# SNAPPER (SNA1) MANAGEMENT PLAN

Prepared by the SNA1 Strategy Group with assistance from the Ministry for Primary Industries

2016

Mai i Te Hiku o Te Ika ki Te Tai Rawhiti Ka huhua ora Tangaroa Ka ora te Tangata

From North Cape to East Cape an abundant marine life will sustain us

# Disclaimer

While every effort has been made to ensure the information in this publication is accurate, the SNA1 Strategy Group 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.

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# Glossary

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| **Annual Catch Entitlement (ACE)** | Allocation of the TACC for a given fishing year. ACE is initially distributed proportionally amongst quota owners, based on number of quota shares held. ACE can also be traded and transferred. |
| **Associated or dependent species** | Any non-harvested species taken or otherwise affected by the taking of any harvested species. |
| **Aquatic environment** | The natural and biological resources comprising any aquatic ecosystem, including aquatic life. These environments can include oceans, seas, coastal areas, inter-tidal areas, estuaries, rivers, lakes and other places. |
| **Benthic** | Relating to the seafloor. |
| **Benthic impact** | The amount of seafloor impacted by fishing methods. |
| **Biological diversity** | The variability among living organisms, including diversity within species, between species, and of ecosystems. |
| **Biomass** | The size of a stock in units of weight. |
| **$B_0$ (unfished or virgin biomass)** | Generally, the average biomass over recent years that would have occurred if the stock had never been fished. |
| **$B_{MSY}$** | $B_{MSY}$ is the biomass (total weight of fish) that can support the harvesting of the maximum sustainable yield. In more formal terms it is defined as the average stock biomass (or size) that results from taking an average catch of maximum sustainable yield under various types of harvest strategies. |
| **Bycatch** | Refers to fish species, or size classes of those species, caught in association with key target species. |
| **Carrying capacity** | The average stock size expected in the absence of fishing. Even without fishing, the stock size varies through time in response to environmental conditions. |
| **Catch per unit of 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. CPUE is often assumed to be an index of relative abundance. |
| **Ensuring sustainability** | Maintaining the potential of fisheries resources to meet the reasonably foreseeable needs of future generations and avoiding, remedying or mitigating any adverse effects of fishing on the aquatic environment. |
| **Exploitation rate** | The proportion of the recruited, or equivalently, the vulnerable, biomass that is caught during a certain period, usually a fishing year. |
| **Fisheries Management Area (FMA)** | New Zealand fisheries waters (the 200 nautical mile Exclusive Economic Zone (EEZ), Territorial and internal waters) are divided into ten FMAs. These FMAs also inform the boundaries of most Quota Management Areas (QMAs). |
| **Fisheries resources** | Any one or more stocks or species of fish, aquatic life or seaweed. |

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| **Fishing mortality** | That part of the total mortality rate applying to a fish stock that is caused by fishing. |
| **Fish stock or Stock** | Any fish, aquatic life or seaweed of one or more species that are treated as a unit for the purpose of fisheries management. |
| **Habitat** | Includes all aspects of the aquatic environment which fisheries resources depend on directly or indirectly in order to carry on their life processes. |
| **Hard limit** | A specified biomass (or proxy) reference level below which a fishery should be considered for closure. |
| **Harvest strategy** | Identifies target, soft, and hard biomass reference points, and management actions associated with achieving the target and avoiding the limits. |
| **Harvest Strategy Standard (HSS)** | The Harvest Strategy Standard is a policy statement of best practice in relation to the setting of fishery and stock targets and limits for fish stocks in New Zealand's Quota Management System. |
| **Input controls** | Controls on fishing effort, for example on how, when and where people can take fisheries resources. |
| **Kaitiakitanga** | The exercise of guardianship and, in relation to any fisheries resources, includes the ethic of stewardship based on the nature of the resources, as exercised by the appropriate tangata whenua in accordance with tikanga Māori. |
| **Maximum Sustainable Yield (MSY)** | MSY is the largest average amount of fish that can be removed from a stock each year, while still leaving enough fish to produce new generations. MSY is defined in the Fisheries Act 1996 as: "In relation to any stock, means 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." |
| **Minimum legal size (MLS)** | Fish above the MLS may be retained while those below it must be returned to the sea. |
| **Model** | A set of equations that represents the population dynamics of a fish stock. |
| **Natural mortality** | That part of the total mortality rate applying to a fish stock that is caused by predation and other natural events. |
| **Output controls** | Direct controls on the quantity of fish harvested. |
| **Pataka kai** | A Māori storehouse in which food is kept for later use.<br>The term is also used to denote arrangements made by kaitiaki (guardians) to harvest and provide seafood for customary use (tangi and hui). |
| **Protected species** | As defined in the Wildlife Act 1953 and the Marine Mammals Protection Act 1978, including all NZ seabirds, all marine mammals, some marine reptiles, black coral, some red corals, giant and black-spotted grouper, deepwater nurse, whale, and white-pointer sharks, manta rays, and spinetail devil rays. |

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| **Quota** | Individual transferable quota has qualities of a property right and is used to proportionally allocate the TACC. Each QMS stock has 100,000,000 tradable quota shares that determine the allocation of ACE amongst quota owners. |
| **Quota Management Area (QMA)** | The spatial boundaries for each QMS stock. These boundaries are aligned with FMAs, either directly or as a part or combination of FMA boundaries. |
| **Quota Management System (QMS)** | The system of fisheries management for the main harvest species in New Zealand which includes the requirement to set a TAC, make allowances for customary Māori interests, recreational interests and fishing-related mortality, and set a TACC. |
| **Recruited biomass** | That portion of a stock's biomass that is available to the fishery; i.e. able to be caught by the gear; also called exploitable or vulnerable biomass. |
| **Recruitment** | The addition of new individuals to the fished component of a stock. This is determined by the size and age at which fish are first caught. |
| **Soft limit** | A specified biomass (or proxy) level that triggers a requirement for a formal, time constrained rebuilding plan. |
| **Stock status** | A determination made about the current condition of the stock on the basis of stock assessment results. |
| **Sustainability measures** | Any measure or action taken for the purpose of ensuring sustainability. |
| **Target biomass** | Generally a biomass (or proxy) level that management actions are designed to achieve with at least 50% probability. Targets may also be expressed in terms of fishing mortality or exploitation rates. |
| **Total Allowable Catch (TAC)** | The total quantity of fishing-related mortality allowed for a QMS stock in a given fishing year. |
| **Total Allowable Commercial Catch (TACC)** | The total quantity of commercial catch allowed for a QMS stock in a given fishing year. |
| **Utilisation** | Conserving, using, enhancing and developing fisheries resources to enable people to provide for their social, economic and cultural wellbeing. |
| **Yield** | Catch expressed in terms of weight. |
| **Yield per Recruit (YPR)** | Is the expected lifetime yield for the average recruit. For a given exploitation pattern, rate of growth, and natural mortality, an equilibrium value of YPR can be calculated for each level of fishing mortality.<br><br>YPR analyses are used to compare the effects of changing exploitation rates and the average size or age of fish at first capture on yields from a fishery. The results can help managers decide on fisheries controls such as minimum fish sizes and complementary fishing gear controls such as net mesh sizes. |

# Summary of the SNA1 Strategy Group's Recommendations

The Snapper 1 fishery ('SNA1') is a valuable resource, fished by customary, recreational, and commercial fishers. Managed sustainably, SNA1 will continue to provide benefits for the nation.

Managing the SNA1 fishery to ensure continued benefits now and in the future presents a number of challenges. All interested parties should work together to find solutions to the problems.

To ensure the fishery can best provide for the interests of all in the long term, there is a need for an increase in the biomass of the snapper population to the level that will provide for the reasonably foreseeable needs of future generations, improvements in fishing practices, minimisation of waste, and a requirement to deal with any adverse effects of fishing on the aquatic environment, on protected species, and on other finfish species commonly caught.

Critical to ensuring the ongoing health of the fishery, is protecting the aquatic environment upon which snapper productivity depends from adverse effects, including those arising from land use and development. It will be important to improve understanding of the environmental factors that impact on snapper, and to ensure that all whose activities interact with the snapper fishery are involved in minimising risks to the environment.

Managing the snapper fishery will require the routine collection of useful, unbiased, and reliable information on the fishery, the effects on the environment, and any effects of a changing environment on snapper.

In September 2013, the Minister for Primary Industries ('the Minister') the Hon Nathan Guy, decided on new management measures for SNA1. Acknowledging the reaction by fishers to his decisions, and recognising the challenges posed for managing the fishery, the Minister formed a representative group to develop a strategy for managing the SNA1 fishery. This SNA1 Strategy Group ('the Group') has developed this Management Plan to make a positive improvement to the fishery and its management.

This Plan document provides background to the SNA1 fishery, the available fisheries management measures, and outlines the Group's discussions and recommendations for managing the SNA1 fishery. The Group's recommendations are summarised in Table 1 below.

| Table 1. Summary of recommendations – SNA1 Management Plan | | | | | |
|---|---|---|---|---|---|
| **Plan para-graph** | **Description** | **Action required** | **Completed by (if not stated then to be determined by priority)** | **Responsibility to act (MPI, commercial, recreational, Māori customary non-commercial, other agencies)** | |
| | | | | **MPI, commercial, recreational, Māori customary non-commercial** | **Other agencies** |
| **Biomass target and timeframe** | | | | | |
| 37 | The SNA1 QMA not be sub-divided at this time, but the three sub-populations (East Northland, Hauraki Gulf, Bay of Plenty) should be monitored and assessed separately. | Plan to Minister by 31/10/2016 for his final approval | | MPI | |
| 37 | Biomass target of 40% unfished level be achieved within 25 years. | Plan to Minister by 31/10/2016 for his final approval | | MPI | |
| 37 | The biomass target may be reviewed at any time the HSS is reviewed or the SNA1 TAC is reviewed. | Plan to Minister by 31/10/2016 for his final approval | | MPI | |
| 37 | An intermediate milestone of 30% of the unfished biomass level be achieved within 10 years (by 2025) as a valuable checkpoint for progress towards the 40% target. | Plan to Minister by 31/10/2016 for his final approval | | MPI | |
| 43 | No reduction of the TAC be made in 2016/17. | | | MPI | |
| 43 | By 2021-22, a review be conducted using updated stock assessment information, and the results be used by the proposed advisory group to recommend subsequent management action, including a TAC change, if required to achieve the intermediate milestone and biomass target within the specified timeframe. | New information and consequent management review | 2021-22, but regular fishery monitoring will ensure stock on track to meet target & timeframe | MPI and all involved in tagging programme | |
| 49 | Over time, the MLS be aligned for commercial and recreational fishers. Increasing the MLS only becomes an option when selectivity has been measured and survivorship of released fish is reliably estimated. | Selectivity research, Survivorship research, Gear modification | ongoing | MPI, commercial, recreational | |
| 49 | Include PSH and other technology in commercial trawl gear and innovations in other fishing gear, if it reduces mortality of small snapper. | Gear modification | ongoing | MPI, commercial | |
| 49 | Educate and encourage non-commercial fishers to use appropriate baited hook sizes, artificial lures, and other innovations that catch fewer small snapper. | Gear modification | ongoing | MPI, recreational, customary | |
| 54 | All fishers be encouraged to avoid catching juvenile fish wherever possible. | Change the way we fish | ongoing | All | |
| 54 | Research be undertaken to determine the survival of snapper released by commercial and recreational fishing methods. | Research programmes | | MPI, commercial, recreational | |
| 54 | Best-practice snapper handling and release methods be updated. | Publish guide | | All | |
| 54 | All fishers be informed and encouraged to adopt best practice methods for handling and releasing snapper. | Education | ongoing | All | |
| 54 | SNA1 Commercial be asked to review the 2015 voluntary 'move-on' measure to align with the best available information. | Monitor and analyse | | MPI, commercial | |
| 54 | Recreational fisher groups be encouraged to develop a 'move on' practice as part of a package of measures to reduce incidental catch of snapper below the MLS. | Education | | MPI, recreational | |

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| **Utilisation of the SNA1 resource** | | | | | |
| 65 | Regular monitoring and analysis of the levels of catch by all sectors and estimates of other sources of fishing-related mortality be required. | Monitor and analyse all catch and mortality | | All | |
| 65 | Reporting of snapper by amateur fishing charter vessels on their Activity Catch Return forms. | Monitor and analyse all catch and mortality | | MPI, recreational | |
| 65 | Māori customary non-commercial catch reporting estimates be improved including through Crown assisting iwi to use electronic reporting. | Monitor and analyse all catch and mortality | | MPI, customary | |
| 65 | Develop a clear set of guidelines for the required precision and timing of updates to inform the regular monitoring and analysis of all catch and other sources of fishing-related mortality. | Develop a set of monitoring guidelines | | All | |
| 65 | If, as a result of monitoring, the Group detects trends that indicate targets and timeframes will not be achieved, then take appropriate action. | Monitor and analyse all catch and mortality | | MPI | Advisory Group |
| **Environmental considerations** | | | | | |
| 78 | Habitats of particular significance for snapper be identified, mapped, areas under threat identified, as well as the loss of habitat be estimated, in 2017. | Research programme | 2017 | MPI | |
| 78 | Analysis of the trawl footprint be reported (using the vessel monitoring system (VMS) information. | Define trawl footprint | | MPI, commercial | |
| 78 | Examine performance of existing protection measures and areas and consider alternatives if they would be more effective, including analysis of size composition of snapper from observer data (to be reported in 2017). | Research programme | 2017 | MPI | |
| 78 | Encourage fishers to find and adopt fishing gear and methods that reduce adverse effects on the benthic environment by 2018. | Research programmes | 2018 | MPI, commercial, recreational | |
| 78 | The existence and implications of habitat bottlenecks for snapper be assessed. | Research programmes | | MPI | |
| 78 | Provide annual updates on the effects of climate change and ocean acidification and comment on relevance to snapper in SNA1. | Research programmes | | MPI | |
| 78 | Opportunities to enhance seabed habitat important to the lifecycle of snapper be explored (in conjunction with local authorities); Mussel restoration? | Research programmes | | MPI | Local authorities |
| 78 | Support programmes targeted at recovery of biogenic structures in SNA1, including updates from Mussel Reef Restoration Trust. | Liaison and resources | | MPI | Local authorities |
| 80 | Pathways be established for engagement between MPI and local authorities on fisheries and environmental impacts. MPI to report. | Liaison and reporting | | MPI | Local authorities |
| 80 | Highlight the importance of coastal marine environments and snapper habitat to fisheries management, to local and regional authorities. | Liaison and reporting | | MPI | Local authorities |
| 80 | Local authorities be required to monitor and report on sediment and nutrient levels in coastal marine area and to adopt mitigation and restoration strategies. | Liaison and reporting | | MPI | Local authorities |
| **Monitoring and research** | | | | | |
| 91 | Test, using management strategy evaluation (MSE), different data collection and management options and associated risks to help define management and monitoring strategies. | Research programme | | MPI | |
| 91 | Secure additional and dedicated funding from a range of sources for designing and implementing new or augmented data gathering, monitoring, and research activities as specified in the Plan. | Monitoring and Research programme | | MPI | |
| 91 | Explore options for monitoring relative abundance including a fisheries-independent survey using commercial bottom longline gear; compare with | Monitoring and Research programme | 30/06/2017 | MPI | |

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| | other options such as trickle tagging; explore options for making quota or ACE available for related research. | | | | |
| 91 | Sample commercial landings or catch at sea to collect otoliths for ageing of snapper subject to appropriate sampling frequency. | Research programme | As part of tagging project | MPI, commercial | |
| 91 | Update the full national panel survey (NPS) to estimate recreational harvest every 5 years. | Research programme | | MPI, recreational | |
| 91 | Provide an intermediate recreational harvest update between NPS estimates. | Research programme | | MPI, recreational | |
| 91 | Complete aerial overflight survey and boat ramp survey for SNA1 coincident with next NPS. | Research programme | | MPI, recreational | |
| 91 | Maintain recreational effort monitoring using web cameras at key ramps and evaluate validity periodically. | Research programme | | MPI, recreational | |
| 91 | Survey recreational catches at key ramps to maintain ability to scale effort to catch. | Research programme | | MPI, recreational | |
| 91 | Monitor return of undersized snapper by amateur and commercial fishers. | Monitoring and Research programme | | MPI, commercial, recreational | |
| 91 | Reporting of recreational snapper catch on charter vessels. | Monitoring and analysis | | MPI, recreational | |
| 91 | Investigate options for updating the estimate of absolute abundance using an appropriate and cost-effective survey, including a tagging biomass survey design to provide information about biomass and movement between sub areas or applying the results from an ongoing trickle tagging programme, if implemented. | Research programme | 30/06/2017 | MPI, commercial, recreational | |
| 91 | Conduct a quantitative stock assessment at least every 5 years to estimate stock status and assess the effectiveness of management measures, including the TAC. | Research programme | | MPI | |
| 91 | Improve reporting of Māori customary non-commercial harvest. | Monitoring and analysis | | MPI, customary | |
| 91 | Improve understanding of total mortality by all fishing methods. | Research programme | 2018 | MPI | |
| 91 | Improve understanding of survival rates of released snapper. Consider if new survival study required. | Research programme | 2018 | MPI | |
| 91 | Develop and update best practice fish handling and release methods. | Publish guide | 30/06/2017 | MPI, commercial, recreational | |
| 91 | Define and identify habitats of particular significance for fisheries management in SNA1. | Research programme | 2017 | MPI | |
| 91 | Investigate performance of existing method and area measures (especially for trawling) and explore options to improve performance. | Research programme | | MPI | |
| 91 | Monitor implications of climate change for SNA1. | Research programmes | | MPI | |
| 91 | Investigate ways to monitor the performance of education and communication initiatives. | Research programmes | | MPI | |
| **Implementing the Plan** | | | | | |
| 99 | Maintain the SNA1 Management Plan as a living document. | Analysis and reporting | Annually | MPI | Advisory Group |
| 99 | Encourage, monitor, and report on the implementation of the recommendations made in the Plan. | Analysis and reporting | Annually | MPI | Advisory Group |
| 99 | Provide regular updated information to public and annual report showing trends, new information, and management priorities. | Analysis and reporting | As required | MPI | Advisory Group |
| 99 | Engage with sectors, via the representatives, to arrive at consensus on proposed management options before formal consultation. | Consultation | As required | MPI | Advisory Group |

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| 99 | Assist MPI in communicating management options and decisions and the reasons for them to stakeholders and the public. | Consultation | As required | MPI | Advisory Group |
| 99 | Advise MPI and Minister on annual planning and prioritisation of research, compliance, and other services. | Planning and priority setting | As required | MPI | Advisory Group |
| 99 | Advise MPI and Minister on setting TAC, TACC, Allowances. | Management review | As required | MPI | Advisory Group |
| 99 | Advise MPI and Minister on supporting measures such as spatial controls, gear controls, MLS, and bag limits. | Management review | As required | MPI | Advisory Group |
| 99 | Advise MPI and Minister on monitoring tools to track Plan performance. | Planning and priority setting | As required | MPI | Advisory Group |
| 99 | Advise MPI and Minister on Plan review and developments. | Planning and priority setting | As required | MPI | Advisory Group |
| 99 | Provide advice and recommendations to relevant management agencies and Ministers on achieving the purpose of the Plan. | Management review | As required | MPI | Advisory Group |
| 100 | SNA1 Advisory Group membership: 3 from each sector, 3 MPI and one public member. Seek nominations. | Plan to Minister by 31/10/2016 for his final approval | | MPI | |
| 100 | SNA1 Advisory Group member tenure: up to 3 year term, max 2 consecutive terms. Members appointed by Minister. | Plan to Minister by 31/10/2016 for his final approval | | MPI | |
| 100 | SNA1 Advisory Group review: review structure, function and performance after 5 years. | Planning and priority setting | | | |
| 100 | SNA1 Advisory Group meetings: 1 – 4 meetings per annum. | Meetings | Annually | MPI | |
| 100 | SNA1 Advisory Group costs: MPI facilitate Group functions, need specific budget from MPI. | Find budget | Annually | MPI | |
| 100 | SNA1 Advisory Group communications: Annual report for the Minister, other reports for public use as required. | Analysis and Reporting | Annually | MPI | |
| **Communication and Education** | | | | | |
| 107 | The plan be promoted to fishers from all sectors, the general public, government agencies including local government, and other Ministers | Liaison and reporting | Awaiting Ministerial approval | | |
| 107 | Improve processes to engage with and receive input from interested parties, to enable early input prior to release of consultation documents. | Develop engagement protocols | | | |
| 107 | The recommended actions for informing and educating interested parties be undertaken by MPI within its broader communications strategy. | Liaison and reporting | | | |
| 107 | Fishers in all sectors are provided with educational material about sustainable fishing practices and their benefits. | Liaison and reporting | | | |
| 107 | The advisory group's role should include developing and disseminating an annual report on progress under the plan (see 100), using the best information available and ensuring that all relevant information used for managing SNA1 is made publicly available. | Analysis and reporting | | | |

1. The snapper or tamure (*Pagrus auratus*) is the major inshore finfish species of northern New Zealand. Snapper are important to all fishing sectors. The species is a 'taonga' or treasure for Māori, an important and valuable food source caught and marketed by commercial fishers, and a highly prized catch for recreational fishers.

2. In the inshore waters of the Snapper 1 fishery ('SNA1') (Figure 1), snapper is the dominant finfish species and a key component of the ecosystem.

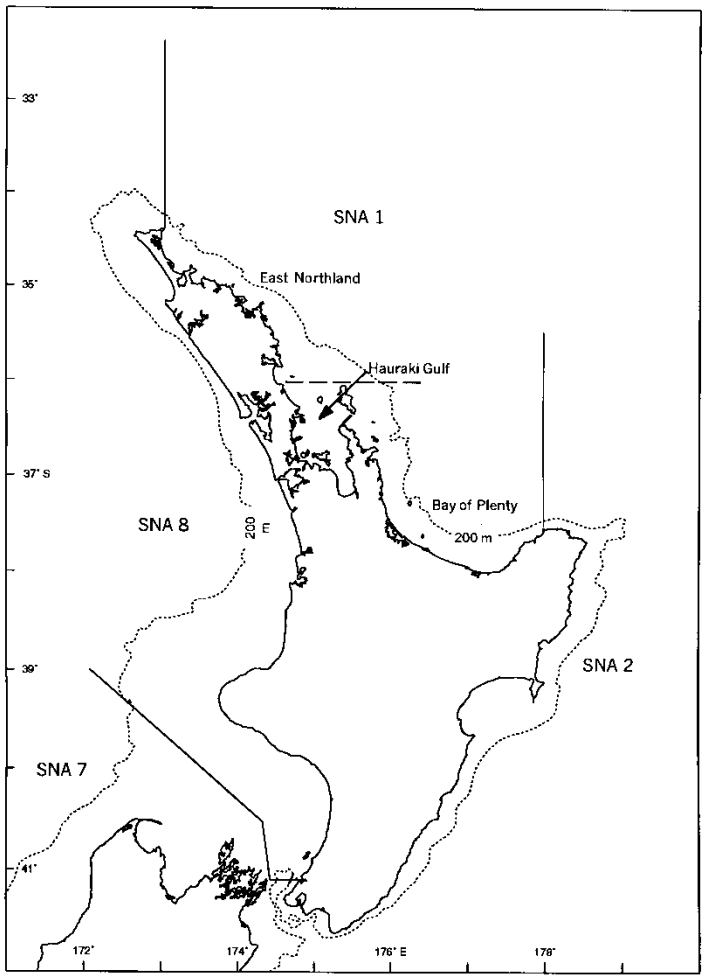


**Figure 1. Quota management area (QMA) for SNA1 and boundaries for the three sub-stocks within SNA 1: East Northland, Hauraki Gulf, and Bay of Plenty.**

3. The SNA1 area provides preferred habitats for snapper and supports productive stocks of the species. The SNA1 stock comprises three sub-stocks – East Northland, Hauraki Gulf, and the Bay of Plenty. The coastline through SNA1 is characterised by estuaries, inlets, bays, islands, and often sheltered waters, making fishing access easy. Moreover, much of the area is within easy reach of New Zealand's largest city, Auckland, and is accessible to that half of the country's population which resides north of Taupo.

4. As the population adjoining the SNA1 area increases, the SNA1 stock is expected to face greater pressure from fishing, and also from adverse effects on inshore environments important for snapper. The management challenges extend beyond what can be directly controlled by fisheries management tools. Agencies with responsibilities for managing land

use and run-off into coastal waters need to ensure that the habitats important for snapper and other inshore finfish species are improved.

5. The management of the SNA1 fishery was reviewed in 2013, and some of the Minister's proposed management measures produced adverse reaction from fishers. Concerns were raised about the impact of some proposed measures on non-commercial fishers, and about the impacts from waste caused by some commercial fishing methods.

6. As part of his 2013 determination (Appendix A), the Minister established the SNA1 Strategy Group ('the Group'). There has been a previous attempt at a management plan for SNA1, in 1994, but it was not successful. Since then there has been little dialogue directly between commercial and recreational interests in this fishery. To address this, a core aim of the Group was to provide a forum for the diverse fishery interests to collaborate with a view to providing advice and recommendations to the Minister on the future management of SNA1. The focus of the Group was not to review the Minister's 2013 determination, but to develop a plan for the future management of SNA1.

7. The Group has met regularly, commencing on 11 February 2014. In total, the Group met 25 times, holding its final meeting on 8 December 2015.

8. Officials from the Ministry for Primary Industries ('MPI') have assisted the Group throughout its deliberations and have provided further clarification on various matters, including:

    - The need for and approaches to determining a target biomass level for SNA1;
    - The timeframe to build to the target biomass;
    - Measures to improve the productivity of the SNA1 stocks and the management of the fishery.

9. The Honourable Sir Ian Barker QC, was appointed by the Minister as independent chair. The Group included three representatives from each of the commercial, recreational, and customary non-commercial sectors. Representatives also had alternates. Officials from MPI and NIWA scientists supported the Group with administrative services, scientific and environmental advice, and information. A list of Group members and alternates, as well as the officials and scientists who provided expert advice to the Group, is provided in Appendix B.

10. The Minister's 2013 determination sets out the main tasks for the Group as follows:

    - Determining what getting the best from SNA1 means across all sectors;
    - How the fishery should be managed to get the best outcomes;
    - What cost-effective research should be carried out in the fishery and how often;
    - Considering how benefits should be allocated in the fishery within the bounds of the direction provided by the Minister;
    - Considering the need for, and the costs/benefits associated with, measures to protect spawning snapper and habitats important for snapper;
    - Considering whether SNA1 should be split into different management areas.

11. This Plan represents the combined views of the Group. Where views could not be reconciled, the different perspectives are noted. Recommendations are made only on matters on which the Group reached agreement.

12. The purpose of the Plan is to articulate the Group's recommendations to the Minister on the proposed framework for managing the SNA1 fishery. The Plan also provides background information to assist readers to understand the legal obligations, available fisheries management measures, and strategies for achieving the aims of the Plan.

13. The overall aim of the Plan, as directed by the Minister, is to enable all fishing sectors (Māori customary non-commercial, recreational, and commercial) to enjoy the ongoing benefits of the SNA1 fishery. There is an opportunity to improve those benefits through greater stock abundance, broader size and age diversity in the snapper populations, minimising the mortality of undersized and returned snapper, and ensuring that the environment and habitats for snapper are maintained in a productive state.

14. The Plan is constructed to operate within the legal framework provided by the Fisheries Act 1996 ('the Act') and associated statutory Regulations. The core principles under the Act are:

- Section 13 - Limiting catch through the total allowable catch ('TAC') to maintain stocks at or above the biomass level that produces the maximum sustainable yield (abbreviated as the $B_{MSY}$). The Minister has the discretion (within guidelines influenced by biological, social, cultural, and economic factors) to determine a stock-management target, a timeframe for achieving the target, and a TAC to deliver the target stock size within the specified time.

- Section 9 - Taking into account the environmental principles in decisions so that –
    - The viability of non-harvested species is maintained;
    - Biodiversity is maintained;
    - Habitats of particular significance for fisheries management are protected.

- Section 10 - Taking into account the information principles in decisions so that –
    - The best available information is used;
    - The uncertainty in the information is considered;
    - The decision-maker is cautious if information is unreliable, uncertain, or inadequate;
    - The absence of, or uncertainty in, any information is not used as a reason for postponing or failing to take any measure to achieve the purpose of the Act.

- Section 21 - Apportioning the TAC between sectors by making Allowances within the TAC for the interests of –
    - Māori customary non-commercial fishing;
    - Recreational fishing;
    - All other sources of fishing-related mortality; and
    - Setting the total allowable commercial catch ('TACC').

- Sections 11, 297, 298 - Setting supporting management measures under the Regulations, including –
    - The minimum legal size ('MLS');
    - Fishing method controls (net mesh sizes, hook numbers and sizes) in support of the MLS;

- Area controls (closed seasons, method restrictions) in support of the MLS and other aims;
- Daily bag limits for recreational fishers;
- Providing for customary non-commercial harvesting and catch recording.

15. The available legal framework provides for the Minister to exercise discretion after considering the different views and aspirations of the fishing sectors which bring different views on how the Minister should exercise his or her discretion. Despite different perspectives and aims, all sectors are required to operate within the constraints of the law.

16. The commercial sector needs to conduct fishing on an economically viable basis and comply with the requirements to report fishing activity and catch. Reporting provides information to support fisheries management and the integrity of the quota management system ('QMS'). Commercial fishing is also subjected to increasing public scrutiny and expectations of best-practice operations. Commercial fishing provides fish for domestic markets, including restaurants, hotels, fishmongers, and supermarkets catering for people who are not recreational fishers. The commercial catch of snapper from SNA1 supports valuable exports to overseas markets. Export trade and the employment opportunities provided by commercial fishing contribute to the general economic and social good of the country. The Group noted that the commercial fishing industry intends to seek international sustainability accreditation for the SNA1 fishery.

17. Recreational fishing is an important leisure activity for many, and generates substantial economic benefits. In 2014 recreational fishing rated as the fifth most popular leisure activity for adult New Zealanders[1]. Recreational fishing is recognised under the Act and is often pursued as a source of food, pleasure, and social wellbeing – commonly all three. The social and economic contributions from the SNA1 recreational fishery are difficult to quantify. However, it is clear that the SNA1 recreational fishery is economically valuable and of great importance to a large number of industries, as well as to fishers and residents in the most populous region of the country.

18. Māori Customary non-commercial fishing and access to seafood for customary use is highly valued by Māori for maintaining their cultural practices. The Act, the Amateur Fishing Regulations and specific Māori Customary Fishing Regulations recognise and provide for customary food gathering and the special relationship between tangata whenua and those places which are of importance for customary food gathering.

19. The recommended Management Plan has explored the different sector interests and tried to cater for them all, to the extent possible and practicable within the existing statutory provisions. The Group has worked collaboratively to develop a framework for managing the SNA1 fishery into the future to achieve outcomes that will benefit all sectors. Achieving the outcomes will require an ongoing process of monitoring, information sharing, dialogue between sectors, and a shared responsibility across all users and managers of the resource.

[1] Sport New Zealand, 2015. *Sport and Active Recreation in the Lives of New Zealand Adults. 2013/14 Active New Zealand Survey Results.* Wellington: Sport New Zealand.

20. The Plan has six sections:

- Biomass target and timeframe
- Utilisation of the SNA1 resource
- Environmental considerations
- Monitoring and research
- Implementing the Plan
- Communication and education

# Biomass target and timeframe

## Overview

21. This section outlines the theory which explains how fish populations respond to fishing, what that means for determining a biomass target for managing fisheries, and how to manage fisheries so as to reach that target. There is also discussion as to whether benefits could be gained from separating SNA1 into sub-areas for management purposes.

### *Setting a biomass target and building towards it*

22. Any substantial level of fishing will reduce the biomass of a population of fish from its natural unfished state. Sustainable fishing is founded on fish populations responding to fishing in quite predictable ways. Fishing reduces the biomass and the number of slow-growing older fish, and shifts the population structure towards faster-growing younger fish. This results in a surplus production that can be harvested sustainably. Fishing can be sustainable at different levels of biomass, but long-term yield is maximised at a specific biomass level ($B_{MSY}$) that is determined by a stock's biology. A stock's biomass is also influenced by factors unrelated to fishing, including environmental variables such as water temperature, food availability, and changes in water and habitat quality.

23. Setting a management target (e.g. a target biomass or fishing mortality rate) is an important part of managing the SNA1 fishery. Higher biomass is typically associated with a greater abundance of fish, more large fish, and fish being distributed throughout more of their suitable habitat. Higher fish abundance also means a greater chance of fishers obtaining better catch rates, although, as biomass increases above $B_{MSY}$ the long-term yield decreases. These factors can influence the quality of fishing enjoyed by customary and recreational fishers, as well as the profitability of commercial fishers.

24. Another factor generally associated with higher biomass, is that a stock is likely to be better able to withstand adverse environmental events, and the effects of harvesting on the wider ecosystem are likely to be less. It is also important to recognise that people fishing in SNA1 take a mix of species, and the target for snapper should consider the interrelationship between snapper and other species. Determining a biomass target for SNA1 therefore requires the consideration of a number of factors that relate to the biology of the different species, the ecosystems in which they live, and the practicalities of fishing (these matters are discussed further in the section on environmental considerations).

25. The Act requires the Minister to set a TAC that will maintain the snapper population at or above the $B_{MSY}$ level or to move it towards that level at an appropriate rate. It is expected that a stock's biomass will fluctuate around its target and that relatively small changes in biomass do not require changes to the catch limit. However, bigger fluctuations should trigger an appropriate management response. MPI's Harvest Strategy Standard ('HSS') (http://www.fish.govt.nz/en-nz/Consultations/Archive/2008/Harvest+Strategy+Standard/) and Guidelines provides guidance for these responses.

26. The size of the snapper populations within SNA1 is measured by fisheries scientists in terms of the numbers and weights of snapper of different ages that together make up the overall biomass. The processes of stock assessment provide estimates of the biomass of a stock at

a given time, using all the relevant information available (i.e. reproduction, growth, mortality, history of catch, how different fishing gear selects snapper of different size and age, information about movement, and estimates of abundance). Similar models also allow scientists and managers to explore the effects of different management strategies into the future.

27. The factors considered in setting stock biomass targets have evolved over recent decades. Previous biomass targets for SNA1 were based on deterministic estimates of $B_{MSY.}$ This resulted in biomass targets of 21% to 23% of the unfished biomass. However, as explained in the HSS and the Plenary[2] document, it is now considered more appropriate to set a biomass target by taking into account natural variability, harvest strategies, and other factors that influence a fishery. The default biomass target for snapper provided by the HSS and Guidelines, based on the biological characteristics of the species, is considered to be 40% of the unfished biomass. Importantly, this biomass target reflects international best practice.

28. The most recent stock assessment estimated the overall SNA1 stock biomass in 2013 to have been at approximately 20% of the unfished biomass (combining results for the separate sub-stocks). The separate sub-stocks were assessed as being at 24% of the unfished biomass for the East Northland sub-stock and 19% for the combined Hauraki Gulf/Bay of Plenty sub-stock. These values are median estimates (confidence intervals are provided in the 2013 and subsequent Plenary reports). Although the biomass has increased by as much as 70% in some parts of the stock since 1988, it appears to have levelled off since about 2005.

29. For a stock such as SNA1 that is currently estimated as being below the recommended target, the Minister must consider how quickly the biomass should be increased to reach the target. Reductions to the current TAC and catch would be likely to increase biomass at a faster rate, but would have impacts on fishing. Making no changes to the current TAC and current fishing practices will result in a slower rate of biomass increase with the possibility that there would not be a significant increase in biomass above the current level. Some strategies discussed by the Group would aim to catch a given proportion of the biomass available each year. These 'constant exploitation rate' strategies would enable catch limits to be increased as evidence becomes available of increasing biomass.

30. The Act provides discretion regarding the way and rate at which stock biomass should move to reach the target. Guidance for exercising that discretion is provided by the HSS, which suggests that the target should be reached within a period that is no longer than twice the time to rebuild without fishing. This has been estimated for SNA1 to be approximately 16 years for the East Northland sub-stock and 24 years for the Hauraki Gulf/Bay of Plenty sub-stock. Given that the timeframe to reach the biomass target (for all of SNA1) proposed by the Group is 25 years, the intermediate milestone of reaching 30% of the unfished biomass within 10 years (by 2025) provides a useful checkpoint to assess progress. Including the new biomass estimate from the tagging survey in an updated assessment no later than 2021-22 will provide an opportunity to measure progress against the intermediate checkpoint and take the necessary action to ensure the target will be reached. Initial estimates from the tagging survey might be available in 2018, and available information will be used to regularly monitor fishery status to ensure it is on track to reach the target and timeframe.
31. The Group discussed different perspectives on what the target biomass should be for SNA1, and also the way and rate it should be achieved. The Group also considered several supporting measures that should be applied to achieve the target biomass level.

[2] Fisheries Assessment Plenary May 2015 Stock Assessments and Stock Status Volume 3: Red Gurnard to Yellow-eyed Mullet.

*Taking into account the different snapper populations in the sub-areas*

32. The Minister asked the Group to consider whether SNA1 should be split into different management areas to improve the ability to manage the fishery. Different management would require separate biomass targets and rebuilding timeframes, given the potentially different stock status and productivity characteristics.

33. The 2013 assessment indicated that the bulk of the biomass (some 72% of the total) was in the Hauraki Gulf/Bay of Plenty combined sub-stock. For the individual sub-stocks, the Hauraki Gulf area was estimated to contain some 65% of the overall biomass, while the East Northland area had 28% and the Bay of Plenty about 7% (from Table 16, page 1213, of the Fisheries Assessment Plenary May 2015 Stock Assessments and Stock Status Volume 3: Red Gurnard to Yellow-eyed Mullet).

34. The populations of snapper in these three areas have different characteristics, including the number and size/age range of fish, growth rates, the likely rate of rebuild, the carrying capacity of the environment, and fishing pressure. This means that the stocks can perform differently from each other. The 2013 stock assessment indicated that the East Northland and Hauraki Gulf populations appear to have been rebuilding up to 2005, while the Bay of Plenty population has been growing at a lesser rate.

35. Management measures generally apply to the overall SNA1 stock and fishery. Although not agreed as a priority, the Group acknowledged that area-based refinements to management measures could be considered if substantial advantages could be anticipated. New information that will help determine any benefits of dividing SNA1 into separate stocks for management purposes may be provided from the tagging survey that will begin in 2016, and the proposed advisory group could then consider the matter in detail. However, the Group noted the technical and legal difficulties associated with sub-dividing the SNA1 QMA into sub-areas, and the likely costs of managing at a finer spatial scale. All sectors acknowledged that dividing SNA1 into sub-areas and managing SNA1 at a finer spatial scale was impractical at this time.

36. The Group agreed that each of the three sub-populations (i.e. East Northland, Hauraki Gulf, and the Bay of Plenty) should be monitored and assessed separately[3], provided it is beneficial and cost-effective to do so.

*Recommended management area, target biomass, and timeframe to reach it*

37. The Group recommends that:

    (a) The SNA1 QMA not be sub-divided at this time, but the three sub-stocks (i.e. East Northland, Hauraki Gulf, and the Bay of Plenty) should be monitored and assessed separately.

    (b) A biomass target of 40% of the unfished state be achieved within 25 years (by 2040).

    (c) The biomass target may be reviewed at any time the HSS is reviewed or the SNA1 TAC is reviewed.

[3] In 2013, SNA1 was assessed as three sub-stocks with movement of fish between them.

(d) An intermediate milestone of 30% of the unfished biomass level be achieved within 10 years (by 2025) as a valuable checkpoint for progress towards the 40% target.

38. The group considers that a biomass target of 40% of the unfished state:

- Complies with the MPI HSS and Guidelines for the default target for a snapper stock;
- Provides an increased sustainable catch;
- The intermediate milestone of reaching 30% of the unfished biomass within 10 years provides a valuable checkpoint to assess progress; and
- Better supports the inshore ecosystem.

## Management measures that will support the target being achieved

39. The Plan relies on both direct and indirect measures that will achieve the target. The measures that can be used to support the biomass increase towards the target are discussed below.

### *Setting the TAC*

40. The Group agreed that the TAC is the primary management measure that will enable the SNA1 stock biomass to move towards the target. The Group also agreed that the 2013 determination ought not to be revisited, and as there will be no new stock assessment until 2018 – 2020 (although we might have early tagging results in 2018), any discussion on the TAC at this time is moot.

41. The Group noted that the estimate of recreational catch in 2014 indicates that catch has declined substantially compared to the 2011-12 National Panel Survey (NPS) to estimate recreational harvest in SNA1. Specifically, recreational catch has declined by 18% in East Northland, by 70% in the Hauraki Gulf, and by 47% in the Bay of Plenty. These data indicate that the total recreational snapper catch in SNA1 can be highly variable, for reasons that are not well understood.

42. The Group noted that commercial fishers have made substantial investments in implementing a number of measures (e.g. increased observation and electronic monitoring of commercial vessels, reporting of the catch of snapper below the MLS) since 2013 to improve the information being gathered on the SNA1 fishery. The recommended changes to the MLS and gear selectivity, and commercial fishers' voluntary 'move-on' rule, are aimed at delivering reductions in the mortality associated with fishing.

### *Recommended TAC*

43. The Group recommends that:

(a) No change to the TAC be made in 2016/17.

(b) By 2021-22[4], a review be conducted using updated stock assessment information, and the results be used by the proposed advisory group to recommend subsequent

[4] Regular fishery monitoring will ensure it is on track to meet the target and timeframe.

management action, including a TAC change, if required to achieve the intermediate milestone and biomass target within the specified timeframes.

*Indirect management measures to support building the biomass to the target*

44. The Group recommends several supporting measures that are aimed at enabling the SNA1 biomass to increase in the coming years without reducing the TAC. In addition, the Group has recommended several monitoring actions that will serve to mitigate risks to the stock by providing the ability to track progress.

45. The Group sought scientific advice on the gains in yield and potential increases in biomass that could be achieved by adopting various indirect measures that take fewer small fish and result in less mortality of small fish. The modelling results indicate that benefits could be gained from:

- Improving the average yield. By improving selectivity, the yield from the fishery can be increased, with fewer fish on average being taken. However, achieving those gains would require the MLS to be closely matched to the size of fish selected by different fishing methods to avoid simply increasing the total mortality.
- Reducing, across all sectors, the incidental mortality caused by fishing, which can be improved through the survival of released snapper and avoiding catching undersized snapper.
- Improvements in fishing methods and fish-handling practices that can increase the size of snapper caught and reduce release mortality.

*Improving average yield by changing the MLS and increasing size selectivity of gear*

46. One purpose of the MLS is to allow snapper to spawn at least once before they can be caught. The available information for snapper in SNA1 shows that they reach sexual maturity at an age of 3 to 4 years and at a length of 20 to 28 cm.

47. At present, a different MLS is set for commercial and recreational fishers for SNA1. The current commercial MLS for snapper is 25 cm, which includes juveniles as well as sexually-mature snapper. The MLS for recreational fishing is now 30 cm, which is larger than the size range for maturing snapper (20 to 28 cm).

48. For snapper, the effect that different MLS options, gear selectivity, and mortality rates would have on the average yield and biomass increase rate was explored using a simulation model. The results (summarised in Appendices C and D) show that:

- The main advantage of increasing the MLS and adjusting selectivity would be a higher optimal exploitation rate (the proportion of the available biomass that is allowed to be taken), an increase in yields available once the target biomass has been reached, and an increase in catch rate (i.e. an increase in the encounter rate of fish by the recreational sector and an increase in catch per unit effort ('CPUE') for the commercial sector).
- The MLS, mortality, and selectivity options tested showed –
    - that the intermediate biomass target is potentially achievable if mortality from all fishing methods can be aligned to mortality achieved by commercial bottom longline fishing.

- that there is no significant change to the time to reach the target if exploitation rates are maintained at 2013 levels.
- that the actual rebuilding time will depend on reproductive success, which could be higher or lower than that used in the simulation model.

### *Recommended actions to improve yield*

49. The Group recommends that for SNA1:
    (a) Over time, the MLS be aligned for commercial and recreational fishers. Increasing the MLS only becomes an option when selectivity has been measured and survivorship of released fish is reliably estimated. Some initial suggestions are:
        i. Including the Precision Seafood Harvesting ('PSH') and other technology in commercial trawl gear and innovations in other fishing gear if it proves beneficial in reducing mortality of small snapper; and
        ii. Educating and encouraging Māori customary non-commercial and recreational fishers to use appropriate baited hook sizes, artificial lures, and other innovations that catch fewer small snapper.

### *Reducing the incidental mortality of snapper in SNA1 across all fishing sectors*

50. Snapper above and below the MLS are killed incidentally by the fishing process, primarily through the requirement for both recreational and commercial fishers to return snapper below the MLS. It is important to know what proportion of fish returned to the sea survives and if this proportion changes. The dead fish can then be accounted for within the total fishing mortality estimates, thereby better informing TAC decisions.

51. Reducing this fishing-related incidental mortality will make a contribution to increasing the biomass of SNA1. The best way to avoid this mortality is to avoid catching small snapper. The focus is largely on fishing gear and practices that avoid catching snapper below the MLS, and ensuring that handling and release practices are effective in minimising the associated mortality.

52. Different types of fishing gear are more or less suited to returning fish alive to the sea. Snapper caught on long lines and by recreational hook-and-line methods often come on board vessels alive. Artificial lures generally hook snapper in the mouth, which improves chances of survival after release. However, snapper that are hooked in the gills or gut are less likely to survive. Snapper caught in set nets, seine nets, or trawl gear are often dead or damaged when brought aboard. The Government and fishing industry are investing in new trawl gear (PSH) that is designed to bring fish aboard in the best possible condition to enhance market value and potentially allow for releasing small fish alive and with a high chance of survival. Gear design is also aiming to improve size and species selectivity to avoid catching fish that are not marketable.

53. Other measures might also be applied to minimise the mortality of very small snapper that could be taken by all sectors. This includes avoiding fishing in areas where small snapper are common, such as the 'move-on' rule voluntarily adopted by the commercial fishers (fishers are required to move on if undersized snapper make up a large proportion of the catch – see link to agreement below).

*Recommended actions to reduce mortality*

54. The Group recommends that:

(a) All fishers be encouraged to avoid catching juvenile fish wherever possible;

(b) Research be undertaken to determine the survival of snapper released after capture by commercial and recreational fishing methods;

(c) Best-practice snapper handling and release methods be updated, and all fishers be informed and encouraged to adopt best-practice methods for handling and releasing snapper;

(d) The SNA1 Commercial industry group be asked to review the 2015 voluntary 'move-on' measure to align with best available information (see SNA1 Commercial agreements at http://www.inshore.co.nz/fileadmin/inshore/images/SNA1_commercial/SNA1_Agreement_-_2014.pdf ).

(e) Recreational fisher groups be encouraged to develop a 'move-on' practice as part of a package of measures to reduce incidental catch of snapper below the MLS.

# Utilisation of the SNA1 resource

## Overview

55. The Act defines utilisation to mean "conserving, using, enhancing, and developing fisheries resources to enable people to provide for their social, economic, and cultural well-being".

56. The Minister provides for utilisation by firstly setting a TAC for a stock. Within the TAC, the Minister makes allowances for Māori customary non-commercial interests, recreational interests, all other sources of mortality caused by fishing, and sets a TACC. Māori customary fishers are provided for according to the best information about what they take collectively. Neither the recreational nor the commercial sector has priority on how much of the TAC they are allocated by the Minister. The Minister has broad discretion under the Act in making allocation decisions.

57. In calling for the Group to be established, the Minister set the tasks of determining what getting the best from SNA1 means for all sectors, and also how the benefits from the fishery should be allocated within the bounds set by him. These matters relate to the 'utilisation' of SNA1.

58. Determining how to get the best from the fishery is a complicated task as there are many views on what is best. Snapper are caught for food, recreation, cultural events, and for sale. A wide range of businesses and jobs are directly and indirectly associated with the recreational and commercial snapper fishery in SNA1. The economic, cultural, and social benefits are accordingly substantial.

59. It may not be possible to meet the expectations of all fishers when the demand for snapper exceeds what can be taken sustainably, and the quality of fishing sought is different. Commercial fishers use powerful, efficient fishing methods and can cover large areas, which means that they can be satisfied with a relatively less abundant stock. Commercial fishers also rely on catching other species without exceeding the SNA1 TACC. Non-commercial fishers use less powerful and efficient methods and are more likely to want a more abundant stock readily available so they can enjoy the benefits of better availability, higher catch rates, and larger fish on average. Snapper for customary use may be caught either by fishers using amateur methods or by commercial fishers and methods providing they have been issued with a customary harvest authorisation.

## Setting Allowances – dividing up the catch limit

60. The Group agreed on the following aspects relating to utilisation:

- SNA1 is subjected to a high level of utilisation and is valued by all sectors;
- It is important to improve the understanding of all sectors of the aspirations for SNA1 of the other sectors;
- The customary non-commercial allowance has been set based on limited information. This is due to customary fishing in SNA1 still largely being managed under the transitional customary provisions within the Amateur Fishing Regulations with no legal requirement to report customary harvest. In addition, the legal constraints of the interim regulations has limited the ability of Māori to exercise their customary harvest rights. Several iwi

within SNA1 have expressed interest in establishing a 'pataka kai' (food cupboard) to harvest and store seafood for later use at tangi and hui. The growing use of pataka kai may have implications for setting future allowances noting that the current customary allowance is 50 tonnes out of 8050 TAC.

61. The Minister has stated that, over time, he intends to allocate an equal amount of snapper to the recreational and commercial sectors. The current allocation of the SNA1 TAC, set in 2013, is as follows (in tonnes):

| TAC | TACC | Recreational | Māori customary non-commercial | Other sources of fishing-related mortality |
|---|---|---|---|---|
| 8050 | 4500 | 3050 | 50 | 450 |

62. The Group has:

- Agreed that the Minister has discretion in setting the allowances and the TACC, and can be guided by various factors that he or she considers are relevant. The Group did not reach agreement on which factors the Minister should consider, but the following were discussed:
    - Relative value of snapper to each sector;
    - Trends in catch rates (CPUE) for each sector;
    - Population trends;
    - Average fish size or other performance indicators of fishing quality.
- Not agreed on a specific allocation, including the Minister's guidance to move to 50:50. However, the commercial sector has stated support for 50:50 provided that the allocation does not change any further. Recreational representatives acknowledge the Minister's 50:50 aspiration and acknowledge that it is within his discretion, although the plan lacks any pathway for achieving it.
- Noted that any move towards a 50:50 allocation between recreational and commercial interests through a reduction in the TAC will severely impact on the existing rights of many quota owners. Subsequent increases in the TACC as the fisheries recover will not return to all those commercial participants, but only to those holding s 28N rights. Section 28N rights are a policy solution to a problem in the regime in 1986 that now means that the wrong incentives exist because although protecting rights, they inhibit the ability to move to solutions for this and other fisheries.
- Suggested that for a more responsive system, the Crown should negotiate with those quota owners holding these preferential allocation rights to extinguish them via an appropriate compensation mechanism.
- Not agreed that a specific policy be adopted for determining how allowances should be made.

63. The Group discussed the current situation with respect to obtaining updated information on the catch by each sector to inform the setting of allowances. The Group noted that the harvest information reported by Māori customary fishers under the Kaimoana Customary Fishing Regulations (1998) covers only a fraction of what is harvested as the majority of customary harvesting occurs under the Amateur Fishing Regulations which contains no legal requirement to report. The Group noted that Te Ohu Kaimoana has developed a web application to support electronic reporting of customary fishing and that this could provide a solution, in combination

with more iwi adopting the Kaimoana Customary Regulations. Several iwi throughout the SNA1 area have indicated their willingness to implement the electronic reporting system pending support to work with their kaitiaki. The Group proposed that Government as Treaty partner look to provide assistance promised to iwi under the Deed of Settlement to better manage customary non-commercial fishing.

## Managing each user group within the share provided

64. The overall management approach to ensure sustainability for all QMS stocks relies on the TAC not being exceeded on average, which means each sector's total catch must generally be within the allowance or TACC provided. However, the allowances and TACC are not absolute. It is expected that the catch taken by each sector will fluctuate above or below the allowance or TACC from year to year. This could occur for a variety of reasons – fisher numbers (e.g. a poor summer restricting recreational boats), the availability of small or bigger fish, changes in catch rates and market forces.

### *Recommended actions to manage catch to Allowances*

65. The Group recommends that:

- Regular monitoring and analysis of the levels of catch by all sectors and estimates of other sources of fishing-related mortality be required. This will additionally involve –
    - Reporting of snapper by amateur fishing charter vessels on their Activity Catch Return forms;
    - Māori customary non-commercial catch reporting estimates be improved, including through the Crown assisting iwi to use electronic reporting;
    - a clear set of guidelines for the required precision and timing of updates to this information;
    - If, as result of monitoring, analysis, and reporting, the recommended future Advisory Group detects trends that indicate that targets and timeframes in this plan (as proposed in paragraph 37) will not be achieved, then appropriate action will be taken.

## Rules that manage the use of the SNA1 resource

66. There are a number of rules that are designed to manage catch within the allowances for recreational interests and the TACC for commercial fishers. Daily bag limits constrain the catch by recreational fishers. Size limits are also used, in part, to keep catch within the allowance. Recreational fishers face fines if they are caught exceeding the bag limit or in possession of fish below the MLS. For commercial fishers, there is a statutory reporting and catch-balancing system that operates to constrain catch within the TACC. An economic penalty (the deemed value) is charged for commercial catch landed in excess of annual catch entitlements held by the individual fisher. Commercial fishers face substantial fines and penalties for breaching commercial fishing rules.

67. Customary non-commercial fishing is managed through the interim customary provisions of the Amateur Fishing Regulations (2013) and the Kaimoana Customary Regulations (1998). Both sets of regulations enable nominated kaitiaki, or authorised persons, to issue a customary harvest authorisation to a fisher specifying the species to be taken, the fishing location, method and date, the quantity and size limits for the seafood to be harvested. The authorisations also

specify the customary use (cultural event) and the venue where the kaimoana will be taken and consumed. The Kaimoana Regulations give kaitiaki greater authority to determine appropriate customary uses. This authority is balanced by an obligation to report the quantities harvested to the Crown. In addition to the customary regulations, it is also common that fish for customary use is taken under rules providing for recreational fishing if the amount of kaimoana required can be met under the daily bag limits for recreational fishing. Iwi and iwi-owned fishing companies also provide fish landed under ACE (commercially caught) to iwi members for customary use. Fish sourced for customary use under the recreational bag limit or the QMS (ACE) is not accounted for within the customary Allowance.

68. The customary regulations also provide for iwi and hapu to establish, after Ministerial approval, specific areas (mataitai reserves and taiapure) over which they may exercise their rangatiratanga through management control. This includes the ability to introduce bylaws or regulations to manage fishing activity, including the prohibition on use of certain fishing methods and exclusion of commercial fishing. While these rules do constrain fishing activity, their primary purpose is to maintain customary fishing rights and ensure the sustainable management of areas important for customary fishing.

69. There are also measures that constrain the use of certain fishing methods or prohibit fishing in specific locations or times of the year. While the existing rules are generally in place to protect juvenile fish, habitats, marine biodiversity, or protected species, some measures could be applied to influence the amount of catch taken.

# Environmental considerations

## Overview

70. The ongoing productivity and success of the SNA1 fishery depends critically on the aquatic environment being in a healthy state that can support snapper production. This fact is true for all stocks, which sets up an important driver for maintaining and, where feasible, improving the productive capacity of the marine environment in SNA1.

71. The marine environment faces a range of effects, both natural and human-induced, that can have an impact on its productive capacity. Fishing itself can have adverse effects on the aquatic environment and ecosystems, as can siltation and pollution from land-based activities. In the longer term, the effects of changes in climate, ocean acidification and ocean circulation might also affect snapper and other marine species.

72. Fishing for snapper can also have impacts on other species, including protected species. Incidental mortality of seabirds has been identified, with specific concern for the black petrel, as explained further below. Measures are currently in place to reduce the capture of seabirds in SNA1 (see section on the *National Plan of Action – Seabirds* below).

73. Snapper is a key target species for all fishers, but fishing for snapper is associated with a bycatch of other species. Actions taken for the snapper fishery to manage the impacts of fishing on the aquatic environment are likely to have a beneficial effect for other species. However, managing the snapper target fishery needs to consider the mixed-species nature of the fishery and also managing the other species taken. Managing other species is out of scope for this Group.

## Habitat Degradation and Loss

74. Several management measures are already in place to protect juvenile snapper from bulk harvesting methods. These closed areas also protect habitats that are important for young snapper from the potentially adverse effects of fishing using bottom-contacting methods. Estuary and harbour areas are closed to commercial trawling, Danish seining, and dredging.

75. However, the important nursery grounds in these protected waters are vulnerable to the effects of siltation and pollution from activities on land. Fishers are not responsible for these effects, but their interests are affected by the impacts on snapper productivity. It is important to ensure that local and regional authorities are well informed about the potential for impacts of land-based activities on the marine environment and snapper productivity, so that adequate planning controls and other measures are implemented to avoid impacts.

76. Fishing also can impact benthic communities and habitats in the wider area that are important for snapper and other species. Different types of habitat are important to each stage of the snapper lifecycle. The Act requires that any adverse effects of fishing on the aquatic environment should be avoided, remedied, or mitigated. It is important to gain a better understanding of the nature and extent of the overlap between potential impacts and important benthic areas and habitats, so that adverse effects can be managed where necessary.

77. Addressing any adverse effects of fishing on the environment is the statutory responsibility of the Minister and MPI and the social responsibility of fishers. In addition, the environmental principles under the Act include that habitats of particular significance for fisheries management should be protected.

### *Recommended actions to address habitat degradation and loss*

78. The Group recommends that MPI undertakes the following actions:

(a) Habitats of particular significance for snapper be identified and mapped, and areas that are under threat be identified, and loss of habitat be estimated, in 2017.

(b) Analysis of the trawl footprint using the vessel monitoring system (VMS) on fishing activity be reported.

(c) The performance of existing protection measures and protected areas (under fisheries legislation) should be examined to determine if alternative areas or protection measures could perform better. This includes considering the protection of areas which are known to have a high number of small snapper or where high numbers of small snapper have previously been reported in research projects. MPI to analyse the size composition of snapper by location from MPI fisheries observer records and to complete the report in 2017.

(d) Encouraging fishers to find and adopt fishing gear and methods that reduce adverse effects on the benthic environment by 2018.

(e) The existence and implications of habitat bottlenecks for snapper be assessed. MPI to request an annual update on new work in this field from NIWA Auckland.

(f) MPI will provide annual updates on the effects of climate change and ocean acidification and comment on its relevance to SNA1, including updates on progress with the research project “Coastal Acidification – rates, impacts and monitoring” (jointly funded by the Ministry for Business Innovation and Employment and MPI).

(g) Opportunities to enhance seabed habitat important to the lifecycle of snapper be explored in conjunction with local authorities.

(h) Programmes targeted at the recovery of biogenic structures in the SNA1 area be supported in conjunction with local authorities. MPI to request an annual update from the Mussel Reef Restoration Trust and to report on other recovery activities in Northland or Bay of Plenty.

## Addressing land-based effects on snapper habitats

79. Responsibility for the coastal environment, including land-based effects and the introduction of associated sediments and pollution into the coastal marine environment, rests with regional councils (for SNA1, the councils are Northland, Auckland, Waikato, Bay of Plenty). Strong relationships with local authorities, including these regional councils, need to be formed by MPI and evidence provided to the councils to inform planning processes and decisions under the

Resource Management Act 1991. In addition, the Environmental Reporting Act 2015 establishes a framework and obligations for reporting on aspects of the environment, including the marine environment from inshore out to the boundaries of the Exclusive Economic Zone ('EEZ'). The reporting obligations should assist with obtaining routinely updated information on the state of the marine environment within SNA1.

### *Recommended actions to address land-based effects*

80. The Group recommends that:

    (a) Pathways be established for engagement between MPI and local authorities responsible for planning rules and decisions that impact on SNA1. MPI to report annually on protocols and engagement in FMA1.

    (b) The importance of coastal marine environments and snapper habitat to fisheries management generally be stressed to local and regional authorities and they be required to recognise the importance in their plans. MPI to advise the Group of opportunities to contribute to the relevant planning processes.

    (c) Local authorities be required to monitor and report on sediment and nutrient levels deposited in the coastal marine area, and to adopt appropriate mitigation and restoration strategies.

## Protected Species Interactions

81. The capture of protected species must be reported by commercial fishers. These reports show that the major protected species interaction in the snapper fishery is with seabirds. All seabirds in New Zealand are protected. Mitigating fishing-related impacts on seabirds is outlined in the National Plan of Action (NPOA) for Seabirds 2013 .

82. A science-based risk assessment has identified black petrel as the seabird most at risk in New Zealand as a result of incidental fishing mortality. The black petrel population is found around the Hauraki Gulf. Long-lining is the main fishing method that poses a risk to black petrel. Specific strategies to address the incidental mortality of seabirds are outlined in the NPOA Seabirds.

83. The available information suggests that the SNA1 fishery has limited interactions with protected species such as dolphins, whales, turtles, corals, etc. The extent of those interactions may become clearer with additional independent monitoring of the commercial snapper fishing fleet from 1 October 2015. The need for specific actions can be reviewed after compilation of several years of fishing data.

# Monitoring and research

## Overview

84. Managing fisheries requires objective and reliable information that is consistent with MPI's Research and Information Standard to be available to guide management decisions. The Act also specifies a set of information principles that require management decisions to be based on the best available information and take into account the uncertainty or inadequacy of the information.

85. In this section, the Group recommends a range of options for the ongoing collection of important data, their analysis, and interpretation. This information will support the requirements to monitor the performance of the stock and the fishery against the management objectives and targets proposed in paragraph 37, and will provide the information base for management actions to achieve the goals and objectives of the Plan.

86. The Group discussed the importance of the SNA1 fishery for all sectors and the need to implement and secure dedicated funding for ongoing, routine monitoring. The Group noted that appropriate monitoring would be essential for providing early warnings of any emerging problems.

87. There are several aspects to the collection of data on SNA1, and how to use the data to support management. Regularly updated data on harvest and fishing effort are used to estimate changes in the relative abundance of the stock over time. Determining the size and age distribution in the catch provides information about the entry of young snapper into the fishery (recruitment) and how the different age classes are moving though the snapper population.

88. Quantitative stock assessments integrate all the relevant data and estimate the status of the stock in relation to management targets and biomass limits. These stock assessments rely on numerical models that simulate the population and stock dynamics of SNA1, and are also used for exploring how the stock would perform into the future under different management scenarios. Following the last stock assessment completed in 2013, the Snapper Plenary noted that as there is uncertainty in the relationship between standardised CPUE and abundance, it is necessary to investigate options for fishery-independent abundance estimates, such as a new tagging study. It has been 20 years since the last SNA1 tagging project and a new estimate of stock abundance and more information on movement between sub-stocks is a research priority.

89. A new SNA1 tagging project is being designed to update knowledge of absolute abundance over the next few years. Limitations in the design of the previous tagging study and the numbers of tag releases resulted in uncertainty in the biomass estimate and information on fish movement (especially between the Hauraki Gulf and the Bay of Plenty). Learning from the previous study, the new tagging survey will address potential causes of bias and should produce a reliable estimate of current biomass for each sub-stock. The tagging survey allows for the number of snapper in the population to be estimated. The basic assumption is that the proportion of tagged fish in the population will be the same as the proportion of tagged fish in the catch. This basic assumption underpins all that follows. By knowing the catch, the number of tagged fish recaptured, and the number released, the total population numbers can be calculated.

90. The frequency at which the various data are collected, and stock assessments are updated, will depend on the chosen management strategy for SNA1. A management strategy evaluation (MSE) research project is underway in which the optimum assessment and monitoring frequency will be determined for a number of alternative SNA1 management strategies pursuant to agreed levels of "acceptable" risk (as outlined in the Harvest Strategy Standard). This project should provide critical information necessary for the development of an appropriate monitoring and research schedule for SNA1.The cost of different management strategy options is a significant consideration, and will be evaluated in conjunction with the MSE.

### *Recommended monitoring and research activities*

91. The Group recommends the following data gathering, monitoring, and research activities:

(a) Testing, using the MSE, different data collection and management options and associated risk to help define management and monitoring strategies.

(b) Securing additional and dedicated funding from a broad range of sources (in addition to the current MPI fisheries research budget) for designing and implementing new or augmented data gathering, monitoring, and research activities, as specified in this Plan.

(c) Implementing an ongoing, routine fisheries-independent monitoring programme to track the performance of the stock and fishery against the Plan. Key elements of such a programme include the following –

iii. Develop, by June 2017, a project proposal to design and cost a fisheries-independent survey using commercial bottom longline gear and comparing this with other alternatives for monitoring relative abundance such as trickle tagging or a research vessel survey. Estimate the costs and benefits of all alternatives identified and explore options for making quota or ACE available for the research.

iv. Sampling commercial landings or catch at sea to collect otoliths (ear bones) for aging snapper annually, subject to analysis of sampling frequency. Projects to read ages and determine the age structure of the population could be undertaken every two years, or as determined by the MSE.

v. Monitoring and reporting recreational catch and effort in SNA1 by –

a. Updating the full national panel survey (NPS) estimate every 5 years;
b. Providing an intermediate recreational harvest update between NPS estimates;
c. Undertaking a coincident aerial overflight and boat ramp survey for SNA1 for the next NPS survey, with cost-benefits to be evaluated over the longer term;
d. Maintaining recreational fishing effort monitoring using web cameras at key boat ramps and evaluating its validity periodically;
e. Surveying recreational catches at key ramps to maintain ability to scale effort to catch and evaluate its validity periodically;
f. Monitoring the catch and return of undersized snapper by commercial and amateur fishers;
g. Reporting recreational snapper catch on amateur-fishing charter vessels.

vi. Investigating options for updating the estimate of absolute abundance from an appropriate cost-effective survey, including by –
    a. Implementing a tagging biomass survey design that will provide information about biomass as well as movement between sub-stocks, as programmed for 2016; or
    b. Applying the results from an ongoing trickle tagging programme, if one is implemented.

vii. Conducting a fully-quantitative stock assessment at least every 5 years to estimate stock status and assess the effectiveness of management measures, including the TAC, required to achieve the intermediate milestone and target, while avoiding the biomass limits.

(d) Improve reporting of Māori customary non-commercial harvest.

(e) Improving understanding of the total mortality associated with all fishing methods. MPI to review catch records from observers, commercial, and recreational fishers and consider whether a survival study using a holding net is required by 2018.

(f) Improving understanding of the survival rate of released snapper, both undersized and legal sized. Review international literature and consider whether a survival study using a holding net is required by 2018.

(g) Developing and updating best-practice fish-handling and release methods. A guide will be developed and promoted by the New Zealand Sport Fishing Council by 30 June 2017 or earlier if possible.

(h) Defining and identifying habitats of particular significance for fisheries management in SNA1. MPI to provide a summary of information available.

(i) Investigating the performance of existing method and area measures (specifically for trawling), and exploring options to improve performance.

(j) Monitor the implications of climate change for FMA1 (sea temperature and ocean acidification). MPI to provide annual updates.

(k) Investigating ways to monitor the performance of education and communication initiatives.

# Implementing the Plan

## Overview

92. The Act provides the legislative framework for managing the SNA1 fishery. The Minister is responsible for almost all decisions required under the Act, other than those which are administrative in nature, such as applications for fishing permits. MPI is responsible for administering the Act, which includes planning and implementing various activities related to management. These activities include research, monitoring, compliance, reporting, regulatory changes, consultation, and providing advice to the Minister.

93. In providing advice to the Minister on most fisheries management matters, MPI is required to consult interested parties and provide for the input and participation of tangata whenua. At present, opportunities for consultation on, and input into, management reviews are provided by a regional recreational fishing forum which meets three times each year to discuss fisheries management matters with MPI, unscheduled meetings with commercial stakeholders as required, and regional iwi forums which operate in the Bay of Plenty and for part of Northland. The Group also noted that the Hokianga Accord, formed in 2005, provides a forum for discussion of Māori customary fisheries interests of mid-north iwi and hapu.

94. Fisheries research progress and results are reviewed by the relevant scientific working groups throughout each year. The Northern Inshore Working Group reviews research related to SNA1 and meets most often in Auckland. The Working Group includes MPI scientists, research providers, commercial fishing and recreational fishing scientists, and other representatives. Attendance at Working Group meetings is open to people interested in the science and who agree to the standards of participation as set out in the Working Group Terms of Reference.

95. MPI undertakes public consultation on proposed changes to the catch limit and fisheries rules. The consultation period is four to six weeks in duration. There is limited opportunity to have input into what options should be considered prior to this consultation.

96. The draft National Fisheries Plan for inshore finfish species is an important management tool used by MPI to determine priorities. The fisheries planning process aims to produce two reports annually – the Annual Review Report (ARR) and the Annual Operational Plan (AOP). The ARR is a high-level assessment of the performance of the fisheries and relies on a few key indicators. The AOP sets out the actions and services that will be undertaken for the upcoming year. There is limited opportunity for people with an interest to be involved in these reports. The Group noted the possibility to include this SNA1 Plan as a specific chapter within the National inshore finfish plan.

97. The Group considers that the existing management processes that apply for SNA1 do not provide adequate opportunities for sector input. The Group considers there is a need to change the way in which stakeholders and tangata whenua engage with MPI and provide input into fisheries management in order that management becomes more responsive to, and representative of, those with an interest in the fishery. Recommendations to address this are provided in the section on Education and Communication.

## Establishing an advisory group

98. The Group recognises the value of the co-operation and goodwill between the three sectors which has been a feature of the Group's work to date. To build on this strength, the Group considers that a future advisory group could play a role in ensuring that customary, recreational, and commercial fishers, and environmental interests, have an effective voice in the management of SNA1. A collaborative group would provide an opportunity to reach collective solutions and advise the Minister on actions for managing SNA1. Such a group could also play an important role in education and communication, as discussed below. It will be important for MPI, as members of the group, to provide support and facilitate the work of the group.

### *Recommendations for an advisory group*

99. The Group recommends that an advisory group be established and its role would include the following, as might be amended by future reviews:

    (a) Responsibility for maintaining the SNA1 Management Plan as a living document;

    (b) Encouraging, monitoring, and reporting on the implementation of the recommendations made in this Plan;

    (c) Providing regularly updated information to the public, including annual reports showing trends, new information, and management priorities;

    (d) Engaging with sectors, via the representatives, to arrive at consensus on proposed management options before formal consultation;

    (e) Assisting MPI in communicating management options and decisions and the reasons for them to stakeholders and the public;

    (f) Advising the Minister and MPI on matters concerning the management of SNA1, including advice on -
        i. Annual planning and prioritisation of research, compliance, and other services;
        ii. Setting the TAC, TACC, and allowances;
        iii. Establishing supporting management measures (for all sectors) such as spatial controls, fishing-gear controls, MLS, and daily bag limits;
        iv. Monitoring tools to track the performance of the Plan;
        v. Plan review and developments.

    (g) Providing advice and recommendations to relevant management agencies and Ministers to achieve the purpose of the Plan. This will include:
        i. Advice and recommendations on the effectiveness of management measures that affect the SNA1 fishery;
        ii. Advice and recommendations on activities occurring outside the SNA1 area if those activities impact, or are likely to impact, on the SNA1 fishery;
        iii. Advice and recommendations on activities occurring within the SNA1 fishery that are affecting associated or dependent fish stocks;
        iv. Advice and recommendations on likely threats to the SNA1 fishery.

100. Formal terms of reference for the advisory group are required. The Group recommends the following:

(a) **Membership:** would consist of an independent chair, 3 representatives from each of the three fishing sectors (Māori customary non-commercial, recreational, commercial), and 3 representatives from MPI; the Minister could also appoint a suitably qualified member of the public in consultation with the sectors.

(b) **Appointment:** members would be appointed for up to a 3 year term, with a maximum tenure of 2 consecutive terms. At the end of each term, one member from each sector would be replaced to ensure continuity. Resignation and replacement provisions should be provided. Members would be appointed by the Minister.

(c) **Review:** The structure, functions, and performance of the advisory group would be reviewed after 5 years.

(d) **Meetings:** would be held as required, within a maximum of 4 and minimum of one meeting per year. The timing of meetings should align with the routine reporting of scientific results (the Plenary Reports) and the monitoring of catches to enable reports that would facilitate timely consideration in management responses.

(e) **Costs:** MPI would facilitate the functioning of the advisory group, including administrative services, but a specific and appropriate budget allocation should be committed by MPI.

(f) **Communication:** The group, with MPI assistance, would produce reports for publication on MPI's website to satisfy the role described above. There would need to be an Annual Report to the Minister.

# Communication and education

## Overview

101. The SNA1 fishery and its management have a history of tension between the sectors and disagreement over management measures. This was evident more than ever in the response to the 2013 management review. To address this, the Minister called for the Group to be established so that the sectors could work together to develop the Plan for managing SNA1 into the future.

102. The Group recognises the importance of ensuring that all stakeholders have a clear understanding of the Plan for SNA1 and the way in which the various management tools will work to deliver a fishery that will produce enduring benefits for all. Ownership of management decisions can be facilitated if representatives from all sectors are able to agree on management objectives and options and explain the reasons for them collectively.

103. To deliver the desired outcomes, several of the measures proposed in the Plan will rely on all fishers adopting relevant codes of practice and guidelines. The better the understanding and acceptance of the rationale for the Plan there is, the more likely fishers will adopt the measures. Effective education programmes will improve compliance with existing rules, help promote improved fishing practices, and enhance understanding of how the SNA1 fishery is managed. This will, in turn, improve the benefits obtained from the snapper fishery for all sectors.

104. As a starting point, the Group acknowledges that some existing education channels are working and should be reinforced. These include MPI articles in fishing publications, MPI messages on best-practice fish handling and release for recreational fishers, fish-measuring stickers, the NZ Fishing Rules App, and the 0800 4 POACHER hotline. Education work will often have a sector-specific focus, and each sector has the opportunity to derive benefit by taking ownership in the development and relaying of key messages to their respective constituents and the greater public. Alternative funding sources for education work are likely to be needed.

105. Given the range of groups with an interest in SNA1, it is clear that some who fish in SNA1 are largely unrepresented by sector-specific organisations. Many recreational anglers might not be reached through the standard communication channels, perhaps because they are non-English speaking, and other fishers, while enjoying their fishing, might simply not wish to engage in fisheries management issues.

106. To address this, the Group agreed that strong communication and education initiatives will be required to promote the Plan, with the recommended ongoing advisory group playing an important role. It is likely that new forms of communication that are simple to understand and have greater outreach, might be needed, especially considering the broad range of communities and interests in the SNA1 area.

*Recommendations on communication and education*

107. The Group recommends that:

(a) The Plan be promoted to fishers from all sectors, the general public, government agencies including local government, and other Ministers.

(b) Processes for engaging with interested parties and providing for their input on fisheries management be improved to enable early input prior to the release of consultation documents.

(c) The recommended actions for informing and educating interested parties be undertaken by MPI within its broader communications strategy, and –

- Alternative funding sources for education initiatives be explored;
- New forms of communication and outreach should be developed and used to better reach the diverse communities in the north, and particularly in Auckland;
- Research into education and communication methods and target audiences should be conducted;
- Any communication and education initiatives should be monitored to determine their effectiveness.

(d) Fishers in all sectors are provided with educational material about improved fishing practices and their benefits, including –

- Best-practice fishing methods, fish handling and release;
- Customary fisheries management tools.

(e) The advisory group's role should include developing and disseminating an annual report on progress under the Plan, using the best information available, and ensuring that all relevant information used for managing SNA1 be publicly available, subject to MPI's data release guidelines.

**Office of Hon Nathan Guy**
**MP for Otaki**
Minister for Primary Industries
Minister for Racing

**B13-189**

To whom it may concern

**REVIEW OF SUSTAINABILITY MEASURES AND OTHER MANAGEMENT AND OTHER MANAGEMENT CONTROLS FOR SNAPPER 1 (SNA 1)**

**Introduction**

The snapper fishery in SNA 1 is New Zealand's key inshore fishery. It is on the doorstep of New Zealand's biggest population centre and is highly valued by recreational fishers. It is also a significant export earner for commercial fishers and an important source of fish for New Zealanders via the domestic market. Customary fishers regard the species as a tāonga.

In this context, it is no surprise that 47,709 submissions were received on the review of management of the SNA 1 fishery. I want to thank those that took the time to put their views on the future of this important fishery in writing.

I carefully considered the best available scientific information, key points raised in submissions and the views of the Ministry for Primary Industries (MPI) in reaching my decisions.

I have decided to make the following changes:

| | | | Allowances | | | Recreational Controls* | |
|---|---|---|---|---|---|---|---|
| | Total Allowable Catch (t) | Total Allowable Commercial Catch (t) | Customary Māori (t) | Recreational (t) | Other sources of fishing-related mortality (t) | Daily Bag Limit (fish per person) | Minimum Legal Size |
| **Decision** | 8050 | 4500 | 50 | 3050 | 450 | 7 | 30 cm |
| **Current Setting** | 7550 | 4500 | 2600** | | 450 | 9 | 27 cm |

* Decisions on recreational controls relate to the recommendation of the making of regulations, **scheduled for 1 April 2014.**
** The allowances for customary Māori and recreational fishing were previously combined

The reasons for my decisions are outlined in the proceeding pages.

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**Total Allowable Catch (TAC)**

I am obliged to move a stock towards a size at or above the level that can produce the maximum sustainable yield. I have discretion in determining the way and the rate at which this occurs. I consider that setting a TAC of 8050 tonnes will best meet the sustainability and utilisation objectives for this fishery. This provides a 500 tonne increase to the current TAC. I believe this approach meets my desire to improve benefits from this fishery now in recognition of the improved status of the stocks while still meeting my objective to rebuild the stock over time to a level, and at a rate, I consider reasonable.

***Current catch***

There is some uncertainty around the level of current catch from SNA 1. In particular, there is uncertainty around the level of mortality of fish less than the minimum size limit from both commercial and recreational fishers and illegal removals. Regardless, the information we do have on catch and other removals for the last full fishing year (2011/12) indicates that the total is well in excess of the current TAC.

***Target***

My decision on the TAC for this year is based on the interim target used to guide the stock assessment, i.e. 40% of the unfished biomass. At the moment, the stock is at about 20% of the unfished biomass, which has increased by as much as 70% in some parts of SNA 1. This is also below the most recent "deterministic" calculation of the stock size that would produce the maximum sustainable yield ($B_{MSY}$), which is 29% of the unfished biomass. Using either target the stock must be rebuilt.

I am interested in the number of fish that might be available as the overall number of snapper increases. Information suggests that there are good benefits to be gained from increasing the number of snapper in the water. Although the science is uncertain, I am advised that the amount of snapper that could be sustainably harvested if the fishery was at more optimal levels (at the interim target, for example) could be as much as 12000 tonnes. This is considerably more than the current TAC of 7550 tonnes.

I am aware that the interim target is essentially a proxy for $B_{MSY}$ . I expect that MPI fisheries managers will work with stakeholders between now and when the stock is next reviewed to produce a realistic estimate of $B_{MSY}$ for SNA 1 that reflects a wider management strategy. I will talk more about how I consider this strategy should be developed, and its contents, later.

***Biological substocks***

The TAC applies across the entire SNA 1 stock. I am aware that there are three sub-populations within the stock; however, I am obliged to set a TAC that covers the entire management area. I am further advised that although the sub-populations vary in their current status, in particular the Bay Of Plenty sub-population seems relatively low compared to the other areas, there is insufficient information to know whether implementing separate management measures for these populations would result in better outcomes. In particular, for the Bay Of Plenty population there is considerable mixing between this area and the Hauraki Gulf. Given this uncertainty, our best science advice is that it is better to manage

the population as a whole and seek to improve the entire population while we refine our understanding of the separate populations.

***Response to support for a higher TAC***

MPI outlined a range of possible TACs for my consideration. The range was wide but the discussion document and advice focused on a narrower range. This was either the status quo (7550 tonnes) or an increase or decrease by 500 tonnes.

I have carefully considered the science and the views of submitters that suggested this stock is not in trouble and has in fact increased in abundance overall since it was last reviewed in 1997. However, I am conscious of the uncertainty around total removals from the fishery and also the uncertainty around the number of juvenile fish that will enter the fishery in future.

Recent numbers of new fish entering the fishery have been greater than average, probably based on some good recent summers leading to warm water temperatures. However, this may not always be the case. In addition, the overall number of fish is below where it needs to be, so the stock needs to increase in size over time, which adds to my belief that I should be relatively cautious when setting the TAC.

Overall, I agree with MPI that a TAC above 8050 tonnes is not warranted at this time.

I am also aware that the impact on the stock from the narrow range of options focused on in the discussion document is not particularly significant (about a 1% difference in rebuild after five years).

Given the uncertainty around total removals from the fishery and current recruitment, I believe some caution is required. I acknowledge that if conditions change and the number of juvenile fish entering the fishery drops significantly further changes to catch limits may be required.

I intend that the catch limit be reviewed within 5 to 7 years depending on the availability of new information, and reflecting my desire for more active management of this fishery.

**Total Allowable Commercial Catch (TACC) and allowances**

Allocation between sectors is a critical issue in this fishery given that it is fully utilised. I am required to set an allowance for Māori customary fishing, recreational fishing, other sources of fishing-related mortality, and a TACC.

Submitters hold differing views on my legislative obligations. These obligations provide the key driver for my decision and I believe clarification of those obligations will help in future sector discussions around this, and other inshore shared fisheries. The final advice (page 37-41) sets these obligations out in detail and I would urge sector representatives to look at this section should they require more information.

Section 21 of the Act states that in setting or varying the TACC, I must have regard to the TAC and allow for: Maori customary interests, recreational interests and other sources of fishing related mortality. Very importantly, the Courts, in examining these provisions, have been clear that I do not need to meet any sector's needs in full, particularly in a fishery like snapper where the demand for fish clearly exceeds the amount that is available while ensuring sustainability. The law does not provide a priority for recreational fishers. I have

considerable discretion in determining the appropriate allowances. There is no definition of the factors I need to take into account. The Courts have said that the allowance for recreational fishers must simply be one I consider reasonable.

It is also important for stakeholders to understand that once the recreational allowance is set, I have an obligation to manage the recreational catch around the level of the allowance using the tools at my disposal. However, the way recreational catch is managed is different from the management of the TACC. The allowance is not actively managed on an annual basis. I acknowledge that recreational catch can and will fluctuate around the allowance set depending on a range of factors such as availability of fish and frequency of adverse weather. Recreational catch is therefore managed by looking at the catch on average.

It is logical that the greater the proportion that recreational catch makes up of total catch and the more valuable (social, cultural and economic) the fishery, the more important it is to closely monitor and manage this catch component to ensure sustainability.

I am very conscious that this has not been the case in this fishery recently. However, I believe it is important that the TAC and allowances have meaning if the Fisheries Act is to operate as intended in inshore fisheries and to ensure the fishery reaches its target within a timeframe I consider reasonable. Ongoing monitoring and management of all catch components will be an important part of the plan for SNA 1 that I will outline in more detail later.

***Future management***

When decision makers have considerable discretion there are costs and benefits. One of the costs is that there is inherent uncertainty for stakeholders around how the decision maker will behave. Uncertainty creates poor incentives for future management. I accept that this is not ideal. There are two ways for this uncertainty to be reduced. The first of these is that stakeholders can develop a plan for future allocation. While this approach does not bind my decisions, clearly if stakeholders agree to an approach it provides a valuable contribution to decision making and leads to considerably less angst over decisions. In this environment, stakeholders can invest in planning for the long term future of the fishery as opposed to lobbying around particular decisions.

I appreciate this is a difficult task, but agreeing on a decision-rule type approach for sustainability measures has proved possible in rock lobster fisheries. There are considerable advantages to stakeholders from working together to create a picture of how they want benefits from the fishery to be shared. I appreciate this is not a straight forward exercise when it comes to utilisation matters, but I consider the optimal outcomes are most likely to be ones that all stakeholders and the Minister agree on.

The second approach is for me to provide a clear objective for my decision and a plan for how I intend my objective to be achieved. Again this is not binding on future Ministers and may carry less weight with future decision makers than combined stakeholders agreeing on an approach.

***Recreational and Commercial Allocations***

Overall my thoughts are that the current ratio between commercial TACC and non-commercial allowances (36% non-commercial versus 64% commercial) does not reflect what

I consider the relative values (social, cultural and economic) of the fishery to be between sectors.

I am particularly focused on the overall value (social, cultural and economic) of the fishery to recreational fishers, which although highly uncertain when quantified, is reflected by overall catch from the sector, the number of submissions, and full engagement of the sector during the submission process. Also, undoubted increased demand on the resource will come from population in the areas surrounding SNA 1, which is projected to increase to about three million people by 2031.

I believe it is reasonable for this increased demand and relative value to be met by a change in proportions of the TAC between commercial and recreational fishers. My initial thinking based on best available information is that over time a 50/50 share of the resource may be reasonable. Over time allowance increases will allow recreational catch to expand in response to increases in population growth. However, I am conscious that this is a shared fishery and that stakeholders should share in the benefits associated with a rebuilding stock. At this time I intend to provide the increase in the TAC to recreational fishers. I consider the allowance currently set for recreational fishers does not reasonably reflect the relative importance and value (social, cultural and economic) placed on the fishery by this sector. I believe the new allowance goes some way to responding to this issue.

In the future, subject to information available at the time of the decision, I would expect increases in the TAC to reflect the need to increase the recreational proportion of the TAC towards 50% while recognising the shared nature of the fishery (shared pain, shared gain). My plan is to do so as biomass increases rather than through reallocation. However, the recreational sector cannot expect catch to grow unrestrained overtime. Catch of all sectors will need to be managed to ensure the stock continues to grow and the overall benefits from harvesting to New Zealand are maintained.

***Māori Customary Fishing***

A specific allowance for customary fishing has not been set before in this fishery. Previously, the allowance for customary fishing was included as part of the recreational allowance. After considering available information and submissions I have decided to set an allowance of 50 tonnes for customary fishing. As with other sectors, getting good information on the level of customary harvest is important to ensure customary catch can be adequately provided for and to support good management decisions. I encourage iwi to continue to work with MPI to further the uptake of the kaimoana regulations and other tools that can aid in gathering information on customary harvest.

***Other sources of fishing-related mortality***

I acknowledge the uncertainty in information surrounding this allowance. I have outlined my approach to getting better information to set this allowance in a subsequent section on discarding. In the interim, I consider that 450 tonnes represents the best available information on the level of other sources of fishing-related mortality for SNA 1.

***Other management controls***

Other management controls are designed to protect the TAC by maintaining catch within the TACC and allowances set. I consider this is incredibly important for this fishery. Clearly the

tools available are often blunt and not particularly effective unless based on good science and monitoring. I have carefully looked at the controls applying to each sector. If changes are to be made, I want them to be based on information that indicates they will achieve the necessary outcomes I am seeking.

*Commercial*

Deemed values are the key controls to manage commercial catch within the TACC. The deemed value rates for SNA 1 were adjusted for the 2012/13 fishing year in response to concerns that the high rates at that time were promoting dumping. In response, the deemed value rates were reduced from $13/kg to $8/kg and more graduated ramping of the rate was introduced to ensure incentives existed to use these payments to balance small rare and infrequent overcatch as opposed to large scale overfishing. Overcatch rates in general have been less than 2% of the TACC. I do not consider there is any information to suggest changes to deemed value rates are necessary for SNA 1 at this time.

*Recreational*

Recreational catch in 2011/12 was above the level of the new allowance. I accept there is uncertainty around these figures; however, I also consider that the figures represent best available estimates. The methodology and the results for estimates (excluding charter boat catch) have been extensively peer reviewed by international experts, and two different approaches generated remarkably similar results. While available information indicates that catch has been increasing, I accept that catch in 2011/12 may have been higher than average. Regardless, even estimates of average recreational catch over the last 5 years suggests that there is a risk that recreational catch will substantially exceed the allowance I have set.

I am required to ensure that recreational catch does not render the TAC or allowance set futile. While the majority of submitters did not want any changes to the key recreational controls of the daily bag limit and the minimum legal size, overall I consider that changes to existing measures are required to ensure that recreational catch does not exceed the recreational allowance on average.

The recommendations presented by MPI acknowledge the uncertainty in managing future catch, but provide an indicative range of combinations of bag limits and minimum legal sizes for each recreational allowance based on available information. I have carefully examined this information and considered the views of submitters who provided detailed information on which bag limit is preferred. Although there was a common theme amongst individual submissions (rather than form submissions) suggesting a bag limit of 6 was acceptable, I believe that a bag limit of 7 better provides for use at this time.

The indicative range of minimum legal sizes necessary to constrain catch to the recreational allowance on average with a bag limit of 7 is between 29 and 33 cm. I believe that a minimum legal size of 30 cm would provide the best certainty of managing recreational catch on average while not increasing handling mortality unacceptably and allowing recreational fishers an opportunity to take a reasonable number of snapper. Where submitters suggest a change to the minimum legal size, many supported a size limit of 30cm.

Based on best available information I believe that these management controls are sufficient to ensure catch is managed within the TAC and allowances set. If information suggests that catch is not being adequately controlled I will seek to make appropriate changes.

**Other issues**

***Strategy***

My decisions at this time are only the start of a process. There remains much work to be done to get the fishery to a place where it is performing optimally and all stakeholders can get the most benefit from it. I believe stakeholders are well placed to determine exactly what that optimal place should be and how best to get there. A consensus of stakeholders would clearly carry considerable weight in future decision making. In submissions a large majority of you agreed that a strategy should be developed.

For this reason I have directed MPI to set up a SNA 1 action group. The group will be tasked with the following:

- Determining what getting the best from SNA 1 means across all sectors;
- How the fishery should be managed to get the best from it;
- What cost-effective research should be carried out in the fishery and how often;
- Considering how benefits should be allocated in the fishery within the bounds of the direction I have provided above.

A number of people raised issues in submissions around improving productivity of the snapper fishery. In particular, submissions supported greater protection of spawning populations and protecting habitats that are important to snapper. I think considering the need for such measures to improve productivity and the assessment of the costs and benefits associated with implementation is ideal work for the group to consider.

I would also like the group to carefully consider whether SNA 1 should be split into different management areas to improve our ability to manage snapper in this northern area.

I would like this group to be active by the end of the year and to receive a plan from the group for management of SNA 1 by 1 October 2015.

***Discards***

I am aware of the significant concern expressed during the consultation process around legal and illegal unreported return of dead fish to the sea by commercial fishers. In particular, there have been some speculative numbers around the scale of this issue recently mentioned in the media and in submissions.

This is an issue being faced internationally across many different fisheries management regimes. We are lucky in New Zealand that we have a strong management regime in place that provides a good foundation to manage catch coming from the water effectively and efficiently.

In New Zealand fishers are required to return fish to the sea that are below minimum legal size (so that markets for small fish do not develop). Apart from that, other than in a few exceptional circumstances, all other returns to the sea of fish managed within the QMS are illegal. It is important that if people see fish being returned to the sea illegally or have

information that would support compliance action they should contact MPI on 0800 4 POACHER.

I acknowledge that there is uncertainty around total mortality from fishing. This uncertainty extends across both commercial and recreational fisheries. However, despite this uncertainty I would like to point out that our fisheries across the country are in good shape. 83.2% of the stocks we manage are doing well (there are no sustainability concerns). For the other 16.8%, rebuilding plans are in place. The QMS as a whole is operating well. But we can do better and I intend to do that.

Industry and MPI have been working on this issue for the last several years to develop a programme to improve information and value from inshore fisheries. The critical first issue is getting good information on the total catch (landed and discarded) to inform good management decisions.

Consequently, working closely with industry, I am going to implement a programme of information gathering nationwide beginning on 1 October 2013. As part of this programme I am doubling the number of inshore observer days for 2013/14, and also fast-tracking trials of electronic monitoring on fishing vessels. I have also directed MPI to support industry with their initiatives to increase monitoring in SNA 1 directly. Accordingly, by 1 December 2013 observer or electronic monitoring coverage will extend across 25% of the SNA 1 trawl fleet, increasing to 50% by 2014 and 100% by the end of 2015. The programme will also progressively increase monitoring across other key inshore fisheries.

The information from these programmes will be directly incorporated into TAC setting over the next few years. I believe this will provide strong incentives for fishers to implement technology necessary to better avoid juvenile fish and bycatch more generally. I much prefer this approach than implementing regulations to require use of a particular type of gear. It is clear to me that there is no single gear solution across the very different fisheries and circumstances faced by fishers in inshore fisheries. However, if information suggests this approach is not managing levels of bycatch within limits set, then I will not hesitate to take further action.

For SNA 1, one of the key drivers for information gathering is juvenile mortality. The information on catch of juveniles from this increased monitoring will allow industry to operate a voluntary "move on rule". The move on rule would require fishers move fishing spots where a significant portion of catch is small juvenile fish. Use of vessel monitoring systems and observer/electronic monitoring will ensure effective compliance with this rule.

I will look carefully at how this programme manages catch of juveniles. If data indicates that the catch remains too high, I will look to implement additional measures including gear restrictions and/or area closures.

***Protected species impacts***

I am aware of particular concern over impacts of bottom longline fishing for snapper on black petrel. I am advised that MPI is in the process of putting in place a series of measures to mitigate risk of seabird captures in the fishery. These measures include ensuring compliance with existing regulatory controls (such as requiring vessels to use tori lines),

investigation of new methods of mitigating risk, and increased monitoring to ensure the measures are effective.

**Summary**

I recognise the value of this fishery to all users. That is clear from the number of submissions received and data on the fishery. There are two key issues:

i) increasing the number of snapper over time so the benefits for users are greater;
ii) how those benefits will be allocated.

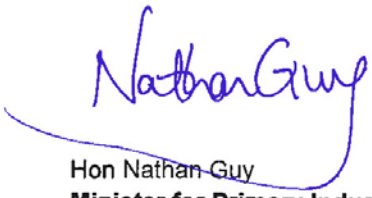
I believe it is reasonable to provide increased benefits from the stock now without sacrificing the need to rebuild the stock over time to levels that will produce more fish for everyone. I also believe it is reasonable that recreational fishers receive an increase in their allowance in recognition of the amount of demand and value (social, cultural and economic) they place on this fishery. This increased share has two dimensions. Firstly, I am increasing the recreational allowance from 1 October 2013. Secondly, I have signalled that I believe it is reasonable for the proportions of the TAC between recreational and commercial to move towards a 50/50 share of the resource. I expect this change to occur over time as part of stakeholders sharing in benefits associated with the rebuild of this fishery.

It will also be important to better manage all removals from the fishery to ensure the stock improves over time. All sectors will need to share in this process. Recreational fishers will face changes to controls necessary to ensure catch is managed to around the allowance set. The commercial sector already has strong controls in place to manage catch. However, reporting of catch and therefore ensuring all catch is managed within the limits set has been highlighted as an issue. I agree, accordingly, that the commercial sector will face measures designed to ensure all catch (above and below minimum legal size) is recorded and to manage that catch within the TAC. Based on the information gained, I will not hesitate to take further action to manage catch of any sector if it appears it poses significant risks to the TAC.

I believe stakeholders are in the best position to provide more detailed guidance on these matters and the future direction of the fishery. It will be no easy task; stakeholders will need to move beyond vested interests and finger-pointing and work constructively together. I intend to review the fishery again in 5-7 years.

I will look forward to seeing a stakeholder plan for managing the fishery before then.

Yours sincerely



Hon Nathan Guy
**Minister for Primary Industries**

# Appendix B – Group members, alternates, and advisors

## Group members

- The Honourable Sir Ian Barker QC – Chair
- Māori customary fishing
    - Peter Douglas – Te Ohu Kaimoana
    - John Willmer – Te Ohu Kaimoana (alternate)
    - Laws Lawson – Te Ohu Kaimoana (alternate)
    - Charlie Bluett – Ngati Awa (Bay of Plenty iwi forum/Mai I Nga Kuri a Wharei ki Tihirau)
    - Kahuipani Petera – Te Hiku o Te Ika Fisheries Forum and Ngati Kuri Trust Board
- Commercial fishing
    - Eric Barratt – fishing industry
    - Jeremy Fleming – fishing industry
    - Dave Moore – fishing industry
    - Dr Jeremy Helson – fishing industry (alternate)
    - Gregory Johansson – fishing industry (alternate)
    - Dr David Middleton – fishing industry (alternate)
- Recreational fishing
    - Keith Ingram – recreational fishing
    - John Holdsworth – recreational fishing
    - Barry Torkington – recreational fishing
    - Trish Rea – recreational fishing (alternate)

## Advisors

- Science
    - Dr Pamela Mace, MPI
    - Dr Martin Cryer, MPI
    - Dr Marc Griffiths, MPI
    - Jeremy McKenzie, NIWA
    - Alistair Dunn, NIWA
    - Dr Richard Bian, NIWA
- MPI Fisheries Management and Policy
    - Steve Halley, Inshore Fisheries Manager
    - Laura Furneaux, Team Manager, Inshore Fisheries
    - Stuart Brodie
    - Tim Persen
    - Nick Jones
    - Graeme McGregor
    - John Taunton-Clark

# Appendix C – Distinction between stochastic stock assessment modelling and deterministic Yield-Per-Recruit modelling

**The importance of uncertainty (stochasticity) in stock assessment modelling**

Processes governing maximum sustainable yield (MSY) in fish stocks are recruitment, growth, natural longevity (life span) and annual fishing mortality (incidental and landed catch). Using mathematical representations of these dynamics, fisheries assessment models attempt to describe the past, current and future status of a stock relative to some predetermined target (e.g. 40% B0).

A consideration of "uncertainty" is an important requirement for most stock assessments; the two main forms of uncertainty being natural variability (e.g. recruitment success and growth rates) and the difficulty of representing biological processes mathematically and estimating their parameters from noisy data. Uncertainty in the key dynamics not only leads to uncertainty in the status of stock relative to a management target but also uncertainty in the measure of the target itself (e.g. 40% B0). Conducting a stock assessment that incorporates uncertainty provides insight as to the likely range of the status of the stock. In contrast, running the model with all parameters fixed (known) typically produces only one deterministic outcome, rather than the full range of possibilities. For this reason, a stock assessment based on deterministic modelling (modelling without error) has relatively limited utility.

**Investigating Yield-Per-Recruit using deterministic modelling**

Although deterministic modelling may not be very informative for stock assessments, the approach can be useful for comparing the relative benefits of different harvest strategies through a process termed yield-per-recruit evaluation. Yield-per-recruit (YPR) analysis evaluates the trade-off between leaving a fish in the water to grow and breed (gain in yield-per-recruit) against the risk of it dying through natural causes (loss of yield-per-recruit). Using deterministic modelling it is possible to compare yield gains and losses associated with harvesting fish at different sizes or ages.

Yield-per-recruit comparisons require the model population to be in a steady-state, i.e. a state where the population is neither increasing nor decreasing such that losses through fishing and natural mortality exactly balance gains through growth and recruitment. A fish stock in this state is said to be at "equilibrium". In the "real world" it is virtually impossible to maintain a stock in an equilibrium state due to natural variation in factors governing its productivity. Because YPR relies on deterministic modelling to derive an equilibrium state the absolute values of the YPR results are largely theoretical. Therefore results are usually expressed as relative differences rather than absolutes; e.g. strategy A produces an x% higher yield relative to strategy B.

# Appendix D – Summary of Yield-Per-Recruit and Projection Modelling Results

**Purpose of YPR simulations**

The SNA1 Group was interested in knowing what yield gains could be expected through improving the survival of returned juvenile snapper, changing the minimum legal size (MLS) for snapper, and changing the selectivity characteristics of the main snapper fishing methods. The group was also interested in knowing whether yield gains associated this these measures were sufficient to off-set any need for quota cuts. Deterministic yield-per-recruit modelling was used to investigate the change in equilibrium yield associated with various harvest strategies.

**YPR model description**

The model used for the YPR simulations was a length-based proxy of the age-based model used in the 2013 SNA 1 assessment, having similar growth, mortality and gear selectivity characteristics as the Hauraki Gulf sub-stock. The key differences between the YPR and SNA 1 assessment model are given in Table 1.

Table 1: Key differences between the YPR and 2013 SNA 1 assessment models**.**

| YPR Hauraki Gulf proxy model | 2013 SNA 1 assessment model |
|---|---|
| single area (Hauraki Gulf characteristics) | three area with movement |
| length –based | age-based |
| deterministic model runs | stochastic model runs |
| dead discarded fish included in catch | dead discarded fish not included |

In the YPR model harvest was specified relative to four fisheries in the model:

1. Commercial longline (LL)
2. Commercial single trawl (ST)
3. Commercial Danish seine (DS)
4. Recreational line (REC)

Model estimates of yield represented the total weight of fish LANDED by each of the four method fisheries. The weight of discarded dead fish (discard mortality) was accounted for in the model but did not contribute to the measure of yield.

Since snapper are known to have different vulnerabilities to fishing gears depending on their length, it was critical that the YPR model accommodated the different selectivity characteristics of the various fishing methods. The selectivity characteristics of each fishery in the model can be represented as a curve of relatively selectivity by length (Figure 1).

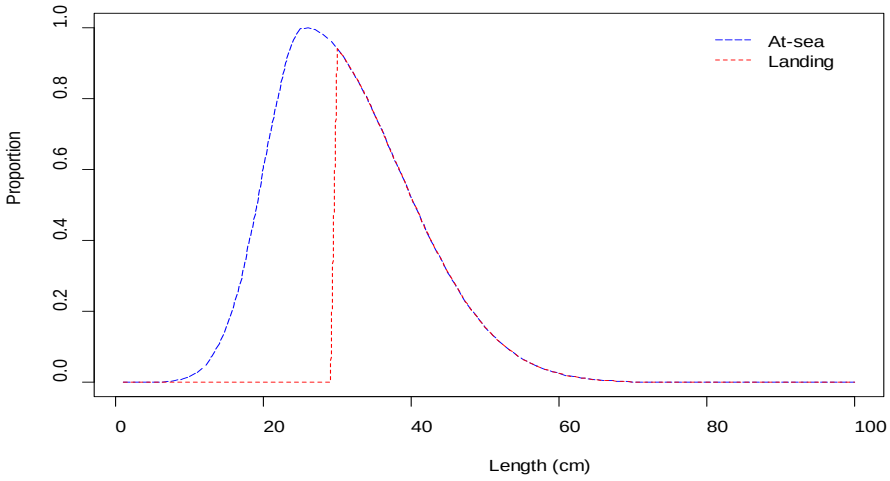



Figure 1: Selectivity curve for the recreational line fishery. The blue line shows the total selectivity of the method by length. From the graph it can be seen that 25 cm snapper are 100% (1.0) selected whereas 60 cm fish are poorly selected. The dotted green line shows the selectivity relative to a 30 cm MLS. A high proportion of snapper less than the MLS are selected by this method implying that a large proportion of the snapper taken by recreational line are likely to be returned to the water.

The model selectivity curves for each method are given in Figure 2, with the blue lines denoting the total at-sea selectivity and the black lines showing the proportion of fish discarded under the MLS that are likely to have died.

The YPR results were tabulated relative to the "status quo" scenario – i.e. the current commercial and recreational MLSs (25; 30 cm) and current assumed levels of discard mortality of 100% for commercial Danish seine and trawl and 10% for commercial longline and recreational line (Figure 2).

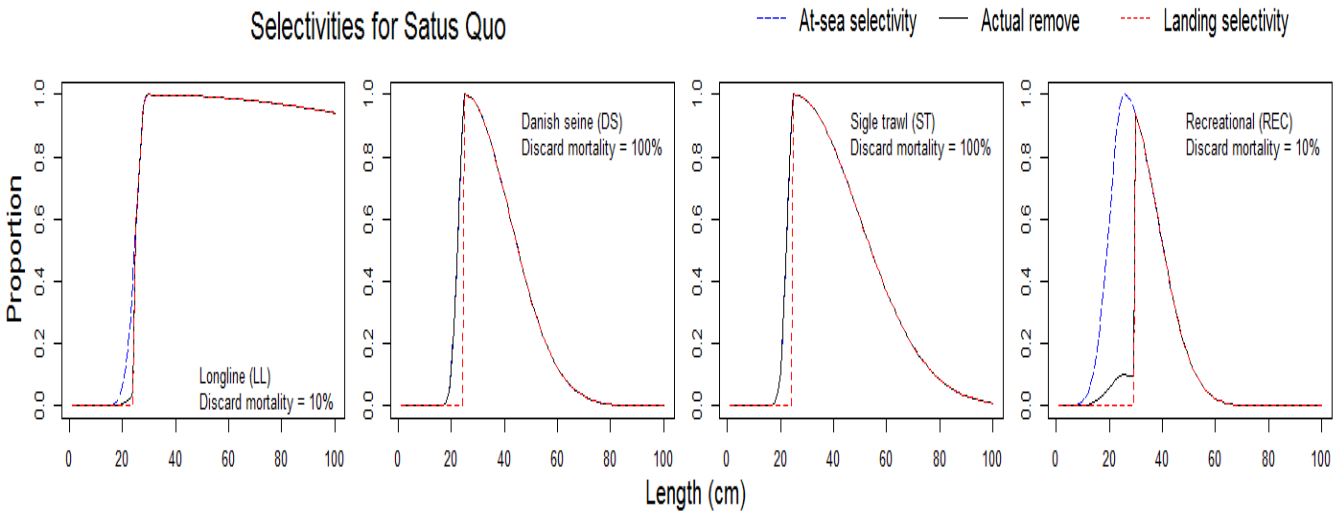



Figure 2: Selectivity curves for the four main fishing gears. The blue lines denote the total at-sea selectivity and the black lines show the proportion of fish discarded under the MLS that are likely to have died.

The yield statistics derived for each harvest strategy pertain to the stock at the target of 40% B0 with the relative landed catch component by fishing method being:

- Commercial longline : 25 %
- Commercial Danish seine: 17.5 %

- Commercial single trawl: 17.5 %
- Recreational line : 40 %

**Simulation results**

**1. Changing MLS and single trawl and Danish seine discard survival**

The first set of model runs investigated equilibrium yield gains and losses at 40% B0 relative to changing the commercial and recreational MLS in combination with reducing the discard mortality for Danish seine and single trawl to 10% (i.e. the level currently deemed to be potentially achievable with the new PSH trawl gear).

Results:

- Changing the recreational MLS up or down resulted in minimal yield gains (< 2%; Table 2).
- Increasing the MLS for the commercial fisheries to 30 cm but not reducing the discard mortality of Danish seine and trawl resulted in a net loss of yield of the order of 6% (Table 2).
- Reducing Danish seine and single trawl discard mortality to 10% resulted in a ~ 4% gain in yield at the 25 cm MLS, with increases to ~ 8% if the commercial MLS is raised to 30 cm (Table 2).

Table 2: Differences in total yield relative to the "status quo" scenario for different combinations of MLS and discard mortality.

| Scenario | Comm MLS | Recreational MLS (cm) 27 | 30 | 33 |
|---|---|---|---|---|
| 100 % DS and ST mortality below MLS | 25 | 0.6% | SQ | 1.4% |
| | 30 | -5.2% | -5.7% | -4.3% |
| 10 % DS and ST mortality below MLS | 25 | 4.3% | 3.6% | 5.0% |
| | 30 | 8.4% | 7.7% | 9.2% |

**2. Changing the selectivity characteristics of Danish seine, single trawl and recreational line**

YPR simulations were undertaken to examine the effect of shifting the selectivity characteristics of Danish seine, single trawl and recreational line methods towards catching larger fish and way from catching smaller fish; i.e. right shifting the selectivity curves given in Figure 2.

Two types of selectivity shift were investigated in the simulations. The first shift-type involved moving the length at maximum selectivity to 30 cm and thereby effectively shifting the whole curve to the right ("right-shift" blue lines in Figure 3). For the second shift type only the length at maximum selectivity and the left hand side of the selectivity curve were shifted, not the right hand side of the curve ("mode-shift" red lines in Figure 3). Again yield comparisons were made relative to the "status quo" scenario at 40% B0.

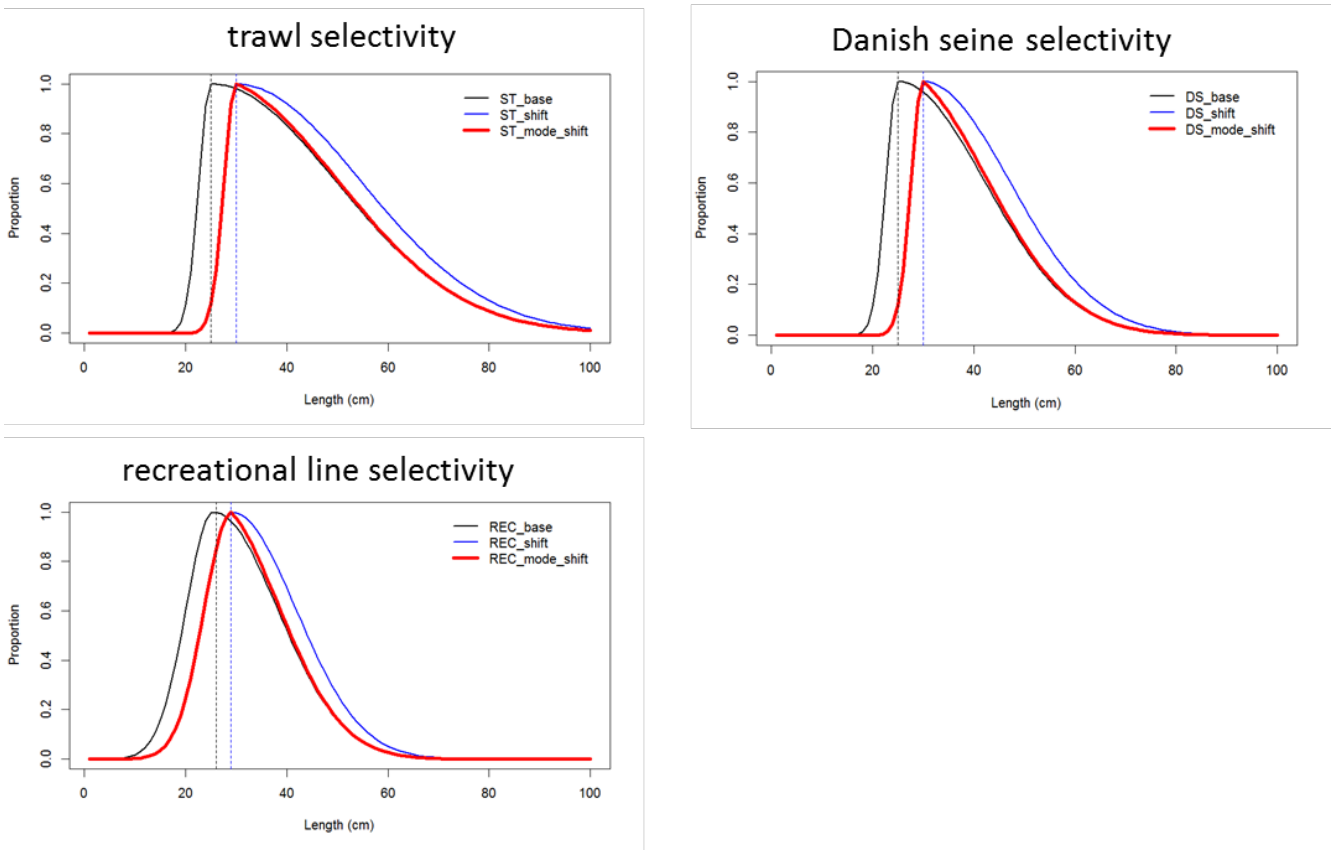



Figure 3: Plots showing the effect of two types of selectivity shifts on the status quo selectivity curves. The blue line is a simple lateral shift to a 30 cm maximum selection (right-shift). The red line is a shift to 30 cm but no shift in the right hand side of the curve (mode-shift).

Results:

- Right shifting the selectivity curves for Danish seine, trawl and recreational fisheries achieved an 18-20% gain in yield at 40% B0 (Table 3); slightly less yield was achieved (17-19%) when the commercial MLS was raised to 30 cm with the Danish seine and trawl mortality remaining at 100% (Table 3).
- Right shifting selectivity and reducing Danish seine and single trawl mortality to 10% resulted in virtually no yield improvement over the 100% mortality scenario; a slight gain in yield (~ 4%) was achieved under a 30 cm commercial MLS (Table 3).
- Yield gains were more modest (7-9%) if only the mode and left hand selectivity was shifted (mode-shift Table 3); reducing Danish seine and trawl mortality resulted in minimal improvement in yield (~ 3%) at an MLS of 30 cm (Table 3).
- Yield gains of the order of 35% were achieved by right shifting the recreational selectivity, moving the entire commercial fishery to the equivalent selectivity and discard mortality levels for longline, and increasing the commercial MLS to 30 cm (Table 3).

Table 3: Differences in total yield relative to the "status quo" scenario for different combinations of gear selectivity, MLS and discard mortality.

| Selectivity and mortality scenarios | Comm MLS | Recreational MLS (cm) 27 | 30 | 33 |
|---|---|---|---|---|
| Right-shift REC, ST and DS selectivity, DS & ST mortality = 100% | 25 | 18.5% | 19.3% | 20.1% |
| | 30 | 17.6% | 18.5% | 19.2% |
| Right-shift REC, ST and DS selectivity, DS & ST mortality = 10% | 25 | 18.6% | 19.5% | 20.2% |
| | 30 | 22.6% | 23.5% | 24.2% |
| Mode-shift REC, DS & ST selectivity, DS & ST mortality = 100% | 25 | 7.2% | 6.9% | 8.6% |
| | 30 | 5.5% | 5.2% | 7.0% |
| Mode-shift REC, DS & ST selectivity, DS & ST mortality = 10% | 25 | 7.4% | 7.0% | 8.8% |
| | 30 | 10.9% | 10.5% | 12.3% |
| Right-shift REC, DS & ST selectivity same as LL DS & ST mortality = 10% | 25 | 31.1% | 31.8% | 32.6% |
| | 30 | 35.6% | 36.5% | 37.2% |

## 3. Investigation of Hauraki Gulf sub-stock potential rebuild times pursuant to various selectivity, discard mortality and MLS scenarios

The SMG were interested in knowing if changing discard mortality, selectivity and MLS changes were likely to improve SNA 1 rebuild times and yields. It was not feasible to do these simulations for SNA 1 as a whole, but it was possible to look at rebuild scenarios for the Hauraki Gulf component of SNA 1. To do this required recalibrating the length-based model used in the above simulations so that it achieved rebuild rates similar to those produced by the 2013 assessment model under status quo conditions. The Hauraki Gulf projection from the 2013 stock assessment declined when the long-term average recruitment was used but increased slightly when the average recruitment from the last 10 years was used. In the time available it only proved feasible to calibrate the length-based model to approximately match the higher-than-average recruitment scenario from the 2013 assessment, so no simulations were done with a lower productivity model configuration (i.e. decreasing stock under status quo harvest). (Note however that the model actually generated recruitment from a deterministic stock-recruitment relationship using a fixed R0 (by definition mean recruitment) and steepness).

All scenario runs involved projecting the Hauraki Gulf stock from its "known" position in 2013 using the observed commercial catches and estimated recreational catches for 2013 and 2014 and constant exploitation rates (note: not constant catch) thereafter until the equilibrium was attained. Catch allocations between the four methods at equilibrium yield were set as per the previous simulations; i.e. (LL; DS; ST; REC): 27%; 17.5%; 17.5%; 40%. In addition to yield estimates, the simulations also provided estimates of the relative changes in catch-per-unit effort (CPUE) for each of the four fishing methods.

Two rebuild projection scenarios were investigated:

1. Projections from the 2013 "known status" using the 2013 exploitation rate (0.08) from 2015 onwards.
2. Projections from the 2013 "known status" using the exploitation rate necessary to achieve equilibrium at 40% B0 from 2015 onwards.

The two rebuild scenarios were run in combination with the five harvest strategy scenarios:

1. Status quo scenario specified as per previous YPR model runs (above);
2. MLS of 30 cm for all commercial and recreational methods; all discard mortalities and all selectivities as per status quo;
3. MLS of 30 cm for all commercial and recreational methods; all discard mortalities reduced to 50% of status quo levels; all selectivities as per status quo;
4. MLS of 30 cm for all commercial and recreational methods; all discard mortalities reduced to 50% of status quo levels; selectivities as follows: REC right-shift; ST right-shift; DS mode-shift; LL unchanged;
5. MLS of 30 cm for all commercial and recreational methods; all discard mortalities reduced to 50% of status quo levels; selectivities as follows: REC right-shift; all commercial catch longline with the longline selectivity and discard mortality of 5%.

**Results from 0.08 exploitation projection runs**

- Yield gains achieved through implementing better yield-per-recruit harvest strategies resulted in larger equilibrium stock sizes (SSB/B0) and higher yield relative to the status quo strategy (Table 4).
- The target of 40% B0 could not be achieved through the implementation of better yield-per-recruit harvest strategies using the 2013 exploitation rate (Table 4).
- The catch rates for all methods improved relative to the status quo due to the combined effect of larger stock sizes and the reduced catch of sub-legal fish from right-shifting gear selectivities; the recreational CPUE had the greatest gains (Table 5).

Table 4: Rebuild times under the constant (2013) exploitation rate (0.08).

| Scenario | Equilibrium SSB/B0 | Exploitation rate | years to reach 30% $B_0$ | years to reach 35% $B_0$ | years to reach 40% $B_0$ | Catch index relative to SQ |
|---|---|---|---|---|---|---|
| 1. SQ | 26.51% | 0.08 | - | - | - | SQ |
| 2. MLS 30; otherwise SQ | 25.95% | 0.08 | - | - | - | 0.98 |
| 3. MLS 30; mortality 50% of SQ; selectivity SQ | 27.58% | 0.08 | - | - | - | 1.04 |
| 4. MLS 30; mortality 50% of SQ; REC, DS & ST selectivity shifts | 29.27% | 0.08 | - | - | - | 1.10 |
| 5. MLS 30; mortality 50% of SQ; REC, selectivity shift; DS & ST catch as LL | 30.70% | 0.08 | 24 | - | - | 1.16 |

Table 5: Change in catch rate (CPUE) relative to SQ catch rates at equilibrium.

| Scenario | CPUE LL | CPUE ST | CPUE DS | CPUE REC |
|---|---|---|---|---|
| 1. SQ | SQ | SQ | SQ | SQ |
| 2. MLS 30; otherwise SQ | 0.88 | 0.87 | 0.86 | 0.97 |
| 3. MLS 30; mortality 50% of SQ; selectivity SQ | 1 | 0.99 | 0.98 | 1.1 |
| 4. MLS 30; mortality 50% of SQ; REC, DS & ST selectivity shifts | 1.13 | 1.32 | 1.15 | 1.68 |
| 5. MLS 30; mortality 50% of SQ; REC, selectivity shift; DS & ST catch as LL | 1.25 | - | - | 1.89 |

**Results from 40% B0 projection runs**

- Rebuild times at exploitation rates needed to achieve the 40% B0 target were similar regardless of the MLS, changes in discard mortalities and selectivity dynamics (Table 6).
- The effect of implementing better yield-per-recruit harvest strategies is seen in higher relative catches at 40% B0 (Table 6).
- The catch rates for all methods improved relative to the status quo; however, because all scenarios achieve 40% B0, the CPUE gains relative to the status quo were largely due to the reduced catch of sub-MLS fish with improved selectivities (Table 7).

Table 6: Rebuild times to attain 40% B0.

| Scenario | Equilibrium SSB/B0 | Exploitation rate | years to reach 30% $B_0$ | years to reach 35% $B_0$ | years to reach 40% $B_0$ | Catch index relative to SQ |
|---|---|---|---|---|---|---|
| 1. SQ | 40.00% | 0.049 | 10 | 19 | 49 | SQ |
| 2. MLS 30; otherwise SQ | 40.00% | 0.050 | 10 | 20 | 56 | 1.00 |
| 3. MLS 30; mortality 50% of SQ; selectivity SQ | 40.00% | 0.051 | 10 | 19 | 48 | 1.04 |
| 4. MLS 30; mortality 50% of SQ; REC, DS & ST selectivity shifts | 40.00% | 0.054 | 9 | 18 | 46 | 1.11 |
| 5. MLS 30; mortality 50% of SQ; REC, selectivity shift; DS & ST catch as LL | 40.00% | 0.057 | 9 | 17 | 42 | 1.17 |

Table 7: Change in catch rate (CPUE) relative to SQ catch rates.

| scenario | CPUE LL | CPUE ST | CPUE DS | CPUE REC |
|---|---|---|---|---|
| 1. SQ | SQ | SQ | SQ | SQ |
| 2. MLS 30; otherwise SQ | 1.06 | 1.07 | 0.93 | 0.87 |
| 3. MLS 30; mortality 50% of SQ; selectivity SQ | 0.98 | 0.98 | 0.98 | 1.06 |
| 4. MLS 30; mortality 50% of SQ; REC, DS & ST selectivity shifts | 1.04 | 1.23 | 1.07 | 1.55 |
| 5. MLS 30; mortality 50% of SQ; REC, selectivity shift; DS & ST catch as LL | 1.10 | - | - | 1.68 |