the available biomass taken by fishing) exceed levels that would enable the stocks to reach and remain at or near the interim target biomass in the long term.

4.2.3 Biomass projections to 2018

98 The stock assessment model was used to explore how the SNA 1 stock would perform under a range of future catch scenarios.

99 Five-year biomass projections were examined under the catch scenarios shown in Table 4.3.

Table 4.3: Details of scenarios for which additional projections were requested

Scenario	TAC (tonnes)	Recreational and customary Māori catch[12] (tonnes)	TACC (tonnes)	Other[13] (tonnes)
1	7 866	3 366	4 500	450
2	7 550	2 600	4 500	450
3	8 050	2 780	4 820	450
4	7 050	2 420	4 180	450
5[14]	0	0	0	0

100 Scenario 1 assumes that future commercial catch will be at the level it was in 2012 and 2013. Scenario 1 assumes that future recreational catch will be at the level of the average recreational catch from 2008 to 2012 (3365.8 tonnes).

[12] In the model, customary catches were assumed to be included in catches from the recreational fisheries.

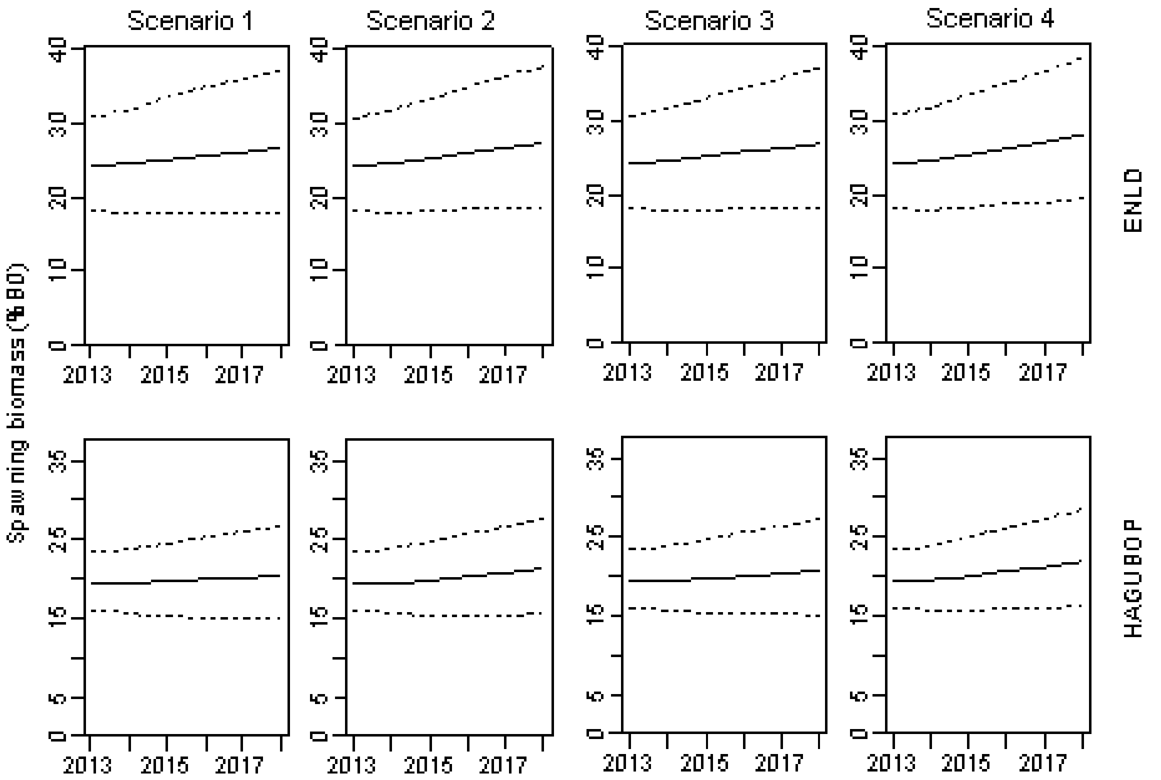
[13] This allowance for other sources of fishing mortality was pro-rated across the commercial fisheries.

[14] A period of twenty years was chosen to allow sufficient time for all stocks to rebuild to the interim target of $40\%B_0$.

101 Scenario 2 assumes that the catch of each sector will be constrained to the current limits and allowances. Scenario 3 provides for a 500 tonne increase to the TAC, with a proportional increase in allocation between the recreational and commercial sectors. Conversely, scenario 4 provides for a 500 tonne decrease to the TAC, with a proportional decrease in allocation between the recreational and commercial sectors. Scenario 5 assumes no fishing in order to estimate the minimum time to reach the interim target (T_{MIN}).

102 Figure 4.3 shows the estimated spawning stock biomass projections (mid points and 95% confidence intervals) until 2018 under the different catch scenarios.

Figure 4.3: Projected spawning biomass (as % B_0) for east Northland (ENLD) and Hauraki Gulf–Bay of Plenty (HAGUBOP). Broken lines are 95% confidence intervals.



103 Under all scenarios, the spawning biomass was projected to increase slowly over the next five years (between 1% and 4%) for both sub-stocks.

104 The five year projections were based on the assumption that recruitment over the next five years would be similar to recruitment observed over the most recent ten years for which recruitment could be reliably estimated (i.e. 1994 to 2004). Based on the full series of recruitment observations, recruitment between 1994 and 2004 is well above average. Five year projections based on the full set of recruitment observations result in the east Northland sub-stock remaining stable and the Hauraki Gulf–Bay of Plenty sub-stock declining.

105 The probabilities relating the 2018 biomass to the target and limits vary little between the scenarios, as shown in Table 4.4. The lack of variation between scenarios is because the range of catches makes little difference over the five year projection period. The different scenarios are expected to change the median 2018 biomass by little more than 1% B_0 over the five year period, as shown in Table 4.5.

Table 4.4: Probabilities, by stock and scenario, relating the 2018 biomass to the target and limits (assuming levels of recent average recruitment)

	Scenario 1	Scenario 2	Scenario 3	Scenario 4
East Northland				
Above target (40% B_0)	0.01	0.01	0.01	0.01
Below soft limit (20% B_0)	0.08	0.05	0.07	0.04
Below hard limit (10% B_0)	0.00	0.00	0.00	0.00
Hauraki Gulf–Bay of Plenty				
Above target (40% B_0)	0.00	0.00	0.00	0.00
Below soft limit (20% B_0)	0.47	0.34	0.42	0.26
Below hard limit (10% B_0)	0.00	0.00	0.00	0.00

Table 4.5: Median B_{2018} (as %B_0), by stock and scenario (assuming levels of recent average recruitment)

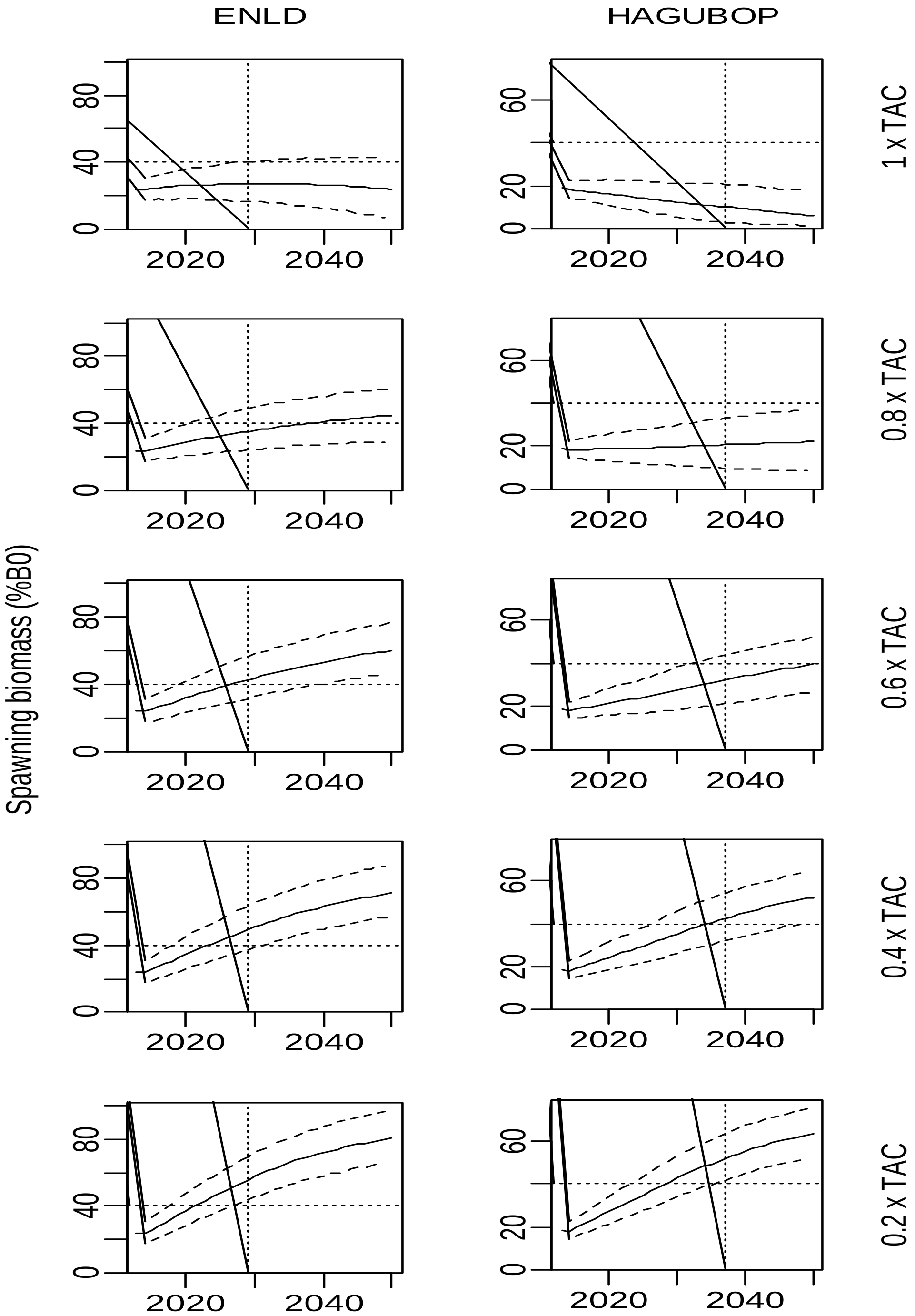
	Scenario 1	Scenario 2	Scenario 3	Scenario 4
East Northland (B_{2013} = 24% B_0)	26.5	27.3	26.8	28.1
Hauraki Gulf–Bay of Plenty (B_{2013} = 19% B_0)	20.4	21.3	20.6	21.9

106 Longer term biomass projections were also undertaken to explore the effect of various catch scenarios and to estimate the time to reach the interim target of 40% B_0.

107 The long term projections indicated that in the absence of fishing the biomass would take eight years for east Northland and twelve years for Hauraki Gulf–Bay of Plenty to reach 40% B_0.

108 Figure 4.4 shows longer term biomass projections under different TAC levels. The longer term projections consider recruitment is likely to be better represented by the full series of recruitment observations (1970 to 2004), rather than the most recent estimated ten year period (1994 to 2004) used in the five year projections.

Figure 4.4: Stock trajectories under various proportions of the current TAC (the vertical lines indicate $2xT_{MIN}$)



109 For the east Northland sub-stock, the long term biomass projections under constant catch at the level of the current TAC show that spawning biomass remains relatively constant at its current level although declining slowly after 2030. For the Hauraki Gulf–Bay of Plenty sub-stock, the biomass is predicted to decline steadily towards levels below 10% B_0. The median biomass estimates for both sub-stocks suggest that neither will reach the interim target of 40% B_0.

110 Catch levels that are constant at 80% of the current TAC are predicted to slowly increase the biomass of both sub-stocks through to 2050. Under this scenario, the east Northland sub-stock reaches the target biomass about five years after $2xT_{MIN}$. The Hauraki Gulf–Bay of Plenty sub-stock does not approach the interim target within the projection period.

111 Catch levels that are constant at 60% of the current TAC result in both stocks increasing, with east Northland reaching 40% B_0 just a few years earlier than $2xT_{MIN}$ and Hauraki Gulf–Bay of Plenty reaching 40% B_0 in roughly $3xT_{MIN}$.

112 Catch levels that are constant at 40% of the current TAC result in the biomass of both sub-stocks reaching the interim target earlier than $2xT_{MIN}$.

113 Table 4.6 shows the estimated SNA 1 TAC levels that would allow the biomass in each sub-stock to reach the interim target within $2xT_{MIN}$; assuming the current proportional split in catch between the two sub-stocks. Because the sub-stocks each have a different current biomass in relation to B_0 and are of markedly different biomasses, a TAC relating to the Hauraki Gulf–Bay of Plenty sub-stock would need to be set to achieve the interim target within the $2xT_{MIN}$ timeframe. Achieving a rebuild to the interim target of 40% B_0 within timeframes suggested by the HSS would require about a 56% reduction of the current TAC of 7550 tonnes.

Table 4.6: Estimated TAC which will result in biomass attaining 40%B_0 in $2xT_{MIN}$ years

Sub-stock	East Northland		Hauraki Gulf–Bay of Plenty	
	SNA 1 TAC (tonnes)	*% current TAC*	*SNA 1 TAC (tonnes)*	*% current TAC*
YCS (All estimated)	5 021	67%	3 309	44%

4.2.4 Yield at 40% B_0

114 The estimated sustainable yield that would be available from the overall SNA 1 stock when each sub-stock is at the interim target of 40% B_0 is approximately 12 000 tonnes (about 9900 tonnes from Hauraki Gulf–Bay of Plenty and 2100 tonnes from east Northland).

5 OTHER KEY CONSIDERATIONS

115 The Minister may set or vary the sustainability measures for a stock (under section 11 of the Act) after taking into account any effects of fishing on any stock and the aquatic environment, any existing controls on fishing, and the natural variability of the stock. In determining the TAC for a stock under section 13 of the Act, the Minister must have regard to the interdependence of stocks, the biological characteristics, and any environmental conditions affecting the stock.

5.1 HABITAT OF PARTICULAR SIGNIFICANCE FOR FISHERIES MANAGEMENT

116 Habitat of particular significance for fisheries management does not have a policy definition although work is currently underway to generate one.

117 For juvenile snapper, it is likely that certain habitats, or locations, are critical to successful recruitment of snapper. Post settlement juvenile snapper associate strongly with three dimensional structured habitats in estuaries, harbours and sheltered coastal areas (such as beds of seagrass and horse mussels). The reason for this association is unclear, but the provision of food and shelter are likely explanations.

118 No information on the influence of specific habitats within SNA 1 is available.

5.2 EFFECTS OF FISHING

5.2.1 Effects of Fishing on Spawning

119 Snapper spawning is described in the previous section on the biological characteristics of SNA 1. Fishing within aggregations of spawning fish may have the potential to disrupt spawning behaviour and, for some fishing methods, may lead to reduced spawning success. No research has been conducted on the potential disruption of snapper spawning, but aggregations of spawning snapper often receive high commercial and recreational fishing effort.

5.2.2 Effects of Fishing: Genetic effects

120 Fishing and environmental changes, including those caused by climate change or pollution, could alter the genetic composition or diversity of a species. A 2003 study estimated genetic diversity for snapper in the Hauraki Gulf. It showed only random fluctuations of mean heterozygosity and mean number of alleles, and a decrease in genetic diversity at only one locus examined.

5.2.3 Effects of fishing: Incidental catch (fish and invertebrates)

121 The best available information on incidental catch of fish and invertebrates in SNA 1 trawl fisheries is from research fishing conducted in the areas where target fisheries take place. Although the gear used for research surveys may be different than that used in the fishery itself (e.g. smaller mesh cod ends are used in trawl surveys than commercial trawl operations), surveys are conducted in the same areas and provide insight as to the fish and invertebrate species likely to be caught in association with snapper.

122 More than 70 species have been captured in trawl surveys within SNA 1, but catches are dominated by snapper. A 2002 study noted the following species in more than 30% of tows by research vessels: jack mackerels (three species), John dory, red gurnard, sand flounder, leatherjacket, rig, eagle ray, lemon sole, and trevally. Smaller numbers of invertebrates are captured including green-lipped mussel, arrow squid, broad squid, octopus, and scallop.

123 For SNA 1, information on bycatch fish and invertebrates associated with research long-lining is also available, although restricted to the inner and western parts of the Hauraki Gulf. The most common bycatch species in this area included: rig, school shark, hammerhead shark, eagle ray, stingrays, conger eel, trevally, red gurnard, jack mackerels, blue cod, John dory, kingfish, frostfish and barracouta.

5.2.4 Effects of Fishing: Incidental Catch (mammals, seabirds, turtles, and protected fish)

124 Capture estimates discussed here include all animals recovered to the deck (alive, injured or dead) of fishing vessels but do not include any cryptic mortality (e.g. seabirds struck by a warp or caught on a hook but not brought onboard the vessel).

125 There were no observed captures of marine mammals in all trawls targeting SNA 1 between 2002/03 and 2011/12. However, low observer coverage of inshore trawlers means that the frequency of interactions is highly uncertain. In the same years, there were no observed marine mammal captures in SNA 1 long-line fisheries, where coverage has averaged 1.6% of hooks set.

126 There were only two observed captures of seabirds (one flesh-footed shearwater and one unidentified small bird) in trawls targeting snapper between 2002/03 and 2009/10. However, low observer coverage of inshore trawlers means that the frequency of interactions is highly uncertain. The estimated number of seabird captures in the snapper bottom long-line fishery declined from 3436 in 2000/01 to 247–644 in 2003/04.

127 Between 2002/03 and 2011/12 there has been one observed capture of a green turtle across the SNA 1 long-line fishery occurring in the Northland and Hauraki Gulf fishing area. Observer records documented the green turtle as captured and released alive.

5.3 BENTHIC INTERACTIONS

128 At least 90% of trawls occur at depths less than 100 metres. Trawling is likely to have effects on benthic community structure and function and there may be consequences for benthic productivity. The consequences of trawling are not considered in detail here but are discussed in the Aquatic Environment and Biodiversity Annual Review (2012).[15]

5.4 ECOSYSTEM INDICATORS

129 Ecosystem indicators using diversity, fish size, and trophic level were derived using data from the Hauraki Gulf trawl survey series. The trawl surveys ran between 1983 and 2001, and have not been conducted since.

130 Information from the surveys showed decreasing trends in the proportion of species with low resilience and the proportion of demersal fish species in waters shallower than 50 metres in the Hauraki Gulf. Several indices of fish diversity showed significant declines in muddy waters shallower than 50 metres, especially in the Firth of Thames. Size-based indicators were not considered as useful as they have been overseas, but there was some indication that the maximum size of fish has decreased in the Hauraki Gulf, especially over sandy bottoms.

5.5 HAURAKI GULF MARINE PARK ACT 2000 (HGMPA)

131 When setting or varying the TAC relating to stocks with boundaries intersecting with the Park, the Minister shall have regard to sections 7 and 8 of the HGMPA. Section 7 recognises the national significance of the Hauraki Gulf, including its capacity to provide for the relationship of tangata whenua and the social, economic, recreational and cultural wellbeing of people and communities. Section 8 of the HGMPA sets out the objectives of the management of the Hauraki Gulf, which include the maintenance or, where appropriate, the enhancement of the Gulf for social and economic wellbeing, and its contribution to the recreation and enjoyment, of the people and communities of the Gulf and New Zealand.

132 MPI considers that all of the proposed TAC options provide for the above outcomes and are consistent with sections 7 and 8 of the HGMPA. Other management options have different costs and benefits for the respective sectors and therefore may shift the balance in

[15] The Review is available online here

terms of providing for social, economic, recreational, and cultural wellbeing as contemplated by the HGMPA.

133 The Hauraki Gulf Forum has established guidelines for addressing concerns regarding the state of the Gulf's environment and resources. While the Forum may make recommendations for the integrated management of the Gulf, including fisheries, the Minister must take a broad range of factors and interests into consideration when making his decisions.

134 Any TAC decision the Minister makes in relation to SNA 1 will need to consider possible impacts on both commercial and non-commercial users of the resource within the Gulf, and the wellbeing of all sectors. MPI invites respondents submissions this paper to provide any additional information that they have on the importance of snapper to the social, economic, recreational, and cultural wellbeing of people in the Hauraki Gulf.

6 PROPOSED RESPONSE

135 MPI is consulting on a range of options for the TAC, allowances, TACC, and other management controls for SNA 1. This section sets out the general approach MPI has chosen based on the available information. Analysis of specific management options is detailed in sections 8 to 11 of this document.

136 The options below are predicated on a more active approach to management which assumes the stock will be reviewed within the next five years following development of a long term management strategy with stakeholders.

6.1 TAC APPROACH

6.1.1 Principle of ensuring sustainability while providing for utilisation

137 Setting a TAC is a practical expression of the concepts of ensuring sustainability and providing for utilisation. Sustainability is the provision of ongoing availability of renewable fishery resources for current and future users of the resources. The provision for utilisation enables people to provide for their social, cultural, and economic wellbeing.

6.1.2 Management unit

138 SNA 1 is managed as a single stock (or management unit). The Act requires that a TAC is set for each stock. The 2013 stock assessment indicates that SNA 1 consists of two biological sub-stocks – east Northland and Hauraki Gulf–Bay of Plenty. While the stock assessment presents information about three areas – east Northland, Hauraki Gulf, and Bay of Plenty, it presents a formal assessment of the relevant status of the two sub-stocks because there is considerable mixing between the Hauraki Gulf and Bay of Plenty populations. The two sub-stocks in SNA 1 are currently at different biomass levels, have different rebuilding rates and the snapper have different growth rates. The assessment information suggests that in the future there is the possibility of implementing measures to manage the two sub-stocks independently.

139 The Act enables a number of measures to be implemented for the purpose of ensuring the sustainability of a stock. The TAC is designed primarily to address stock-wide utilisation and sustainability issues. However, sub-stock sustainability issues may affect the maintenance of the stock at or above the level that can produce the maximum sustainable yield, and therefore a TAC adjustment may be appropriate. The size of the sub-stock is relevant to this consideration.

140 MPI acknowledges that measures designed to ensure sustainability at a stock-wide level may not be effective at providing desired levels of access to fisheries on a sub-stock or local area basis. The Act provides for a range of measures that may be applied on a stock or sub-stock basis, including catch spreading arrangements; area specific catch limits and bag limits; closed areas; and controls on methods, size, and season. Consideration could be given to subdividing a QMA to reflect the presence of two or more biological stocks.

6.1.3 Stock management target

141 Section 13 of the Act specifies a requirement to maintain a stock at a biomass level being at, or above, a level that can produce the maximum sustainable yield (MSY) and the related biomass (B_{MSY}). MSY is defined as being the greatest yield that can be achieved over time while maintaining the stock's productive capacity, having regard to the population dynamics of the stock and any environmental factors that influence the stock.

142 In setting the TAC, the Minister must base his decision on B_{MSY} for the stock as a whole and not the individual level of any sub-stocks. The Minister should not set the TAC at a level solely designed to bring a component sub-stock to B_{MSY}.

143 There is no one universally recognised method of calculating B_{MSY}. The B_{MSY} is a function of the fishing strategy adopted (e.g. the type of fishing method, the size limit, or the fishing season); the biological characteristics of the species; the type, frequency and quality of the available information; and the type of analytical technique used to assess the status of the stock. The B_{MSY} is also a function of the management strategy employed (e.g. how frequently the TAC is reviewed). The HSS provides analytical or conceptual proxies for B_{MSY} where it cannot be directly estimated.

144 The Minister can set a TAC that will maintain the biomass above the level that can produce the MSY on an ongoing basis. Such a 'target level' may be an appropriate management strategy in order to meet the wider social, cultural or economic goals acknowledged in section 8 of the Act (the purpose statement) or due to the interdependence of a second species on the target species, or other considerations regarding the environmental principles under the Act.

145 A new stock assessment model for assessing the status of SNA 1 was completed this year. This model will form the basis for evaluating the benefits of a long term management strategy for SNA 1. To report on the current status of the stock, a target biomass level is required. In the absence of a management strategy and a long term biomass target level, the stock assessment working group for SNA 1 adopted an interim biomass target of 40% B_0, consistent with the HSS, as a reference for the assessment.

146 Combining the sub-stock estimates provided in the assessment allows an assessment of SNA 1 stock status relative to B_{MSY}. Best available information suggests that the overall stock status for SNA 1 is 20% B_0. MPI consider that section 13(2) is the appropriate section for setting of the TAC for this stock.

147 There are some areas of uncertainty in the assessment. The key uncertainties are referred to in the stock assessment chapter. Despite these uncertainties, MPI regards the stock assessment as representing the best available information about the status of the stock and appropriate to be used to inform management decisions for SNA 1. The uncertainties relating to the assessment are regarded as not being sufficient to delay management decision.

148 The assessment of current stock status for the sub-stocks is shown in Table 6.1. Both sub-stocks are very unlikely (less than 10% probability) to be at or above the interim target, and both are about as likely as not (40 to 60% probability) to be below the soft limit of the HSS. Both are very unlikely to be below the hard limit.

Table 6.1: Base model estimates of B_0 and current biomass (B_{2013} as %B_0). 95% confidence intervals are displayed in brackets.

Sub-stock	B_0 (thousand tonnes)	B_{2013} as % B_0
East Northland	66 (53–79)	24 (18–30)
Hauraki Gulf–Bay of Plenty	306 (288–325)	19 (15–23)

149 MPI considers that any likely future target biomass is likely to be well above the current biomass. As a result, there is a need to continue with the rebuild of SNA 1. The key issue is the way and rate the stock rebuilds.

6.2 WAY AND RATE OF REBUILD

150 Under section 13 of the Act, if a stock is below B_{MSY}, the Minister is to consider the way and rate at which the stock is to be rebuilt in setting the TAC. In determining the way in which, and rate at which, a stock is altered to achieve the B_{MSY} stock level (or above), the Minister is required to have regard to such social, cultural, and economic factors as he or she considers relevant (section 13(2) of the Act).

151 The rate of rebuild and the timeframe adopted to achieve B_{MSY} is a matter for the Minister's discretion. For SNA 1, the Minister could set a TAC that initially allowed the stock to decline away from the B_{MSY} level, provided his long term intention is to rebuild the stock to the target level over a reasonable period of time. No time frame is specified in the Act within which the Minister must achieve a rebuild of a stock.

152 The stock assessment indicates that the two sub-stocks are near the soft limit (20% B_0), a reference point contained in the HSS. As noted above, because the two sub-stocks are estimated to be well below both the interim biomass target and any likely future biomass target there is a need to continue with the rebuild of SNA 1. Therefore, a decision is required about the way and rate the rebuild is to be achieved.

153 The HSS recommends a rebuild timeframe of between one and two times the minimum number of years required to rebuild a stock to the target in the absence of fishing (T_{MIN} – $2xT_{MIN}$). However, the Minister is not bound by the HSS guidance; he can consider the relative benefits and risks, trade-offs, short term and long term utilisation levels of different rebuild timeframes.

154 Crucial to consideration of the way and rate of rebuild are:

- The current status of the stock.
- The vulnerability of the stock to changes in environmental conditions.
- The vulnerability of the stock to changes in recruitment levels.
- The projected rebuild of the biomass under different TAC levels.
- The social, cultural, and economic costs of rebuilding SNA 1 within a specific timeframe.
- The benefits derived from the current TAC compared to the benefits derived from a fully rebuilt stock.

155 Projections for a range of TAC scenarios have been modelled, and are described in section 4. Projections based on recent average levels of recruitment indicate that under a range of scenarios the stock will (slowly) rebuild or remain at about the current biomass level over the next five years. However, projections based on long term average levels of recruitment indicate that under the same scenarios the biomass level will decline. MPI has a preference for using projections based on recent average recruitment levels to assess the impact of proposed options because of the intention to review that SNA 1 stock within the next five years. However, if the Minister decides to take a less active management approach, then projections using long term average recruitment should be given more weight when determining management options.

156 MPI acknowledge that the stock assessment projections suggest the range of possible options is much broader than the options considered in this review. Analysis based on recent average recruitment levels indicates that a TAC of up to 9000 tonnes could be taken over the next five years with minimal impact on the current status of the sub-stocks. Under a TAC of 9000 tonnes, the east Northland sub-stock would increase slightly from 24.1% B_0 to 25.7% B_0 and the Hauraki Gulf–Bay of Plenty sub-stock would remain unchanged at 19.5% B_0.

However, the projections based on long term average recruitment levels indicate that a TAC level of around 3800 tonnes is required in order to rebuild the stock within the timeframe recommended by the HSS. However this TAC is a passive "set and forget" management approach based on a setting a TAC that will rebuild the stock and not adjusting management controls until the biomass has reached the target. This approach would cause significant short and medium term cultural and economic impacts and would result in potentially significant lost yield until the point the TAC is increased. MPI does not consider this approach appropriate for a high value species such as snapper. As noted, MPI prefers a more active management approach which involves more regular adjustment of management controls as the stock rebuilds to maximise utilisation opportunities without compromising the rebuild timeframe.

157 The paper does not analyse in detail options to decrease the TAC to 3800 tonnes or to increase the TAC to 9000 tonnes. MPI has not proposed a formal rebuilding plan as required under the HSS for SNA 1. How the stock will rebuild to any specified target will be considered as part of future discussions with stakeholders. MPI considers implementing a formal rebuilding plan that aligns to the interim target would be presumptuous prior to those discussions taking place. Similarly, MPI does not propose making large changes to the TAC this year in advance of these discussions and also given sensitivities of the projections to future recruitment levels.

158 Consequently the TAC options analysed in detail in the paper range within a relatively narrow continuum. Options that consider TAC levels of 7550 and 8050 tonnes place greater emphasis on the projections based on recent average recruitment levels. These options reflect the view that projections beyond a five year period are increasingly uncertain and the intention to undertake a further review of SNA 1 within the next five years. In contrast, the option that considers a TAC of 7050 tonnes places a greater weight on the projections based on long term average recruitment levels, given the risk that recent recruitment levels may not be sustained over the next five years.

159 However, the Minister is not fettered from considering other options which are within the bounds indicated in the stock assessment and informed by views of tangata whenua and stakeholders.

6.3 ALLOCATION

6.3.1 General approach

160 Within the TAC, a TACC is set to provide for commercial fishing. In varying any TACC the Minister is required to allow for Māori customary non-commercial fishing interests, recreational interests, and all other mortality to the stock related to fishing. The

Minister has broad discretion in this decision. The Act contains no priority in terms of allocating the TAC for a stock.

161 SNA 1 is a highly valued shared fishery. Shared fisheries are fisheries in which commercial, recreational, and Māori customary fishers all have significant interests and share the available catch. Commercial and non-commercial interests in a shared fishery often seek qualitatively different values from the fishery. A fishery managed to maximise yield over time may meet the needs of the commercial sector, but it may not meet the needs and interests of non-commercial sectors who generally place a higher value on large fish size or high catch rates.

162 SNA 1 is also a fully utilised stock. The collective demands on the resource exceed the current TAC. This means that the allocation of the TAC requires consideration of the competing demands on the resource. Once allocations are determined there is a need to enact measures which ensure the allowances are not, on average, exceeded. In general the TAC should be fully allocated and sector shares utilised.

163 The allocations made to each sector do not represent a fixed share of the TAC in relation to future changes. The Minister has discretion to determine how to allocate the TAC for each stock on a case by case basis, on each occasion he or she reconsiders allocation of the TAC for that stock.

164 The Act does not provide guidance on specific factors that must be taken into account when allocating the TAC. However, MPI considers a number factors may be relevant to the exercise of the Minister's discretion about allocating the TAC, including (but not limited to):

- The characteristics and current status of the stock.
- The existing allocations within the TAC.
- Previous decisions made by the Minister.
- Current and past fishing practices and current catch levels.
- The equity of allocation – whether the idea of "shared pain" when a stock declines and "shared benefit" when a stock rebuilds is appropriate.
- Participation rates and population trends. In particular, the growth of urban centres such as Auckland can have a significant impact on nearby fisheries.
- The assessment of the value of the resource to respective sectors.
- The social, cultural, and economic impacts of decisions made by the Minister.

165 When adjusting catch allowances for one or more sectors, outcomes can be characterised broadly as either proportional or non-proportional. Proportional allocation is

best described as a system of "shared pain, shared gain". Where a decline in a fishery is to be addressed by a reduction in the TAC, the share of the TAC allocated to all sectors is reduced in the same proportion.

166 There is no clear statement in the Act as to what constitutes a reallocation of the TAC or the implications or consequences that flow from such a decision. The following situations could be considered as constituting a reallocation of catch:

- The TAC is maintained but changes are made to the allowances allocated to commercial, customary, and recreational sectors.
- The TAC is decreased and non-proportional changes to the ratio of catch are allocated to recreational and commercial fishers.
- A TAC and allocations are made but there is a failure to constrain the sectors to their respective allocation where information suggests that the catch of the sector on average is likely to significantly exceed the quantum allocated to that sector.

167 While there is no legal obligation to undertake a proportional reduction between recreational and commercial interests where the TAC is adjusted, MPI has historically favoured a proportional policy as a default approach. In situations where there is limited information about the relative benefits to be derived from allocating a stock to one or other sector, or there is information to suggest both sectors place equal or similar value on the stock, then it is equitable for both commercial and recreational fishers to ensure the sustainability of the stock through a reduction in the TACC and recreational allowance (along with the implementation of measures to effect a reduction in catch – such as bag limit reductions). Equally, commercial and recreational fishers should derive shared benefit from the rebuild of a fishery in terms of the allocation provided to the respective sectors, all other things being equal.

168 Where there is no particular reason for making a reallocation, the expectation that a required TAC adjustment would be dealt with proportionally provides a consistent approach for stakeholders. There is benefit in taking a consistent approach to allocation. In particular, a proportional approach enables commercial fishers to plan and invest with a greater degree of confidence. Decisions that adversely impact on commercial rights, or a perception by fishers that such decisions do erode the value of the right, have the potential to undermine long term incentives for sustainable management.

169 While the imprecision of the recreational catch may preclude strict proportionality, whereas commercial catch is reduced for sustainability reasons, reasonable steps should be taken to avoid the reduction being rendered futile through increased recreational fishing (i.e. other management controls will need to be considered).

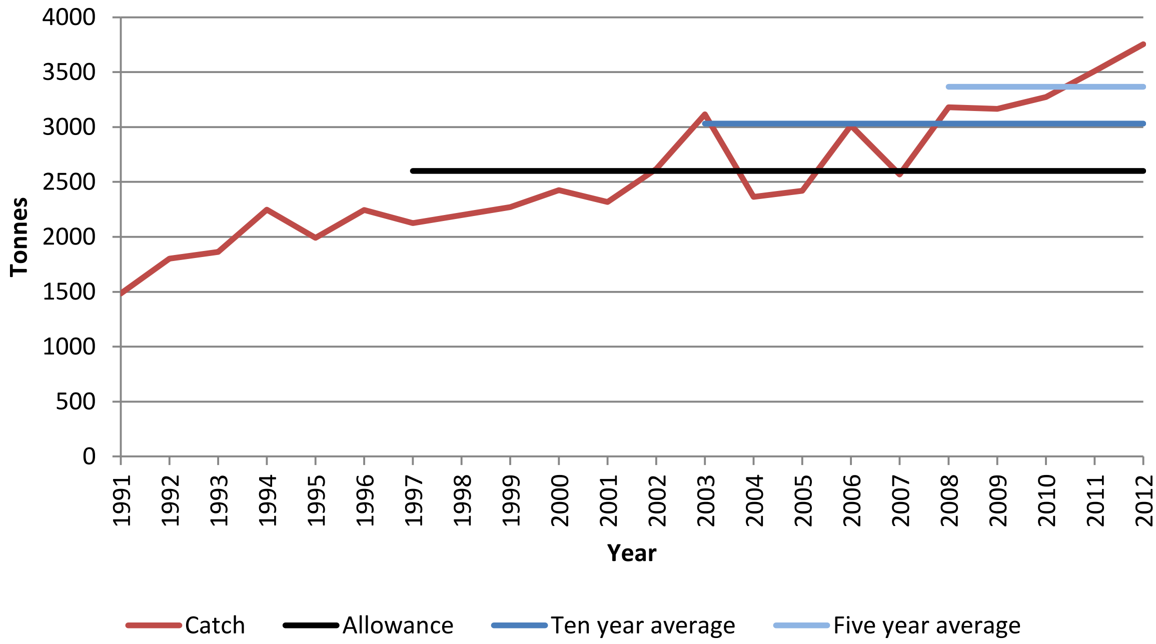
170 MPI notes that a default proportional approach, however, does not fetter the Minister's discretion to explicitly recognise the competing demands on a resource. Consideration of individual circumstances may lead the Minister to decide to depart from a proportional approach where it is considered reasonable to do so. In particular, in situations where the TAC is increased, given the absence of any fixed shares in the TAC, there can be no expectation as to how the additional catch will be allocated (proportional or otherwise).

171 In the case of SNA 1, the three TAC options are presented on the basis of a proportional allocation of the TAC. However, information is also presented about alternative allocation options.

6.3.2 Recreational allowance and commercial allocation

172 MPI is aware of concerns about how well the recreational allowance reflected recreational catch at the time it was set. A number of methods have been used to provide an estimate of recreational catch; these are detailed in section 3.2. Figure 6.1 shows estimates of the recreational catch since 1991 used in the stock assessment model.

Figure 6.1: Estimated recreational catch from 1991 to 2012 used in the stock assessment model[16]



173 For recent years, the best available information indicates that recreational catch now well exceeds the recreational allowance. In order to ensure the integrity of the TAC and

[16] Actual estimates of recreational catch are included from aerial access surveys in 2004-05 and 2011-12. Most other values were calculated from summertime boat ramp survey data (catch rates in kilograms per trip) and scaled up according to the change in the aerial-access results. In years where no ramp survey data is available, the recreational catch was assumed to lie on the exponential curve fitted through the boat ramp survey results.

allowances it is necessary to assess whether the current allowance is appropriate and what actions are required to maintain recreational catch at the level of the allowance determined by the Minister.

174 Ideally, tangata whenua and stakeholders collectively are best placed to arrive at an understanding and agreement as to how best value can be achieved through allocation of the resource. Each sector should also be responsible for managing within the allocation provided and for determining appropriate management settings to do so. It is acknowledged that the current framework does not provide an easily comparable set of rights that allow for collective agreement nor create strong incentives for the recreational sector to take responsibility. However, that does not preclude these discussions taking place. Government involvement in the absence of agreement or sector responsibility will necessarily involve making trade offs between sectors that will result in less optimal outcomes.

175 The Act states that prior to setting the TACC, the Minister must allow for recreational interests in the stock – an allowance must be made for recreational fishers where demand exists. However, there is no requirement to provide for recreational demand in full, nor does the recreational allowance take priority over the commercial allowance. However, the allowance set must be reasonable having regard to the factors noted above and taking into account the fact that SNA 1 is shared fully allocated fishery and users are competing for a share of the available resource.

176 The available information indicates that all sectors place considerable value on SNA 1. Commercial value is demonstrated by way of the landed value of catch (the port price paid to fishers), the export price; the ACE price, and the quota value (the future anticipated earnings from the commercial share of the SNA 1). Data on the value of the commercial SNA 1 catch is outlined in the commercial characterisation of the SNA 1 fishery (section 3.1.4).

177 Commercial fishers also derive benefit from the snapper fishery that is not directly related to the value of the fish caught. The snapper fishery allows fishing vessels to continue operating throughout the year in other target fisheries. This means the costs associated with not fishing are avoided – these costs include berthing, and laying off and rehiring crew. MPI has no ability to assess such costs without gathering further information from operators.

178 Estimates of recreational value (although highly uncertain) are outlined in the recreational characterisation of the SNA 1 fishery (section 3.2.5). The analysis of commercial and recreational value data suggests values obtained from harvesting of SNA 1 are roughly similar between the recreational and commercial fishers. However, there is considerable uncertainty in this comparison. No analysis about the downstream impacts of

any decision on charter boat operators, fishing tackle and bait suppliers, and tourism, has been undertaken at this time.

179 MPI does not manage recreational catch on an annual basis. The allowance reflects that recreational catch can vary from year to year largely in response to a combination of factors, including changes in the availability and abundance of snapper and the participation rate and fishing effort of the recreational sector. The participation rate is reflective of the availability of snapper an increased number of fishers (reflective of increased population growth experienced in Auckland). Recreational management controls (bag limits and MLS) are not set on an annual basis and as a result are not sufficiently nuanced to reflect changes in recreational catch levels. There is the potential that in years of poor availability management controls may constrain recreational catch well below the recreational allowance. The converse may also result; in years of good availability, the existing recreational management controls may not constrain catch within the recreational allowance. Consideration of the overall trend, that is recreational catch on average, will be important in determining whether there is a need to change existing management settings.

180 Ideally, catch levels of each sector should be regularly monitored and appropriate measures implemented in response to changes in catch levels. This will ensure that decisions based on consideration of the current status of the stock and relative benefits provided to each sector are not undermined. This is of particular importance for highly valued, shared fisheries. As a result, a more regular programme of recreational catch assessment will be required in key recreational fisheries. MPI is developing a non-commercial information strategy during 2013, in consultation with tangata whenua and stakeholders which will outline a proposed approach. MPI is also proposing to require amateur charter vessel operators to report catch of SNA 1 to improve annual information on recreational removals.

181 In order to determine the average recreational catch, reliance is placed on the estimates of historic recreational catches used as an input to the stock assessment. Recreational catch is estimated to have averaged 3 030 tonnes over the last ten years and 3 365 tonnes over the last five years. The last several years have seen recreational catch continue to increase, reaching 3 700 tonnes in 2012.

182 Analysis commissioned from NIWA has looked at the potential effects of different bag and size limits upon recreational harvest in SNA 1 based on data collected during the 2012 aerial overflight survey. While the analysis is uncertain and cannot anticipate all changes in behaviour, it does provide a range of different estimates of likely recreational harvest under different bag and MLS controls. Estimates that MPI considers most relevant in a review of existing management controls are shown in Table 6.2.

Table 6.2: Expected annual recreational catch under different bag and size limit controls based on 2011-12 harvest levels and snapper availability (values are in tonnes)

	Daily bag limit (per person)						
MLS (cm)	**3**	**4**	**5**	**6**	**7**	**8**	**9**
27	2 398	2 786	3 079	3 303	3 476	3 609	3 705
30	2 359	2 716	2 981	3 177	3 323	3 426	3 489
31	2 320	2 657	2 900	3 076	3 200	3 283	3 329
32	2 278	2 590	2 809	2 961	3 065	3 130	3 166
33	2 216	2 494	2 681	2 804	2 884	2 932	2 957
34	2153	2 397	2 555	2 654	2 715	2 751	2 769
35	2 063	2 273	2 399	2 475	2 522	2 546	2 559
36	1 968	2 142	2 242	2 301	2 335	2 353	2 361
37	1 858	1 998	2 075	2 120	2 146	2 158	2 164
38	1 752	1 865	1 925	1 960	1 979	1 988	1 992

6.3.3 Māori customary allowance

183 In most cases, there is very little information on customary fishing harvest, although this will improve as customary regulations take effect and better reporting processes are implemented. Where new information suggests that customary take is significantly below or above the level previously allocated, customary allowances are amended accordingly. The allowance is intended to reflect what customary fishers are likely to harvest from the fishery. The allowance does not provide a limit on the amount of customary catch that can be harvested.

184 For SNA 1, limited reporting of customary catch is available. In part this reflects that tangata whenua groups still operate under the Fisheries (Amateur Fishing) Regulations which do not require reporting of catch. MPI considers that the existing provision for a customary catch of 300 tonnes within the combined non-commercial allowance of 2600 tonnes is likely to be significantly undercaught. Best available information on customary catch estimates the take to be of the order of 50 tonnes. MPI seek tangata whenua input on the level of current customary harvest from this fishery.

6.3.4 Other sources of fishing related mortality

185 An allowance for other sources of fishing related mortality includes illegal catch, discards, and incidental mortality from fishing gear. Often, little quantitative information is available to assess the level of this allowance, although inferences can be drawn from the impact associated with a particular method, or information from similar stocks or species.

186 The stock assessment for SNA 1 provides a summary of research regarding various other sources of fishing related mortality (including by sector and method). The current allowance of 450 tonnes was set as a proportion of the TACC (i.e. 10%), but excludes recreational and customary related mortality. The stock projections assumed an allowance of 450 tonnes for all scenarios.

187 The estimate of other sources of fishing related mortality is likely to be affected by any changes made to the TAC and allowances set for SNA 1. Despite limitations concerning the estimate of other sources of fishing related mortality, MPI regards the estimate as the best available information. A revised estimate should be considered as part of the development of a management strategy for SNA 1.

188 MPI notes that mortality from commercial fishing makes up a significant component of this allowance. Anecdotal information suggests mortality of fish below the MLS is a significant component of commercial other sources of fishing related mortality.

189 While this may not impact on sustainability of the resource, assuming the allowance is broadly reflective of actual mortality, because it is incorporated into the stock assessment, it does result in lost productivity to the stock.

190 As part of the strategy MPI intends to work with stakeholders on a range of measures to reduce other sources of mortality and improve the overall productivity of SNA 1.

191 One of the issues considered will be the effectiveness of the MLS in commercial fisheries, particularly for trawl vessels. The level of reporting of sub-MLS discards from this method is likely to be very low. It is not clear how many of these sub-MLS fish can survive being landed and returned to the sea. In the absence of information on the size of the mortality and therefore the amount of lost productivity occurring there are no strong incentives on fishing operators to avoid sub-MLS fish.

192 One option to address this issue would be to remove the MLS and require all fish taken to be landed. Linked to an increase in monitoring, this approach would ensure overall commercial catch was constrained by the TACC and would provide strong incentives for fishers to manage catch of fish of lesser economic value

193 The second approach to this issue is to gather more information to support analysis as part of developing a longer term strategy for this fishery. The commercial sector is looking to implement a number of measures designed to provide better estimates of the level of commercial other sources of fishing related mortality (outlined in more detail in the Initial Consultation (section 12)).

194 Once the data has been obtained there will be an opportunity to consider the level of mortality relative to the current allowance, and ways to reduce the mortality. Fishing method is known to be a key determinant of mortality but data will in particular allow consideration of the importance of area and time on the levels and type of mortality.

195 If the amount of mortality is reduced over time then the other sources of fishing related mortality should be reduced to account for that reduction. Where there is a documented reduction in a sector’s contribution to other sources of fishing related mortality, this reduction should be allocated to the sectors allowance or TACC so that it can be harvested. The amount allocated will need to be considered given differences in the size of fish taken.

7 PROPOSED SNA 1 MANAGEMENT OPTIONS

196 Before discussing the proposed options in detail it is helpful to recap the available information about the status of SNA 1 and the management approach to be applied.

7.1 AVAILABLE INFORMATION AND MANAGEMENT APPROACH

197 The 2013 SNA 1 stock assessment shows that both sub-stocks are below the level of the B_{MSY} (the interim target and any likely future target); hence there is a need to consider rebuilding the stock further.

Table 8.1: Base model estimates of B_0 and current biomass (B_{2013} as $\%B_0$). 95% confidence intervals are displayed in brackets.

Sub-stock	B_{2013} as % B_0
East Northland	24 (18 – 30)
Hauraki Gulf–Bay of Plenty	19 (15 – 23)

198 Five year projections based on levels of recent average recruitment show the biomass will increase slightly over five years under all catch scenarios tested. However, projections using long term average levels of recruitment show the biomass declining for all scenarios tested.

Table 8.2: Median B_{2018} (as $\%B_0$), by stock and scenario (assuming recent average recruitment levels)

	Hauraki Gulf–Bay of Plenty (B_{2013} = 19% B_0)	East Northland (B_{2013} = 24% B_0)
Scenario 1: Current catch levels	20.2	26.5
Scenario 2: TAC and catch of 7550 tonnes	21.3	27.3
Scenario 3: TAC and catch of 8050 tonnes	20.6	26.8
Scenario 4: TAC and catch of 7050 tonnes	21.9	28.1

199 The projections based on long term average levels of recruitment show biomass is likely to decline unless the current TAC is reduced by approximately 20%.

200 The primary obligation is to move stock biomass towards or above the B_{MSY}. The Act allows for different ways and rates of recovery to the B_{MSY} level. The stock assessment suggests that different options for rebuilding are available and these have different costs and benefits.

201 Given the lack of an agreed management biomass target and harvesting strategy for SNA 1, MPI considers that a short term approach is appropriate at this time. MPI notes that a long term management strategy for SNA 1 will be developed in collaboration with tangata whenua and stakeholders. MPI intends to review the SNA 1 management arrangements to give effect to the long term strategy and achieve the appropriate rebuild.

7.2 OPTIONS

202 MPI proposes three core options which are within the range of scenarios tested using the assessment model. The options include retaining the current TAC, increasing the TAC by 500 tonnes, or decreasing the TAC by 500 tonnes. All options also consider the adjustment of other management controls.

203 These options have little influence on the short term biomass trajectories, but have different short term costs and benefits. The increase option places greatest weight on the short term projections and recognition that the stock has rebuilt considerably from its low point in 1997 so there is an opportunity to provide an increase in benefits now. The status quo option provides for a more conservative approach to be taken prior to the development of a longer term strategy. The third option in the paper (a 500 tonne TAC decrease) places greater weight on the long term projections, given uncertainty over current levels of recruitment and the possibility for recent recruitment not to be sustained over the next five years.

8 OPTION 1

205 Option 1 proposes:

- The TAC be set at 7550 tonnes, unchanged from the present TAC.
- A customary allowance is created, and set at 50 tonnes.
- The other sources of fishing related mortality allowance be set at 450 tonnes; unchanged from the present allowance

206 Option 1 proposes the Minister consider how to allocate 7050 tonnes between the recreational allowance and the TACC. MPI is supportive of an allocation unchanged from the present situation, which is a recreational allowance of 2550 tonnes, and a TACC of 4500 tonnes.

207 Under Option 1 changes to existing management controls (in particular the recreational daily bag limit and/or the recreational minimum legal size) may be implemented to give effect to the TAC and sector allowances set.

8.1 TAC

208 Option 1 proposes retaining the existing TAC of 7550 tonnes. Option 1 gives weight to the fact that there are social, economic and cultural benefits to be gained from the continued rebuild of SNA 1 and a desire to maintain the status quo while the long term future management of the fishery is discussed with stakeholders. However, if future recruitment is more like the long term average there is a risk that the TAC will need to be reduced to rebuild the stock within a reasonable timeframe to any future target.

209 Projections indicate the rate of rebuild under a TAC of 7550 tonnes is slow. In addition, the projections assume that catch will not exceed the current TAC, and that recruitment levels are similar to those observed in the fishery during the period 1994-2004 and are therefore above average.

210 With a TAC of 7550 tonnes, over the next five years, the biomass for the east Northland sub-stock is predicted to increase from 24.1% to 27.3% B_0. The Hauraki Gulf–Bay of Plenty sub-stock is projected to increase from 19.5% to 21.3% B_0. There remains a 34% probability that under a TAC of 7550 tonnes, the 2018 biomass will be below the soft limit for the Hauraki Gulf–Bay of Plenty sub-stock.

211 Projections using long term average recruitment levels and a TAC of 7550 tonnes show both the east Northland and Hauraki Gulf–Bay of Plenty sub-stocks declining slowly

over time. However, MPI supports use of the projections using recent average levels of recruitment for assessing stock status given the stock will be reviewed again with five years.

8.2 ALLOCATION

212 Explicit allowances for recreational and customary fishers are proposed. There is also a need to consider changes to other management controls in order to ensure that sector allowances are not exceeded.

8.2.1 Māori customary allowance

213 MPI policy preference for Māori customary allowances is set out in the proposed response section above. Based on the best available information, MPI considers an allowance of 50 tonnes for Māori customary fishing is appropriate.

214 As noted previously, the allowance does not act as a constraint on customary catch rather it reflects the level of catch taken. MPI welcomes information provided during the consultation process that can better inform estimates of customary catch for SNA 1.

8.2.2 Recreational allowance and the TACC

215 The current combined recreational and customary allowance is 2600 tonnes. MPI proposes to remove the existing 50 tonnes customary catch from the combined allowance to provide for an explicit customary allowance.

216 That would leave a total of 7050 tonnes to allocate between the recreational allowance and the TACC. The only allocation criteria confirmed by the Courts is that the allowance must be reasonable. A range of criteria MPI considers applicable to consideration when setting allowances have been outlined in the proposed response section above.

217 With respect to allocating the 7050 tonnes between the recreational allowance and the TACC, the following choices are available to the Minister:

- Set an allowance for the recreational and commercial sectors based on the existing proportional shares of the TAC.
- Increase the recreational allowance to cover some or all of the current catch by reallocating catch from the TACC.
- Increase the TACC and decrease the recreational allowance.

8.3 PROPORTIONAL ALLOCATION UNDER OPTION 1

218 MPI supports setting a recreational allowance and TACC based on current proportions of the TAC if the TAC is to remain unchanged. Retaining existing proportions provides some certainty to stakeholders that they will be able to retain their existing harvest right.

219 MPI's policy preference for proportional allocation does not fetter the Minister from making a different decision following consultation with stakeholders.

220 MPI is aware of concerns raised about whether the existing recreational allowance is a reasonable reflection of historical and current recreational catch. MPI acknowledges there is uncertainty around the level of recreational catch. However, the best available information suggested that the allowance set in 1997 was a reasonable representation of recreational catch at that time. As abundance of snapper has increased recreational catch has also increased.

221 A risk of this option is that average recreational catch may exceed the allowance. Recreational catch over the last ten years has averaged 3030 tonnes, while average recreational catch over the last five years has averaged 3365 tonnes. Consideration will need to be given to application of other management controls to constrain recreational catch on average to within the allowance.

222 The current TACC is imposing costs on industry. Industry advise that snapper is an important limiting species; the TACC for snapper can constrain the catch of related species because of the inability to source ACE for SNA 1. As the stock continues to rebuild there is the potential that this problem will be exacerbated under the TACC. Increased abundance is also likely to lead to increased levels of discards (both sub-MLS fish and legal sized fish).

223 For the commercial sector, there was a sharp decrease in the commercial catch of other FMA 1 inshore fishstocks in 2011/12. There was also a much lower deemed value payment for snapper than in recent years; these two factors could signal the effect of fishers changing harvest practices to avoid catching snapper.

8.4 OTHER ALLOCATIVE CHOICES UNDER OPTION 1

224 The Minister could decide to change existing proportions up or down for either the commercial or recreational sector. A key reason for implementing a non-proportional allocation would be to increase the overall benefit from the fishery by a change in the amount the sectors harvest. Although highly uncertain, information suggests that there is roughly

equivalent value between the recreational and commercial sectors in relation to SNA 1. However the current proportions of the TAC are 60% commercial, 40% recreational. Other factors as noted in section 6.3 are also relevant in providing supporting rationale for a change to allocation.

225 Changing proportions between sectors within an unchanged TAC will create significant impacts beyond the value transfer between sectors. While the ability of the Government to impact on rights associated with sustainability decisions is well understood, change to existing rights solely for the purpose of shifting benefits from one sector to another is precedential. Such a decision would create uncertainty about when Government will intervene on allocation issues and the security associated with existing rights. Increased uncertainty around the nature of those rights will undermine the incentives for long term husbandry of the resource and investment generated from secure long term access to the resource.

226 MPI notes that changes in benefits between sectors could be achieved in SNA 1 by gradual change in shares in the fishery as part of increases to the TAC as the stock rebuilds towards future target levels. Development of the long term strategy for SNA 1 will include consideration of how benefits can be maximised and an allocation approach for how that can be achieved. Development of such a policy will provide more certainty to stakeholders around how and when changes to the TACC and allowances may occur.

227 However this policy position does not fetter the discretion of the Minister to take a different approach. If he chooses to consider non-proportional options the recreational allowance could be increased from the current level in order to cover some or all of the recent observed level of recreational catch.

228 The impact on the commercial sector of this option depends on the amount of the reduction to the TACC. However MPI notes that a reduction in the TACC of 815 tonnes would be required to provide for current recreational catches of 3365 tonnes. Such a change could adversely impact upon the commercial sector with expected losses of $4.7 million in landed value, $3.4 million in ACE value, and losses between $6.4 and 8.6 million in export receipts (depending on the form snapper is exported as). MPI notes that recreational value of an equivalent magnitude could be gained by adopting this option.

229 Alternately, the Minister could decide to increase the TACC, and decrease the recreational allowance. This possibility would give weight to increasing economic returns from export receipts and commercial fishing operations. Such a choice would have to be considered against the costs incurred at the expense of the recreational sector, some of which might be considerable. If this allocative choice was made, significant changes to the

management controls on recreational fishing would be required to ensure average recreational catch was constrained to the allowance.

8.5 CONSIDERATION OF OTHER MANAGEMENT CONTROLS FOR THE RECREATIONAL SECTOR

230 For the recreational sector, the catch can vary significantly between years. The estimated average recreational catch for the last ten years was 3030 tonnes, and the average for the last five years was 3365 tonnes. Depending on the allowance set, the Minister may need to constrain recreational catch to ensure it remains within the allowance on average.

231 Although recreational catch has exceeded the allowance on average over the last five years, the availability of snapper to recreational fishers can cause the recreational catch to fluctuate considerably. In some years snapper are simply more available to the recreational sector than in other years due to environmental conditions influencing whether snapper come more into shallow water areas where they can be more easily targeted by recreational fishers. The 2011/2012 year is considered one of extremely high availability.

232 If recreational catch continues to exceed the allowance with no additional management controls imposed, there will be implicit benefits being obtained by the recreational sector during this period that have not been formally allowed for by the Minister. The implicit benefit transfer to the recreational sector may not maximise benefits from the fishery overall.

233 Under a TAC of 7550 tonnes, if the Minister chose to maintain the existing allowances, changes to recreational management controls may be required. MPI considers that if the recreational sector has exceeded the recreational allowance; recreational fishers should accept the responsibility for constraining catch to ensure the recreational allowance and the TAC is not exceeded.

234 The primary management tools available to manage recreational catch are the recreational daily bag limit and the recreational MLS. There is a matrix of options available as to how the bag limit and MLS can be used in combination to constrain recreational catch (as set out in table 8.1).

Table 8.1: Recreational allowance of 2 550 tonnes. MLS and bag limits that will constrain catches to the proposed allowance are shown in green. Options left white indicate combinations of MLS and bag limits that are considered unlikely to constrain catch to the proposed allowance. Estimates of harvest do not include charter vessel catch or catch taken under section 111 of the Act.

MLS	3	4	5	6	7	8	9
27							
30							
33							
35							

235 To constrain recreational catch to an allowance of 2550 tonnes, the Minister could chose to retain a bag limit of nine but increase the minimum legal size from 27 cm to 35 cm. This will further increase the difference between the commercial and recreational MLS. Using only the daily bag limit as a means of constraining catch to around the allowance would require the bag limit to be reduced to three fish.

236 A significant increase to the MLS is likely to increase handling mortality. Generally speaking, to land a fish over a 35cm MLS, fishers would need to catch and release several fish under a 35cm MLS. The released fish would be subject to handling mortality. Earlier studies show this can be 3-8% for smaller fish. The higher the MLS, the more fish that will be handled to catch a fish that can be kept. In extreme cases, the increased handling mortality could negate the potential positive effects of the increased MLS. There is no analysis of the potential impact of this level of MLS increase currently available.

237 Given that recreational catch can vary from year to year and the long term average is the key consideration, a bag limit greater than three fish or a MLS less than 35cm could be implemented. Consideration could be given to trending recreational catch down over time, with an initial set of measures implemented this year and further changes considered as part of a more active management approach. Similar approaches have been taken in commercial fisheries, although this has been achieved by a phased reduction of the TAC and TACC.

238 MPI invites discussion on the proposed changes to the recreational daily bag limit and the minimum legal size (and combinations thereof), particularly to identify if there is a general consensus on the measures to be implemented to constrain recreational catch in the event that the Minister decides it appropriate to do so.

239 Changes to existing recreational management controls will have flow-on effects beyond individual recreational fishers. A reduction in recreational catch may adversely affect charter boat operators and fishing gear and bait suppliers in particular. It is likely that such a

change will also impact on other stocks with recreational fishers potentially harvesting more of other species. No analysis has been undertaken of the extent of these effects.

8.6 ALLOWANCE FOR OTHER SOURCES OF FISHING RELATED MORTALITY

240 The current allowance of 450 tonnes was set as a proportion of the TACC. MPI considers retaining the allowance of 450 tonnes is appropriate under all options considered. Further information on this matter is outlined in the proposed response (section 6).

241 It is acknowledged, however, that changes to the recreational daily bag limit and the minimum legal size, along with retention of the current TACC could lead to n increase in other sources of fishing related mortality. With a lower daily bag limit there is the potential that some fishers will continue to fish after filling the daily bag limit leading to high-grading and/or increased handling mortality. Similarly, a higher MLS could lead to increased handling mortality.

242 There is also the potential that the inability to source ACE to cover catch of snapper may leaded to increased discarding of snapper by commercial fishers.

9 OPTION 2

243 Option 2 proposes:

- The TAC be set at 8050 tonnes, increased from the present TAC of 7550 tonnes.
- A customary Māori allowance be created, and set at 50 tonnes.
- The other sources of fishing related mortality allowance be set at 450 tonnes; unchanged from the present allowance.

244 Option 2 proposes the Minister consider how to allocate 7550 tonnes between the recreational allowance and the TACC. MPI is supportive of a proportional allocation, which is a recreational allowance of 2730 tonnes, and a TACC of 4820 tonnes.

245 Under Option 2 changes to other management controls (in particular the recreational daily bag limit and/or the recreational MLS) may need to be implemented to give effect to the TAC and sector allowances.

9.1 TAC

246 Option 2 proposes to increase the TAC by 500 tonnes from 7550 to 8050 tonnes.

247 Option 2 recognises the potential for a short term increase to the TAC. The fishery has steadily rebuilt since the last review of SNA 1 in 1997 and fishers have foregone catch and benefits in order to achieve the observed rebuild since the last review.

248 There is a degree of latitude as to how to progress with the rebuild without increased risk to the stock. There are widely held anecdotal views by recreational and commercial fishers about the relative health of the stock. In particular, MPI is aware that recreational and commercial fishers have reported good catches over the last several years. An increase to the TAC can allow fishers to increase the utilisation and therefore benefits from the fishery.

249 With a TAC of 8050 tonnes, based on recent average levels of recruitment, over the next five years, the biomass for the east Northland sub-stock is estimated to increase from 24.1% to 26.8% B_0. The Hauraki Gulf–Bay of Plenty sub-stock is projected to increase from 19.5% to 20.6% B_0. There remains a 42% probability that under a TAC of 8050 tonnes, the 2018 biomass will be below the soft limit for the Hauraki Gulf–Bay of Plenty sub-stock.

250 Option 2 gives weight to the opportunity to obtain a short to medium term increase in benefits from the stock without putting the longer term rebuild of the fishery at risk. However, if future recruitment is more like the long term average there is a risk that the TAC

will need to be reduced to rebuild the stock within a reasonable timeframe to any future target.

9.2 ALLOCATION

251 The Minister has discretion, after taking into account relative benefits derived from the fishery, as to how a TAC of 8050 tonnes is allocated.

252 Explicit allowances for recreational and customary fishers are proposed. There is also a need to consider changes to other management controls in order to ensure that sector allowances are not exceeded.

9.2.1 Māori customary allowance

253 As outlined the proposed response (section 6), MPI proposes to set the Māori customary allowance at a level that will provide in full for Māori customary non-commercial interests. The best available information on customary catch estimates the take to be in the order of 50 tonnes.

254 The allowance does not act as a constraint on customary catch rather it reflects the level of catch taken. MPI welcomes information provided during the consultation process that can better inform estimates of customary catch for SNA 1.

9.2.2 Recreational allowance and the TACC

255 Under a TAC of 8050 tonnes, MPI proposes the Minister allocate 7550 tonnes between the recreational allowance and the TACC.

256 With respect to allocating the 7550 tonnes between the recreational allowance and the TACC, the following choices are available to the Minister:

- Change the recreational and commercial allowances based on the existing proportional shares of the TAC.
- Change the current proportional shares of the TAC by allocating a disproportional amount of the 500 tonne increase to the sectors.
- Change the current proportional shares of the TAC by allocating the 500 tonne increase to one sector plus an additional amount by reducing the allowance or TACC of the other sector.

9.3 PROPORTIONAL ALLOCATION UNDER OPTION 2

257 One option available to the Minister is to allocate the increased TAC by proportionately increasing current allowances. Under a proportional allocation with a TAC of 8050 tonnes, the recreational allowance would be increased from 2600 tonnes to 2730 tonnes and the TACC would be increased from 4500 tonnes to 4820 tonnes.

258 For commercial fishers, an increase to the TACC would provide additional economic return. The value of an additional 320 tonnes of commercial catch is estimated to be worth an additional $1.85 million in landed value, and $1.32 million in ACE value. Export returns between $2.53 million and $3.36 million per annum are also possible (depending on the form snapper is exported as), assuming all the additional catch is exported.

259 Commercial fishers in SNA 1 advise that snapper is a limiting species; the TACC for snapper can constrain the catch of related species because of the inability to source ACE for SNA 1. As the stock continues to rebuild there is the potential that this problem will be exacerbated under the TACC. Increased abundance is also likely to lead to increased levels of discards (both sub-MLS fish and legal sized fish). An increase to the TACC of 320 tonnes may alleviate this issue to some extent – most of the ACE is held by fishers targeting snapper.

260 The increase in the recreational allowance would provide for some of the increased recreational catch since the allowance was last reviewed. MPI considers this increase in allowance is reasonable given broadly equivalent values between the commercial and recreational fishers (although calculation of recreational value is uncertain), and reflects increased population numbers over time and the efforts of the recreational sector to rebuild the stock (i.e. the reduction in recreational bag limits from fifteen to nine snapper in 1997).

261 The key risk of this option is that average recreational catch will still exceed the allowance proposed. The risk of recreational catch exceeding the recreational allowance supports the consideration of additional management controls.

9.4 OTHER ALLOCATIVE CHOICES UNDER OPTION 2

262 The Minister could decide on a non-proportional approach to allocation under this option. If a determination is made that harvest levels between sectors should be adjusted to improve overall benefits from the fishery, amongst other things, then MPI support this change being made as part of TAC increases as opposed to reallocating existing rights.

263 The Minister could decide to allocate the 500 tonne TAC increase solely to the commercial sector if he considered it reasonable to do so. One of the factors considered may be the different types of benefits to the economy generated by utilisation of the stock by each

sector. The Minister could, for example, decide to place greater weight on export receipts as opposed to activity which circulates money within New Zealand. Under this option the 500 tonnes could generate additional export value of between $6.48 million and $8.61 million annually (depending on the form snapper is exported as).

264 As noted above, snapper are considered by commercial fishers to be a limiting species, potentially constraining the catch of related species because of the inability to source ACE for SNA 1. As the stock continues to rebuild there is the potential that this problem will be exacerbated under the TACC. Increased abundance is also likely to lead to increased levels of discards (both sub-MLS fish and legal sized fish). An increase to the TACC of 500 tonnes may alleviate this issue to a greater degree than other options considered.

265 For commercial fishers, an increase to the TACC of 500 tonnes could provide additional economic return. The value of an additional 500 tonnes of commercial catch is estimated to be worth an additional $2.89 million in landed value, and $2.07 million in ACE value. Additional export returns between $3.95 million and $5.25 million per annum are also possible (depending on the form snapper is exported as), assuming all the additional catch is exported.

266 Alternatively, the Minister could choose to allocate the 500 tonne increase solely to recreational fishers. This increase in allocation would give additional weight to the factors noted in the proportional option above. In particular, it would give weight to a consideration that the existing allowance does not reflect a reasonable share of the SNA 1 resource for recreational fishers given equivalent values between sectors and increasing population numbers. The current recreational share of the TAC is 40% compared to 60% for the commercial sector. This does not reflect the roughly equivalent values between these sectors. However, it should be noted that this comparative assessment is highly uncertain and should be treated with caution.

9.5 CONSIDERATION OF ADDITIONAL MANAGEMENT CONTROLS FOR THE RECREATIONAL SECTOR

267 If the Minister decided on a proportional increase to the TACC and allowances, the recreational allowance would be below estimates of current average recreational catch. To manage the risk of the recreational catch substantially exceeding the allowance, changes to recreational management controls may be required.

268 The primary management tools available to manage recreational catch are the recreational daily bag limit and the recreational minimum legal size. There is a matrix of options available as to how the bag limit and minimum legal size can be used in combination to constrain recreational catch (as set out in table 9.1).

Table 9.1: Recreational allowance of 2730 tonnes. MLS and bag limits that will constrain catches to the proposed allowance are shown in green. Options left white indicate combinations of MLS and bag limits that are considered unlikely to constrain catch to the proposed allowance. Estimates of harvest do not include charter vessel catch or catch taken under section 111 of the Act.

MLS	3	4	5	6	7	8	9
27							
30							
33							
35							

269 Available information suggests that retaining a daily bag limit of nine snapper and a minimum legal size of 34 cm would constrain recreational catch to within the allowance. This change would result in a significant difference between the commercial and recreational MLS. An increased size limit will result in more fish being returned to water and there will be additional incidental mortality of fish. This should be explicitly accounted for in the other sources of fishing related mortality in future strategy development. Reliance on the daily bag limit as a means of constraining catch would require the bag limit to be reduced to three fish to constrain catch within the proposed allowance.

270 Allocating the 500 tonne TAC increase solely to the recreational sector would result in a recreational allowance of 3050 tonnes. Assumed average annual recreational catch over the last ten years has been 3030 tonnes. However, recreational catch over the last five years has averaged 3365 tonnes annually. Therefore there is a risk that the proposed allowance will not cover recreational catch on average. If the Minister wanted to restrain catch to around an allowance set at 3030 tonnes, Table 9.2 below outlines possible options.

271 Retaining the daily bag limit of nine snapper and a MLS of 33cm would ensure catch remains within the allowance. Conversely, retaining the current MLS of 27cm would require a reduction to the daily of the daily bag limit from nine to five fish.

Table 9.2: Recreational allowance of 3050 tonnes. MLS and bag limits that will constrain catches to the proposed allowance are shown in green. Options left white indicate combinations of MLS and bag limits that are considered unlikely to constrain catch to the proposed allowance. Estimates of harvest do not include charter vessel catch or catch taken under section 111 of the Act.

MLS	3	4	5	6	7	8	9
27							
30							
33							
35							

272 Alternatively the Minister could decide to allocate the 500 tonne TAC increase solely to the commercial sector, resulting in a recreational allowance of 2550 tonnes. Under this scenario the information presented under Option 1 relating to changes to the recreational daily bag limit and the MLS would be applicable.

273 Given that recreational catch can vary from year to year and the long term average is the key consideration, thought could be given to trending recreational catch down over time, with an initial set of measures implemented this year and further changes made when the long term management strategy is implemented. Similar approaches have been taken in commercial fisheries, although this achieved by a phased reduction of the TAC and TACC.

274 Changes to existing recreational management controls will have flow-on effects beyond individual recreational fishers. A reduction in recreational catch will affect charter boat operators and fishing gear and bait suppliers and boat ramps in particular. It is likely that such a change will also impact on other stocks with recreational fishers potentially harvesting more of other species. No analysis has been undertaken of the extent of these effects.

275 MPI invites discussion on the proposed changes to the recreational daily bag limit and the minimum legal size (and combinations thereof), particularly to identify if there is general consensus on the measures to be implemented to constrain recreational catch in the event that the Minister decides it appropriate to do so.

9.6 OTHER SOURCES OF FISHING RELATED MORTALITY ALLOWANCE

276 The current allowance of 450 tonnes was set as a proportion of the TACC. MPI considers retaining the allowance of 450 tonnes is appropriate under all options considered. Further information on this matter is outlined in the proposed response (section 6).

277 It is acknowledged, however, that changes to the recreational daily bag limit and the minimum legal size, along with retention of the current TACC could lead to increase in other sources of fishing related mortality. With a lower daily bag limit there is the potential that some fishers will continue to fish after filling the daily bag limit leading to high-grading and/or increased handling mortality. Similarly, a higher MLS could lead to increased handling mortality.

278 There is also the potential that the inability to source ACE to cover catch of snapper may lead to increased discarding of snapper by commercial fishers.

10 OPTION 3

279 Option 3 proposes:

- The TAC be set at 7050 tonnes, decreased from the present TAC of 7550 tonnes.
- A customary Māori allowance is created, and set at 50 tonnes.
- The other sources of fishing related mortality allowance be set at 450 tonnes; unchanged from the present allowance.

280 Option 3 proposes the Minister consider how to allocate 6550 tonnes between the recreational allowance and the TACC. MPI is supportive of a proportional allocation, which is a recreational allowance of 2370 tonnes, and a TACC of 4180 tonnes.

281 Under Option 3 changes to existing management controls (in particular the recreational daily bag limit and/or the recreational MLS) may be implemented to give effect to the TAC and sector allowances set.

10.1 TAC

282 Option 3 proposes reducing the TAC by 500 tonnes from 7550 to 7050 tonnes.

283 Option 3 reflects a conservative approach given current information suggests the TAC will need to be reduced in order to rebuild the stock to any likely future management target. While a decision about the rate of rebuild and the social, cultural and economic benefits associated with rebuild is best considered as part of the development of a management strategy for SNA 1, a 500 tonne reduction can be seen as the start of a programme of TAC reductions (dependent on future recruitment and determination of a long term target level for the stock) that will be necessary to ensure the stock rebuilds to any future likely target level.

284 The stock assessment for SNA 1 provides projections looking at various catch levels based on recent average and long term average levels of recruitment. Under all scenarios considered, projections using recent average levels of recruitment indicate the two sub-stocks will continue to increase. However, projections based on long term average levels of recruitment indicate that under a TAC of 7050 tonnes the stock will slowly decline. MPI prefers using recent average levels of recruitment and five year projections because it is intended to review the stock within the next five years.

285 With a TAC of 7050 tonnes, based on recent average levels of recruitment, over the next five years, the biomass for the east Northland sub-stock is estimated to increase from 24.1% B_0 to 28.1% B_0. The Hauraki Gulf–Bay of Plenty sub-stock is projected to increase

from 19.5% B_0 to 21.9% B_0. There remains a 26% probability that under a TAC of 7050 tonnes, the 2018 biomass will be below the soft limit for the Hauraki Gulf–Bay of Plenty sub-stock.

286 Option 3 gives weight to the fact that there are social, economic and cultural benefits to be gained from the continued rebuild of SNA 1 (notwithstanding the absence of any long term biomass target having been determined). Initial analysis suggests that in the long term there would be significant additional yield available to fishers from a fully rebuilt fishery.

10.2 ALLOCATION

287 The Minister has discretion, after taking into account relevant benefits derived from the fishery, as to how a TAC of 7050 tonnes is allocated.

288 Explicit allowances for recreational and customary fishers are proposed. There is also a need to consider changes to other management controls in order to ensure that sector allowances are not exceeded.

10.2.1 Māori Customary Allowance

289 As outlined in the proposed response (section 6), MPI proposes to set the Māori customary allowance at a level that will provide in full for Māori customary non-commercial interests. The best available information on customary catch estimates the take to be in the order of 50 tonnes.

290 The allowance does not act as a constraint on customary catch rather it reflects the level of catch taken. MPI welcomes information provided during the consultation process that can better inform estimates of customary catch for SNA 1.

10.2.2 Recreational Allowance and the TACC

291 Under a TAC of 7050 tonnes, MPI proposes the Minister allocate 6550 tonnes between the recreational allowance and the TAC.

292 A range of criteria MPI considers applicable to consideration when setting allowances have been outlined in the proposed response (section 6). With respect to allocating the 6550 tonnes between the recreational allowance and the TACC, the following choices are available to the Minister:

- Set an allowance for the recreational and commercial sectors based on the existing proportional shares of the TAC.
- To change the current proportional shares of the TAC by allocating a disproportional amount of the 500 tonne decrease to the sectors.

- To change the current proportional shares of the TAC by allocating the 500 tonne decrease to one sector plus an additional amount by further reducing the allowance or TACC of the other sector.

10.3 PROPORTIONAL ALLOCATION UNDER OPTION 3

293 One option available to the Minister is to allocate the reduced TAC by proportionately reducing current allowances and the TACC. Under a proportional allocation with a TAC of 7050 tonnes, a recreational allowance of 2370 tonnes and a TACC of 4180 tonnes would be set.

294 For commercial fishers, a decrease to the TACC could result in economic losses. The loss of 320 tonnes from the TACC is estimated to be worth losses of $1.85 million in landed value, and $1.32 million in ACE value. A loss of export returns between $2.53 million and $3.36 million per annum are also possible (depending on the form snapper is exported as).

295 Industry advise that snapper is an important limiting species; the TACC for snapper can constrain the catch of related species because of the inability to source ACE for SNA 1. As the stock continues to rebuild there is the potential that this problem will be exacerbated. Increased abundance may also lead to increased levels of discards (both sub-MLS fish and legal sized fish).

296 Analysis suggests that a TACC of 4180 tonnes will likely lead to significant constraints placed on the catch of important associated species. Alternatively, there is the prospect that the TACC will be exceeded. This is more likely to occur in the short term while industry adjusts fishing patterns and catch to the new limit. If the TACC is exceeded, the deemed value payments will increase. While ramping provisions in the deemed value framework are intended to discourage significant catch by individual fishers in excess of ACE holdings, this could increase the incentive to discard snapper (an unlawful practice).

297 A recreational allowance of 2370 tonnes would not cover existing recreational catch. It would lead to a reduction in existing benefits to the recreational sector in the short term as the stock rebuilds. Additional management controls would be needed to constrain recreational catch to this level.

10.4 OTHER ALLOCATIVE CHOICES UNDER OPTION 3

298 The Minister could choose to allocate the entire 500 tonne reduction in the TAC either to commercial or recreational fishers.

299 If a 500 tonne TAC reduction was allocated solely to the commercial sector (so that the TACC was set at 4000 tonnes from the current 4500 tonnes), it would exacerbate the risk of commercial fishing in excess of the TACC, along with increased deemed value payments and risk of discarding. Under this scenario the additional 500 tonnes could equate to an export value of $3.95 million and $5.25 million per annum (depending on the form snapper is exported as).

300 Allocating the 500 tonne TAC decrease solely to the commercial sector would result in a recreational allowance of 2550 tonnes.

301 Alternatively, the Minister could decide to allocate the 500 tonne TAC decrease solely to the recreational sector; this would result in a recreational allowance of 2050 tonnes and would require changes to other management controls to constrain recreational catch to within the allowance.

10.5 CONSIDERATION OF ADDITIONAL MANAGEMENT CONTROLS FOR THE RECREATIONAL SECTOR

302 If the Minister decided on a proportional decrease to the TACC and allowances, the recreational allowance would be below estimates of recent average recreational catch (over the last five years). To manage the risk of the recreational catch substantially exceeding the allowance, changes to recreational management controls may be required.

303 The primary management tools available to manage recreational catch are the recreational daily bag limit and the recreational minimum legal size. There is a matrix of options available as to how the bag limit and minimum legal size can be used in combination to constrain recreational catch (as set out in table 10.1).

Table 10.1: Recreational allowance of 2 370 tonnes. MLS and bag limits that will constrain catches to the proposed allowance are shown in green. Options left white indicate combinations of MLS and bag limits that are considered unlikely to constrain catch to the proposed allowance. Estimates of harvest do not include charter vessel catch or catch taken under section 111 of the Act.

MLS	3	4	5	6	7	8	9
27							
30							
33							
35							
36							

304 To restrain recreational catch within a recreational allowance of 2370 tonnes the Minister could retain the existing daily bag limit of nine snapper and increase the minimum legal size from 27 cm to 36 cm. Alternatively retaining the current MLS of 27 cm would require a daily bag limit of three fish.

305 If the Minister decided to decrease the recreational allowance by 500 tonnes (2050 tonnes) a daily bag limit of nine snapper and an MLS of 38 cm would be required to constrain catch to within the allowance. Alternatively an MLS of 27cm would require a reduction of the daily bag limit to two fish to constrain catch within an allowance of 2050 tonnes.

306 Given that recreational catch can vary from year to year and the long term average is the key consideration, thought could be given to trending recreational catch down over time, with an initial set of measures implemented this year and further changes made when the long term management strategy is implemented. Similar approaches have been taken in commercial fisheries, although this achieved by a phased reduction of the TAC and TACC.

307 MPI invites discussion on the proposed changes to the recreational daily bag limit and the minimum legal size (and combinations thereof), particularly to identify if there is general consensus on the measures to be implemented to constrain recreational catch in the event that the Minister decides it appropriate to do so.

308 Changes to existing recreational management controls will have flow-on effects beyond individual recreational fishers. A reduction in recreational catch may adversely affect charter boat operators and fishing gear and bait suppliers in particular. It is likely that such a change will also impact on other stocks with recreational fishers potentially harvesting more of other species. No analysis has been undertaken of the extent of theses effects.

10.6 OTHER SOURCES OF FISHING RELATED MORTALITY ALLOWANCE

309 The current allowance of 450 tonnes was set as a proportion of the TACC. MPI considers retaining the allowance of 450 tonnes is appropriate under all options considered. Further information on this matter is outlined in the Proposed Response section.

310 It is acknowledged, however, that changes to the recreational daily bag limit and the minimum legal size, along with retention of the current TACC could lead to increases in other sources of fishing related mortality. With a lower daily bag limit there is the potential that some fishers will continue to fish after filling the daily bag limit leading to high-grading and/or increased handling mortality. Similarly, a higher MLS could lead to increased handling mortality.

311 There is also the potential that the inability to source ACE to cover catch of snapper may lead to increased discarding of snapper by commercial fishers.

11 FUTURE MANAGEMENT OF SNA 1

312 This review is intended to provide advice for the Minister to make a decision on the SNA 1 TAC, allowances, TACC, and other management controls for the October 2013/14 fishing year. However, MPI is aware that tangata whenua and stakeholders may support the development of a long term management strategy for SNA 1. MPI is receptive to, and supports the desire of, tangata whenua, commercial and recreational stakeholders to work alongside government to determine how best to maximise benefit from SNA 1.

313 The SNA 1 fishery is New Zealand's most valuable inshore finfish fishery. It is important that stakeholders have the opportunity to provide input into the management of the fishery to ensure views can be taken into account in developing the best approach to maximising benefits.

314 Following this review, MPI may consider development of a long term management strategy for SNA 1 in collaboration with stakeholders. The focus of the strategy would be around better information supporting improved benefits from the snapper fishery for all stakeholders.

315 MPI is interested in exploring options to improve the productivity of the fishery. Of particular interest are ways to reduce juvenile mortality, consideration of measures to protect spawning snapper, and identifying and protecting habitats of significance for the snapper population.

316 Development of a long term management strategy will also need to consider the following issues:

- What does maximising benefit mean for the SNA 1 fishery?
- How should the fishery be managed to maximise benefits?
- What is the target biomass that will ensure benefits are maximised?
- How should fishery performance be measured to monitor whether benefits are being maximised?
- What management approach should be taken to provide certainty and transparency in decision making?
- What cost effective research should be carried out, and at what times, to assess and monitor fishery performance?
- What management tools should be implemented to ensure benefits can be maximised?
- Consideration of how the benefits of the fishery are allocated?

- How should ongoing engagement with stakeholders occur over SNA 1?
- How to best manage the sub-stocks within SNA 1, including a consideration of splitting catch?

317 Following this review, a long term management strategy could be developed over the next two years. MPI considers a long term management strategy for SNA 1 could form a chapter in the National Fisheries Plan for Inshore Finfish.

318 MPI is seeking stakeholder feedback on the importance and direction of the future management of the SNA 1 fishery, and invites any further options that stakeholders may have.

12 INITIAL CONSULTATION

319 MPI met with several tangata whenua and stakeholder representatives to provide initial feedback on this review of the SNA 1 fishery during May and June 2013.

320 The Te Hiku o Te Ika (THOTI) Iwi Fisheries Forum represents several iwi in the far North area of SNA 1. The THOTI forum identifies snapper as a taonga species (noted in the Māori customary fishing section above). While the Forum has expressed interest in the review, initial views on a preferred approach or management controls have not been specified.

321 MPI met with some recreational stakeholders, including members of the FMA 1 and 9 Recreational Fishing Forum. The Recreational Fishing Forum commented on information around the 2013 stock assessment as follows:

- There was concern about a lack of recent information from catch sampling which would have provided information on recent average levels of recruitment.
- There was concern that the model and projections may be inaccurate because recruitment levels from 2006 onwards have not been included in the assessment.
- The recreational harvest information from this year's boat ramp surveys needs to be reviewed by science working groups. The Recreational Fishing Forum considered it was likely that recreational catch levels in the Hauraki Gulf is much less this year, than the previous two years.

322 The Recreational Fishing Forum also commented on the management approach for SNA 1, requesting that a review of the current recreational allowance take into account the value of snapper to recreational fishers, the rebuild of the SNA 1 fishery, the better quality information that is now available, and the Court's commentary on Ministerial discretion. The Recreational Fishing Forum also objected to any proposed changes to the daily bag limits until other sectors had improved fishing practices.

323 MPI also met with the New Zealand Sports Fishing Council (NZSFC) to discuss the management of SNA 1. The NZSFC have their own SNA 1 policy for management of the fishery, and have expressed a desire to further develop a range of measures to achieve the objectives of the NZSFC.

324 MPI met with members of the commercial sector to discuss the review of SNA 1. In response to concerns about the future of the SNA 1 fishery, industry has provided written and verbal support to increase their responsibility for the future of the fishery. The industry held meetings involving 73% of the SNA 1 quota owners and 96% of the operators responsible for

catching and/or managing the SNA 1 ACE. These meetings supported the following initiatives:

- Consideration of installation of vessel monitoring systems (VMS) on the commercial fishing fleet operating in SNA 1. There was also support for investigation of the use of electronic cameras on vessels.
- Consideration of ways to record returns to the sea of sub-MLS fish and investigation of the survivability of returning live snapper to the sea.
- Support for investigation of tagging programme designs and methods for SNA 1.
- Investigating the development of an electronic log book and greater use of tablets and similar devices for recording fishing information.
- Collection of more data, in association with science working groups.
- Greater engagement between fishers and scientists, and with fisheries managers.
- Working with MPI on compliance, with strong support for the Voluntary Assisted Directed Enforced (VADE) compliance model.
- Support for obtaining more information and better reporting requirements for charter vessel catch.

GLOSSARY

Annual Catch Entitlement (ACE). An entitlement to harvest a quantity of fish, aquatic life, seaweed or other stock, taken in accordance with a fishing permit and any conditions and limitations imposed by or under the Fisheries Act 1996.

B_0: Virgin (unfished) biomass. The theoretical carrying capacity of the recruited or vulnerable biomass of a fish stock. In some cases, it refers to the average biomass of the stock in the years before fishing started. More generally, it is the average over recent years of the biomass that theoretically would have occurred if the stock had never been fished. B_0 is often estimated from stock modelling and various percentages of it (e.g. 40% B_0) are used as biological reference points to assess the relative status of a stock.

B_{MSY}. The average stock biomass that results from taking an average catch of MSY under various types of harvest strategies. Often expressed in terms of spawning biomass, but may also be expressed as recruited or vulnerable biomass. B_{MSY} is a common fisheries management target.

Catch Per Unit Effort (CPUE). The quantity of fish caught with one standard unit of fishing effort; e.g. the number of fish taken per 1000 hooks per day, or the weight of fish taken per hour of trawling. Plenary definitions state that CPUE is often used as an index of relative abundance.

Danish Seine. A method of boat seining with a large net, but landing the catch on the vessel; a single or pair boat operation where an area of seafloor is swept as two encircling ropes leading to a trawl-like net are retrieved by the operating vessel(s). Fish within the area of the ropes are herded back into the net during hauling. Also called anchor seine, Danish seine trawl, Danish trawl.

Deemed values. Deemed values are set for each fish stock in the QMS. Deemed values encourage fishers to balance catch with available ACE and in doing so, constrain harvesting to the TACC, or where applicable, the total available ACE. When the amount of a fisher's reported catch is more than the amount of ACE held, the fisher is issued with a deemed value invoice. MPI sets both interim and annual deemed value rates for each quota management stock. The annual deemed value rate for a stock will always be higher than the interim deemed value rate.

Ecosystem. An interacting system of living and non-living parts such as sunlight, air, water, minerals, nutrients, plants and animals.

Fishery Management Area (FMA). The New Zealand exclusive economic zone is divided into ten areas, each known as a Fishery Management Area (FMA). FMAs are based on likely stock boundaries as well as administrative considerations. The standard FMAs are the basis of QMAs for most fish stocks.

Hard Limit. A biomass limit noted in the Harvest Strategy Standard, below which fisheries should be considered for closure.

Harvest Strategy Standard (HSS). The HSS is a MPI policy statement of best practice in relation to the setting of fishery and stock targets and limits for fishstocks in the QMS. The HSS requires that target and limit biological reference points be set for all QMS fishstocks, but is flexible about the means by which the reference points are determined.

Long-lining. A line of considerable length, bearing numerous baited hooks, and which is usually set horizontally in the water column; used in snapper, grouper, ling and bluefin tuna fisheries. The line is set for varying periods up to several hours on the seafloor. Also: a fishing line with baited hooks set at intervals on branch lines; it may be on the sea bed or above it supported by floats. It may be anchored or drift free and is marked by floats. Also called line trawl.

Maximum Constant Yield (MCY). The maximum sustainable yield that can be produced over the long term by taking the same catch year after year, with little risk of stock collapse.

Minimum Legal Size (MLS). The minimum size of fish which may be taken.

Maximum Sustainable Yield (MSY). The largest long term average catch or yield that can be taken from a stock under prevailing ecological and environmental conditions. It is the maximum use that a renewable resource can sustain without impairing its renewability through natural growth and reproduction.

Quota. Quota is a right which allows people to own a part of the 100 million shares available for a particular fishstock in a defined area. Quota can be bought or sold. Ownership of quota generates an annual catch entitlement to catch that fishstock.

Quota Management Area (QMA). Species within the QMS are managed by QMAs. QMAs are geographic areas within the New Zealand exclusive economic zone. The standard fishery management areas are the basis of quota management areas for most fish stocks.

Quota Management System (QMS). The QMS was introduced in October 1986 and controls the overall catches for most of the main fish stocks found within New Zealand's exclusive economic zone.

Set netting. A fishing method where a net is placed in the water with floats at the top and weights on the bottom. Fish are caught as they swim into the net.

Soft Limit. A biomass limit noted in the Harvest Strategy Standard, below which the requirement for a formal, time-constrained rebuilding plan is triggered.

Spawning Stock Biomass (SSB): The total weight of sexually mature fish in a stock that spawn in a given year.

Total Allowable Catch (TAC). A catch limit that applies to fishstocks in the QMS, the TAC is the total quantity of each fish stock that can be taken by commercial, customary Maori interests, recreational fishery interests and other sources of fishing-related mortality, to ensure sustainability of that fishery in a given period, usually a year.

Total Allowable Commercial Catch (TACC). A catch limit that applies to fishstocks in the QMS, the TACC is the total quantity of each fish stock that the commercial fishing industry can catch in a given year. The TACC is a portion of the TAC that is set after allowances have been made for customary and recreational fishing, and for other sources of fishing-related mortality.

Trawl. A fishing net that is dragged behind a boat. A wide range of species of fish are taken by this fishing method which entails one or a pair of vessels towing a large bag-shaped net either along the seafloor or in mid-water. It has a buoyed head rope and a weighted foot rope to keep the net mouth open.