WWF NZ Submission on the Review of the New Zealand Fisheries Management System

December 2015

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WWF New Zealand thanks the Ministry for Primary Industries for the opportunity to provide comments and ideas into the review of the Fisheries Act and the Quota Management System.

Our comments are focused on three underlying challenges with fisheries management in New Zealand:

1) The information that fisheries management decisions are based on is incomplete and limited. While it may not be possible to have 'full information', there are improvements that can be made.
2) Fundamental theories and frameworks for management and decision-making are limited in their effectiveness to achieve long-term sustainable fisheries and should be updated to reflect the best and most recent science and management practices.
3) The purpose and objectives of current fisheries management legislation are premised primarily on utilisation and should be amended to reflect sustainability of the natural resources as the primary consideration. Furthermore, 'Sustainable utilisation' is a narrow concept that can be interpreted as being concerned primarily, if not solely, with fish stocks. Fishing in New Zealand can and should be concerned with whole of ecosystem impacts and this should be reflected in the Act.

In this submission, the issues under these three challenges are identified and recommendations for the Government[1] are made. There is also an additional issues and recommendations section (that does not fit within these three challenges), and a summary of recommendations at the end.

1 Management decisions based on incomplete and limited information

- Our scientific understanding of the marine environment, fish stocks, ecosystems, and the impacts of human use on ocean resources is limited – in part because of the practical difficulties and economic constraints of conducting ocean research; and also because of problems with monitoring and reporting fishing activity.

- WWF New Zealand recognises that the fundamental basis for good fisheries management is accurate information about fishing activity, and strongly recommend the Government use the fishing reforms as an opportunity to address issues with monitoring and reporting including:
  ➢ Discarding and mis-reporting of catches
  ➢ Problems with reporting location of fishing
  ➢ Lack of reporting of recreational catch

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[1] In this document 'Government' refers to the Ministry of Primary Industries and any other government ministries or official groups involved in fisheries management.

Please see Appendix 1 for detailed discussion of these issues.

1.1 Improving monitoring and reporting

- WWF NZ strongly advocates for issues of discarding and misreporting to be addressed, real-time vessel location monitoring, enhanced monitoring of on-board fishing activity, and independent dockside weighing.

1.1.1 Address discarding and misreporting

- WWF recognises that the incentives that drive fish discarding and misreporting by vessel operators are complex and difficult to solve, however these issues are of critical importance and therefore must be addressed.

- On-board observers are a proven way to minimise discarding (Arnason, 2014). WWF recommends that the Government increase funding and support for an improved and expanded on-board monitoring programme.

- WWF recommends that the Government investigate how the Quota Management System (QMS) could reduce the incentive to discard by better enabling fishers to have a mix of annual catch entitlements (ACE) that more closely reflects the species that they are likely to catch. This could include making quotas more easily transferable, making it possible to move quotas between species to some extent, and enabling fishers to obtain multi-species ACE packages for specific mixed fishery areas (sub areas in a Quota Management Area). These changes combined with fine-scale real-time reporting could enable more responsive spatial management.[2]

1.1.2 Real-time vessel location and complete trawl tracking

- WWF recommends that the Government explore the opportunities as well as the limitations of the use of electronic reporting, and in particular how it could be used to achieve: complete trawl records (including full trawl footprints of small boats as well as big); and real-time monitoring of fishing locations to more quickly and accurately inform observer programmes.

1.1.3 Electronic monitoring and reporting

- WWF is supportive of MPIs work to explore the option of introducing an Integrated Electronic Monitoring and Reporting System (IEMRS) programme. We recognise that technologies will develop and become more effective, so it is important that the Act can enable future application of technologies.

- We recommend amendments to the Fisheries Act and its regulations to enable integration of electronic monitoring on fishing fleets, including the ability to require the use of certain electronic tools, systems and devices.

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[2] Please see Arnason (2014) for further analysis and recommendations for reducing discards in IQ/ITQ managed fisheries.

1.1.4   *Independent dockside weighing*

- Independent dockside weighing has been effective in other parts of the world (particularly Iceland) to improve accuracy of catch records[3] and we recommend the Government explore whether it would also be useful in the New Zealand context.

1.1.5   *Improved monitoring of recreational fishing*

- WWF considers that the first step towards improving management of recreational fishing is to enable systematic and effective monitoring of recreational fishing catches.[4] However we also recognise the cultural shift that will be required to achieve this and the time that this could take.

- We recommend that the Government continue existing work engaging recreational fishers at local and regional levels to develop bottom-up support for solutions. In addition, the Government should continue trailing new approaches for recreational fishing monitoring and potential new tools and processes such as the use of smart phone apps as part of the proposed recreational fishing parks.

2   Updating management theories and frameworks in-line with the best science and practice

- The fundamental theories and frameworks for fisheries management and decision-making are outdated and limited in their effectiveness to achieve long-term sustainable fisheries, and need to be updated.

- Single species stock management aimed at fishing stocks to their biomass at which they produce Maximum Sustainable Yield (bMSY), is not adequately ensuring that New Zealand will have healthy fish stocks in the future. The impacts of single stock management based on (bMSY) include: overfishing of target stock, changes in stock age structure and reproductive capacity, and increased stock vulnerability to environmental fluctuation and long-term climate change. Fishing also has wider impacts on the marine community and ecosystems, including: cumulative degradation of the food web, loss of biodiversity, and decreased resilience to climate change. See Appendix 1 for evidence and discussion of these significant impacts of the bMSY approach.

- A key underlying problem with single species management under the QMS is that it largely does not account for links between species – such as the impact of fishing one species on

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[3] However we realise that it will not help measure discarding at sea.
[4] Recent advice from the International Council for the Exploration of the Sea (ICES) European Union highlights the important uses of data on recreational fisheries (ICES, 2015). These include: i) Improving information used to set catch levels; ii) Design and evaluation of management measures for recreational fisheries; iii) Development and evaluation of management plans/strategies involving recreational fisheries; and iv) Marine spatial planning purposes.

other species, the links between fish and their environment, or the cumulative impacts of fishing and climate change.[5]

- WWF New Zealand recommends that the Government start making steps towards some changes in fisheries management that are required to bring our management up-to-date and ensure sustainability of our fish resources. This includes:
  - ➢ Creating an iterative pathway towards EBFM
  - ➢ Building more precaution into TAC setting
  - ➢ Developing the science for the effective implementation of EBFM
  - ➢ Enabling trials and studies of EBFM

2.1 Steps towards EBFM

- Increasingly around the world, fisheries management is evolving from single species stock management to ecosystem-based fisheries management (EBFM).[6] However, it is not simple and will not happen quickly. We are unlikely to ever fully understand all of the interactions within complex marine ecosystems, so EBFM should be viewed as an on-going process of improving our understanding of how ecosystems work and learning how to make use of this information in management decisions. The impossibility of perfection should not be used as an excuse to avoid trying to be better.

- New Zealand's fisheries management regime is still primarily managing single stocks, however there is well established understanding and significant agreement within the scientific community of the need to move towards EBFM. There has already been progress to build the scientific foundations required for EBFM such as indicators to monitor the marine environment and ecosystems, and there is some important (NIWA) research going on to test marine ecosystem models such as Atlantis, Ecopath and Ecoism.[7]

- While we recognise that more work is needed to develop the knowledge, experience, and science about EBFM to justify large changes to legislations, the following important initial and incremental changes should be made now:
  - ➢ Incorporate management objectives that will safeguard and build resilience of marine ecosystems (explained more in section 3.2)
  - ➢ Set more precautionary catch limits that build in consideration of the links between different species and the impacts of fishing on food webs and ecosystems
  - ➢ Enable trials of EBFM approaches, such as through functional groups and geographically based fishing communities for some inshore areas rather than the more centrally-run single species approach. This could include improving options for fine spatial (sub-quota management area) management.

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[5] WWF NZ acknowledges that some multi-species management is undertaken under the QMS
[6] EBFM recognises the combined physical, biological, economic, and social tradeoffs for managing the fisheries sector as an integrated system, specifically addresses competing objectives and cumulative impacts to optimise the yields of all fisheries in an ecosystem (Patrick and Link, 2015).
[7] For example see: Eddy et al. (2015).

2.2 Building more precaution into TAC setting

- There is a strong body of evidence showing that sustainable fisheries requires including more precaution into management decisions, which means keeping stocks larger to account for and buffer against increasing climatic variability and longer-term climate change (NOAA, 2015; Britten et al, 2015.[8]

- Fisheries managers around the world are using or testing out more precautionary management tools for setting catch levels such as Maximum Economic Yield – which leaves more fish in the sea; multispecies maximum sustainable yield (mMSY)[9] which is a move towards recognising the links between species and the wider ecosystem impacts of fishing, and which also result in stocks being kept at a larger biomass[10]; and fishing a balanced proportion of fish species from particular ecosystems to maintain stable trophic dynamics/ food webs (OHI, 2015, Hilborn, 2011).

- WWF encourages the Government to look at more precautionary models for TAC setting and at the minimum – Bmsy should be a limit for stock management in the Fisheries Act, rather than a target. New Zealand's Harvest Strategy Standard recognises the importance of maintaining stocks above Bmsy, and legislation needs to explicitly reflect this best-practice.[11]

- Bmsy as a limit needs to be set at a level that accommodates the natural fluctuations in a stock and will not result in biomass dropping below the soft limit. For example, in hoki, the Bmsy can be estimated to be around 25% of the biomass, but if it was at this level it would regularly drop below the soft limit (20% of the biomass) because of natural fluctuations, therefore Bmsy needs to be set higher (Ministry of Fisheries, 2008).

2.3 Develop the science for EBFM

- Moving towards EBFM requires building understanding and knowledge of the impacts of fishing on the wider ecosystems as well as the environmental (climatic and oceanographic) effects of fishing on fish. NIWA has produced some robust and useful analysis of the science and knowledge gaps, along with providing recommendations to improve data collection

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[8] Overall, a less-heavily fished marine system, and one which shifts the focus from individual species for functional group and fish communities, is likely to provide more stable catches with climate variability and change than would a heavily fished system (Perry et al., 2010).

[9] Multispecies maximum sustainable yield (mMSY) is the highest average catch (by weight) of all target species in a region that could be caught over time without causing a decline in any single species.

[10] mMSY is the highest average catch (by weight) of all target species in a region that could be caught over time without causing a decline in any single species (http://www.oceanhealthindex.org/Components/Fisheries_Catch/).

[11] The Operational Guidelines for New Zealand's Harvest Strategy Standard recognises that "*even from a single-species perspective, maintaining stocks above BMSY can be beneficial. For relatively small sacrifices in yield, average biomass can be maintained relatively far above BMSY, resulting in reduced sustainability risks, and higher catch per unit effort and therefore reduced costs of catching fish.*" (Ministry of Fisheries, 2011, p1)

about biological and environmental indicators of marine ecosystems (Pinkerton, 2010) with particular relevance to deep water fisheries (Tuck et al, 2014).[12]

- We recommend that the Government implement the recommendations of Tuck et al (2014) and Pinkerton (2010) that will build essential science for EBFM.[13]

2.4 Enabling trials and studies of EBFM

- Testing models of EBFM will be an important step for New Zealand as it has been overseas. In the USA, regional fishery management councils have developed fishery ecosystem plans that work within existing single species stock management framework (Patrick and Link, 2015).

- WWF recommends that the Government enable groups (such as Quota holders) to develop and trial fishery ecosystem management plans for specific case study sites. The existing Fishery Management Plans under the Fisheries Act could be used for this purpose, but amendment to the Fisheries Act may be needed to enable this.

- EBFM approaches for inshore areas could also trial engagement with a wider land-use stakeholder group given the impacts of agriculture and forestry on some inshore fishing grounds.[14] The Ministry for Primary Industries, which encompasses all of these industries, would seem to be in an ideal position to encourage or facilitate engagement across these sectors.

3 Amendments for better utilisation – sustainability balance

- We consider that the current purpose of the Fisheries Act is weighted towards utilisation rather than sustainability/maintaining marine biodiversity and that the Fisheries Act should be amended to reflect sustainability of the natural resources as the primary consideration.[15] One example of how utilisation is prioritised over sustainability objectives, is the poor management of the benthic impacts of fishing and the fact that destruction of benthic

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[12] Measuring biological and environmental indicators supports fisheries management decisions by (1) describing the pressures affecting the ecosystem, the state of the ecosystem and the response of management to these, (2) tracking progress towards meeting management objectives, and (3) communicating trends in complex impacts and management processes (Jennings 2005).

[13] Please contact WWF NZ if you would like us to provide a summary of the two reports (Tuck et al, 2014 and Pinkerton 2010).

[14] WWF New Zealand recognises that better coordination and integration of land-based and marine natural resource legislation and policies will be necessary for effective management of land based impacts on fisheries such as marine pollution from agricultural nutrient waste and sedimentation. Through the Reconnecting Northland Programme WWF New Zealand is working in the area of freshwater ecosystem restoration which will reduce sediment inputs to the marine environment over time. WWF New Zealand is open to working with the Government to find solutions and ways to better enable these types of efforts.

[15] One example of how utilisation is prioritised over sustainability objectives, is the poor management of the benthic impacts of fishing and the fact that destruction of benthic habitats and ecosystems is allowed to occur before science has even been carried out to see what lives there (Clark and Dunn, 2012).

habitats and ecosystems is allowed to occur before science has even been carried out to see what lives there (Clark and Dunn, 2012).

- While the purpose of the Fisheries Act is carved out of the current review, we note that there is a Cabinet driven mandate to improve the clarity of the objectives of fisheries management in New Zealand.[16] We consider that this review provides the opportunity to clarify the principles and objectives, and to achieve greater balance between sustainability, conservation and utilisation by:
  - ➢ Including the precautionary approach in Section 9 of the Fisheries Act
  - ➢ Including a new objective that recognises the significance of climate change for fisheries management

3.1 Include the precautionary approach in Section 9 of the Fisheries Act

- We acknowledge that the precautionary approach is already enshrined in the Fisheries Act for the conservation and management of straddling fish stocks and highly migratory fish stocks.[17] We recommend that the precautionary approach be a guiding principle for all fisheries management, and therefore recommend it be included as an additional principle in Section 9 of the Fisheries Act with words to the following effect:

  Management decisions should be guided by the precautionary approach that ensures that lack of full scientific certainty is not used as a reason for postponing measures to prevent environmental degradation.

- Specific guidelines for application of the precautionary approach as a general principle for sustainability in the Fisheries Act should be informed by the guidelines set out in Schedule 1A, Part II, Article 6 of the Fisheries Act.[18]

- Some specific management actions that we recommend are taken to implement the precautionary principle include:

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[16] We note that when Cabinet approved the Fisheries 2030 strategy, it was agreed that legislative change would be required to "*improve management planning by providing clarity and certainty about environmental limits and management objectives.*" (Cabinet Economic Growth and Infrastructure Committee, 18/8/2009)

[17] Fisheries Act 1996, Schedule 1A.

[18] Schedule 1A, Part II, Article 6 provides guidelines for the application of the precautionary approach in relation to the management of straddling fish stocks and highly migratory fish stocks and highly migratory fish stocks:
- (a) improve decision-making for fishery resource conservation and management by obtaining and sharing the best scientific information available and implementing improved techniques for dealing with risk and uncertainty;
- (b) apply the guidelines set out in Annex II and determine, on the basis of the best scientific information available, stock-specific reference points and the action to be taken if they are exceeded;
- (c) take into account, inter alia, uncertainties relating to the size and productivity of the stocks, reference points, stock condition in relation to such reference points, levels and distribution of fishing mortality and the impact of fishing activities on non-target and associated or dependent species, as well as existing and predicted oceanic, environmental and socio-economic conditions; and
- (d) develop data collection and research programmes to assess the impact of fishing on non-target and associated or dependent species and their environment, and adopt plans which are necessary to ensure the conservation of such species and to protect habitats of special concern.

➢ Actions to improve benthic protection
➢ Precautionary protocol for new fisheries

3.1.1 Improve benthic protection

- The high biodiversity and endemism in our deep seas make them of global interest and importance. WWF considers it important that management of benthic environments includes more proactive research and conservation to balance and mitigate the current significant fishing impacts.[19] Please see Appendix 1 section 5.3 for detail about the impacts of fishing on the sea floor. Appropriate actions include:
  ➢ A trawl foot print freeze
  ➢ Spatial management (including a network of open and closed areas)
  ➢ Limits on proportion of habitat type area that can be trawled
  ➢ Move on rules

Trawl foot print freeze

- Due to the extensive impact of bottom trawling and very slow recovery of habitats post fishing, vulnerable and ecologically important benthic habitats need protection measures in place before fishing occurs (Clark and Dunn, 2012).

- WWF strongly advocates for a freeze on the trawl footprint until adequate research[20] has been done and protection measures have been implemented to safeguard a network of representative benthic habitats and ecosystems.

Spatial management for the deep sea

- Specialists in deep sea ecology and fisheries science recommend that spatial management is the best, and perhaps the only, method to balance sustainable fishing objectives with those of habitat and biodiversity protection. This approach is best achieved by implementing a system of zones which can allow exploitation in productive fishing areas, while protecting vulnerable or sensitive species and habitats. Typically, this involves a network of open and closed areas, with closure of unfished areas where benthic communities occur in their natural state (Clark, 2015; Clark and Dunn, 2012; Johnston and Santillo, 2004).[21]

- WWF New Zealand recommends that a representative network of marine protected areas be established and we support the creation of marine protected areas framework legislation that covers the EEZ as well as the territorial sea.

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[19] There are closed seamounts and benthic protection areas that ensure a portion of our protected coral fauna in the region are not impacted by fishing. However in terms of the size of our zone and depths of some of the closed areas, the protection from trawling is not a huge in the deep-sea (Tracey, pers. comms.)

[20] The areas of required research would include habitat and fauna, biodiversity, species mix, depth range, connectivity, and capacity for recovery (Tracey, pers. comms).

[21] This assumes that some benthic habitats will be heavily impacted, perhaps even destroyed by fishing, and some will be completely protected – just as some forests are destroyed for land conversion to pasture, and preserving representative habitats in national parks and reserves. Considering that there can be many ecologically important and distinct areas within sea mounts, it is better to protect some entire sea mount areas instead of protecting a part of a sea mount (Clark and Dunn, 2012)

- We recommend that the Government lead or outsource more research concerning the impacts of fishing on the benthic environment in order to scope areas for protection. More information is needed about sensitive habitat areas and what refuges may exist for vulnerable species such as corals as the oceans warm and the ocean chemistry changes.

Trawling limits associated with benthic habitat types

- Analyses of bottom trawling impacts on different benthic habitat types (BIOMEC classification), shows that some types of benthic habitat experience much greater impact. For example, 6 out of the 15 BIOMEC classified benthic habitats have had more than 40% of their area impacted by trawling between 1989/90 and 2010/11, and 73% of one habitat type has been trawled (Black and Tilney, 2015).

- WWF New Zealand recommends that the Government establish limits on allowable bottom trawling impact to protect particular habitat types from being impacted to a level at which they can no longer sustain their associated biodiversity to a robust level. WWF New Zealand recommends that MPI fund research to inform the development of trawling impact limits for different habitat types, with the objective of protecting the biodiversity of benthic ecosystems.

Move-on-rules

- We recommend that Government explore the application of move-on-rules within New Zealand's EEZ. Currently move-on-rules are used in the SPRFMO[22] area and in the Ross Sea under CCAMLR[23] rulings to limit fisheries impacts on sensitive or rare benthic communities. If fishing vessels catch a certain amount of benthic by-catch, they must move to a new area. These rules could be useful for within the New Zealand EEZ (Tracey pers. comms).

3.1.2 Precautionary management protocol for new fisheries

- There is a particular need for precaution in the case of the discovery of new fisheries. Past experience (particularly with orange roughy) shows that fishers can develop fisheries and deplete stocks very quickly – well before scientists have had a change to study the stock or its habitat (Clark and O'Driscoll, 2003; Clark and Dunn, 2012). Establishing some protocols for new fisheries could help to ensure that this does not continue to happen.

- WWF New Zealand recommends that Government consider developing a protocol for new deep sea fisheries. This could involve:
  - ➢ Ban on bottom trawling in virgin/unfished areas until habitat and fauna has been scoped and sensitive and important benthic habitats have been adequately protected
  - ➢ Establishment of precautionary catch limits (potentially feature-based catch limits) to enable initial stock assessment research

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[22] South Pacific Regional Fisheries Management Organisation.
[23] Convention on the Conservation of Antarctic Marine Living Resources.

➢ Require credible scientific evaluation and monitoring of the resource to justify higher catch limits, and precautionary and responsive fishery management must be implemented and enforced

3.2 Include new objective: to build resilience of marine ecosystems to climate change

- We see an important gap in the current objectives to be the lack of reference to climate change. Climate change will increasingly drive variability and change in our oceans, and marine management policies need to more explicitly address climate related challenges (NOAA, 2015; Britten et al, 2015). As outlined in Appendix 1 section 5.4, current fishing practices make fish populations and marine ecosystems more sensitive to climate variability, and less able to adapt to long term climate change (Perry, et al., 2010).

- WWF recommends that the Fisheries Act be amended to include the objective: *to build resilience of marine ecosystems to climate change.* This essential management objective will help to future-proof the Fisheries Act by guiding measures and regulations necessary to safeguard the New Zealand fishing industry from impending climate change impacts. Examples of management goals that would help achieve this objective include:
  ➢ Maintaining demographic structure in fish population i.e. maintain large (older) individuals in exploited populations[24]
  ➢ Maintaining spatial structure in fish populations
  ➢ Maintaining genetic diversity and life history traits in exploited fishes, i.e. use indicators such as growth rate and age-at-maturity in target species
  ➢ Maintaining buffering capacity of populations to environmental and ecosystem variability by keeping populations larger
  ➢ Maintaining functional biodiversity in middle trophic level groups (Perry et al., 2010)

- Examples of management actions that would fall under the proposed objective to build resilience of marine ecosystems to climate change include:
  ➢ Protecting representative habitats to safeguard biodiversity (biodiversity being essential for resilience)
  ➢ Protecting other areas to enhance fishing productivity (spawning areas and nursery habitats).

3.2.1 Protecting representative habitats

- There is strong scientific evidence that one of best ways to protect marine biodiversity and maintain or build resilience of ecosystems to the cumulative effects of fishing and climate change, is to build a network of protected areas that contains representative habitats and ecosystems, as well as vulnerable and ecologically important habitats and species (endemic and rare/threatened species) (Riemer et al. 2015; Levin and Lubchenco, 2008).

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[24] A balanced age structure (where the biomass is made up of numerous age classes) provides a buffering capacity to the stock, dampening the effect of recruitment variability caused by short-term environmental fluctuations, and hence minimizes the influence of the environment on the stock (Planque *et al.*, 2010).

3.2.2 *Protected areas as a fisheries management tool*

- Protected areas are increasingly becoming used around the world as fisheries management tools.[25] Protecting structured habitats, nursery grounds, and fish spawning areas can help sustain fish reproduction, resilience and abundance of target species populations (Reimer, et al. 2015; Low et al 2003). It is for these reasons that the Southeast U.S. fishery managers are considering a proposal to protect certain areas where fish live and spawn. The proposed spawning special management zones would target small, important areas on the edge of the continental shelf.[26]

- Protections for spawning sites can maintain healthy populations and help the recovery of struggling species. In some spawning areas where resource managers have limited fishing, fish have grown larger and more numerous, and their populations expanded over a wider area, replenishing nearby fishing grounds. In these areas, fish also produced greater numbers of eggs that were more likely to survive and hatch. Additional species are attracted to this abundance, leading to the growth of robust food webs. Safeguarding spawning sites is a proven way to help fish flourish and replenish the oceans with life (PEW, 2014).

- WWF NZ recommends that the Government take active steps to implement the existing environmental principle in the Fisheries Act to protect habitats of particular significance for fisheries management.[27] Steps include learning from and implementing what has been proven successful in other parts of the world.[28]

4 Additional issues and recommendations

4.1 Reduce by-catch of protected species

- Catch of non-target species (by-catch) in commercial fishing is a significant focus of WWF NZ's work, and we are engaged in various government and stakeholder processes concerning Māui dolphins, sea lions and sea birds. We will use these worZk streams contribute to specific management and conservation work, however we wish to make some general comments regarding bycatch of protected species. WWF encourages the Government to:
  - ➢ Provide more funding for essential research identified in the Threat Management Plans for Sea Lions and Māui dolphins
  - ➢ Implement important management recommendations from the Threat Management Plans, and National Plan of Action for Sharks, and Southern Sea Bird Solutions Trust
  - ➢ Provide more support for industry efforts and programmes to improve practices and make changes that will reduce by-catch of protected species

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[25] 24% of 1600 of marine protected areas in the USA are focused on sustainable fisheries (Wenzel and Brock, 2013)

[26] http://www.pewtrusts.org/en/research-and-analysis/fact-sheets/2015/08/protecting-fish-spawning-sites

[27] Fisheries Act 1996, Section 9c.

[28] WWF NZ is undertaking further research into protected areas as fisheries management tools and can provide more information at the request of MPI.

4.2 Make required links between Fisheries legislation and Marine Protected Area Legislation

- There will need to be clear links between Fisheries Act and the Marine Protected Areas (MPA) Act to ensure the sharing of information for management decisions. For example, there will need to be estimates of the expected fishing displacement[29] from MPAs (increased fishing pressure in areas outside of MPAs) to determine whether there needs to be a "sustainability adjustment" in the QMS.

- WWF recommends that the Government take the opportunity that the reforms provide to build science for improved fisheries management. MPAs have significant research value as scientific controls, providing baseline information of un-fished areas, which can be useful to improve stock assessment (IUCN, 2008).

4.3 Ensure independence of fisheries research

- WWF New Zealand considered it essential that fisheries research remains as independent as possible. We support the existing engagement forums and other mechanisms for industry and stakeholder input into setting the fisheries research agenda, however we recommend that Government ensure that the scientists undertaking the research are independent from industry or any other stakeholder group.

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[29] Displacement refers to when a closure intended to protect one vulnerable species or area may increase unintended fishing pressure on another species or areas (Wenzel and Brock, 2013).

5 Summary of recommendations

Management decisions based on incomplete and limited information

- To improve the information that management decisions are based on, WWF NZ recommends that the Government improve monitoring and reporting by:
  - ➢ Exploring ways to better enable fishers to have the correct mix of ACE to reduce the incentive to discard
  - ➢ Increasing funding and support for expanding and improving the on-board observer programme
  - ➢ Making changes to the Fisheries Act and its regulations to enable the uptake of electronic monitoring on fishing fleets, including the ability to require certain electronic systems and devices to be used in the future
  - ➢ Investigating the opportunities as well as the limitations of electronic reporting, and in particular how it could be used to achieve complete trawl records, and real-time monitoring of fishing locations to more quickly and accurately inform observer programmes
  - ➢ Investigating technological solutions for mitigating discarding (e.g. electronic recording of catch weights)
  - ➢ Developing a recreational fishing monitoring programme (and potential tools and processes such as the use of smart phone apps) for trialling in the proposed recreational fishing parks
  - ➢ Engaging recreational fishers at local and regional levels to develop bottom-up support for solutions to improve monitoring of recreational catch; and trialling new approaches for recreational fishing monitoring and potential new tools and such as the use of smart phone apps as part of the proposed recreational fishing parks.

Updating management theories and frameworks in-line with the best science and practice

- To update the New Zealand fisheries management system to more effectively ensure the sustainability of fish resources, we recommend that the Government:
  - ➢ Make steps towards EBFM
  - ➢ Build more precaution into TAC setting and, at the minimum, establish Bmsy as a limit for stock management in the Fisheries Act, rather than a target
  - ➢ Continue to build the science for EBFM including implementing some of the research recommendations of Tuck et al (2014) and Pinkerton (2010)
  - ➢ Enable trials and studies of EBFM including making the necessary amendments to the Fisheries Act to enable groups (such as Quota holders) to develop and trial fishery ecosystem management plans for specific case study sites

Achieve a better balance between utilisation and sustainability

- To achieve better balance between utilisation and sustainability the Fisheries Act should reflect sustainability of the natural resource as the primary consideration. WWF recommends that the Government amend the Act to:
  - ➢ Include the precautionary approach as a guiding principle of sustainability in Section 9 of the Fisheries Act. Management actions in the precautionary approach should include

improving benthic protection and developing a precautionary management protocol for new fisheries

➢ Include the objective: *to build resilience of marine ecosystems to climate change*. Management actions under this new objective should include protecting representative habitats, and protecting areas to enhance fisheries

Reduce by-catch of protected species

- WWF NZ encourages the Government to take further action to reduce by-catch of protected species through:
  - ➢ Providing more funding for essential research identified in the Threat Management Plans
  - ➢ Implementing important management recommendations from the Threat Management Plans, National Plan of Action for Sharks, and Southern Sea Bird Solutions Trust
  - ➢ Providing further Government support for industry efforts and programmes to improve fishing practices and to implement changes that will reduce by-catch of protected species

Link the Fisheries Act and the new Marine Protected Areas Act

- WWF NZ recommends that the Government make the required links between Fisheries legislation and Marine Protected Area Legislation, including accounting of fishing effort displacement from MPAs, and use MPAs to build science for improved overall fisheries management.

Ensure independence of fisheries research

- WWF New Zealand recommends that Government ensure that the scientists undertaking the research are independent from industry or any other stakeholder group.

6 Appendix 1: Impacts of fishing on marine ecosystems

Analysis of the impacts of fishing on marine ecosystems is necessary to identify issues that the fisheries management regime must address. Some of the most serious impacts of fishing on target fish stocks include: overfishing, changes in stock age structure and reproductive capacity, and decreased genetic diversity within stocks. All of these impacts make stocks more vulnerable to environmental fluctuation and long-term climate change. Fishing impacts on the wider marine community and ecosystems include: cumulative degradation of the food web, reduced biodiversity and decreased resilience to climate change. Additionally, bottom trawling causes long-lasting damage and destruction of benthic habitats and communities.

6.1 Impacts on target fish stocks

6.1.1 Over fishing

- Over fishing of fish stocks directly affects the target stock, as well as the wider food web and ecosystem. In 2010, 31% of the fish stocks in New Zealand for which there was available stock status (119 out of 633 stocks in total) were considered to be below maximum sustainable yield target levels, and almost a quarter (24%) of fish stocks experienced overfishing.[30] Nine stocks were collapsed,[31] and only three of the collapsed stocks were closed to fishing (MfE 2010).

6.1.2 Changes in stock age structure and reproductive capacity

- Fishing often targets the larger fish which can change the age structure of fish stocks, with significant affects on stock reproduction and resilience to environmental fluctuations (Brunel and Piet, 2013; Longhurst, A. 2006; Planque et al, 2010). Harvesting the large older fish is a problem because they have a higher reproductive value than those which are young and small. Large/old fish spawn over extended time periods (within a year) and over greater areas, compared to young/smaller fish. Additionally, the eggs produced by larger/older fish have higher rates of survival. A reduced age structure may therefore lead a population to literally 'put all its eggs in the same basket' by spawning highly vulnerable eggs in a reduced time/space window (Perry, et al. 2010; Wright and Trippel, 2009).[32]

6.1.3 Increased vulnerability to environmental fluctuation and long-term climate change

- When the stock age structure is truncated by fishing, with the effect that spawning is limited to a smaller season and space, the recruitment rate is extremely susceptible to climate conditions at the time of spawning, hatching and larval development (Perry et al., 2010).

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[30] MfE defines overfishing as when the rate at which fish are extracted exceeds the rate that produces maximum sustainable yield (MfE 2010).

[31] Below 10% of the pre-fishing biomass, or quarter of the biomass needed to produce MSY, which ever is higher yield (MfE 2010).

[32] Studies have found that the age structure of the spawning population may be as important as its biomass in determining the reproductive potential of a stock (Planque *et al.*, 2010; (Wright and Trippel, 2009).

- Fishing also leads to a spatial contraction of fish populations (they live in a smaller area), loss of genetically distinct population sub-units, alteration of life history traits, and reduced genetic diversity within populations.[33] All of these effects make fish populations more sensitive to climate variability over years and decades (Perry, et al. 2010).

6.2 Impacts of fishing on wider marine community and ecosystems

6.2.1 Cumulative degradation of the food web

- Studies have shown managing multiple fish stocks at the Maximum Sustainable Yield (MSY)[34] level (as New Zealand currently does) can potentially lead to chronic and cumulative degradation of the food web (Cury and Christensen, 2005; Jennings et al., 2002; Jackson et al 2001; Branch 2009), also referred to as ecosystem overfishing (Murawski, 2000; Coll et al., 2008).

6.2.2 Increased vulnerability to short-term environmental fluctuations

- Intensive fishing affects the wider fish community structure in ways that make communities less stable and more vulnerable to environmental fluctuations (Perry, et al. 2010). Fishing impacts of community structure include:
  - Reduced mean size of individuals and mean trophic level of communities
  - Altered patterns of predation and competition[35]
  - Decreased species richness/diversity[36]

6.2.3 Increased vulnerability to long-term climate change

- Fishing also affects the ability of species to adapt to longer term incremental climate change, by reducing the genetic diversity within and among species. Fishing can drive simplification of the structure of ecosystems by removing top predators and decreasing intraspecific and interspecific diversity (Perry et al., 2010). The presence of genetic diversity within and among species increases the ability of species to adapt to the physiological consequences of climate change and the changes in prey and predators that will also occur (Perry, et al., 2010).

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[33] The potential for fishing to cause rapid evolutionary change in fish species is now well established. Changes include maturation occurring at a lower age or size (Swain, et al. 2007, Pinkerton, 2009). Life history traits of fish (age distribution, sex ratio, and age structured fecundity) are evolved to make the most of all aspects of their environment. Therefore, changes to fish physiology and age structure may reduce their natural resilience to stress associated with variably (Tuck et al. 2014).

[34] Maximum sustainable yield (MSY) is a term used in fishery management to describe the highest average catch (by weight) that does not reduce a stock's abundance over time, taking into account the stock's reproductive and growth capacities under prevailing environmental conditions (OHI, 2015).

[35] Fishing drives changes in food webs including patterns of predation and competition. By removing top predators, fishing can drive increases in the biomass and production of species at lower trophic levels. These types of changes may not easily be reversed because the now-dominant middle trophic level species is now a predator on the early life stages of the former top predator.

[36] Biodiversity is hypothesised to be a major determinant of ecosystem stability (Hooper et al., 2005).

6.3 Impacts of trawling on sea flood (benthic) habitats and communities

6.3.1 Long lasting damage/destruction of marine habitats

- There is clear evidence of a substantial impact on benthic fauna from deep water trawl fisheries in New Zealand, and the consequential need for active management to conserve these environments (Clark and O'Driscoll, 2003).[37] A study of the bottom trawl footprint on different benthic habitat types (BIOMEC classified) shows that 6 out of the 15 unique benthic habitats experience trawling over 40% or more of the total habitat area (MPI, 2015).[38]

- The practice of bottom trawling often causes substantial and irreversible harm to fragile benthic ecosystems and dependent species, presenting significant challenges for the sustainability of fisheries and broader ecosystem function and resilience (Clark et al, 2015; Williams et al. 2010).

- The recovery of benthic ecosystems after trawling is likely to take more than a year (National Research Council, 2002), and for deep sea features (such as sea mounts) that are home to long-lived and slow-growing invertebrates, recovery is predicted to take decades to centuries after fishing has ceased (Malcom et al. 2015).[39] The fauna of seamounts off Australia and New Zealand have shown no evidence of recovery to an unfished state even after 5-10 years of no trawling (fishing closures) (Williams et al. 2010).

6.3.2 Loss of opportunities for science and conservation

- The rapid rate of fisheries development in the past has seen extensive trawling damage occurring well in advance of scientific research assessing the benthic communities involved. For example, the development of an orange roughy fishery off the East Cape began with heavy fishing on one seamount, but rapidly extended within 2 years to a further 11 adjacent features. This occurred before any study of the benthic habitats in the region (Clark and O'Driscoll, 2003).

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[37] The total area trawled for all species in the New Zealand oceans from 1989/90 to 2010/11 is estimated to be 383 085 km² - which is about 9% of the EEZ and TS, and 27% of the 'fishable area' (Black and Tilney, 2015). The 'fishable area is defined to be shallower than 1600 m and outside all Benthic Protection Areas (BPAs), Seamount Closure and Marine Reserve areas) (Black and Tilney, 2015). The fishable area in the TS and EEZ is 1 408 210 km² (34% of the total area of seabed in the TS and EEZ) (Black and Tilney, 2015).

[38] In 2012 NIWA produced a Benthic-optimised Marine Environment Classification (BOMEC) for New Zealand waters (Leatherwick et al. 2012). There are fifteen BIOMEC classes – representing proxies for various benthic habitats.

[39] Stony corals that dominate the biomass of seamount megafauna on seamounts and ridge structures are very slow growing and long lived, which is why it takes so long for these habitats to recover from fishing damage (Clark and Dunn, 2012).

- While the extent of virgin ground trawled each year continues a downwards trend, new areas continue to be trawled (2958 km2 of sea floor was trawled for the first time in 2010/11)[40] and the intensity of trawling is increasing (Tilney and Black, 2015).[41]

6.4 Cumulative impacts of fishing and climate change

- As sections 5.1.3 and 5.2.3 above already indicate, there is a significant relationship between climate and the resilience of fish populations. Studies have found many significant correlations between climate indices, and fish year-class strength (proportion abundance of different age groups), and annual biomass indices (Britten et al, 2015; Hurst et al. 2012; Dunn et al. 2009).

- Climate change can act synergistically with fishing to cause long-term change in marine ecosystems which can affect sustainable fisheries' yield (Tuck et al. 2014). Studies show that the strength of effect of climate variability on fish stocks is significantly increased by fishing pressure (Ottersen et al.; Perry et al. 2010).

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[40] Two new areas have been trawled: in the region to the east of Campbell Island targeting southern blue whiting; and a cluster of trawls targeting oreo on the southern flank of the Chatham Rise (Tilney and Black, 2015).
[41] The mean frequency of trawls within the trawled cells increased by between 2-4% in 11 of the 15 BIOMEC classes. The areas with the highest trawl frequencies per cell occur south-east of Stewart Island and on the western Chatham Rise (Tilney and Black, 2015).

7 Appendix 2: Problems with monitoring and reporting of fishing activity

7.1 Discarding and misreporting catches

- Discarding of by-catch (non target species) or over-catch (when too many fish are caught) and misreporting catch are significant issues that have the potential to undermine the integrity of the QMS. While there have been improvements over recent decades (largely as result of on-board observers), there is strong evidence that discarding and misreporting are still significant (Simmons, et al, 2015). This means that the catch information upon which important management decisions (such as TAC setting) are made is incomplete.

- The New Zealand system of reporting largely relies on fishers filling in reports manually, which means that misreporting can occur because it is reliant upon the honesty of the fishers to report accurately. There are some strong incentives that drive misreporting. For areas where there are many species living in the same habitat (such as South Island inshore bottom trawling), it is difficult to catch particular species and not others. Often fishers do not hold the required ACE for all the species they are catching. There is a strong incentive to dump the by-catch and not report it when it is of very low value (when it is a size or species that the Licenced Fish Receiver will not accept) and in order to avoid the associated deemed values (financial penalty). Deemed values plays an important role in encouraging fishers to minimise by-catch as much as possible, however also incentivise discarding and misreporting (Simmons, et al., 2015).

7.2 Problems with reporting location of fishing

- Currently, trawl records are incomplete because vessels smaller than 28 metres long are obliged only to report the start location of trawls - not the end point (Black and Tilney, 2015). Full trawl records are important to monitor impacts of fishing on the benthos.

- There are significant delays in reporting information about where fishing is occurring. This is a particularly important issue for observer placement for protected species conservation. At the recent Māui Dolphin Research and Advisory Group, a representative from the observer programme reported that there were delays of up to three months before the MPI Observer Services Unit was notified that particular boats were fishing in areas where observers were required.[42]

- Additionally, manual reporting means that fishing crew could misreport the location of fishing in order to avoid having to accommodate an observer on board (if they fish within the area where observers are required).

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[42] Andy McKay from MPI Observer Services Unit reported that there are sometimes 3 month delays between the time of fishing and information being received by the Observer Services Unit (WWF notes from MRAG meeting, 2 November 2015).

7.3   Lack of reporting of recreational catch

- Recreational fishing is not systematically monitored or reported on. This is a problem because the recreational catch is significant (particularly for inshore fisheries such as snapper, blue cod, rock lobster, kahawai, paua and scallops) and it is important that we can properly account for the total recreational catch order to set TAC limits at sustainable levels (ICES, 2015).[43]

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[43] The primary driver of data collection of recreational fisheries around the world is the need to quantify the total removals from a stock for sustainable management (ICES, 2015).

References

Arnason, R., (2014). *Best Practice in the Use of Right-based Management to Reduce Discards in Mixed Fisheries*, European Parliament.
http://www.europarl.europa.eu/RegData/etudes/note/join/2014/529054/IPOL-PECH_NT(2014)529054_EN.pdf

Bakun, A. (2005). Regime shifts. In: Robinson, A.R.; Brink, K. (eds). The Sea, Vol. 13, The Global Coastal Ocean, Multiscale Interdisciplinary Processes, pp. 971-1026. Harvard University Press, Cambridge, MA, USA.

Black and Tilney, (2015). Monitoring New Zealand's trawl footprint for Deepwater fisheries: 1989-1990 to 2010-11. *New Zealand Aquatic Environment and Biodiversity Report* No. 142.

Britten, G.L., Dowd, M., Worm, B. (2015), Changing recruitment capacity in global fish stocks. *Proceedings of the National Academy of Sciences*.

Brock, W.A.; Carpenter, S.R. (2006). Variance as a leading indicator of regime shift in ecosystem services. *Ecology and Society* 11: 9.

Brunel, T., and Piet, G. J. (2013). Is age structure a relevant criterion for the health of fish stocks? – *ICES Journal of Marine Science*, doi:10.1093/icesjms/fss184

Clark, M.; Althaus, F.; Schlacher, T.A.; Williams, A.; Bowden, D.A.; Rowden, A.A. (2015). The impacts of deep-sea fisheries on benthic communities: a review. *ICES Journal of Marine Science*

Clark and O'Driscoll, (2003). Deepwater Fisheries and Aspects of Their Impact on Seamount Habitat in New Zealand. *J.Northw.Atl.Fish.Scie.*, Vol. 31, 441-458

Dunn, M.R.; Hurst, R.; Renwick, J.A.; Francis, R.I.C.C.; Devine, J.; McKenzie, A. (2009). Fish abundance and climate trends in New Zealand. *New Zealand Aquatic Environment and Biodiversity Report* 31: 74pp.

Eddy, T.D.; Coll, M.; Fulton, E.A.; Lotze, H.K. (2015). Trade-offs between invertebrate fisheries catches and ecosystem impacts in coastal New Zealand. *ICES Journal of Marine Science*.

Clucasm I. (1997) A study of the options for utilization of bycatch and discards from marine capture fisheries, *FAO Fisheries Circular* No. 928 FIIU/C928.
http://www.fao.org/docrep/w6602e/w6602E00.htm

Food and Agriculture Organisation of the United Nations, (2009*). International Guidelines for the Management of Deep-sea Fisheries in the High Seas*. Rome, Italy.

Hilborn, R., (2011). The Evolution of quantitative marine fisheries management 1985 – 2010. *Natural Resource Modelling*, Vol 25 Issue 1.

IUCN (The World Conservation Union) (2008), *Establishing Resilient Marine Protected Area Networks – Making it Happen*. (Full Technical Version)

ICES (The International Council for the Exploration of the Sea) (2015), ICES Special Request Advice, Northeast Atlantic, EU request on data needs for monitoring of recreational fisheries. http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2015/Special_Requests/EU_data_nee ds_for_monitoring_the_recreational_fisheries.pdf

Jennings, S. (2005). Indicators to support an ecosystem approach to fisheries. *Fish and Fisheries,* 6: 212–232.

Johnston, P.A. & Santillo, D. (2004). Conservation of seamount ecosystems: application of a marine protected areas concept. *Archive of Fishery and Marine Research* 51: 305–319

Leathwick, J.R.; Rowden, A.; Nodder, S.; Gorman, R.; Bardsley, S.; Pinkerton, M.; Baird, S.J.; Hadfield, M.; Currie, K.; Goh, A. (2012). A Benthic-optimised Marine Environment Classification (BOMEC) for New Zealand waters. *New Zealand Aquatic Environment and Biodiversity Report* No. 89. 54p

Levin and Lubchenco, (2008). Resilience, Robustness, and Marine Ecosystem-based Management. *BioScience* 58 (1): 27-32. doi: 10.1641/B580107

Longhurst, A. (2006). The sustainability myth. *Fisheries Research* 81: 107-112

Ministry for the Environment, (2010). Environmental Report Card – Fishing Activity: Fish Stocks.

Ministry of Fisheries, (2008), Harvest Strategy Standard for New Zealand Fisheries.

Ministry of Fisheries, (2011), Operational Guidelines New Zealand's Harvest Strategy.

Ministry of Primary Industries, (2015) Annual Review Report for Deepwater Fisheries for 2013/14, MPI Technical Paper No. 2015/07

Ministry of Primary Industries, (2015). Fisheries Assessment Plenary May 2015: Stock Assessments and Stock Status. Compiled by the Fisheries Science Group, Ministry for Primary Industries, Wellington, New Zealand.

NOAA (2015), Fish Stock Climate Vulnerability Assessment.

Norse, E.A., Brooke, S., Cheung, W.W.L., Clark, C.W., Clark, M.R., Ekeland, I., Froese, R., Gjerde, K.M., Haedrich, R.L., Heppell, S.S., Morato, T., Morgan, L.E., Pauly, D., Sumaila, R. & Watson, R. (2011). Sustainability of deep-sea fisheries. Marine Policy 36: 307–320.

OHI (Ocean Health Index), 2015. (http://www.oceanhealthindex.org/Components/Fisheries_Catch/)

Ottersen, G.; Hjermann, D.O.; Stenseth, N.C. (2006). Changes in spawning stock structure strengthen the link between climate and recruitment in a heavily fished cod (Gadus morhua) stock. Fisheries Oceanography 15: 230-243.

Perry, R.I.; Cury, P.; Brander, K.M.; Jennings, S.; Mo¨llmann, C.; Planque, B. (2010). Sensitivity of marine systems to climate and fishing: concepts, issues and management responses. Journal of Marine Systems 79: 427-435.

PEW Charitable Trust, (2014). Breeding Abundance – Protecting Places Where Underwater Life Begins. Fact Sheet, August 2014.

Pinkerton, M.H. (2010). Headline indicators for the New Zealand ocean. Research report for Coasts &

Patrick W. S. and Link J. S., (2015), Myths that Continue to Impede Progress in Ecosystem-Based Fisheries Management. *Fisheries*.

Planque, B., Fromentin J.M., Cury, P., Drinkwater, K.F., Jennings, S., R.I., Kifani, S., (2010). How does fishing alter marine populations and ecosystems sensitivity to climate? *Journal of Marine Systems* Volume 79, Issues 3–4, 10 February 2010, Pages 403–417

Reimer, J.N.; Grorud-Colvert, K.; Barner, A.K.; Lubchenco, J. (2015). Health oceans, healthy people, healthy economies: Integrating fisheries management and protected areas for environmental, economic, and social benefits, Brief for the GSDR 2015. United Nations. https://sustainabledevelopment.un.org/content/documents/6549120_Reimer_HealthyOceans_HealthyPeople_HealthyEconomies.pdf

Simmons, G., Graeme Bremner, Christina Stringer, Barry Torkington, Lydia Teh, Kyrstn Zylich, Dirk Zeller, Daniel Pauly and Hugh Whittaker, (2015). *Preliminary reconstruction of marine fisheries catches for New Zealand (1950-2010),* Working Paper #2015 – 87, Fisheries Centre, University of British Columbia.

Thrush, S.F.; Hewitt, J.E.; Lundquist, C.; Townsend, M.; Logrer, A.M. (2011). A strategy to assess trends in the ecological integrity of New Zealand's marine ecosystems. NIWA Client Report HAM2011-140. 58 p.

Tracey, D., (NIWA scientist). Personal communications, 8 December 2015.

Tuck, I.D.; Cole, R.; Devine, J. (2009). Ecosystem indicators for New Zealand fisheries. New Zealand *Aquatic Environment and Biodiversity Report* No. 42: 180p.

Williams, A., Schlacher, T.A., Rowden, A.A., Althaus, F., Clark, M.R., Bowden, D.A., Stewart, R., Bax, N.J., Consalvey, M. & Kloser, R.J. (2010). Seamount megabenthic assemblages fail to recover from trawling impacts. *Marine Ecology* 31 (supplement 1): 183–199.

Wright P., Trippel E. A. (2009) Fisheries-induced demographic changes in the timing of spawning: consequences for reproductive success. *Fish and Fisheries* 2009;10:283-304