

Shellfish Fisheries

Code	Title
OYS2009/01	Foveaux Strait oyster stock assessment
SCA2009/01	Monitoring scallops in the Kaipara Harbour scallop 186A closure
SCA2009/03	Scallop growth
SCI2009/01	Estimating the abundance of scampi in SCI 3
SCI2009/02	Stock assessment of scampi

Project: Foveaux Strait oyster stock assessment

Project Code: OYS2009/01

Start Date: 1 October 2009

Completion Date: 30 September 2012

Vessel Use: Subject to tender

Overall Objectives:

1. To provide information on the status of the Foveaux Strait oyster (*Ostrea chilensis*) fishery and infection by *Bonamia exitiosa*.

Specific Objectives:

1. To carry out a survey in February 2010, 2011 and 2012 to determine the distribution, prevalence and intensity of infection by *Bonamia exitiosa*.
2. To undertake a stock assessment of Foveaux Strait oysters in March/April 2011 or in a year as determined by reference to the Foveaux Strait Dredge Oyster Fisheries Plan and the Strategic Research Plan
3. To sample the commercial catch for length data during the 2010, 2011 and 2012 oyster seasons.

Note: The specific objectives of this project will be determined in reference to the draft Foveaux Strait Dredge Oyster Fisheries Plan www.fish.govt.nz/en-nz/Fisheries+Plans/Ministry-led+fisheries+plans

Reporting Requirements:

Research Reporting

Objective 1

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 1 September 2010, 1 September 2011 and 1 September 2012.
2. To present the reports in 1 above to meetings of the Shellfish Fisheries Assessment Working Group in September 2010, September 2011 and September 2012 in Wellington.
3. To submit to the Chief Scientist, MFish a draft revised Working Group Report as specified in Research Reporting form 8 for OYU 5 by 1 April 2010, 1 April 2011 and 1 April 2012.

4. To present the reports in 3 above to meetings of the Shellfish Fisheries Assessment Working Group in April 2010, April 2011 and April 2012 in Wellington

Objective 2

1. Present a draft strategic research plan to Shellfish Working Group in April 2011
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 1 September 2011

Objective 3

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 1 September 2010, 1 September 2011 and 1 September 2012.
2. To present the reports in 1 above to meetings of the Shellfish Fisheries Assessment Working Group in April 2010, April 2011 and April 2012 in Wellington.

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, 2011 and 2012.

Rationale:

General

The Foveaux Strait oyster fishery is a high value fishery that has been in existence for over 100 years. Commercial annual landings of Foveaux Strait oysters in recent years total between 7.5 and 15 million oysters with a landed value in excess of \$5 million. Recreational and customary fishers potentially take up to 1 million oysters annually.

Before 1985, the annual value of this fishery was about \$30 million. Between 1986 and 1992, a *Bonamia exitiosus* epizootic spread from an initial infection of the western beds in central Foveaux Strait to the periphery of oyster distribution. By 1992, the size of the

oyster population had been reduced to probably less than 10% of the virgin level, and in 1993, the fishery was closed to allow the population to rebuild. The distribution of *Bonamia* was mapped in 1995, and the size of the oyster population estimated as 679 million oysters in October 1995. This was estimated to be around 39% of the 1975 population size, indicating a recovery since 1992. The fishery was subsequently reopened in 1996 and had rebuilt towards historical levels by 1999. However, a further *Bonamia* epizootic between 2000 and 2003 killed around 1 billion legal-sized oysters and the population size declined to a similar level as in 1992.

Dredge oyster populations have been substantially reduced by *Bonamia*. The status of the population is uncertain, but it is most likely to be below a size that will support the maximum sustainable yield. Furthermore, it is likely to be locally depleted across parts of the strait. However, stocks appear to be rebuilding as the current exploitation rate is low in relation to the current surplus production.

The management approach for the OYU5 Foveaux oyster fishery has been determined as part of a Ministry-led Fisheries Plan, which involves all stakeholders in the fishery. The plan signals priority research areas as:

- Further development of the spatially explicit stock model for the fishery.
- Further development of the epidemiological model for the fishery.
- Collection of fine scale data for these models.
- Fishery independent surveys of stock size as required to support stock assessment.

Objectives 1-3

These objectives will continue the current annual surveys to determine the distribution, prevalence and intensity of infection by *Bonamia*, the routine sampling of the commercial catch for age-at-length data, into a three year programme.

Objective 2 will undertake a stock assessment of oysters in Foveaux Strait using the spatially explicit length based population model that has been developed for the Foveaux Strait oyster fishery area. The year that the assessment will be undertaken within the three year term of the project as determined by the Foveaux Strait Dredge Oyster Fisheries Plan and Strategic Research Plan.

Weighting of Objectives:

Weightings indicate the relative importance of each of the objectives. The weightings for the objectives are equal.

Project: Monitoring scallops in the Kaipara Harbour scallop 186A closure

Project Code: SCA2009/01

Start Date: 1 October 2009

Completion Date: 30 September 2010

Vessel Use: Subject to tender

Overall Objective:

1. To monitor scallops in Kaipara Harbour.

Specific Objectives:

1. To estimate the distribution, relative abundance and availability of scallop to non-commercial fisheries in the Kaipara Harbour.
2. To compare the distribution, relative abundance and availability of scallop to non-commercial fisheries in the Kaipara Harbour compared to the survey undertaken in August 2007.

Reporting Requirements:

Research Reporting

Objectives 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 the report in 1 above to meetings of the Shellfish Fishery Assessment Working Group and Customary Fisheries 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 are a highly valued resource to non-commercial fishers and an important customary fisheries resource in the Kaipara area. The Kaipara Harbour has been closed by regulation to commercial fishing since 1986. Community concerns that amateur fishing has contributed to localised depletion of the scallop resource have resulted in the closure of the Kaipara Harbour scallop fishery to recreational fishing since 2005 under a S186A temporary closure.

Following the initial two year temporary closure, a survey (CUS 2006-01) was conducted in August 2007 to estimate the distribution, size, structure and relative abundance of scallops in the Kaipara Harbour. This survey has provided information about the Kaipara Harbour recreational scallop fishery as well as establishing a baseline for further monitoring.

The survey results suggest that the Kaipara scallop resource dredged by recreational fishers is likely limited to two main beds. Limited numbers of juveniles were found, suggesting that there was no widespread recruitment occurring at that time.

Since the survey was undertaken, the period of the temporary closure has been extended, with community support to extend the closure period until September 2009. This research project is an opportunity to monitor changes in the fishery following the section 186A closure as well as provide information to consider in future management decisions.

S186A of the Fisheries Act provides for temporary closures to fisheries where there is evidence of localised depletion. These closures are instigated by requests from customary fishers manages and are put in place as temporary closures until such time there is some information on increases in the populations of the key species of interest to customary fishers. Decisions to lift these temporary closures should be based on an assessment of the current state of the specific fisheries resources targetted by the temporary closure. Changes in relative abundance and size frequency of these populations would inform the management decision process of either lifting or continuing with closures.

Objectives 1 & 2

These objectives would estimate the distribution, size structure and relative abundance of scallops in the Kaipara Harbour and compare this with the survey undertaken in August 2007 to establish any changes in the populations.

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: Scallop growth
Project Code: SCA2009/03
Start Date: 1 October 2009
Completion Date: 30 September 2010
Vessel Use: Subject to tender

Overall Objective:

1. To investigate factors influencing scallop growth rates, and provide improved estimates of growth.

Specific Objectives:

1. To collate and review all available historical data on the growth of scallops in New Zealand and reanalyse factors influencing growth using appropriate modelling.
2. To provide new data on scallop growth (and age) using tagging and other appropriate methods.

Note: This project should be linked to projects *SCA2007/01 Stock assessment of Coromandel scallops* and *SCA2007/02 Stock assessment of Northland scallops*.

Reporting Requirements:

Research Reporting

Objective1&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 the 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

Growth varies in scallop populations for reasons that are poorly understood. Previous studies of scallop growth were mainly concentrated in areas of the Coromandel fishery, and suggest growth is variable among areas, seasons, years, and depths. Food supply undoubtedly plays a role.

Growth is a critical input into the stock assessment of scallops. In the current methodology used to assess all scallop stocks in New Zealand, start of season recruited biomass is estimated by projecting forward the survey length frequency distribution to the start of the season using a length-based growth transition matrix based on tag return data. Growth increments for 129 scallops tagged during various pre-season surveys and recaptured in the first half of the following fishing season were used to develop the (logarithmic) growth model. The tag return data used in the current model were from scallops in (mainly one area of) the Coromandel fishery (for which the model was developed initially), but the model is applied to predict growth in all other areas of the Coromandel, Northland, and Challenger scallop fisheries. Discussions at the 21 July 2008 Shellfish Working Group meeting highlighted that if this assessment methodology is to be used for all scallop fisheries, we need to improve it.

Most of the historic tagging data available are for scallops tagged in the Coromandel fishery, but some data are available for scallops in other areas of the New Zealand scallop fisheries. A review and reanalysis of these data using appropriate modelling would improve our knowledge of growth and identify where the information gaps lie.

In addition to the current paucity of data on growth for many scallop fishery areas, one of the biggest uncertainties comes from the lack of information on the growth of small scallops. We have very few tag return data for animals smaller than about 40 mm. The logarithmic model used in the current work up process is based on the growth of larger animals (over 40 mm), and the fit is unrealistic for smaller scallops. Projecting these scallops forward from time of survey to start of season using these implausibly high predicted growth rates could inflate estimates of recruited biomass. Recent exploratory analyses suggest the current methodology could be improved in a number of ways, including the use of an alternative (inverse logistic) growth model.

Commercial scallop fishers have expressed the need for more data on scallop growth specific to the key areas of each fishery, based on their observations of temporally consistent differences in growth among important scallop beds. It is likely that different beds probably contribute differently to fishery productivity. Improving our estimates of growth through appropriate modelling and the collection of new growth data, thereby increasing our overall understanding of scallop growth, would reduce

uncertainty in the stock assessments by applying growth rates specific to key areas of the fisheries, resulting in more precise estimates of recruited biomass.

Objective 1

This objective would collate and review all available historical growth data for New Zealand scallops. Factors influencing growth would be examined using appropriate modelling, and the best modelling approach for use in stock assessment would be recommended. Information gaps would be identified and requirements for new tagging studies prioritised.

Objective 2

Based on the results of Objective 1, this objective would undertake tagging studies to provide new empirical measurements of scallop growth in different areas of the Coromandel, Northland, and Challenger scallop fisheries. To help reduce overall costs, fieldwork for this objective could be incorporated into the annual pre-season (dredge and diver) surveys of scallops.

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: Estimating the abundance of scampi in SCI 3

Project Code: SCI2009/01

Start Date: 1 July 2009

Completion Date: 30 June 2011

Vessel Use: Subject to tender (charter)

Overall Objective:

1. To estimate the abundance of scampi (*Metanephrops challengeri*) in SCI 3.

Specific Objectives:

1. To estimate the relative abundance of scampi using photographic techniques in SCI 3.
2. To estimate growth of scampi from tagging in SCI 3.
3. To estimate the relative abundance of scampi in SCI 3 in 2007 from images collected during the OS2020 surveys.

Reporting Requirements:

Research Reporting

Objective 1, 2 & 3

1. To submit to MFish a Voyage Programme as specified in Research Reporting form 2, one month before the beginning of the survey.
1. To submit to MFish a Research Progress Report as specified in Research Reporting form 4 by 30 August 2010.
2. To present the report detailed in 2 above to meetings of the Shellfish Fisheries Working Group in 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 June 2011.
4. To present the report in 3 above to a meeting of the Shellfish Fisheries Assessment Working Group in August 2011.

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 July 2011.

Rationale:

General

The scampi fishery is based on the species *Metanephrops challengeri*, which is widely distributed around New Zealand. The total scampi landings in 2006/07 were 838 t (limit 1291 t). Based on the port price the total scampi fishery was worth in excess of \$150 million. The landings for scampi in SCI 1 were 110 t (TACC 120 t) in 2006/07 and SCI 2 were 80 t (TACC 200 t). The other major fisheries are SCI 3 (TACC 340 t), SCI 4A (TACC 120 t), and SCI 6A (TACC 306 t). Scampi are taken by light trawl gear, which catches the scampi that have emerged from their burrows. Emergence rates, and therefore catch rates, vary over daily and longer cycles. The main fisheries are in waters 300 - 500 m deep. Little is known about the growth rate and maximum age of scampi. Available information is that scampi are quite long lived.

Stock assessment of scampi is problematical and there are contradictory trends between CPUE indices and photographic surveying. The use of CPUE indices in stock assessments has been questioned because of concerns that changes in these indices may be strongly influenced by changes in catchability caused by the behaviour of scampi rather than by changes in abundance. Photographic surveying has been used extensively to estimate the abundance of the European scampi. Photographic surveying has been carried out in New Zealand since 1998. To-date, data from six surveys in SCI 1 are available (1998 & 2000 – 2003, 2008) and four surveys from SCI 2 (2003 - 2006). Two surveys are available from SCI 3 (both in 2001). Two survey have been conducted in SCI 6A (2007 & 2008), and one is anticipated in 2009.

Scampi catch rates in SCI 3 and 4A have declined markedly in recent years, raising some concerns. While landings in SCI 3 have been maintained, recorded effort has doubled between 2004-05 and 2006-07. In SCI 4A, landings were over 100 tonnes in 2004-05, but have fallen to about 40 tonnes more recently. A reliable stock assessment and subsequent determination of the status of the stock in relation to the B_{MSY} is not currently possible for any scampi stock. The management and stock assessment approach for scampi is to develop a time series of relative abundance indices for the major scampi fisheries in an effort to better understand the status of scampi in each fish stock, and to develop a model for a quantitative stock assessment. Photographic surveys are required on a regular basis for selected scampi stocks to provide indices of relative abundance.

This research project is of high priority given sustainability concerns about scampi stocks and the lack of a robust stock assessment model.

Objective 1

This objective will undertake photographic surveys to estimate the relative abundance of scampi in SCI 3. The establishment of an ongoing time series of abundance estimates derived from photographic surveys for the major scampi stocks has been accepted by the Shellfish Fishery Assessment Working Group as an important component in the stock assessment of scampi. SCI 3 is the largest scampi fishery with a TACC of 340 tonnes, and has been identified as a high priority for developing a photographic index of abundance and subsequent stock assessment. A minimum of three photographic surveys is required for the first iteration of a stock assessment model with preferably five surveys. For SCI 3 this objective would provide the first photographic survey since 2001, the two previous surveys both conducted in that year.

Objective 2

The length based stock assessment model that has been developed for SCI 1 shows that the model approach is limited by information on growth. Better information on scampi growth is required for all scampi stock assessments as they are progressively developed for each major scampi stock. This Objective would undertake tagging scampi as part of the programme on estimating abundance from photographic surveys in Objective 1. Information from tagging may also provide additional data for fitting a tag-based estimate of absolute abundance or biomass within the stock assessment model. Tagging of scampi has been undertaken in SCI 6A in recent years, and returns have been used to provide an estimate of stock abundance.

Objective 3

The OS2020 surveys on the Chatham Rise in 2007 collected seabed photographic data from stations within and adjacent to the main scampi fishing areas in the region (see Figure 1). Since the last scampi survey work in SCI 3 was in 2001, these data provide a valuable source of additional information on the stocks, and this objective would identify and work up images from appropriate stations using the standard scampi protocols to provide abundance estimates for 2007.

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, 0.3, 0.3.

Project: Stock assessment of scampi

Project Code: SCI2009/02

Start Date: 1 October 2009

Completion Date: 31 March 2011

Vessel Use: None

Overall Objective:

1. To undertake stock assessments of selected scampi stocks (*Metanephrops challenger*).

Specific Objectives:

1. To revise the stock assessment model for SCI 1 and SCI 2, including estimating biomass and yield.
2. To undertake a stock assessment for SCI 6A using the revised stock assessment model developed in Objective 1.

Reporting Requirements:

Research Reporting

Objective 1&2

2. To submit to MFish a Research Progress Report as specified in Research Reporting form 4 by 30 August 2010.
3. To present the report detailed in 1 above to meetings of the Shellfish Fisheries Working Group in September 2010.
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 31 March 2011.
5. To present the report in 3 above to meetings of the Shellfish Fisheries Assessment Working Group in April 2011.
6. To submit to the Chief Scientist, MFish a draft revised Working Group Report as specified in Research Reporting form 8 for SCI by 1 April 2011.

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 April 2011.

Rationale:

General

The scampi fishery is based on the species *Metanephrops challengeri*, which is widely distributed around New Zealand. The total scampi landings in 2006/07 were 838 t (limit 1291 t). Based on the port price the total scampi fishery was worth in excess of \$150 million. The landings for scampi in SCI 1 were 110 t (TACC 120 t) in 2006/07 and SCI 2 were 80 t (TACC 200 t). The other major fisheries are SCI 3 (TACC 340 t), SCI 4A (TACC 120 t, and SCI 6A (TACC306 t). Scampi are taken by light trawl gear, which catches the scampi that have emerged from their burrows. Emergence rates, and therefore catch rates, vary over daily and longer cycles. The main fisheries are in waters 300 - 500 m deep. Little is known about the growth rate and maximum age of scampi. Available information is that scampi are quite long lived.

Given the biology of the species and distribution, the recreational and customary fishery is assumed to be non-existent.

Stock assessment of scampi is problematical and there are contradictory trends between CPUE indices and photographic surveying. The use of CPUE indices in stock assessments has been questioned because of concerns that changes in these indices may be strongly influenced by changes in catchability caused by the behaviour of scampi rather than by changes in abundance. Photographic surveying has been used extensively to estimate the abundance of the European scampi. Photographic surveying has been carried out in New Zealand since 1998. To-date, data from six surveys in SCI 1 are available (1998 & 2000 – 2003, 2008) and four surveys from SCI 2 (2003 - 2006). Two surveys are available from SCI 3 (both in 2001). Two survey have been conducted in SCI 6A (2007 & 2008), and one is anticipated in 2009.

A reliable stock assessment and subsequent determination of the status of the stock in relation to the B_{MSY} is currently not possible for any scampi stock. The management and stock assessment approach for scampi is to develop a time series of relative abundance indices for the major scampi fisheries in an effort to better understand the status of scampi in each fish stock, and to develop a model for a quantitative stock assessment. A preliminary stock assessment model for SCI 1 and SCI 2 has been developed but it requires further refinement with the addition of additional data. Photographic surveys are required on an annual basis for selected scampi stocks to provide indices of relative abundance. By October 2009 it is anticipated that three

surveys of SCI 6A will have been completed, sufficient to start developing a model for this area.

This research project is of high priority given sustainability concerns about scampi stocks and the lack of a robust stock assessment model.

Objective 1

This Objective will provide further refinement of the SCI 1 and SCI 2 stock assessment models. A current project SCI2006/01 is updating the stock assessment model for SCI 1 and continuing the development of this model to SCI 2, and further progress is anticipated in SCI2008/03 if funded. The development of the stock assessment model has been an iterative process over recent years and requires updating each year as new data become available.

At present, one factor contributing to the difficulty in determining the most appropriate model structure (in terms of defining the time steps, and how to deal with catchability or availability varying with sex and time step) is lack of data, in that the survey time series are quite short, and the observer coverage is patchy. A scampi assessment workshop planned for October 2008 will examine some of these issues, and this project would follow up on any aspects not addressed in SCI2008/03.

Objective 2

This objective would begin the development of a stock assessment modal for SCI 6A, using the approaches adopted during previous projects to start the development of an assessment model.

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.