

## Aquatic Environment

BEN2009-02	Monitoring change in benthic communities in Spirits Bay
BEN2009-04	Spatial overlap of scallop dredging and benthic habitat
ENV2009-07	Habitats of particular significance for fisheries management: Kaipara Harbour
PRO2009-01A	Abundance, distribution and productivity of Hector's (and Maui's) dolphins
PRO2009-04	Development and efficacy of seabird mitigation measures

**Project:** Monitoring change in benthic communities in Spirits Bay

**Project Code:** BEN2009-02

**Start Date:** 1 October 2009

**Completion Date:** 30 September 2011

**Vessel Use:** Subject to tender

**Overall Objective:**

1. To monitor changes in the benthic invertebrate communities in Spirits Bay following closure of an area to bottom trawling and dredging.

**Specific Objectives:**

1. To survey Spirits Bay and Tom Bowling Bay benthic invertebrate communities according to the monitoring programme designed in ENV2005/23.
2. To assess changes in benthic communities inside and outside of the closed area since 1997.

**Reporting Requirements:**

Specific Objectives 1 and 2

1. To submit to MFish, a Research Progress Report as specified in Research Reporting form 4 by 31 July 2010.
2. To submit to MFish, a draft Aquatic Environment and Biodiversity Report as specified in Research Reporting Form 6 by 31 July 2011.
3. To present the report in Reporting Requirement 2 to a meeting of the Aquatic Environment Working Group by 30 August 2011. Presentations to more than one meeting in Wellington may be required.
4. To submit to MFish a revised draft Aquatic Environment and Biodiversity Report as specified in Research Reporting Form 6 by 30 September 2011.

**Project Update Reports**

No Project Update Reporting is required for this project.

**Work In Progress Reports**

Monthly Work In Progress Reporting (form 13) is required for this project in accordance with the Conducting Research with the Ministry document.

## Data Reporting

To submit any data generated, collected or modified during the course of this project to the Research Data Manager, MFish by 31 October 2011.

### Rationale:

#### *General*

Spirits Bay (Piwhane) is at the northern-most tip of the North Island of New Zealand, between North Cape and Cape Reinga. Ngati Kuri have been the kaitiaki of these waters for at least the last 700 years, but the area is of great cultural and spiritual significance to all Maori, as the pathway to the spiritual world of their ancestors. The area also supports several commercial fisheries including (but not restricted to) an important part of the Northland scallop fishery and some bottom trawling for snapper and trevally, and recreational fishing interests.

Concerns over sponge bycatch in the area lead to a voluntary closure to scallop dredging in Spirits Bay and the adjacent Tom Bowling Bay in 1997. The foliose nature and large size of much of the colonial, filter-feeding fauna in Spirits Bay suggested that, not only was the community unique, but it was also likely to be susceptible to damage through suffocation and burial during the course of bottom dredging for scallops.

Because of concerns over the effects of fishing on benthic communities in the area, the Ministry of Fisheries commissioned research to examine the nature and extent of the sponge- and bryozoan-dominated community between North Cape and Cape Reinga (ENV9805, conducted between October 1998 and September 2000). This was seen as a first step in assessing the extent to which mobile bottom fishing gear affected benthic community structure in the area. A combination of spatial, temporal, and a priori information on likely sensitivity strongly suggests that there had been a substantial change in the benthic community in the most intensively fished part of Spirits Bay. As a second step, therefore, the Ministry funded project ENV2005-23 (recently completed) to design a more focussed programme to monitor the changes in the benthic communities in the area. This project would provide for the second focussed survey in a time series to monitor changes in benthic communities in the area. Additional information is available from the wider area survey conducted under ENV9805 but direct comparisons with that study will be complicated by differences in sampling approaches and scale.

#### *Strategic Relevance*

This project forms a part of the programme to determine direct and indirect effects of fishing on benthic biodiversity, habitats of particular significance for fisheries management, and maintenance of biological diversity in the marine environment. This project is therefore consistent with the *Marine Environment Research* section of the *Ministry of Fisheries Strategic Research Directions* document. This project contributes to Objective 3.1 (d), (e), and (f) and 3.4 (a) to (d) of the *Biodiversity Strategy* (for which the Ministry of Fisheries was identified as lead organisation) in that it will provide for an assessment of the threat of fishing to biodiversity, the development of an environmental monitoring system, increased community awareness of the effects of our activities on marine biodiversity, the identification of species and habitats at risk from fishing, and improved environmental impact assessment

of fishing. This work is, therefore, strongly supportive of the *Biodiversity Strategy* and will lead to greatly improved tools for better management of the incidental effects of fisheries. In particular, this project will enable the identification of the species or habitats most at risk from dredge fishing (as mandated by the Ministry's *Strategy for Managing the Environmental Effects of Fishing*), and contribute to the Ministry's priority (in the *Statement of Intent*) of improving the environmental performance of fishing through an ability to assess and monitor levels of modification of the aquatic environment relative to specified standards. Consistent with the 2005 Strategy for Managing the Environmental Effects of Fishing (SMEEF), the information will also be used to develop and refine standards for the effects on benthic habitat through better understanding of the rate of recovery of specific habitats. The 2008/13 Statement of Intent (SOI) states "Effective management requires environmental fisheries standards to be set and achieved. Standards should help achieve this outcome by defining the acceptable level of risk to the aquatic environment from fishing impacts, and the acceptable level of impacts of fishing on stocks." The SOI also establishes a priority work area of "Progressing development of environmental fisheries standards", to which this study would contribute. Therefore, this research is of a high priority.

### *Weighting of Objectives*

Weightings indicate the relative importance of each of the objectives. The weightings for the objectives in this project are (in order): 0.85: 0.15.

**Project:** Spatial overlap of scallop dredging and benthic habitat

**Project Code:** BEN2009-04

**Start Date:** 1 October 2009

**Completion Date:** 30 September 2010

**Vessel Use:** Subject to tender

**Overall Objective:**

1. To assess the spatial overlap of scallop dredging and benthic habitats in the Northland and Coromandel scallop fisheries.

**Specific Objectives:**

1. To use existing information on substrate, flora, fauna, and environmental drivers of habitat type to estimate the distribution of benthic habitats off the north-east coast of the North Island (10–60 m depth).
2. To rank the vulnerability to fishing disturbance of habitat classes developed in Objective 1.
3. To describe the spatial pattern of dredge fishing for scallops and assess overlap with each of the habitat classes developed in Objective 1.

**Reporting Requirements:**

Specific Objectives 1–3

5. To submit to MFish, a draft Aquatic Environment and Biodiversity Report as specified in Research Reporting Form 6 by 31 July 2010.
6. To present the report in reporting requirement 1 to a meeting of the Aquatic Environment Working Group by 31 August 2010.
7. To submit to MFish a revised draft Aquatic Environment and Biodiversity Report as specified in Research Reporting Form 6 by 30 September 2010.

**Project Update Reports**

No Project Update Reporting is required for this project.

**Work In Progress Reports**

Monthly Work In Progress Reporting (form 13) is required for this project in accordance with the Conducting Research with the Ministry document.

## **Data Reporting**

To submit any data generated, collected or modified during the course of this project to the Research Data Manager, MFish by 30 September 2010.

### **Rationale:**

#### *General*

Scallop dredging occurs in the Northland and Coromandel scallop fisheries in various bays and coastal areas between Spirits Bay in the north and Motiti Island in the south. Scallops are widespread off the north-east coast in silty to gravely habitats, but many areas where scallops are abundant are closed to scallop dredging, especially enclosed harbours and areas of high non-commercial interest. It is thought that dredging is spatially focussed in the areas where it does occur, but the fine-scale distribution of fishing relative to habitats of different sensitivities has not been well-documented, especially in the Northland fishery. Thus, although dredging for shellfish is known to have the greatest benthic impacts of the common fishing methods, the system-wide effects of such fishing are less well understood.

#### *Objective 1*

A previous project designed to provide information to underpin the development of a “proof of concept” Fisheries Plan for the Coromandel Scallop Fishery (ZBD2005/15) developed proxy habitat classes and estimated their overlap with an estimated “footprint” of the commercial fishery. That study generated a hierarchical spatial classification for the fishery area using continuous data on depth, tidal current, and mean orbital velocity at the seabed. The 10-class classification from this model was combined with categorical data from existing sediment charts by dividing each model class into sediment-type components. This procedure produced 34 relevant class-sediment combinations that were assumed to represent 34 different habitat types. This relatively ad hoc procedure was the best that could be done at the time, given the general-purpose nature of the marine environment classification approach then available (the 2005 MEC), but better methods and more data are now available, including a “benthic-optimised MEC” nearing completion under project BEN2006/01A. It is anticipated that these newer approaches should provide a substantially better classification of benthic habitats throughout the northeast coast of the North Island to a depth of about 60 m, including both the Northland and Coromandel scallop fisheries. This objective would collate and extend all the habitat class information for both the Northland and Coromandel scallop fisheries.

#### *Objective 2*

Concerns over heavy bycatch of sponges and other structure-forming colonial taxa in Spirits Bay and Tom Bowling Bay lead to a voluntary closure to scallop dredging there in 1997 and, eventually, to a regulated closure. These types of fauna are recognized as being sensitive to disturbance by fishing gear, and some taxa are slow to recover from such disturbance. Horse mussels are also known to be sensitive to dredge disturbance, but increasingly we are becoming aware of their importance as nursery habitat for highly valued species of fish like snapper and trevally. They also provide an important structural focus for biodiversity on otherwise moderately-structured soft-sediment habitats, and play other important roles in system productivity. Horse mussels are important to tangata whenua and impacts on them by dredging would be a particular concern for them. This objective will provide for a risk-based assessment of the likely sensitivity of the different habitat types identified in Objective 1

using existing empirical information, published sensitivity rankings where appropriate, and ecological first principles.

### *Objective 3*

Dredging for scallops is reported on CELR forms, almost always using statistical reporting areas rather than latitudes and longitudes. This low reporting resolution makes it impossible to assess the overlap between fishing and habitats accurately. However, many scallop dredgers use stored recollections, logbooks and/or sophisticated GPS plotters to record and guide their fishing activity. With the cooperation of the skippers, this information could form the basis of a cost-effective approach to describing the distribution of fishing effort at a resolution that will enable comparisons with the distribution of habitat types developed in Objective 1. For the Coromandel fishery, it was provisionally concluded in project ZBD2005/15 that all but two habitat classes likely to be sensitive to dredge disturbance (c.f. the rankings in Objective 2) had not been fished over more than two-thirds of their extent in the past 10 years. The remaining two habitat classes had been fished over 65 and 80% of their extent. This approach can, therefore, be used to identify which, if any, habitat classes and areas might need closer scrutiny.

### *Strategic Relevance*

This project forms a part of the programme to determine direct and indirect effects of fishing on benthic biodiversity, habitats of particular significance for fisheries management, and maintenance of biological diversity in the marine environment. This project is therefore consistent with the *Marine Environment Research* section of the *Ministry of Fisheries Strategic Research Directions* document. This project contributes to Objective 3.1 (d), (e), and (f) and 3.4 (a), (b), and (d) of the *Biodiversity Strategy* (for which the Ministry of Fisheries was identified as lead organisation) in that it will provide for an assessment of the threat of fishing to biodiversity, the development of an environmental monitoring system, increased community awareness of the effects of our activities on marine biodiversity, the maintenance of associated fauna, the identification of species and habitats at risk from fishing, and improved environmental impact assessment of fishing. This work is, therefore, strongly supportive of the *Biodiversity Strategy* and will lead to greatly improved tools for better management of the incidental effects of fisheries. In particular, this project will enable the identification of the species or habitats most at risk from dredge fishing (as mandated by the Ministry's *Strategy for Managing the Environmental Effects of Fishing*), and contribute to the Ministry's priority (in the *Statement of Intent*) of improving the environmental performance of fishing through an ability to assess and monitor levels of modification of the aquatic environment relative to specified standards. This project will generate information to meet objectives developed for the Coromandel scallop "proof-of-concept" fisheries plan and analogous environmental objectives being developed for the Northland scallops fisheries plan. Consistent with the 2005 Strategy for Managing the Environmental Effects of Fishing (SMEEF), the information will also be used to develop and refine standards for the effects on benthic habitats. The 2008/13 Statement of Intent (SOI) states "Effective management requires environmental fisheries standards to be set and achieved. Standards should help achieve this outcome by defining the acceptable level of risk to the aquatic environment from fishing impacts, and the acceptable level of impacts of fishing on stocks." The SOI also establishes a priority work area of "Progressing development of environmental fisheries standards", to which this study would contribute. Therefore, this research is of a high priority.

### *Weighting of Objectives*

Weightings indicate the relative importance of each of the objectives. The weightings for the objectives in this project are (in order): 0.3; 0.2; 0.5

**Project:** Habitats of particular significance for fisheries management: Kaipara Harbour

**Project Code:** ENV2009-07

**Start Date:** 1 October 2009

**Completion Date:** 30 September 2011

**Vessel Use:** Subject to tender

**Overall Objectives:**

1. To identify and map areas and habitats of particular significance in the Kaipara Harbour that support fisheries, and assess potential fishing and land-based threats to their function.

**Specific Objectives:**

1. Collate and review information on the role and spatial distribution of habitats in the Kaipara Harbour that support fisheries production.
2. Assess historical, current, and potential anthropogenic threats to these habitats that could affect fisheries values, including fishing and land-based threats.
3. Design and implement cost-effective habitat mapping and monitoring surveys of habitats of particular significance for fisheries management in the Kaipara Harbour.

**Reporting Requirements:**

Specific Objectives 1 and 2

8. To submit to MFish, a draft Aquatic Environment and Biodiversity Report as specified in Research Reporting form 6 by 31 August 2010.
9. To present the results of reporting requirement 1 to a meeting of the Aquatic Environment Working Group by 30 September 2010.
10. To submit to MFish, a revised draft Aquatic Environment and Biodiversity Report as specified in Research Reporting form 6 by 31 October 2010.

Specific Objective 3

11. To submit to MFish, a Research Progress Report as specified in Research Reporting form 4 proposing a habitat mapping and monitoring survey by 31 August 2010.
12. To present the results of reporting requirement 4 to a meeting of the Aquatic Environment Working Group by 30 September 2010.

13. To submit to MFish, a draft Aquatic Environment and Biodiversity Report as specified in Research Reporting form 6 by 31 August 2011.
14. To present the results of reporting requirement 6 to a meeting of the Aquatic Environment Working Group by 30 September 2011.
15. To submit to MFish, a revised draft Aquatic Environment and Biodiversity Report as specified in Research Reporting form 6 by 30 September 2011.

### **Project Update Reports**

No Project Update Reporting is required for this project.

### **Work In Progress Reports**

Monthly Work In Progress Reporting (form 13) is required for this project in accordance with the Conducting Research with the Ministry document.

### **Data Reporting**

To submit any data generated, collected or modified during the course of this project to the Research Data Manager, MFish by 30 September 2011.

### **Rationale:**

#### *General*

Recent work (Biodiversity Project ZBD200408, and FRST-funded studies) suggests that biogenic structure can be extremely important for coastal fisheries production. Research to support management of the combined impacts of bottom-fishing and land-use on biogenic structure is a high priority because such structure seems to be disproportionately both important and vulnerable. A review of non-fishing effects (including sedimentation) that might have important impacts on fisheries values has been commissioned to raise awareness among fisheries and land managers. However, no comprehensive appraisal has been made of any particular area. The Kaipara Harbour is emerging as a vital component of west coast North Island fisheries, and recent work suggests that virtually all snapper on this coastline can be sourced back to biogenic habitat nursery grounds inside the harbour, at least for one yearclass. West coast harbours are also known to support important nursery habitats for trevally, yellow-belly and sand flounders, kahawai, rig, and school shark and be important for grey mullet. Particular structural habitat types include seagrass meadows (intertidal and subtidal), mangrove forests, horse mussel beds, sponge gardens, oyster reefs, and areas of invasive date mussels as well as less-structured habitats such as un-vegetated mud flats, sands and coarse gravels.

With increasing human usage of the harbour and its surrounding catchment, pressures on these habitats and their associated fisheries production are thought to be increasing. These include in particular issues around sedimentation, along with eutrophication and cascades of effects generated by their combination (e.g., increased turbidity, suspended sediment loads, and smothering of benthic plants and animals). An assessment of these threats to important

fisheries habitats in the Kaipara Harbour would be timely. Given the role of land-based management in addressing these threats, interactions with regional and district councils are likely to be extremely important. Current indications are that there is very strong support, and potential for collaborations (including co-funding), from DOC and both regional and district Councils as well as from northern MFish Operations teams. Tenderers should specify in their tenders any synergies or collaborations that could increase the cost-effectiveness of their proposed studies.

#### *Objectives 1 and 2*

These objectives will provide for a review of available information on the role and spatial distribution of habitats of the Kaipara Harbour that are important for fisheries, and of historical, current, and potential anthropogenic threats to these roles (both fisheries and land-based). Sources will include science publications, grey literature, and local and traditional knowledge. As wide a range of information as possible should be investigated, including knowledge of past and current land-use patterns (and changes to these), and linkages via physical processes to the harbour environment. This research should build on the risk assessment approach to assessing cumulative (and disparate) impacts in the coastal zone commissioned under project BEN2007/05.

#### *Objective 3*

Based on the first two objectives, a habitat mapping survey of Kaipara Harbour should be designed. This should identify the most cost effective mapping technologies available, and their relevance to mapping features directly or indirectly important as fish habitat. For instance, intertidal and sub-tidal sea-grass areas have significantly different roles, so methods that are able to incorporate bathymetry into their mapping assessment would be critical. Following review of the design by AEWG, baseline mapping surveys should be completed of one or more habitats critical for fisheries production thought to be most at risk of decline or degradation. Outputs should be in a spatial format easily used in Geographic Information Systems (GIS), and compatible with central and local government systems.

#### **Strategic Relevance:**

This project forms a part of the programme to determine direct and indirect effects of fishing on benthic biodiversity, habitats of particular significance for fisheries management, and maintenance of biological diversity in the marine environment. This project is therefore consistent with the *Marine Environment Research* section of the *Ministry of Fisheries Strategic Research Directions* document. This project contributes to Objective 3.1 (d), (e), and (f) and 3.4 (a) to (d) of the *Biodiversity Strategy* (for which the Ministry of Fisheries was identified as lead organisation) in that it will provide for an assessment of the threat of fishing to biodiversity, the development of an environmental monitoring system, increased community awareness of the effects of our activities on marine biodiversity, the identification of species and habitats at risk from fishing, and improved environmental impact assessment of fishing. This work is, therefore, strongly supportive of the *Biodiversity Strategy* and will lead to greatly improved tools for better management of the incidental effects of fisheries. In particular, this project will enable the identification of the species or habitats most at risk from fishing (as mandated by the Ministry's *Strategy for Managing the Environmental Effects of Fishing*), and contribute to processes that reduce impacts not caused by fishing (as foreshadowed in the *2008/13 Statement of Intent*). The SOI also establishes a priority work area of "Progressing development of environmental fisheries standards", to which this study would contribute. Therefore, this research is a high priority.

### *Weighting of Objectives*

Weightings indicate the relative importance of each of the objectives. The weightings for the objectives in this project are (in order): 0.2; 0.2; 0.6

**Project:** Abundance, distribution and productivity of Hector's (and Maui's) dolphins

**Project Code:** PRO2009-01A

**Start Date:** 1 July 2009

**Completion Date:** 31 August 2010

**Vessel Use:** Subject to tender

**Overall Objectives:**

1. To estimate critical aspects of the biology, abundance and distribution of Hector's and Maui's dolphin populations to assess the effects of fishing-related mortality on these populations.

**Specific Objectives:**

1. To estimate the distribution of the South Coast South Island Hector's dolphin sub-population in both summer and winter.

**Reporting Requirements**

**Research Reporting:**

Objective 1

1. To submit to MFish a Research Progress Report as specified in Research Reporting Form 4, detailing methods to be used throughout this project to meet the requirements of Specific Objective 1, with a coversheet as specified in Research Reporting Form 10, by 31 October 2009. Electronic and hard copy formats of reports are required.
2. To present the report in Reporting Requirement 1 to a meeting of the Aquatic Environment Working Group by 31 November 2009 in Wellington. Presentations to more than one meeting may be required.
3. To submit to MFish a draft Final Research Report as specified in Research Reporting Form 5 or a draft Aquatic Environment and Biodiversity Report as specified in Research Reporting Form 6, detailing distribution and sightings for both summer and winter, by 30 September 2010.
4. To present the report in Reporting Requirement 3 to a meeting of the Aquatic Environment Working Group by 31 October 2010 in Wellington. Presentations to more than one meeting may be required.
5. To submit to MFish a final Aquatic Environment and Biodiversity Report as specified in Research Reporting Form 6 by 30 November 2010.

## **Project Update Reports**

No Project Update Reporting is required for this project.

## **Work In Progress Reports**

Monthly Work In Progress Reporting (form 13) is required for this project in accordance with the Conducting Research with the Ministry document.

## **Data Reporting**

To submit any data generated, collected or modified during the course of this project to the Research Data Manager, MFish by 30 September 2010.

## **Rationale:**

### *General*

Knowledge of protected species mortalities and their consequences is required if the Minister is to exercise his/her powers under section 15 of the Fisheries Act 1996 and to be in a position to take into account the purpose and environmental principles set out in sections 8 and 9. For some species, the risk posed by fishing mortalities, and the nature and extent of these interactions is difficult to quantify, because of the nature of the fisheries concerned and the characteristics of the species themselves. For species where adverse effects of fishing are suspected it is important to review existing information and identify potential approaches to managing any adverse effects of fishing.

Recent research carried out under projects MOF2002-03D and IPA2006/05 included modelling of Hector's and Maui's dolphin population trajectories under a number of management scenarios. These modelling approaches have highlighted the need for better information on the distribution, abundance and key biological parameters, including survival and productivity.

This research will gather new data in order to improve knowledge about the Hector's and Maui's dolphin population dynamics which will enable better monitoring of populations trends, allow more accurate analysis of population viability and assessment of management options to reduce fishing related threats to the populations.

The Ministry notes that there may be opportunities to collaborate with the Department of Conservation (through both Head and Conservancy offices) to fund and coordinate research on Hector's and Maui's dolphins. It will be important that any research done on these dolphin species is complementary and, ideally, part of a coordinated research plan. This project will target key risks and information gaps first and will develop so as to complement other work being done.

### *Objective 1*

The research will, over time, determine the distribution and abundance of Hector's and Maui's dolphins throughout their range in New Zealand waters. Emphasis will be placed on achieving precise and accurate results for population estimates, and to assessing the sampling error of any technique used. Methods adopted should be those that can be repeated with sampling effort that is achievable on a medium term basis to allow for comparison of results and monitoring changes in population size through time. A variety of study techniques may

be applied to assessing population size and trend, including aerial surveys, genetic analysis and photo identification programmes.

Determining Hector's and Maui's dolphin distribution provides a mechanism to examine whether management is focused at an appropriate spatial scale and to determine if there is any expansion or contraction in distribution of the four subpopulations and Hector's and Maui's dolphin stocks within the subpopulations. Initially this research will focus on determining the distribution of sub-populations most at risk, in order to better inform managers and allow identification of areas where distribution of fisheries and Hector's dolphins overlap.

Research to date has shown that Hector's dolphins are a relatively shallow water species, rarely found in waters deeper than 100 m. In order to help identify the management threats to Hector's dolphins, there is merit in confirming the depth and offshore limits of the dolphins' range on a seasonal basis. If the currently recognised distribution is confirmed, there would be no need to undertake abundance surveys beyond the continental shelf. Currently, there seems to be strong merit in surveying out to 100 m depth, irrespective of the distance offshore.

Ideally, any surveys to determine distribution and abundance estimates should be undertaken according to internationally recognised protocol. Aerial surveys are preferred, as Hector's dolphins are attracted to boats, leading to potential bias in survey results. While a distribution-wide survey undertaken during the winter and again during the summer would be ideal, it may be possible to identify a selection of groups to survey on a regular basis (e.g., Banks Peninsula, Clifford/Cloudy Bays, Te Waewae Bay, Buller River region). Research into the distribution of Hector's dolphins will tie in closely with abundance surveying and, particularly, monitoring the movement of Hector's dolphins on a seasonal and individual basis.

The relatively long time-frames between previous abundance surveys and differences in methodology make it difficult to assess the current state of the populations. Focused research using consistent methodology over a five year period to determine baseline information will enable ongoing monitoring to determine trends in population size and, consequently, whether threats to the populations are being managed effectively.

MFish considers that estimates of population size either should be made during both summer and winter (as there may be a seasonal shift in distribution and accompanying population size), or consistently during one time of year to identify any relative changes in population size over time. Genetic analysis could also supplement systematic aerial surveying, in that it provides some indication of past trends in abundance (for example, a reduction in genetic diversity signals that the population may have undergone a decline in abundance). Photo-ID also can be used to obtain population estimates, particularly from a relatively small and highly resident group such as that found in Porpoise Bay.

During 2009/10, the research will focus on the distribution of South Coast South Island sub-population of Hector's dolphin, as this sub-population's distribution is least well understood and the distribution is important for assessing the overlap with fishing effort and therefore potential risk to the Hector's dolphins. When further funding is available, this project will shift its focus to the other sub-populations and research topics as is appropriate.

### *Weighting of Objectives*

Weightings indicate the relative importance of each of the objectives. The weightings for the objectives in this project are (in order): 1.0.

**Project:** Development and efficacy of seabird mitigation measures

**Project Code:** PRO2009-04

**Start Date:** 1 July 2009

**Completion Date:** 30 September 2010

**Vessel Use:** Subject to tender

**Overall Objectives:**

1. To test the efficacy of a variety of configurations of mitigation techniques at reducing seabird mortality (or appropriate proxies for mortality) in longline fisheries.

**Specific Objectives:**

1. To test the efficacy of a variety of configurations of streamer lines at reducing seabird mortality in pelagic longline fisheries.
2. To test the efficacy of a variety of line weighting configurations at reducing seabird mortality in demersal longline fisheries.

**Reporting Requirements**

**Research Reporting:**

Objective 1

1. To conduct collaborative discussions on the design of methods with the Mitigation Technical Advisory Group by 30 September 2009.
2. To submit to MFish a Research Progress Report as specified in Research Reporting Form 4, detailing methods to be used throughout this project to meet the requirements of Specific Objective 1, with a coversheet as specified in Research Reporting Form 10, by 31 October 2009. Electronic and hard copy formats of reports are required.
3. To present the report in Reporting Requirement 1 to a meeting of the Aquatic Environment Working Group by 30 November 2009 in Wellington. Presentations to more than one meeting may be required.
4. To submit to MFish a draft Final Research Report detailing distribution and sightings for both summer and winter as specified in Research Reporting Form 5 or a draft Aquatic Environment and Biodiversity Report as specified in Research Reporting Form 6 by 30 June 2010.
5. To present the report in Reporting Requirement 3 to a meeting of the Aquatic Environment Working Group by 31 July 2010 in Wellington. Presentations to more than one meeting may be required.

6. To submit to MFish a final Aquatic Environment and Biodiversity Report as specified in Research Reporting Form 6 by 31 August 2010.

## Objective 2

7. To conduct collaborative discussions on the design of methods with the Mitigation Technical Advisory Group by 30 September 2009.
8. To submit to MFish a Research Progress Report as specified in Research Reporting Form 4, detailing methods to be used throughout this project to meet the requirements of Specific Objective 7, with a coversheet as specified in Research Reporting Form 10, by 31 October 2009. Electronic and hard copy formats of reports are required.
9. To present the report in Reporting Requirement 1 to a meeting of the Aquatic Environment Working Group by 30 November 2009 in Wellington. Presentations to more than one meeting may be required.
10. To submit to MFish a draft Final Research Report detailing distribution and sightings for both summer and winter as specified in Research Reporting Form 5 or a draft Aquatic Environment and Biodiversity Report as specified in Research Reporting Form 6 by 30 June 2010.
11. To present the report in Reporting Requirement 3 to a meeting of the Aquatic Environment Working Group by 31 July 2010 in Wellington. Presentations to more than one meeting may be required.
12. To submit to MFish a final Aquatic Environment and Biodiversity Report as specified in Research Reporting Form 6 by 31 August 2010.

## **Project Update Reports**

No Project Update Reporting is required for this project.

## **Work In Progress Reports**

Monthly Work In Progress Reporting (form 13) is required for this project in accordance with the Conducting Research with the Ministry document.

## **Data Reporting**

To submit any data generated, collected or modified during the course of this project to the Research Data Manager, MFish by 30 September 2010.

## **Rationale:**

### *General*

Seabird bycatch in New Zealand fisheries is a well known problem, and considerable resources are spent on policy and management solutions. However, the fundamental requirements of empirical information on which to define optimum mitigation configurations is lacking in New Zealand fisheries, and are known as information gaps on a global scale. The Ministry of Fisheries recently implemented a suite of mandatory mitigation measures to reduce the bycatch of seabirds in its domestic demersal and pelagic longline fisheries, including use of night setting, line weighting, and streamer lines.

Within New Zealand and in International Fisheries forums, debate continues about which mitigation measures are the most effective at reducing seabird mortality in specific fishery situations, and which configurations of key measures (e.g. line weighting, streamer lines) are optimal.

Melvin (2007) states “*Streamer lines are the most widely prescribed seabird mitigation tool in pelagic and demersal fisheries, but controlled studies demonstrating their effectiveness in pelagic fisheries in the context of production fishing are non-existent.*” New Zealand took up the opportunity recently to collaborate with Dr Melvin to conduct observations of pelagic mitigation measures, but due to the short time available for the study, and various logistical difficulties, little new information was gathered in the collaboration about the relative efficacy of different tori line configurations. This experience indicated that a more carefully considered, locally based, and longer term research project, perhaps in collaboration with researchers such as Dr Melvin, but which has specific objectives that meet the needs of New Zealand, is the best way to approach this kind of study.

In recent developments in the WCPFC fishery for tunas and sword fish, a variety of streamer line configurations have been proposed, and scientific testing of these remains equivocal, highlighting the need for clear information their efficacy and optimum configurations. In the WCPFC forum, Japanese research supports the use of lightweight streamer lines, consisting of a backbone on which streamers of less than 30 cm are threaded (Yokota et al. 2008). Streamer lines with multiple short streamers threaded onto one branch streamer have been observed on Japanese vessels operating in the NZ area (Melvin and Walker 2008, Brouwer and Walker 2008). The testing of alternative configurations of streamer lines and their attachment positions, and other mitigation devices, such as line weighting configurations or new and developing measures is required to allow clear scientific advice to be developed on the most appropriate measures to consider for management of New Zealand’s seabird bycatch problem on pelagic longline vessels.

Recent regulations introduced by the Ministry for demersal longline fishing in New Zealand waters include a line weighting configuration option to night setting that approximates those used in other fisheries (e.g. CCAMLR) to achieve sink rates that remove the baited hooks from within diving depths of seabirds quickly. Research detailing sink rates for relatively thick longline main lines (or back bones) set in deep water (e.g. Robertson 2000, Robertson *et al.* 2001, Smith 2001, Melvin and Wainstein 2006). However New Zealand demersal longline vessels also set in shallow water with back bones as thin as 1.8mm. It is considered desirable to investigate the line weighting configurations that would be required to achieve adequate sink rates using various back bone diameter and materials.

Research programmes of this type are best conducted as collaborative studies with the fishing industry and in many instances have benefited from the involvement of independent scientists who are specialists in mitigation studies. This research is proposed to enable a working-group reviewed, and collaborative study to be conducted to enable New Zealand to advance its knowledge of optimum streamer configuration and to allow development of line weighting regimes that are suitable for use in New Zealand pelagic longline fisheries.

The research will undertake practical, on-board testing of one or more mitigation techniques for each pelagic and demersal longline vessels, and will make use of MFish observers, specially trained researchers, and overseas experts in mitigation research, as available and practical. The researchers conducting the study should seek advice from the Seabird Mitigation Technical Advisory Group (key contact, D. Middleton, SeaFIC). The study may be conducted on one or more fishing vessels operating in the New Zealand EEZ, and be conducted as part of normal fishing operations or under special conditions as required. Collaborative approaches are likely to be most effective.

Initially this project will consider the two higher priority specific objectives discussed at the RCC; efficacy of streamer line designs for reducing seabird mortality during pelagic longlining; and, efficacy of line weighting configurations for reducing seabird mortality during demersal longlining. The remaining specific objectives may be tendered at a later stage: efficacy of line weighting configurations for reducing seabird mortality during pelagic longlining; and, efficacy of streamer line designs for reducing seabird mortality during demersal longlining.

#### *Weighting of Objectives*

Weightings indicate the relative importance of each of the objectives. The weightings for the objectives in this project are (in order): 0.5, 0.5.

## Deepwater Fisheries Resources

OEO2009-02	Estimation of the abundance of black oreo and smooth oreo in selected areas
ORH2008-02	Orange roughy stock assessment
ORH2009-04	Estimating the non-spawning proportion of mature orange roughy
ORH2009-06	Stock assessment of orange roughy fisheries outside the New Zealand EEZ

**Project:** Estimation of the abundance of black oreo and smooth oreo in selected areas

**Project Code:** OEO2009-02

**Start Date:** 1 September 2009

**Completion Date:** 31 December 2010

**Vessel Use:** Subject to tender, November 2009

**Overall Objectives:**

1. To estimate the abundance of black oreo (*Allocyttus niger*) and smooth oreo (*Psuedocyttus maculatus*) in selected areas.

**Specific Objectives:**

1. To estimate the abundance, with a target coefficient of variation (c.v.) of the estimate of 20-30% for smooth oreo in OEO 4 on the Chatham Rise.

**Reporting Requirements:**

**Research Reporting**

Objective 1

1. To submit to MFish a Voyage Programme as specified in Research Reporting form 2 one month before the beginning of the survey.
2. To submit to MFish a Voyage Report as specified in Research Reporting form 3 one month after the completion of the survey.
3. To present the results to the Deepwater Working Group at meetings in Wellington in June-July 2010 as required.
4. To submit to the Chief Scientist MFish a Final Research Report as specified in Research Reporting form 5 or a draft Fishery Assessment Report as specified in Research Reporting form 7 by 30 November 2010.

**Project Update Reports**

No Project Update Reporting is required for this project.

**Work In Progress Reports**

Monthly Work In Progress Reporting is required for this project in accordance with the Conducting Research with the Ministry document.

## Data Reporting

To submit any data generated, collected or modified during the course of this project to the Research Data Manager, MFish by 31 December 2010.

### Rationale:

#### *General*

The smooth oreo fishery in OEO 4 currently produces landings of almost 6000 t annually. Based on the current stock assessments for the various oreo Fishstocks, smooth oreo in OEO 4 have the largest estimates of current biomass, the largest estimates of sustainable yield, and the largest stock size in relation to virgin biomass (and conversely the lowest level of depletion) of any of the oreo Fishstocks. Therefore, it appears that this fishery has the potential to produce the largest sustainable yield over the long term of any of the oreo Fishstocks.

The OEO 4 smooth oreo stock assessment was updated in 2007, and is reported in the 2008 Plenary report:

“The model estimates of mid-year mature biomass in 2005–06 was 57% (51–62) of mature  $B_0$  and suggests that there is not an immediate sustainability issue with this stock. However, there are considerable uncertainties associated with this assessment described in section 4.3.6 above. The main uncertainty is that substantial proportions of the abundance in each acoustic survey are attributed to layer marks which are generally not fished by the commercial fishery. Also, standardised CPUE in the larger east fishery has declined in recent years.”

The MFish Deepwater Medium Term Research Plan has a programme of updating the biomass indices for each of the main oreo fisheries in the New Zealand EEZ every 3 to 5 years. Three acoustic surveys have been carried out for smooth oreo in OEO 4 – in 1998, 2001 and 2005. Therefore, it is proposed to obtain an acoustic biomass estimate for smooth oreo in OEO 4 in 2009 (4 years after the previous survey).

The following is a summary of the acoustic surveys that have provided estimates of abundance of black and smooth oreos and that have been used as inputs into the stock assessments for these species:

- 1997 – black oreo and smooth oreo in OEO 3A and 4
- 1998 – black oreo and smooth oreo in OEO 4
- 2001 – smooth oreo in OEO 4
- 2002 – black oreo in OEO 3A
- 2005 – smooth oreo in OEO 4
- 2006 – black oreo in OEO 3A

#### *Objective 1*

It is proposed to estimate the abundance, with a target coefficient of variation (c.v.) of the estimate of 20-30% for smooth oreo in OEO 4 using acoustic survey.

#### *Weighting of Objectives:*

Weightings indicate the relative importance of each of the objectives. The weightings for the objectives in this project are (in order): 1.0

**Project:** Orange roughy stock assessment

**Project Code:** ORH2008-02

**Start Date:** 1 September 2009

**Completion Date:** 30 September 2010

**Vessel Use:** None

**Overall Objectives:**

1. To carry out a stock assessment of orange roughy (*Hoplostethus atlanticus*), including estimating biomass and sustainable yields.

**Specific Objectives:**

1. To update the descriptive analysis of the commercial catch and effort data from selected orange roughy fisheries with the inclusion of data up to the end of the 2007/08 fishing year. These fisheries include ORH 1, ORH 2A (North and South), ORH 2B, ORH 3A, ORH 3B (Chatham Rise and other areas).
2. To update the unstandardised and standardised catch per unit effort analyses with the inclusion of data up to the end of the 2007/08 fishing year for the following area:
  - ORH 1
  - East Cape
  - MEC
3. To analyse length frequency, sex ratio, and reproductive data for orange roughy collected by the Observer Programme and from other sources during the 2007/08 fishing year for input into stock assessment models. The target number of samples that will be collected by the Observer Programme for each fishery in 2007/08 is specified below in the Rationale.
4. To update the stock assessment, including reviewing and summarising the historical biological data collected by the MFish Observer Programme and other sources, and estimating biomass and sustainable yields for the following area:
  - MEC

**Reporting Requirements:**

**Research Reporting**

Objectives 1 to 4

5. To present the results to the Deepwater Working Group at meetings in Wellington in March 2010 as required.
6. To submit to the Chief Scientist MFish a draft Working Group Report as specified in Research Reporting form 8 by 20 March 2010.

7. To submit to the Chief Scientist MFish a Final Research Report as specified in Research Reporting form 5 or a draft Fishery Assessment Report as specified in Research Reporting form 7 by 30 September 2010.

### **Project Update Reports**

No Project Update Reporting is required for this project.

### **Work In Progress Reports**

Monthly Work In Progress Reporting is required for this project in accordance with the Conducting Research with the Ministry document.

### **Data Reporting**

To submit any data generated, collected or modified during the course of this project to the Research Data Manager, MFish by 30 September 2010.

### **Rationale:**

#### *General*

Orange roughy is the most important of the deepwater species in New Zealand with current annual landings of about 15,500 t. There is a need to carry out regular monitoring programs and stock assessments to determine stock status and estimate sustainable yields for all orange roughy fisheries. The fisheries included in this project were selected on the basis of the schedule of updates for CPUE set out in the medium term research plan. The results of these analyses will be used in future to update the stock assessments for these stocks.

This research project is considered high priority because:

#### *Objectives 1 & 2*

In order to update the stock assessment for each fishery, commercial catch and effort data should be monitored and the descriptive analysis of the commercial catch and effort data should be updated on an annual basis.

In addition standardised CPUE analyses will be updated with the inclusion of data for the 2007/08 year for the following areas:

- ORH 1
- East Cape
- MEC

Note: in 2006 the Deepwater WG did not consider the CPUE data from the East Cape fishery were indices of abundance because of recent changes in the fishery.

### *Objective 3*

The current stock assessments for all fisheries incorporate information on fish length, sex ratios, length-weight data, and reproductive information of orange roughy from both commercial at-sea sampling and research surveys.

It is proposed to estimate biological parameters for input into the stock assessments by analysing length frequency and sex ratio data collected by the Observer Programme and from other sources during the 2007/08 fishing year.

A total of about 530 observer days are expected from these fisheries as follows:

- ORH 3B
  - Chatham Rise 430 days
  - South of 46° S and Arrow Plateau 40 days
- ORH 2A (South) 40 days
- ORH 1 20 days

### *Objective 4*

An update of the stock assessment for MEC was attempted in 2007, where the standardised CPUE analysis was split into an early series (1983-96) and a late series (1996-2004). The assessment was not finalised as the model gave poor fits to the recent CPUE data, predicting less rebuild in the model than the CPUE indices of abundance. This problem is seen in many stocks where the predicted rebuild is a function of the recruitment assumption in the model rather than the fishery data. In this case the WG considered that the stock was likely to be increasing under recent catch levels.

#### *Weighting of Objectives:*

Weightings indicate the relative importance of each of the objectives. The weightings for the objectives in this project are (in order): 0.2, 0.2, 0.1 and 0.5.

**Project:** Estimating the non-spawning proportion of mature orange roughy

**Project Code:** ORH2009-04

**Start Date:** 1 October 2009

**Completion Date:** 31 December 2010

**Vessel Use:** Subject to tender

**Overall Objectives:**

1. To estimate the annual non-spawning proportion of mature orange roughy.

**Specific Objectives:**

1. Review and refine the methodology for estimating the proportion of non-spawning female orange roughy.
2. Investigate the potential for estimating the non-spawning proportion of male orange roughy.

**Reporting Requirements:**

**Research Reporting**

Objective 1

1. To present the results to the Deepwater Working Group at meetings in Wellington in June-July 2010 as required.
2. To submit to the Chief Scientist MFish a Final Research Report as specified in Research Reporting form 5 or a draft Fishery Assessment Report as specified in Research Reporting form 7 by 30 November 2010.

**Project Update Reports**

No Project Update Reporting is required for this project.

**Work In Progress Reports**

Monthly Work In Progress Reporting is required for this project in accordance with the Conducting Research with the Ministry document.

**Data Reporting**

To submit any data generated, collected or modified during the course of this project to the Research Data Manager, MFish by 31 December 2010.

**Rationale:***General*

The estimate of the non-spawning proportion is critical to the management approach currently being used to manage ORH 3B, where future yield is determined as a fixed proportion of mature biomass.

The literature on the proportion of orange roughy that spawn each year was reviewed by Dunn & Dunn (draft report presented to the Plenary 2008). This project aims to re-visit the assumptions of the method and make methodological improvements where possible, examine the possibility of making an estimate for males, and then apply the technique, for the first time, to the east and south Chatham Rise.

*Objective 1*

Previous applications have estimated the non-spawning proportion as the number of female orange roughy at maturity stage 3 (maturing, will definitely spawn that year) or above, divided by the number of orange roughy above the mean length of first maturity. Biases might arise from the (usually macroscopic) determination of maturity stage: this is of particular interest for fish in the length range expected to be maturing (e.g., 15–30 cm SL), the calculation of the mean length at maturity (which could be affected by the size of fish which migrate to spawn), and the measurement of relative density. Historical data to investigate the assumptions would be available for the MEC stock.

*Objective 2*

It is currently assumed that there are both non-spawning females and also males, and that the proportion of non-spawning males will be the same as females. However, possible differences in the energetic costs of spawning and migration to spawning grounds mean that the non-spawning proportion of males may be different. There have been histological studies of maturation of males in other species, but as far as we know not yet in orange roughy. This objective would be expected to consist of the evaluation of macroscopic staging following analyses of histological samples, and then, if possible, the estimation of the non-spawning proportion of males.

*Weighting of Objectives:*

Weightings indicate the relative importance of each of the objectives. The weightings for the objectives in this project are (in order): 0.7, 0.3

**Project:** Stock assessment of orange roughy fisheries outside the New Zealand EEZ

**Project Code:** ORH2009-06

**Start Date:** 1 December 2009

**Completion Date:** 30 September 2012

**Vessel Use:** None

**Overall Objectives:**

1. To monitor orange roughy (*Hoplostethus atlanticus*) fisheries in the New Zealand region outside the EEZ.

**Specific Objectives (to 30 September 2010):**

1. To update descriptive analyses of commercial catch and effort data from orange roughy fisheries in the mid Tasman Sea (Lord Howe Rise and Northwest Challenger), Louisville Ridge and Norfolk Ridge and any other areas outside the EEZ with the inclusion of data up to the end of the 2008/09 fishing year.
2. To analyse length frequency, sex ratio, and reproductive data for orange roughy from fisheries outside the New Zealand EEZ collected by the Observer Programme and from other sources during the 2008/09 fishing year for input into stock assessment models.

**Note:**

It is proposed to contract this project for 3 years with annual updates of the specific objectives, subject to review each year.

**Reporting Requirements (to 30 September 2010):**

**Research Reporting**

Objectives 1 and 2

1. To submit to the Chief Scientist MFish a draft Working Group Report as specified in Research Reporting form 8 by 20 March 2010.
2. To submit to the Chief Scientist MFish a Final Research Report as specified in Research Reporting form 5 or a draft Fishery Assessment Report as specified in Research Reporting form 7 by 30 September 2010.

**Project Update Reports**

No Project Update Reporting is required for this project.

## **Work In Progress Reports**

Monthly Work In Progress Reporting is required for this project in accordance with the Conducting Research with the Ministry document.

## **Data Reporting**

To submit any data generated, collected or modified during the course of this project to the Research Data Manager, MFish by 30 September 2010.

## **Rationale:**

### *General*

Fisheries for orange roughy occur in waters outside the EEZ, in distant waters (South east Indian Ocean) and within the general New Zealand region (e.g. Lord Howe Rise, Northwest Challenger, Louisville Ridge, and Norfolk Ridge). The fishery in the mid Tasman Sea (Lord Howe Rise and Northwest Challenger) began in the mid to late 1980s, on the Louisville Ridge, east of the Chatham Rise, in 1994, and on the South Tasman Rise in 1997. The fisheries in the former two areas currently are not subject to any management measures. The fishery on the South Tasman Rise was managed through an Arrangement between the Australian and New Zealand governments, which includes a catch limit, but there has been little participation by New Zealand vessels in recent years.

New Zealand has an ongoing obligation to monitor the status of its fisheries in international waters.

### *Objective 1*

In order to assess the status of these fisheries, commercial catch and effort data should be monitored and the descriptive analysis of the commercial catch and effort data should be updated on an annual basis.

### *Objective 2*

The current stock assessments for all fisheries incorporate information on fish length, sex ratios, length-weight data, and reproductive information of orange roughy from both commercial at-sea sampling and research surveys. It is proposed to estimate biological parameters for input into the stock assessments by analysing length frequency and sex ratio data collected by the Observer Programme and from other sources during the 2008/09 fishing year.

### *Weighting of Objectives:*

Weightings indicate the relative importance of each of the objectives. The weightings for the objectives in this project are (in order): 1.0

## Hoki and Middle Depths Fisheries

HOK2008-02	Estimation of proportion spawning in hoki and potential demographic factors affecting recruitment
JMA2009-02	Stock assessment of jack mackerels in JMA7
MID2009-01	Characterisation and fishery monitoring of middle depth species (two species to be determined)
SBW2009-01	Stock assessment of southern blue whiting

**Project:** Estimation of proportion spawning in hoki and potential demographic factors affecting recruitment

**Project Code:** HOK2008-02

**Start Date:** 1 September 2009

**Completion Date:** 31 December 2010

**Vessel Use:** None

**Overall Objectives:**

1. To estimate the proportion of hoki that spawn each year and to investigate demographic factors that may be influencing recruitment of hoki (*Macruronus novaezelandiae*)

**Specific Objectives:**

1. To estimate the proportion of hoki that spawn each year from the western stock.
2. To review research on the importance of factors such as maternal age structure and condition on recruitment success and variability with particular reference to hoki.

**Reporting Requirements:**

**Research Reporting**

Objective 1

1. To present the results to the Hoki Fishery Assessment Working Group as required by 30 September 2010.
2. To submit to the Chief Scientist MFish a Final Research Report as specified in Research Reporting form 5 or a draft Fishery Assessment Report as specified in Research Reporting form 7 by 31 December 2010.

Objective 2

1. To submit to the Chief Scientist MFish a Final Research Report as specified in Research Reporting form 5 or a draft Fishery Assessment Report as specified in Research Reporting form 7 by 31 December 2010.

**Project Update Reports**

No Project Update Reporting is required for this project.

**Work In Progress Reports**

Monthly Work In Progress Reporting is required for this project in accordance with the Conducting Research with the Ministry document.

## **Data Reporting**

To submit any data generated, collected or modified during the course of this project to the Research Data Manager, MFish by 31 December 2010.

### **Rationale:**

#### *General*

Hoki is one of New Zealand's largest fisheries with a TACC of 90,000 t since 1 October 2007. This is much less than catch levels in recent years and reflects the current poor status of the western stock estimated in recent stock assessments. Although managed as a single stock, in the past hoki have been assessed as two stocks, western and eastern. The current hypothesis is that juveniles from both stocks mix on the Chatham Rise and recruit to their respective stocks as they approach sexual maturity.

The proportion spawning has been estimated in a number of studies but these have not been consistent through time. The early estimates (Livingston & Bull 2000) were much lower than those from a recent study (Grimes & O'Driscoll 2005). It is thought that the methods used may have influenced the results rather than representing real differences in spawning proportions between years.

The hoki fishery is largely recruitment driven and recruitment to the western stock was below average in the years 1995–2001, and although year class strength from 2002 to 2005 has improved, current estimates suggest they may still be at or below the long term average. The extended period of low recruitment has had a considerable impact on the fishery, yet the cause remains unknown. The role of climate variability in hoki recruitment patterns is almost certainly important, however, the key drivers and mechanisms are equivocal (Francis et al. 2006).

If the environmental conditions are less than optimal for hoki recruitment, it is important for managers to know if there are other factors which may be also affecting recruitment, particularly if fishing practices can be altered in such a way as to optimise the chance of improved recruitment. Reproductive processes in fishes is a rapidly developing field and includes research into the spawning dynamics of fish, links between the age structure, sex ratios and spawning success of fish, recruitment, and other mechanisms linking environmental conditions to reproductive success. This project will review the literature on fish reproductive processes and search existing data for evidence of demographic or energetic effects on recruitment and recruitment variability in the hoki fishery.

Studies with various fishes have found obvious and not-so-obvious relationships between characteristics of female fish and the quantity, quality and viability of their offspring. The age structure of commercially fished stocks is typically truncated with few older classes from the population. Experiments with species such as cod, striped bass, and rockfish, suggest that maternal age can influence the quantity, quality, and timing of eggs produced and can inflate recruitment variability if only small demographic segments of the population are successful in a given year. Stock-recruitment relationships currently assume that the number of recruits ultimately produced by a population is not influenced by the age structure of that population- i.e. every larva is equal.

The field is evolving rapidly, and the mechanisms for interactions with fisheries are complex. These types of effects are still not commonly incorporated into stock assessment models,

largely because the biology is lagging behind the modelling ability. There is a large effort to incorporate this information as the mechanisms are understood for each species. For example, incorporating age diversity into the stock-recruitment relationship improved the fit with Icelandic cod (Marteinsdottir and Thorarinsson 1998). Several new indicators of reproductive potential, (e.g., liver weights, prey availability) have been proposed for Arctic cod, Scotian Shelf haddock, and US striped bass (Marshall et al 2003). A maternal age effect that gives older females even higher production than fecundity alone would suggest has been found in Pacific ocean perch, and has been incorporated into the stock assessment (Spencer and Ianelli 2006).

### *Objective 1*

Samples of female gonads have been taken from the trawl surveys of the Sub-Antarctic in recent years with the intention to determine spawning proportion each year. Once an agreed protocol has been established these samples will be processed and read to identify fish that spawned in the previous winter.

### *Objective 2*

The literature review will focus on exploited teleosts, but will also include relevant research from other taxonomic groups to describe the range of effects known to date and their mechanisms of action. Fisheries management in New Zealand can benefit from the work done elsewhere on parental effects, but much of the specific information must be generated for each species through biological research and sensitivity modelling. This project will apply the appropriate concepts to the long time series of hoki demographics, sex ratios, body condition, and recently collected data of other biological attributes (liver condition and individual gonad development) to identify indices correlated with stock productivity. A synthesis of information available on hoki and current research results on parental effects may also suggest new indices to develop, such as female energy reserves, spawning data by age, age structure of males, or egg atresia rates as indicators of success in a given year.

### *Weighting of Objectives:*

Weightings indicate the relative importance of each of the objectives. The weightings for the objectives in this project are (in order): 0.7 and 0.3

**Project:** Stock assessment of jack mackerels in JMA7

**Project Code:** JMA2009-02

**Start Date:** 1 December 2009

**Completion Date:** 31 December 2010

**Vessel Use:** None

**Overall Objectives:**

1. To conduct stock assessments for the two New Zealand species, *Trachurus declivis* and *T. novaezelandiae* in JMA 7, including estimating biomass and sustainable yields.

**Specific Objectives:**

1. To update the descriptive analysis of the fisheries for jack mackerels in JMA7 with the inclusion of data up to the end of the 2008/09 fishing year.
2. To review and summarise the historical biological and other relevant data (including length frequency, sex ratio, otoliths, and reproductive condition data) for jack mackerel collected from shed sampling, the scientific observers programme and other sources (e.g. historical survey work) and the use of these data as inputs into a stock assessment.
3. To update the standardised and unstandardised CPUE indices with the inclusion of data up to the end of the 2008/09 fishing year.
4. To conduct stock assessments including estimating biomass and sustainable yields for jack mackerel species *Trachurus declivis* and *T. novaezelandiae* (JMA 7).

**Reporting Requirements:**

**Research Reporting**

Objectives 1 to 4

8. To present the results to the Middle Depths Working Group at meetings in Wellington in September 2010 as required.
9. To submit to the Chief Scientist MFish a draft Working Group Report as specified in Research Reporting form 8 by 30 September 2010.
10. To submit to the Chief Scientist MFish a Final Research Report as specified in Research Reporting form 5 or a draft Fishery Assessment Report as specified in Research Reporting form 7 by 30 September 2010.

**Project Update Reports**

No Project Update Reporting is required for this project.

## Work In Progress Reports

Monthly Work In Progress Reporting is required for this project in accordance with the Conducting Research with the Ministry document.

### Data Reporting

To submit any data generated, collected or modified during the course of this project to the Research Data Manager, MFish by 31 December 2010.

### Rationale:

#### *General*

The jack mackerel fisheries catch three species, the two New Zealand species, *Trachurus declivis* and *T. novaezelandiae*, and the more recently arrived *T. murphyi*. The non-native *T. murphyi* spread into New Zealand waters in the early 1980s and in some years is the dominant species in some areas.

Jack mackerels were introduced to the QMS as a species assemblage of the three species *T. declivis* (JMD), *T. novaezelandiae* (JMN) and *T. murphyi* (JMM) under a single species code, JMA. Accordingly it is not possible to determine the quantity of each species caught annually from commercial catch landings data.

In the last 6 years the catch of jack mackerel has increased to the level of the TACC in JMA7. The increase in landings has been attributed to market demand and reduction in the availability of quota for other preferred species. Reported landings in 2007-08 were 34 059 t.

A preliminary stock assessment was completed in research project JMA2004/02 and is reported in the 2008 Plenary report:

“Of the three jack mackerel species taken in JMA 7, recent information on stock status is only available for *T. declivis*. The current TACC is approximately 50% greater than the historical MCY-based yield estimates for *T. declivis* and *T. novaezelandiae* combined. These estimates of yield do not include *T. murphyi* which comprise an important part of the catches from JMA 7 in some years.

The 2007 preliminary assessment for *T. declivis* did not indicate sustainability concerns with this component of JMA 7 at that time though there are uncertainties in the assessment relating to the catch histories and abundance indices. The preliminary stock assessment indicates that current biomass is 53% of  $B_0$ , so the stock is probably above  $B_{MSY}$ . The historical estimate of  $B_0$  (see MCY section) is similar to that from the 2007 assessment.

The status of *T. novaezelandiae* and *T. murphyi* in JMA 7 is not known, nor is the sustainability of current removals of these species.

Overall it cannot be determined if the TAC or current removals are sustainable for JMA 7, but it is likely that the removals from one component of the fishery (*T. declivis*) are sustainable at this time. Given increased catches in recent years continued monitoring of the catch composition is strongly recommended as is further work on potential abundance indices.”

The recent increase in catches from the JMA7 fishery suggests that stock assessments are required for the two New Zealand species. The medium term research plan for jack mackerels indicates that a stock assessment is scheduled for 2009-10.

#### *Objective 1*

A descriptive analysis of the fishery is important to understand the way in which the fishery operates and how it may change over time. Any subsequent changes over time are important for the interpretation of CPUE indices and other fishery dependent data.

Under this objective the previous characterisations should be updated and the spatial and seasonal structure of the fishery be described. Fleet composition should be examined for consistency over time and any potential changes in gear configuration considered.

#### *Objective 2*

Relevant information from recent shed sampling or scientific observer programmes should be compiled for inclusion in the stock assessment. Any historical data not previously included in the assessment, but considered useful for inclusion, should be compiled under this objective.

#### *Objective 3*

The previous CPUE analysis should be updated taking into account any changes in the fishery identified under Objective 1. Special consideration should be given to the importance of spatial factors.

#### *Objective 4*

This will be the first assessment undertaken for this stock and will be strongly reliant on the successful development of a CPUE series under specific objective 3. It is anticipated that an age-structured assessment would be developed to allow incorporation of the catch sampling data.

One or more plausible model scenarios will form the basis of the assessment. For these model scenarios, biological reference points (e.g. MSY and  $B_{MSY}$ ) should be estimated and uncertainty being characterised using Bayesian or other approaches. Short and medium term projections will be undertaken for a restricted set of models based on a range of future catch scenarios to be determined later.

#### *Weighting of Objectives:*

Weightings indicate the relative importance of each of the objectives. The weightings for the objectives in this project are (in order): 0.1, 0.1, 0.3, 0.5

**Project:** Characterisation and fishery monitoring of middle depth species

**Project Code:** MID2009-01

**Start Date:** 01 December 2009

**Completion Date:** 31 December 2010

**Vessel Use:** None

**Overall Objectives:**

1. To review the status of middle depth Fishstocks not routinely assessed. The two species chosen for review this year are ribaldo and lookdown dory.

**Specific Objectives:**

**Ribaldo**

1. To characterise the New Zealand ribaldo fisheries by analysis of commercial catch and effort data up to 2008/09 including:
  - To carry out CPUE analyses for the major fisheries (Fishstocks) where appropriate.
  - To review the indices from CPUE analyses, all relevant research trawl surveys and Observer logbooks to determine any trends in biomass estimates, size frequency distributions or catch rates.
  - To review stock structure using data accessed above and any other relevant biological or fishery information.
  - To assess the availability and utility of developing a series of age frequency distributions from trawl survey and Observer collected otoliths.
  - To make recommendations on future data requirements (including recommendations for annual levels of Observer sampling) and methods for monitoring the stocks.

**Lookdown dory**

2. To characterise the New Zealand lookdown dory fisheries by analysis of commercial catch and effort data up to 2008/09 including:
  - To carry out CPUE analyses for the major fisheries (Fishstocks) where appropriate.
  - To review the indices from CPUE analyses, all relevant research trawl surveys and Observer logbooks to determine any trends in biomass estimates, size frequency distributions or catch rates.
  - To review stock structure using data accessed above and any other relevant biological or fishery information.
  - To assess the availability and utility of developing a series of age frequency distributions from trawl survey and Observer collected otoliths.
  - To make recommendations on future data requirements (including recommendations for annual levels of Observer sampling) and methods for monitoring the stocks.

## **Reporting Requirements: Research Reporting**

### Objective 1

1. To present the results to the Middle Depths Working Group at meetings in Wellington in September 2010 as required.
2. To submit to the Chief Scientist MFish a draft Working Group Report as specified in Research Reporting form 8 by 30 September 2010.
3. To submit to the Chief Scientist MFish a Final Research Report as specified in Research Reporting form 5 or a draft Fishery Assessment Report as specified in Research Reporting form 7 by 30 September 2010.

### Objective 2

1. To present the results to the Middle Depths Working Group at meetings in Wellington in September 2010 as required.
2. To submit to the Chief Scientist MFish a draft Working Group Report as specified in Research Reporting form 8 by 30 September 2010.
3. To submit to the Chief Scientist MFish a Final Research Report as specified in Research Reporting form 5 or a draft Fishery Assessment Report as specified in Research Reporting form 7 by 30 September 2010.

## **Project Update Reports**

No Project Update Reporting is required for this project.

## **Work In Progress Reports**

Monthly Work In Progress Reporting is required for this project in accordance with the Conducting Research with the Ministry document.

## **Data Reporting**

To submit any data generated, collected or modified during the course of this project to the Research Data Manager, MFish by 31 December 2010.

## **Rationale:**

### *General*

Many of the middle depth fisheries are of moderate size or value compared to the hoki, hake, ling and southern blue whiting fisheries and are not routinely monitored or assessed. This project is designed to ensure that data available for monitoring the moderately important middle depth species are routinely summarised and assessed on a 5 year rotating schedule. This will allow for research needs relevant to current management issues to be appropriately assessed.

The medium term research plan lists the requirements for future research for each species. Updating the fishery characterisations for 2 species each year will ensure that they are all updated at least every 5 years. The most recent reports on characterisations and other stock assessment research for middle depth species are:

Species	Characterisation	Other stock assessment research
Arrow squid	1988,1995 1997 (Japanese) 2008-09 (proposed)	CPUE 2001 <i>N. sloanii</i> Age and growth 1992 (Japanese) MID2008-01
Barracouta	1988 BAR1 2002  2008-09 (proposed)	Tagging 1989 BAR 5 CPUE SI stock structure 2002 CPUE BAR1 2002 CPUE BAR5 1999 MID2008-01
Blue warehou	2005	Stock assessment 1999 WAR3 Age methodology 1998
Frostfish	2001	Biology, commercial landings 1998
Gemfish – southern	1998	Climate and recruitment 1999
Ghost shark – dark – pale	2003 2003	Ageing technique 2001
Lookdown dory	None	Ageing (LDO2004/01)
Ribaldo	2006 (Up to 2002-03)	Ageing (RIB2007/01)
Silver warehou	2007-08	MID2007-03 (SWA 3 & 4) Stock structure 2001 Ageing methodology 1996
White warehou	2005	Ageing & stock assessment 1999

Based on the information needs required to manage these fisheries in the short-term, ribaldo and lookdown dory have been chosen for full characterisation in MID2009/01.

### *Objective 1*

In New Zealand ribaldo is caught on bottom longlines and as a bycatch of trawling. Up to 7000 t were reported in 1977 by Japanese and Korean longline vessels target fishing for ling on the Chatham Rise and east coast of the South Island in the 1970s. In recent years (since the early 1990s) most of the New Zealand catch has probably been by longline but most reported catch from about 1978 to 1990 has probably been as a bycatch during target trawling for hoki (*Macruronus novaezelandiae*), orange roughy (*Hoplostethus atlanticus*) and ling (*Genypterus blacodes*) at 500–1000 m. Reported catch has been mainly from the Chatham Rise and east coast South Island (QMAs 3 & 4) and since 1991–92 from east coast North Island (QMAs 1 & 2). Reported catch prior to 1990 was probably less than actual catch because some of the ribaldo caught by trawling was discarded.

Ribaldo was introduced into the QMS from 1 October 1998. The TACCs remained unchanged until the 2000–01 fishing year when quotas were raised for QMAs 1, 2 and 3. TACCs were increased from 1 October 2006 in RIB 6 to 231 t and in RIB 7 to 330 t. In these stocks landings were above the TACC for a number of years and the TACCs have been increased to the average of the previous 7 years plus an additional 10%.

The stock status is unknown for any ribaldo stocks. The objective of this project is to describe the main fisheries for ribaldo and determine by what means the stocks can be monitored in the long term to determine whether the TACCs are appropriate in each area. The working group report should also be updated to reflect the latest information available.

### *Objective 2*

Lookdown dory is generally caught by bottom trawling in depths of 200 to 800 m as a bycatch in a range of fisheries including hoki, barracouta, hake, ling, scampi and jack mackerel. A small amount of target fishing is reported from FMA 7. Most of the catch has come from FMA 3 (east coast South Island), FMA 4 (Chatham Rise), and FMA 7 (west coast South Island) (Table 4). Landings from around the North Island have been restricted mostly to a few tonnes from FMA 1 and FMA 2 in each year, as well as from FMA 9 in the last three fishing years. In FMA 5 (Southland) and FMA 6 (Sub-Antarctic) landings have been in the order of 10–30 t over the past six years. No landings have been reported from outside the New Zealand EEZ.

The greatest proportion of the estimated catch of lookdown dory is taken as bycatch in the hoki fishery. For all fishing years and FMAs combined, 83% of lookdown dory catch has been bycatch in the hoki fishery, with other fisheries (barracouta 4%, hake 3%, ling 2% and scampi 2%) catching a smaller fraction.

There are no known sustainability concerns in the lookdown dory fishery. Trawl surveys indicate stable abundance in the main fishery. However, the stock status is unknown for any lookdown dory stocks. The objective of this project is to describe the main fisheries for lookdown dory and determine by what means the stocks can be monitored in the long term to determine whether the TACCs are appropriate in each area. The working group report should also be updated to reflect the latest information available.

### *Weighting of Objectives:*

Weightings indicate the relative importance of each of the objectives. The weightings for the objectives in this project are (in order): 0.5, 0.5

**Project:** Stock assessment of southern blue whiting

**Project Code:** SBW2009-01

**Start Date:** 01 October 2009

**Completion Date:** 30 September 2010

**Vessel Use:** None

**Overall Objectives:**

1. To carry out stock assessments of southern blue whiting (*Micromesistius australis*) including estimating biomass and sustainable yields.

**Specific Objectives:**

1. To determine catch at age from the commercial fisheries at Campbell Island, Auckland Island, Bounty Platform, and Pukaki Rise for 2008/09 from samples collected at sea by the Observer Programme and other sources, with a target coefficient of variation (c.v.) of 20 % (mean weighted c.v. across all age classes).
2. To update the stock assessment of the Campbell Island stock, including estimating biomass and sustainable yields.

**Reporting Requirements:**

**Research Reporting**

Objectives 1 and 2

1. To present the results to the Middle Depths Working Group at meetings in Wellington in March-April 2010 as required.
2. To submit to the Chief Scientist MFish a draft Working Group Report as specified in Research Reporting form 8 by 20 March 2010.
3. To submit to the Chief Scientist MFish a Final Research Report as specified in Research Reporting form 5 or a draft Fishery Assessment Report as specified in Research Reporting form 7 by 30 September 2010.

**Project Update Reports**

No Project Update Reporting is required for this project.

**Work In Progress Reports**

Monthly Work In Progress Reporting is required for this project in accordance with the Conducting Research with the Ministry document.

## **Data Reporting**

To submit any data generated, collected or modified during the course of this project to the Research Data Manager, MFish by 30 September 2010.

## **Rationale:**

### *General*

This fishery was developed in the early 1970's by the Soviet fleet. Landings have fluctuated considerably, peaking at 75,000 t in the 1991/92 fishing year, when almost 60,000 t was taken from the Bounty Platform stock. From 1992/93 to 1995/96 an annual catch limit of 32 000 t applied, but this was increased for the 1996/97 fishing year to 58 000 t, as the stock assessment indicated higher yields were available. Southern blue whiting was introduced into the QMS in 1999 with separate TACs for each of the four main stocks in SBW6. TACCs have been set at the level of the estimated CAY in most stocks each year resulting in fluctuating total catch limits. The TACC was reduced to 20 000 t from 1 April 2006.

There is uncertainty over the estimates of current stock size for all four stocks. This is due to imprecision in the acoustic data and to uncertainty over recent and future recruitment. The fishery is strongly recruitment driven and is currently dependent on less than 5 year classes, compared with up to 15 year classes in the past. The most recent stock status for the Campbell Islands stock was not updated in 2009, and remains as described in the 2007 Plenary report:

“The 2006 Campbell Island stock assessment was updated by including an additional year of proportion-at-age data and an additional acoustic index. For the base case,  $B_{2006}$  was estimated to be 78 000 t (90% credible interval 56 000–106 000 t), corresponding to 30% $B_0$  (90% credible interval 20–41%).

The catch is dominated numerically by the strong 2001 and 2002 year classes, and the incoming 2004 year class also appears to be above average. The TACC was reduced to 20 000 t in 1 April 2006, and at this level of catch, the biomass is projected to remain stable over the next 2–3 years. At the current TACC level, the probability that the biomass will drop below  $B_{1991}$  is projected to rise to 3% over the next three years (Table 10). The assessment is much more optimistic than the equivalent stock assessment presented in 2006, particularly in the projections, as stock size is not predicted to decrease with future catches of 20 000 t (current TACC)”.

### *Objective 1*

A time series of catch at age data has been developed for all the fisheries using otolith samples collected by the Observer Programme. Catch at age data provides information on the year class strength of recent recruitment to the fishery. These are important in future predictions of stock biomass and yield.

### *Objective 2*

In 2010, another year of catch at age data will be available from objective 1. For the Campbell Islands Rise stock a new estimate of biomass from the 2009 acoustic survey (SBW2009/02) will also be available to update the assessment.

### *Weighting of Objectives:*

Weightings indicate the relative importance of each of the objectives. The weightings for the objectives in this project are (in order): 0.3, 0.7

## Inshore Finfish Fisheries and Freshwater Eels

BCO2009-04      Catch per unit effort analysis of the commercial blue cod fishery in  
BCO 4

**Project Title:** Catch per unit effort analysis of the commercial blue cod fishery in BCO 4

**Project Code:** BCO2009-04

**Start Date:** 1 October 2009

**Completion Date:** 30 September 2010

**Vessel Use:** Nil

**Overall Objective:**

1. To characterise the BCO 4 fishery
2. To analyse trends in CPUE of the BCO 4 stock

**Specific Objectives:**

1. To characterise the BCO 4 fishery
2. To analyse CPUE trends in commercial BCO 4 commercial fishery up to the end of 2008/2009.

**Note:**

Research providers should also take cognisance of recent progress made in data grooming for CPUE standardization for inshore finfish including methods used to reconcile landings with estimated catch. Potential science providers are referred to the Kendrick and Walker (2004) and Starr et al. (2007) reports for further details.

**Reporting Requirements:**

**Research Reporting**

Objective 1

1. To submit to the Chief Scientist MFish a Progress report as specified in Research Reporting form 4 by 14 March 2010.
2. To present the report in 1 above to meetings of the Southern Inshore Fishery Assessment Working Group in July 2010 in Wellington. Presentations to more than one meeting may be required.
3. To submit to the Chief Scientist MFish a Final Research Report as specified in Research Reporting form 5 or a draft Fishery Assessment Report as specified in Research Reporting form 7 by 30 September 2010.

**Project Update Reports**

No Project Update Reporting is required for this project.

## **Work In Progress Reports**

Monthly Work In Progress Reporting is required for this project in accordance with the Conducting Research with the Ministry document.

## **Data Reporting**

To submit any data generated, collected or modified during the course of this project to the Research Data Manager, MFish by 30 September 2010.

## **Rationale:**

### *General*

Blue cod is a bottom-dwelling species endemic to New Zealand. Although distributed throughout New Zealand near foul ground to a depth of 150 m, they are more abundant south of Cook Strait and around the Chatham Islands. Growth may be influenced by a range of factors, including sex, habitat quality and fishing pressure relative to location. Size-at-sexual maturity also varies according to location.

Blue cod is predominantly an inshore domestic fishery with very little deepwater catch. The major blue cod fisheries in New Zealand are off Southland and the Chatham Islands. In BCO 4 the commercial fishery landed 736t in the 2006/07 fishing year, making BCO 4 the second most important BCO fishery nationally. Recreational and customary non-commercial blue cod catch has not been estimated from this region.

This research is necessary because:

- blue cod support important commercial, recreational, and customary fisheries;
- current stock status of blue cod is unknown, no formal stock assessments are undertaken for this species;
- the project has been identified as integral to the blue cod component of the New Zealand Inshore Fisheries Medium Term Research Plan; and

Within this context, this research project is considered a **high** priority.

### *Objective 1*

Results of the characterisation will be used to determine the data grooming procedures for the CPUE analysis and which fisheries need to be assessed and the spatio-temporal analyses required in order to ensure the CPUE analysis is reflective of the fishery. The characterisation will also provide valuable input for the fisheries plan that is presently being developed.

### *Objective 2*

Alternative indices based on landed and estimated catch should, where possible, be calculated for BCO 4. Research providers should also take cognisance of recent progress made in data grooming for CPUE standardization for inshore finfish including methods used to reconcile landings with estimated catch.

### *Weighting of Objectives:*

Weightings indicate the relative importance of each of the objectives. The weightings for the objectives in this project are (in order): 0.33 and 0.66.

## Non-Commercial Fisheries

EEL2009-01	Survey of tuna in customary areas of ANG 14
EEL2009-04	Assessment of the eel population in Patea River catchment
KIN2009-01	Catch-at-age and CPUE of recreational charter catch of kingfish in KIN 1
TOH2009-01	Distribution and abundance of toheroa on Ninety Mile Beach

**Project:** Survey of tuna in customary areas of ANG 14

**Project Code:** EEL2009-01

**Start Date:** 1 October 2009

**Completion Date:** 30 September 2010

**Vessel Use:** None

**Overall Objective:**

1. To characterise the population structure of eels in selected areas of customary significance in ANG 14.

**Specific Objectives:**

1. To determine the distribution, species composition, size and age structure, and sex composition of eel populations in the areas of customary significance in ANG 14 to provide a reference point for any future monitoring of the population and management of the customary fishery.

**Reporting Requirements**

**Research Reporting:**

Objectives 1

1. To submit to MFish a Final Research Report as specified in Research Reporting form 5 or a draft Fishery Assessment Report as specified in Research Reporting form 7 by 30 September 2010.
2. To present the report detailed in 1 above to meetings of the Eel Fishery Working Group in August/September 2010. Meeting locations to include Christchurch and/or Wellington.

**Project Update Reports**

No Project Update Reports are required for this project.

**Work In Progress Reports**

Monthly Work In Progress Reporting (Form 13) is required for this project in accordance with the document entitled "Conducting Research with the Ministry".

**Data Reporting**

To submit any data generated, collected or modified during the course of this project to the Research Data Manager, MFish by 30 November 2010.

## **Rationale:**

### *General*

Tuna (freshwater eels) are of significant value to customary fishers of Arowhenua and Waihao Runanga in the Quota Management Area 14 (ANG 14). In the past, tuna flourished in rivers, creeks, and waterways within close proximity to Arowhenua, Waihao and Punatarakao Pa. Today, there are fewer and smaller tuna in the waterways than in the past. The smaller eels tangata whenua are able to find are not of a good size to harvest.

The reduction in the size of tuna available within the Arowhenua and Waihao takiwā threatens the sustainability of the fishery for customary fishers. Establishing the present extent and well-being of mahinga kai species will provide a baseline for any future monitoring of the population and management of the customary fishery. Information on the species composition and size structure, and catch and effort data from the survey, will provide data for comparison with other eel population surveys. This will enable some assessment to be made of the status of the eel populations in the selected customary areas.

### *Objective 1*

This Objective will determine the distribution, relative abundance, species composition, size and age structure and sex ratio of tuna in selected areas of customary importance in ANG 14. The by-catch of other species will also be determined. Comparisons will be made of the species and size composition of eels, and catch and effort, from the commercial fisheries sampling and other data sources.

ANG 14 includes several major rivers, lagoons and smaller rivers/creek that contain eel populations of significance to customary fishers, including:

Opihi Lagoon and tributaries  
Orari River  
Temuka River  
Coopers Creek  
Ohape River  
Washdyke Lagoon inlet tributaries  
Orakipaoa River  
Waihao River  
Hook River  
Wainono Lagoon  
Waimate Stream  
Hakataramea River.

There will necessarily be limitations on the number of locations that will be sampled. The location of sampling sites will be determined in consultation with the nominated Tangata Tiaki/Kaitiaki.

**Project:** Assessment of the eel population in Patea River catchment

**Project Code:** EEL2009-04

**Start Date:** 1 October 2009

**Completion Date:** 30 September 2010

**Vessel Use:** None

**Overall Objectives:**

1. To characterise the population structure of the eel population in the Pātea River catchment.

**Specific Objectives:**

1. To determine the distribution, species composition, size and age structure, and sex of freshwater eels in the Patea River catchment to provide a reference point for any future monitoring of the eel population and management of the respective customary fishery.
2. Based on Objective 1 provide an assessment of eel population structure in relation to selected habitat types.

**Note:**

This project would require consultation and involvement of local iwi in undertaking the survey and communication of the results.

**Reporting Requirements**

**Research Reporting:**

Objectives 1 and 2

3. To submit to MFish a Final Research Report as specified in Research Reporting form 5 or a draft Fishery Assessment Report as specified in Research Reporting form 7 by 30 September 2010.
4. To present the report detailed in 1 above to meetings of the Eel Fishery Working Group in August/September 2010. Meeting locations to include Hamilton and/or Wellington.

**Project Update Reports**

No Project Update Reports are required for this project.

**Work In Progress Reports**

Monthly Work In Progress Reporting (Form 13) is required for this project in accordance with the Conducting Research with the Ministry document.

## **Data Reporting**

To submit any data generated, collected or modified during the course of this project to the Research Data Manager, MFish by 30 November 2010.

### **Rationale:**

#### *General*

Tuna are important local resource to the hapu of the Patea River catchment, including Rangitaawhi, Puu Korokoro, Tupito, and Ringi.

Traditionally, māori harvested tuna according to the maramataka (lunar cycle), with particular focus on the tuna heke (seasonal tuna migration), when large numbers of well conditioned tuna would provide bountiful harvests.

Hapu consider that the customary eel take in the Pātea River catchment has fallen markedly over time and anecdotal evidence attributes this to a decline in the longfinned eel population. The decline began in the early 1900's when large longfinned eels, so treasured by tangata whenua, became the subject of a nation-wide "pest" eradication program. Commercial fishing and construction of migration barriers, notably of Pātea Dam, led to an accelerated rate of decline. Major habitat loss no doubt also contributed to the fall in the population. Large podocarps once stood along the Patea River but these trees have largely disappeared, removed for their timber and then for agriculture. Much of the stream and river margins are now barren with only a few remaining pockets of forest remaining along the waterways. Associated with the loss of riparian cover and change in land-use came water quality issues, increased water temperature and loss of in-stream woody cover for large eels.

The rapid decline in abundance and distribution of tuna over the past century disconnects tangata whenua from the traditional practice of fishing for tuna. Traditional principals governing sustainable harvest require far greater abundance than what currently exists in the Pātea River catchment. This project aims to determine the present status of the eel population of the Pātea River.

#### *Objectives 1 & 2*

These objectives will determine the current distribution, species composition, age structure and sex composition of freshwater eels in the Pātea River catchment. The size and age composition of juvenile eels (i.e., < 300 mm) will be determined to provide evidence of recruitment, and also be an index of future recruitment into the "adult" fishery (i.e., tuna of sufficient size for harvest for customary purposes). Sampling will include areas of different habitat with a view to providing some assessment of the status of the eel population in relation to habitat type and quality.

#### *Weighting of Objectives:*

Weightings indicate the relative importance of each of the objectives. The weightings for the objectives in this project are (in order): 0.9, 0.1.

**Project:** Catch-at-age and CPUE of recreational charter catch of kingfish in KIN 1

**Project Code:** KIN2009-01

**Start Date:** 01 September 2009

**Completion Date:** 30 July 2012

**Vessel Use:** None

**Overall Objectives:**

1. To monitor the status of kingfish (*Seriola lalandii*) stocks in KIN 1.

**Specific Objectives:**

1. To characterise the fisheries in order to inform the sampling design development and to investigate the use of Charter Boat CPUE as a monitoring tool for KIN 1.
2. To conduct representative sampling to determine the length, sex, and age composition of the recreational charter boat landings of kingfish in KIN 1 for the 2009/10 and 2010/11 fishing years to monitor the KIN 1 stock. The target coefficient of variation (CV) for the catch-at-age will be 30% (mean weighted CV across all age classes).

**Note:**

The sampling design will be reviewed by the Inshore Working Group prior to the sampling commencing using the criteria set out in the “Guidelines to the design, implementation and reporting of catch sampling programmes”. This contains details of what is expected in relation to designing and implementing a catch sampling programme and reporting the subsequent results back to a working group.

**Reporting Requirements:**

**Research Reporting**

Objective 1-3

1. To present the proposed sampling design for specific objective 1 to the Northern Inshore working Group in September 2009.
2. To submit to the Chief Scientist MFish a Progress report as specified in Research Reporting form 4 by 1 September 2010.
3. To present the report in 2 above to meetings of the Northern Inshore Fishery Assessment Working Group in October 2010 in Auckland.

4. To submit to the Chief Scientist MFish a Final Research Report as specified in Research Reporting form 5 or a draft Fishery Assessment Report as specified in Research Reporting form 7 by 30 February 2012.
5. To present the report in 4 above to meetings of the Northern Inshore Fishery Assessment Working Group in March 2012 in Auckland.

### **Project Update Reports**

No Project Update Reporting is required for this project.

### **Work In Progress Reports**

Monthly Work In Progress Reporting is required for this project in accordance with the Conducting Research with the Ministry document.

### **Data Reporting**

To submit any data generated, collected or modified during the course of this project to the Research Data Manager, MFish by 30 July 2012.

### **Rationale:**

#### *General*

Kingfish is highly regarded by recreational fishers in New Zealand for its sporting attributes and large size. Kingfish are most often caught by recreational fishers from private boats and from charter boats, but are also a prized catch for spearfishers and shore based game fishers. Kingfish are recognized internationally as a sport fish, and kingfish caught in New Zealand waters hold 20 of the 22 International Gamefish Association World Records.

Recreational fishers have voiced concerns over a perceived marked decline in the size of kingfish available to them in recent years. Many clubs, competitions and charter boats have implemented a voluntary one kingfish per person per day limit in response. A number of gamefish clubs have also adopted a minimum size limit of 100 cm for kingfish.

Recreational harvest estimates by fish stock have been obtained from national telephone diary surveys undertaken in 1996 and 2000, with a follow up survey in 2001. Regional telephone diary surveys were undertaken in 1991–92 in the South Region, 1992–93 in the Central Region and in 1993–94 in the North Region.

This research is necessary because:

- kingfish support important commercial, recreational, and customary fisheries
- CPUE and catch-at-age for the recreational fisheries will be important monitoring tools and inputs for any future stock assessment.
- the project has been identified as integral to the kingfish Medium Term Research Plan.

Within this context, this research project is considered a **high** priority.

#### *Objective 1*

Results of the characterisation will be used to determine spatio-temporal sampling effort and which fisheries need to be sampled in order to obtain representative samples. The characterisation will also provide valuable input for the fisheries plan that is presently being developed.

This objective includes investigating the use of charter boat catch and effort data to develop a CPUE based index of abundance for kingfish in KIN1.

Note: Recreational catch monitoring by charter boats may become compulsory in the near future. This may influence the design strategy for this project.

#### *Objective 2*

While a formal stock assessment (based on a stock assessment model) is not proposed for kingfish at this time, age composition of the catch has been shown by previous studies to provide information on stock status and the sustainability of current removals. It is, however, critical that accurate information on the size (and age) composition of released fish is collected.

Age structure provides a tool with which exploitation rate can be measured, allowing for both temporal and spatial comparisons. Monitoring age structure also provides a means to better evaluate the response of a population to changes in regulations. Some outputs from this objective will include:

- Estimation of the age structure of the population/s
- Estimates of total fishing mortality that incorporate uncertainty in key parameters (e.g. age at full recruitment and other selectivity issues) and the different properties of regression and Chapman-Robson estimators.
- Proxies for  $F_{msy}$  based on spawner biomass per recruit analyses (e.g.  $F_{40\%SBR}$ .)

#### *Weighting of Objectives:*

Weightings indicate the relative importance of each of the objectives. The weightings for the objectives in this project are (in order): 0.3, 0.7.

**Project title:** Distribution and abundance of toheroa on Ninety Mile Beach

**Project code:** TOH2009-01

**Start date:** 1 September 2009

**Completion Date:** 30 December 2010

**Vessel use:** None

**Overall Objectives:**

1. To determine the distribution of toheroa (*Paphies ventricosum*) beds, and the abundance and size structure of toheroa on Ninety Mile Beach.

**Specific Objectives:**

1. To review the survey design for estimating the abundance of toheroa on Ninety Mile Beach.
2. To estimate the size structure and absolute abundance of toheroa on Ninety Mile Beach, during February – May 2010. The target c.v. for the estimate of absolute abundance of legal sized toheroa ( $\geq 100$  mm shell length) is 20%.
3. To describe changes in the size structure and absolute abundance of toheroa on Ninety Mile Beach by comparing the results from this work with those from previous surveys.

**Note:** The Ministry of Fisheries recognises the importance of the toheroa resource to customary fishers. The successful tenderer will consult with and involve tangata whenua in the conduct of this research project.

**Reporting Requirements:**

Specific Objective 1

1. To submit to MFish, a Progress Report as specified in Research Reporting form 4 detailing the methods proposed in specific objective 1 by 1 December 2009.
2. To present the results of reporting requirement 1 to a meeting of the Shellfish Fishery Assessment Working Group in the week of the 14<sup>th</sup> to 18<sup>th</sup> of December 2009.

### Specific Objectives 2 & 3

1. To present the findings of the draft Fisheries Assessment Report, incorporating specific objectives 1, 2 and 3 above, to a meeting to the Shellfish Fishery Assessment Working Group by 30 November 2010. Presentations to more than one meeting in Auckland may be required.
2. To submit to MFish a draft Fisheries Assessment Report as specified in Research Reporting Form 5 by 30 December 2010.

### **Project Update Reports**

No Project Update Reporting is required for this project.

### **Work In Progress Reports**

Monthly Work In Progress Reporting (form 13) is required for this project in accordance with the Conducting Research with the Ministry document.

### **Data Reporting**

To submit any data generated, collected or modified during the course of this project to the Research Data Manager, MFish by 30 December 2010.

### **Rationale:**

#### *General*

Toheroa represent an important Maori customary fishery and have historically also supported commercial and recreational fisheries of importance in Northland. Annual surveys of Muriwai, Dargaville and areas of Ninety Mile Beach were used to estimate the availability of toheroa during the 1960s. By 1967 the estimated stocks of toheroa on Northland beaches had become so low that the annual season for picking was closed to the public. Results from these surveys also showed that recruitment was highly variable and that the populations suffered large scale natural mortalities of both adults and juveniles. In 1993 surveys conducted in the north found only one animal of legal size.

Ongoing time series of abundance of toheroa are required on all major toheroa beaches, Ninety Mile Beach, Dargaville Beach, Murawai Beach (North Island), and Oreti Beach and Bluecliffs Beach (Southland).

#### *Objectives 1, 2 & 3*

A survey conducted on Ninety Mile Beach in May 2006 (TOH2005-01) showed that the overall population size of toheroa was 8.88 million (c.v. 31.0%), but only one individual over 74 mm was encountered. Problems were encountered with the survey stratification, making comparison with past surveys problematic. Objective 1 would review the survey design used in the last survey and make any necessary survey improvements to avoid the problems with the 2006 survey. The survey design would require a satisfactory review by the Shellfish Fisheries Working Group before the survey is undertaken. This new

survey would provide an updated assessment of the distribution and abundance of toheroa on Ninety Mile Beach.

Determining the population size structure may provide an indication of the health of the toheroa population and help determine if the 2000 recruitment pulse has translated into high adult toheroa abundance. Spatial and size information will assist kaitiaki in managing the resource available for customary harvest.

#### *Weighting of Objectives*

Weightings indicate the relative importance of each of the objectives. The weightings for the objectives in this project are (in order): 0.15: 0.7: 0.15.

## SHELLFISH FISHERIES

PPI2009-01	Stock assessment of Mair Bank pipis
SCA2009-06	Environment-recruit relationships for scallops
SCA2009-07	Scallop medium term research plan
SUR2009-01	Characterisation of kina fisheries

**Project:** Stock assessment of Mair Bank pipis

**Project Code:** PPI2009-01

**Start Date:** 1 October 2009

**Completion Date:** 30 September 2010

**Vessel Use:** None

**Overall Objectives:**

1. To carry out a stock assessment of pipis (*Paphies australis*) on Mair Bank Whangarei Harbour, including estimating absolute biomass and sustainable yields.

**Specific Objectives:**

1. To estimate the size structure and absolute biomass of pipis on Mair Bank during March – April 2010. The target coefficient of variation (c.v.) of the estimate of absolute recruited biomass is 20 %.
2. To complete the stock assessment and estimate yields for pipis on Mair Bank for the 2010/2011 fishing year.
3. To determine the growth rate of pipis on Mair Bank

**Reporting Requirements:**

Specific Objective 1, 2 and 3

1. To present the findings to a meeting to the Shellfish Fishery Assessment Working Group by 30 August 2010.
2. To submit to MFish a draft Fisheries Assessment Report as specified in Research Reporting Form 5 by 30 September 2010.

**Project Update Reports**

No Project Update Reporting is required for this project.

**Work In Progress Reports**

Monthly Work In Progress Reporting (form 13) is required for this project in accordance with the Conducting Research with the Ministry document.

**Data Reporting**

To submit any data generated, collected or modified during the course of this project to the Research Data Manager, MFish by 30 September 2010.

## **Rationale:**

### *General*

Ninety nine percent of the commercial pipi catch in New Zealand comes from Mair Bank (in Whangarei Harbour). Annual commercial landings from Mair Bank have averaged 182 tonnes since 1990-91.

The commercial fishery area is defined in regulation as that area within 1.5 nautical miles of the coastline from Home Point at the northern extent of the Whangarei Harbour entrance, to Mangawhai Heads, south of the harbour. The defined area includes Snake Bank within the harbour. Commercial access to the fishery was constrained by the moratorium on granting new fishing permits for non-QMS fisheries. No new entrants entered the fishery after 1992.

Mair Bank pipis (PPI 1A) were introduced into the Quota Management System from 1 October 2004 with a total allowable catch (TAC) of 250 t, comprised of a total allowable commercial catch (TACC) of 200 t, a customary allowance of 25 t, and a recreational allowance of 25 t.

Non-commercial fishers (recreational and customary) harvest pipi on Mair Bank and elsewhere in the harbour. The amateur daily bag limit is 150 pipi per person per day. Customary fishing permits are issued by iwi to allow Māori to take more than the amateur daily limit for customary purposes. There is no information available on the quantities of pipi harvested in the harbour by these fishers.

A biomass survey and yield estimate was undertaken in March – May 2005. Overall, the 2005 biomass estimate and simple yield estimates suggest that fishing at the level of the recent average landings were likely to be sustainable in the short term. Only two biomass estimates have been made for Mair Bank, and it is not known how biomass in the population varies over time. Periodic biomass surveys and yield estimates are required to monitor the fishery.

### *Objectives 1, 2 & 3*

These objectives would undertake a biomass survey of Mair Bank pipis in March – May 2010 and make estimates of yield. Periodic biomass surveys and yield estimates are required to monitor the fishery. The last biomass survey and yield estimate was made in 2005. Little is known about the growth rate of pipis. Better estimates of growth will improve the precision of the yield estimates

### *Weighting of Objectives*

Weightings indicate the relative importance of each of the objectives. The weightings for the objectives in this project are (in order): 0.33: 0.33: 0.33.

**Project:** Environment-recruit relationships for scallops

**Project Code:** SCA2009-06

**Start Date:** 1 October 2009

**Completion Date:** 30 September 2010

**Vessel Use:** None

**Overall Objective:**

1. To investigate how environmental variations influence scallop population dynamics

**Specific Objectives:**

1. To identify possible environmental factors influencing scallop biology through analysis of historical data to determine the extent to which scallop population dynamics is predictable.

**Reporting Requirements:**

3. To present the findings to a meeting to the Shellfish Fishery Assessment Working Group in Auckland by 30 August 2010.
4. To submit to MFish a draft Fisheries Assessment Report as specified in Research Reporting Form 5 by 30 September 2010.

**Project Update Reports**

No Project Update Reporting is required for this project.

**Work In Progress Reports**

Monthly Work In Progress Reporting (form 13) is required for this project in accordance with the Conducting Research with the Ministry document.

**Data Reporting**

To submit any data generated, collected or modified during the course of this project to the Research Data Manager, MFish by 30 September 2010.

## **Rationale:**

### *General*

Scallops are an important component of New Zealand's marine ecosystem, are widely distributed in a range of habitats around the coastline, and support valuable commercial, recreational, and customary fisheries. Growth, condition, mortality, and recruitment all vary in scallop populations for reasons that are poorly understood. In general, scallops grow rapidly, have high natural mortality, and exhibit highly variable recruitment. Such a life history results in large fluctuations in population abundance, often independent of fishing effort. Currently, we do not fully understand the processes that have resulted in these large fluctuations, but sea temperature and food supply undoubtedly play a role. Fundamental biological processes (reproduction, growth, mortality, and recruitment) are known to be strongly influenced by environmental conditions, and changes in these conditions can alter the population dynamics of marine species. This concept is termed oceanographic forcing. Previous exploratory investigations suggest that scallop recruitment in northeastern New Zealand appears to be strongly linked to El Niño-Southern Oscillation (ENSO) and sea temperature.

What is needed is a greater understanding of the relationship between environmental conditions and recruitment so that we adapt management to environmental fluctuations. This is especially relevant when considering the potential development of an integrated stock assessment model for scallops, suggested as a future research direction at the 21 July 2008 Shellfish Working Group meeting. An important component of such a model would be recruitment strength.

A variety of extensive spatial/temporal data relating to different life-history phases are already available. These include data on adult condition (meatweight data from fish processors), larval settlement success (spatfall data from enhancement programmes and research projects), growth (from tagging studies), and population abundance (fishery catch and effort data, and data from fishery-independent dredge and diver surveys). Using the time series of climate and oceanographic data available, these data provide the basis to assess the influence of the environment on scallop fisheries.

### *Objective 1*

This objective will identify possible environmental factors influencing scallop biology. Appropriate historical data should be analysed in relation to environmental variables to determine the extent to which scallop population dynamics is predictable.

### *Weighting of Objectives*

Weightings indicate the relative importance of each of the objectives. As there is only one objective in this project it carries a weighting of 1.

**Project:** Scallop medium term research plan

**Project Code:** SCA2009-07

**Start Date:** 1 October 2009

**Completion Date:** 30 September 2010

**Vessel Use:** N/A

**Overall Objective:**

1. To prepare a medium term research plan (MTRP) that will identify the main research directions and needs for undertaking research on scallops over the next three to five years.

**Specific Objectives:**

1. To review the current knowledge of research and fisheries management of scallops.
2. To identify and prioritise the key areas where research is required to improve the stock assessment and management of scallops.

Note: The development of this report will be reviewed by the SFWG in March-April 2010 to allow all stakeholders the opportunity to have input into the MTRP.

**Reporting Requirements:**

**Research Reporting**

Objective 1 & 2

1. To submit to the Chief Scientist MFish a Final Research Report as specified in Research Reporting form 5 or a draft Fishery Assessment Report as specified in Research Reporting form 7 by 30 September 2010.
2. To present a draft outline of the report in 1 above to a meeting of the Shellfish Fisheries Assessment Working Group in March-April 2010.
3. To present the draft completed report in 1 above to a meeting of the Shellfish Fisheries Assessment Working Group in October-November 2010

**Project Update Reports**

No Project Update Reporting is required for this project.

## **Work In Progress Reports**

Monthly Work In Progress Reporting is required for this project in accordance with the Conducting Research with the Ministry document.

### **Data Reporting**

To submit any data generated, collected or modified during the course of this project to the Research Data Manager, MFish by 31 October 2010.

### **Rationale:**

#### *General*

Scallops (*Pecten novaezelandiae*) support valuable commercial, recreational, and customary fisheries around New Zealand's coastline. Total commercial scallop landings in 2006–07 were over 1,900 t greenweight. Scallop research requirements are currently assessed within a medium-term research plan (MTRP) for shellfish fisheries. This contains a number of marine invertebrate stocks (mostly bivalves, but also crabs, echinoderms, and gastropods) that constitute a number of fisheries at various stages of development. Not included in the Shellfish MTRP are paua, scampi, and rock lobster which all have individual MTRPs. Most of the species in the Shellfish MTRP benefit from low exploitation levels compared with their allowed catch (TACC), and, therefore, there is no research deemed necessary until such a time as a fishery develops. Notable exceptions, however, are scallops and oysters, and, to a lesser extent, cockles, pipi, and mussels. Fisheries for these species are fully developed and, as with other fully developed fisheries, it is appropriate to separate out these bivalves from the current Shellfish MTRP and prepare more comprehensive MTRPs exclusively for these bivalve species.

In the current Shellfish MTRP, research requirements for scallop fisheries concentrate on a repetition of surveys to determine abundance in some fisheries. However, there are a number of aspects of scallop biology and ecology where research could improve stock assessment and management. Examples include the need for more information on growth, mortality, recruitment, and the effects of fishing on habitats and by-catch. The development of a MTRP for scallops will provide an opportunity to take a fresh look at what kind of research is needed for the sustainable management of the stocks. We need to review the current knowledge of research and fisheries management of scallops to identify the information that is not available for each stock. We can then prioritise which of this information is needed to make informed management decisions which provide for the utilisation of fisheries resources while ensuring sustainability.

The development of a Scallop MTRP plan could involve the inclusion of industry representatives and research providers who will be able to contribute to achieving the Specific Objectives of this project. The plan will be used to identify specific research projects for consideration during the Ministry of Fisheries annual research planning process over the next three to five years. It is likely that the MTRP would be reviewed after three years and updated accordingly.

### *Objective 1*

This objective would review the historical sequence of research and management of scallops in New Zealand. This could also include reviewing research, stock assessment, and management of scallops overseas. These reviews would identify key areas where there are knowledge gaps that if filled could improve the stock assessment and fisheries management of scallops in New Zealand.

### *Objective 2*

Based on the results of the review of existing knowledge from Objective 1, this objective would identify specific research requirements for scallops. A list of research priorities to meet research and management needs for scallops over the next five years would be produced.

### *Weighting of Objectives:*

Weightings indicate the relative importance of each of the objectives. The weightings for the objectives in this project are (in order): 0.4, 0.6.

**Project:** Characterisation of kina fisheries

**Project Code:** SUR2009-01

**Start Date:** 1 October 2009

**Completion Date:** 30 September 2010

**Vessel Use:** None

**Overall Objectives:**

1. To characterise the kina fisheries in the major kina stocks.

**Specific Objectives:**

1. To characterise the major kina fisheries in New Zealand using available data.
2. To provide advice on suitable procedures to monitor the sustainable utilisation of kina fisheries.

**Reporting Requirements:**

Specific Objective 1 & 2

5. To present the findings to a meeting to the Shellfish Fishery Assessment Working Group by 30 August 2010.
6. To submit to MFish a draft Fisheries Assessment Report as specified in Research Reporting Form 5 by 30 September 2010.

**Project Update Reports**

No Project Update Reporting is required for this project.

**Work In Progress Reports**

Monthly Work In Progress Reporting (form 13) is required for this project in accordance with the Conducting Research with the Ministry document.

**Data Reporting**

To submit any data generated, collected or modified during the course of this project to the Research Data Manager, MFish by 30 September 2010.

## **Rationale:**

### *General*

Kina were introduced into the Quota Management System for the South Island in 2002 and the North Island in 2003. The total TACC for all kina stocks is 976 tonnes and the reported total 2005/06 landings were 826.5 tonnes. The fisheries within each kina stock appear to be at various levels development, with some stocks fully utilised. Kina are highly valued as a customary fishery. The extent of the customary harvest is not known.

There is little understanding of the status of various kina stocks. Fisheries plans are being developed for inshore fisheries, including kina. Additional information on the various kina fisheries would assist in the development of fish plans.

### *Objective 1*

This objective would characterise the most important kina fisheries in New Zealand, this should specifically address at least stocks SUR1B, 4, 5 and 7A. The characterisation would include catch history, distribution of landing, methods, and catch and effort. The characterisation would include any available information from log books programmes undertaken by fishers. The characterisation would also include any available information on the distribution and extent of the customary fishery for kina.

### *Objective 2*

Monitoring landings against the TACC for kina is the only monitoring tool presently applied to kina. There are no stocks assessments or any other form of monitoring to determine the status of various kina stocks. This Objective would provide advice on the most appropriate methods of monitoring the status of kina stocks for the purpose of sustainable management and utilisation.

### *Weighting of Objectives*

Weightings indicate the relative importance of each of the objectives. The weightings for the objectives in this project are (in order): 0.85: 0.15.