Ministry of Fisheries
Te Tautiaki i nga Tini a Tangaroa

Appendix 2

Foveaux Strait Dredge Oyster Information Brief

Draft January 2009

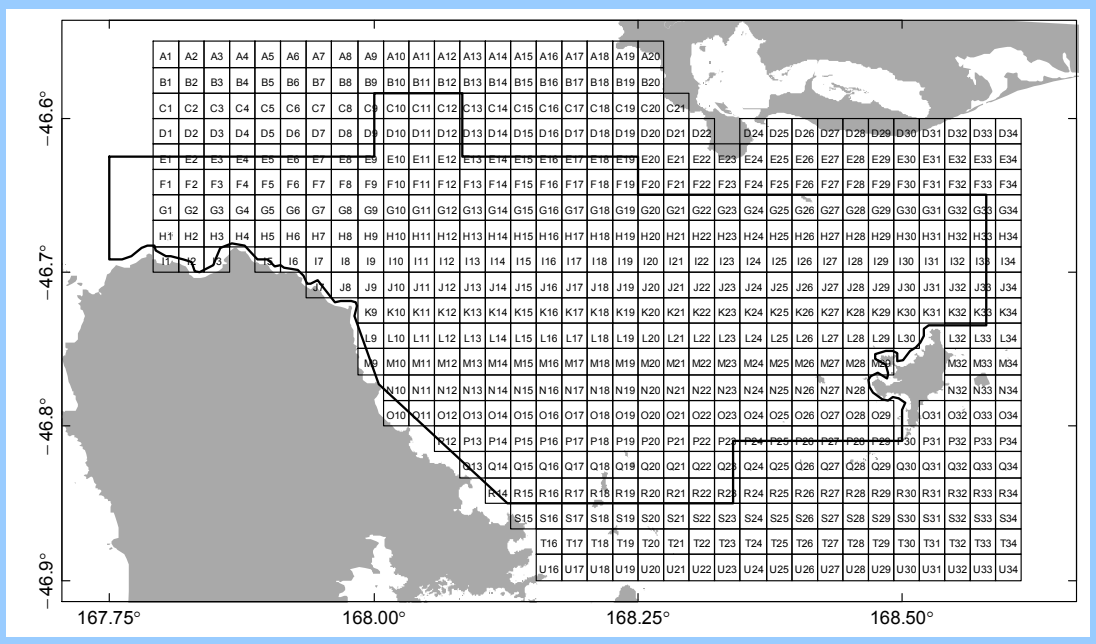


Figure 1: The Foveaux Strait Dredge Oyster Fishery showing the commercial fishery area boundary along with the oyster fishers' logbook reporting grid.

Scope of this Information Brief

1 This information brief relates to the dredge oyster (*Ostrea chilensis*, previously *Tiostrea chilensis, Ostrea lutaria,* and *Ostrea sinuata*) in Foveaux Strait (OYU5). This species is a native bivalve mollusc of the family *Ostreidae* (true oysters). It filter feeds microalgae, diatoms and other suspended organic particles in the size range 0.2-10 um.

2 The brief has been drafted in collaboration with tangata whenua and stakeholders in the Foveaux Strait Dredge Oyster Fishery, and with support from NIWA. It summarises the current fishery situation under the following headings:

Section 1: Biological Information

Section 2: Social, Cultural and Economic Information

Section 3: Management and Services

and supports the Fisheries Plan for the Foveaux Strait Dredge Oyster Fishery. Where the 'proof of concept' fisheries plan, developed in 2007 has already resulted in changes to management, this is noted in the text.

Section 1: Biological Information

Key Biological Information and Issues

- **Two bottlenecks constrain the production of dredge oysters in Foveaux Strait; settlement and survival of small oysters, and the mortality of predominantly market size oysters from *Bonamia* infection.**
- **The fishery suffers cyclic, catastrophic mortality from *Bonamia.* Stock size is directly related to this mortality. There are number of potential triggers for *Bonamia* epizootics. At present there is no direct evidence that fishing contributes to the spread of *Bonamia.* Disease events may be driven by factors operating at a regional or global scale.**
- **Dredging for oysters modifies benthic habitat and biodiversity. However, habitat has been observed to regenerate relatively quickly in some parts of Foveaux Strait.**

Distribution

3 Dredge oysters occur from the intertidal zone to the deepest parts of Foveaux Strait and can attain very high densities. The main beds are found between 20 and 50 metres depth.

4 Oyster "beds" (oysters in sufficient density for fishing) stay the same over long time scales, although in the short term beds appear to change as a result of mortality from the disease *Bonamia* and other factors.

5 Oyster larvae are disperse throughout Foveaux Strait. The distribution of dredge oysters may be primarily habitat driven with recruitment levels determined by factors such as suitable settlement substrate, competition, predation (particularly of oyster spat) and the occurrence of parasites (particularly *Bonamia*).

Growth, Reproduction, Recruitment and Natural Mortality

6 Two bottlenecks currently constrain the production of dredge oysters in Foveaux Strait; settlement and survival of small oysters, and the mortality of predominantly market size oysters from *Bonamia* infection. Growth, reproduction, recruitment and natural mortality are driven by large scale environmental factors such as habitat, sea and wave climate, and by primary productivity[1].

7 Dredge oyster growth rates are slower in some parts of Foveaux Strait than others. In southern Foveaux Strait dredge oysters may reach legal size (>58mm diameter) in only three years, whereas the heavier-shelled oysters in eastern parts of the strait may take up to 8 years to reach legal size. Oyster growth then slows significantly, although oysters may become deeper as they age.[2]

8 Reproductive and recruitment processes are uncertain. Dredge oysters spawn first as males, then as both males and females as they grow. Foveaux Strait dredge oysters mature sexually as females at around 50mm diameter, but usually reproduce as males prior to this size.

[1] These factors may cycle, for example with the Southern Oscillation (El Nino).
[2] Oysters, tagged 27 years ago have recently been recovered from Foveaux Strait. At around 62mm in length they have not increased significantly since they were tagged.

9 Dredge oysters have an unusually extended incubation period and release relatively few (~50, 000), but well provisioned larvae, most of which are thought to settle within minutes, often on parent shells. Some oyster larvae are released early into the plankton for remote settlement. Settlement appears to peak in summer, however, equally high proportions of oysters incubating larvae have been observed throughout the year.

10 Suitable settlement substrate is limited to oyster and other mollusc shells. Post settlement mortality is thought to be high, both from biotic and abiotic causes.

11 Natural mortality is generally low from around the second year after settlement, however, *Bonamia* is a serious parasite of reproductively mature dredge oysters.

Bonamia

12 The haplosporidian, Bonamia is a parasitic disease of oyster blood cells and is found in oysters (Ostridae) worldwide. Bonamia widespread exitiosa*,* is endemic to New Zealand dredge oysters and suspected mortality was reported as early as 1906. The possible introduction of a second, but similar bonamia species cannot be discounted, any may be responsible for the hightened epizootics and mortality in Foveaux Strait since 1985.

13 *Bonamia* proliferates utilising the oyster's energy reserves, especially late in the female reproductive cycle. Oysters are exhausted to a point where they cannot maintain physiological functions or keep their shells closed, making them vulnerable to predation. The breakdown of dead oysters' tissues release infective particles that are dispersed by tidal currents. Infective particles filtered from seawater by oysters during feeding pass through the gut to the blood stream and blood cells. *Bonamia* multiplies rupturing cells, exhausting oysters energy reserves and leading to death

14 Transmission of *Bonamia* infection is by infective particles oyster to oyster. Only one of the bonamia species, B perspora, produce spores. There is no known spore stage for Bonamia exitiosa, but tests have shown *Bonamia* is likely to survive 2-4 days in the Foveaux Strait water column.

15 *Bonamia* is present at background levels in most New Zealand oyster populations and probably causes ongoing, low, levels of oyster mortality. However, during major disease events (epizootics) such as those in Foveaux Strait between 1985-92, 2000-05, and possibly 1960-62[3] *Bonamia* built up a wave of infection that killed most dredge oysters in its path and up to 90% of mature dredge oysters in the fishery overall. While small dredge oysters and spat, along with other shellfish and invertebrate species are not usually susceptible to *Bonamia mortality*, these have also been reported to be killed during a wave of high infection.

16 Some mass mortalities of dredge oysters from farms are probably caused by *Bonamia,* but rarely do other populations attain high enough densities for mortality from *Bonamia* to be easily detected

17 It is not certain what triggers epizootics. *Bonamia* can spread very rapidly within areas of high oyster density and oyster density is likely to be a key factor. During epizootics, progress of the wave of infection across Foveaux Strait appears to relatively slow, with the infection front moving around 2-3 nautical miles per year. Thus, the pattern of oyster distribution across the strait may be important in determining whether an initial outbreak of *Bonamia* gives rise to an epizootic.

18 *In-vitro* tests also indicate that intensity of infection is exacerbated by stress and by high

[3] *Bonamia* has been confirmed from tissues stored from 1963.

temperatures (>15°C), but is reduced by lower salinity. Consequently, changes in habitat, sea climate, primary productivity, or stress from disturbance are also likely to be important triggers of epizootics.

19 Links between fishing and/or fishing-induced changes to benthic habitat and the spread of *Bonamia* in Foveaux Strait dredge oysters have been suggested. At present, there is no evidence of a direct link. For example, high levels of *Bonamia* have been found in beds that haven't been fished for many years, furthermore, the disease spreads during summer when fishing doesn't occur.

20 Different people have different views on the relationship between fishing, other human activities and *Bonamia.* Hypotheses include:

- *Bonamia* is solely triggered by oyster density or by abiotic factors in the Foveaux Strait environment (such as declines in oceanic productivity, the diversion of the Waiau River or warming sea temperatures) and is not affected by fishing.

- Mechanical disturbance during fishing is a stressor that can trigger *Bonamia* outbreaks when conditions (such as abiotic factors or oyster density) are right.

- Dredging has modified the benthos and/or the pattern of oyster distribution in such a way as to predispose the oyster fishery to outbreaks of *Bonamia* (for example, by removing filtering organisms that clean *Bonamia* from the water, or by more evenly distributing oysters across the strait).

21 Mortality due to *Bonamia* is currently the primary determinant of oyster stock size in Foveaux Strait and therefore significant research is being undertaken on *Bonamia* and on the relationships between oyster production, habitat, and *Bonamia*, and their responses to fishing.

Non-QMS and QMS Bycatch

22 As a consequence of the primary method used to take dredge oysters (dredging) and the biodiverse reef system in Foveaux Strait, a large quantity of material is brought aboard during fishing. Although the majority of this is non-living substrate material, some of this material is benthic species such as; bryozoans, octopus, sponges, molluscs, starfish, tunicates and seaweed.

23 Information on non-QMS bycatch is not well-recorded by statutory reporting forms; only octopus tends to be recorded. On average 630kg of octopus has been taken each year since 2000. More information on non-QMS bycatch is recorded on non-statutory logbooks used by all commercial skippers and during scientific assessments of the fishery. Since 2006, fishers logbooks have recorded 100% of fishing events, and recorded data on catch and effort, describe bycatch components in eight categories including the location of sponges and mixed invertebreate bycatch, the size composition of oysters, recruitment, diseases mortality, and dredge performance. Bycatch data is also recorded from stock assessment and bonamia surveys. Prior to 2007, these data were incidentally recorded on digital images. Since 2007, presence absence data for 92 taxa are directly recorded from the catch and digital images record bycatch.. These data give very general characterisations of benthic habitats indicated by bycatch, focusing on dominant substrate and faunal composition in the dredge. Because of the nature of these data, differences in the way these data were classified and recorded over the years, and the lack of repeated sampling of small spatial-scale areas through time, these data provide little qualitative information to either describe benthic assemblages or how they may have changed from both fishing and severe weather events.

24 There is little QMS bycatch in the fishery and this must be recorded on statutory returns. On average 300kg of kina has been taken each year since 2000, along with small amounts (<30kg) of blue cod and spiny dogfish.

Habitat Issues

25 The western entrance to Foveaux Strait is the most exposed coastal area in New Zealand. Large oceanic swells are dissipated into this high-energy environment, similar to swells pounding an exposed beach. Depth varies from west to east: the effect of wave energy is greatest in the northwest, but tidal currents are stronger in the east. These factors determine the composition of the seabed sediments and shape the habitats within the Strait.

26 The seabed is coarse gravel overlaid with fine gravel and sand that is formed into waves, banks, dunes, and scour channels by swells and currents. Water flow into the western entrance is relatively unimpeded, and the tidal current accelerates through the eastern strait. The flow of water within the Strait is likely to be complex and probably form eddies in the central strait. Severe southwesterly storms with large oceanic swells and high wind-driven currents move vast amounts of sediment capable of changing the landscape of the seafloor. Sediment transport is greatest in the northwestern entrance to the Strait, the northern strait, and eastern strait where the shallow depth accentuates these effects. These areas are characterised by highly mobile coarse sediments with little fine sand and usually no animals and plants living on the seabed. Generally, the central and southeastern strait becomes progressively more sheltered from swell and tide by Stewart Island. Seabed sediments in these areas become increasingly less mobile and the surface sediments are finer.

27 Moving sediment may smother benthic communities, including oysters in commercial fishery areas. Mobile sediments may affect recruitment, and contribute to increased stress, and therefore susceptibility to disease and even mortality of oysters. Weather conditions may determine whether the larvae (young) of oysters and blue cod and the reproductive propagules of benthic fauna are retained or transported out of the strait. Where the effects of swell and tide are reduced and seabed sediments are relatively stable, shellfish and oyster shells provide settlement surfaces for animals on the seabed.

28 Foveaux Strait is primarily influenced by warm subtropical water of the Southland Current that is highly productive and supports high production of phytoplankton. The strong tides through Foveaux Strait ensure this water mass is well mixed, both vertically and horizontally. The annual primary production in Foveaux Strait can vary from year to year depending on a number of factors including the influence of the Southland Current.

29 The Foveaux Strait ecosystem comprises of four main seabed types and three distinct groups of benthic fauna. Seabed types include mobile gravels, hard rocky reef habitat, mobile sand over stable sand wave structures, and stable seabed sediments comprising of a mixture of sands and gravels. Benthic fauna can be classified in to animals living in the seabed sediments (infauna), especially the mobile gravels, the most visible being tuatua, large and small dog cockles, and geoducs; sessile animals (that do not move) such as bivalves (oysters and mussels), sponges, sea squirts, and bryozoans; and mobile animals on the seabed such as starfish, crabs, urchins, gastropods (circular saws and volutes), and octopuses.

30 Diverse assemblages of epibenthic communities primarily occur on stable substrates, while mobile sediments are characterized by infauna. There is a common assumption that these communities are stable through time and that they form climax communities that persist

unchanged. This is unlikely in this high energy dynamic environment. We have no data that provides descriptions of benthic habitats in Foveaux Strait and the animals that originally inhabited them and how they may have changed through time.

31 Large scale changes (habitat landscapes) over short time periods are likely to be caused by environmental factors such as severe storms. Fishers have observed these changes and the impacts they have on both benthic habitats and their oyster catches.

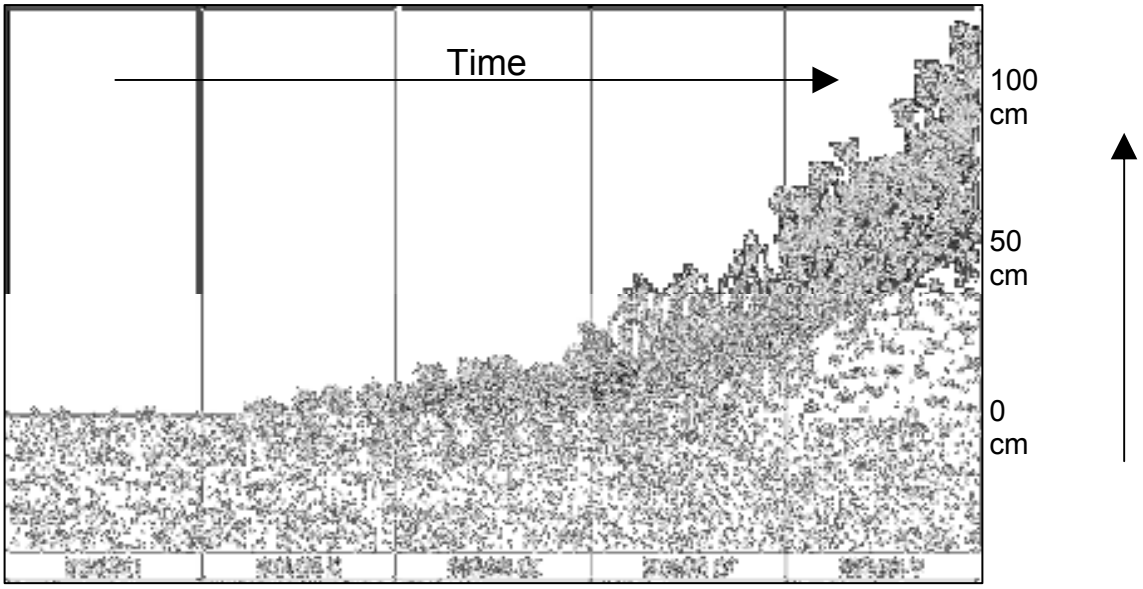
32 We lack the data to describe large scale, long term changes in the fishery over the 140 years the fishery has been operating. The stock area is some 3300 km^2 and although the fishery operates in a much smaller area (around 1000 km^2) within the stock boundaries, only a small proportion of this area supports commercial densities of oysters and has been fished. The annual footprint of the fishery is relatively small. In 1975, oyster survey area encompassing almost all the fishery covered some 374 km^2, but commercial oyster beds covered 12 km^2 (12%) of that area and by inference only a small portion of the stock area was actively dredged. Although it is likely that all commercial oyster fishery areas in Foveaux Strait are likely to have been fished, the location, extent, intensity and frequency of fishing at the scale of oyster patches or beds is not known. Nevertheless, it is likely that environmental effects such as storm events, the persistence of currents and gyres may have a greater influence on the ecology of Foveaux Strait than the impacts of dredging at a fishery scale.

33 Commercial oyster fishery areas have persisted over time and are not associated with living highly complex benthic habitats. Although these habitats and their assembalages of animals are well represented in the oyster fishery area, we cannot determine how their distribution may have changed either through dredging or environmental factors. Fishers tend to avoid these complex habitats as they mostly provide poor catch rates.

34 Dredging for oysters modifies the structure and stability of benthic habitat and may reduce biodiversity, but these effects are localised and their persistence varied. Habitat can regenerate relatively quickly (28 months) in some parts of Foveaux Strait and, therefore, different areas and habitats are likely to respond differently to dredging. Regeneration could also vary between years. There are few quantitative data on effects of fishing on benthic habitat and their regeneration. Available survey data suggest, oyster production and bonamia are not significantly affected by dredging at a fishery scale. Investigations into the effects of dredging have relied on fishery data recorded at spatial scales that are too large, do not capture dredging effort for entire fleet, or rely very heavily on indirectly sampled data.

35 Available research data have been analyzed to investigate temporal changes in species assemblages in dredge bycatch and seabed composition. These data could not resolve habitat classes and distinct assemblages of species at large scales. There is insufficient fine spatial-scale data from locations repeatedly sampled over time to determine changes with dredging effort.

Figure 2: Diagram of habitat regeneration following dredging in the Foveaux Strait Dredge Oyster Fishery.



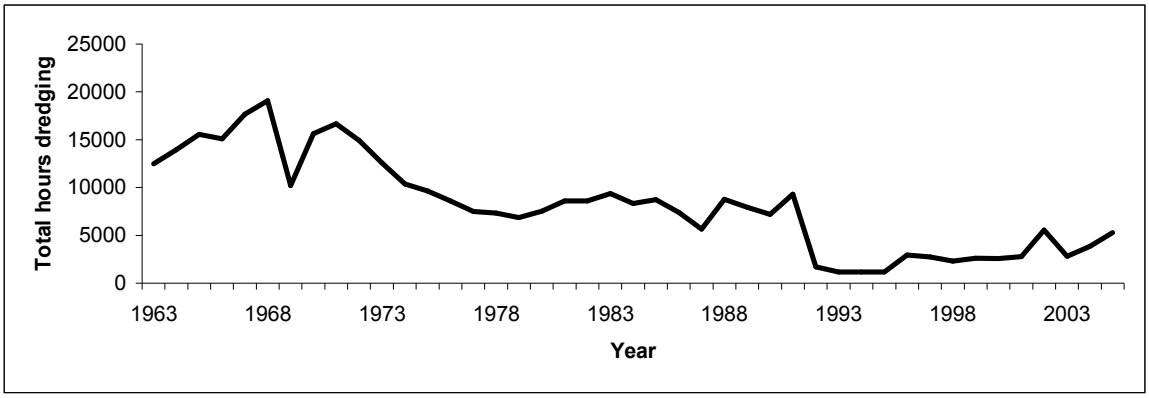
36 In some cases, dredging has been observed to increase the productivity of oyster beds by stimulating oyster growth (e.g. thinning overcrowded oysters and/or removing competitors) and by extending suitable oyster habitat (for example the "Stage III" habitat in Figure 2).

37 Oyster dredging causes incidental damage to dredge oysters that is inversely proportional to the size of oysters: only a few legal sized oysters in the path of the dredge are killed, but 19-36% spat (<10 mm) are killed. Consequently, incidental mortality from dredging may reduce recruitment in heavily fished areas at local scales,but is unlikely to be important at the scale of the fishery.

38 Dredging for oysters has been shown to influence the local behaviour and abundance of commercially fished groundfish (short range movements of larger fish). Blue cod in Foveaux Strait could be negatively affected by the removal of benthic habitat at the local scale of dredging and may be replaced by opportunistic fish such as spiny dogfish until habitats begin to regenerate.

39 Relatively low catch limits since 1992 should also have mitigated the impacts of dredging in recent times by reducing recent dredging effort in the fishery to between one-eighth to one-fourth of historical effort (Figure 3). As dredge size has remained the same since the 1970s the area dredged has probably decreased.

Figure 3: Total dredging effort in the Foveaux Strait dredge oyster fishery



Assessment of the environmental effects of dredging

40 To support development of the 'proof of concept' fisheries plan MFish commissioned a study on the environmental effects of dredging. The MFish Aquatic and Environment Working Group has reviewed this study and all available information on the environmental effects of dredging and has summarised our understanding of the key issues as follows:

- *What habitats do fishers work?*

41 Oyster dredgers generally fish on gravel, sand, and shell substrates. They do not target areas of complex biogenic structure, but do take some biogenic bycatch. Historical records suggest that biogenic bycatch was substantial in some tows. There is some suggestion that oyster density is higher close to structure (physical or bogenic).

- *Have biogenic habitats declined over time?*

42 Biogenic bycatch has declined over time in the regularly-fished core part of the fishery. There may have been a reduction in biogenic reefs in the strait since the 1970s, but there are few hard data, and there is no consensus that such reefs were (or were not) extensive or dominated by the bryozoan *Cinctopora elegans*. Analysis of death assemblages shows there must have been substantial amounts of bryozoans and molluscs in the strait at some time, but other invertebrates do not leave such traces. We can say very little about changes in habitat or community composition before ~1960.

- *Do oysters and mullock necessarily go together?*

43 No, there is no especially great correlation between oysters and mullock. Oysters can be found in both "open" and biogenically-structured" areas but seem to be concentrated on the edges of physical and biogenic structures. Oyster shells frequently provide the settlement surface for structural biota and for oysters, but *Modiolus*, ascidians, and encrusting bryozoans were also important precursors to the development of complex epibenthic communities.

- *To what extent is natural disturbance a key driver in the strait?*

44 Foveaux Strait is the most exposed length of coastline in New Zealand, though disturbance from ocean waves and swell is less in the shelter of Stewart Island. Sediment transport is well known to occur and to affect the distribution of fauna. Biogenic sands dominate. Biogenic reefs may have an armouring effect against disturbance. Natural events may bury reefs and this disturbance regime leads to less in the way of biogenic structure in the northern part of the strait. We do not know how natural disturbance and fishing disturbance interact. High relief reefs or structures require a succession through several stages to come about, and any of these stages may be overwhelmed by physical disturbance. This should lead to a variety of different successional stages in the strait. The interaction of this process with dredge disturbance is poorly understood.

- *Performance of blue cod fisheries and its relevance*

45 The catch of blue cod has been fluctuating without apparent trend for the past 10 years. There has been a recent decline in CPUE in the stat area that includes Foveaux Strait, but the reasons for this are not known. The current performance of the blue cod fishery is not a good guide

to historical performance of the oyster fishery or to impacts on habitat. Blue cod is known to be strongly associated with structure, including sponges, and thus may be affected, at least in the short term, by dredging. The footprint of the oyster fishery may not be trivial relative to the area of available habitat for blue cod.

- *Performance of the oyster fishery and its relevance*

46 Outbreaks of *Bonamia* are currently a major driver of oyster abundance in the strait. After the 1992 decline, oyster biomass rebuilt in areas that were previously core parts of the fishery, largely on gravel, sand, and shell substrates. We don't know why the epizootic that started in 1985 was so much more devastating than previous ones. There is some potential for biogenic structure or filtration by other fauna to minimise or ameliorate the spread of *Bonamia*. No Bonamia DNA has been detect in samples of filterfeeding invertebreates from fishery areas with high bonamia infection. The interaction of stress from *Bonamia* and other stressors (e.g., mechanical, temperature, or salinity) is poorly understood.

- *What can we agree about Local Ecological Knowledge (LEK)?*

47 Original LEK studies started in 1975 alongside a major tagging programme. Skippers were talked to two or three times each year and a background data and understanding of the issues was built up. This led to a more structured interview approach in 1994 and some appraisal of fishers' logbooks. The results of this study suggested that the East bed was fished first, then Ruapuke, and that the catch of "mullock" had declined in both. This information was summarised by Cranfield et al and circulated to participants in the study without much feedback. Only during the development of the "proof of concept" Fisheries Plan for the oyster fishery did disagreement with this summary surface. This led the Ministry to commission a semi-structured study in 2006. This study was stratified by time in the fishery, retirement status, etc. Participant's "signed off" on a summary of their data. The study tried not to interpret the observations as a whole, rather to capture the variance of perspectives. Some participants thought that mullock had declined substantially, others did not. The summary of the observations from the 1994 study was within the variance of observations in the 2006 study, so the two are not necessarily inconsistent.

These summaries together describe our collective view of the state of knowledge on how dredging for oysters has affected the Foveaux Strait system, especially benthic invertebrate communities that afford structural habitat for other fauna, including fish.

Other Environmental considerations

48 As inshore, sedentary, filter-feeders, dredge oysters are influenced by land-use practices in the coastal areas, particularly any that result in increased suspended sediment.

49 Environmental changes in the Southland coastal area, such as the development of an aluminium smelter at Awarua and the closure of the meat works at Ocean Beach have from time to time been suggested as the cause of a decline in the productivity of the fishery. It is also speculated that, in the past, flooding from the Wāiua river periodically lowered salinity across the strait. With the diversion of the Wāiua this protective effect from *Bonamia* was eliminated. However, there is currently no evidence that these activities have been of significant affect.

Protected Species Interaction

50 Oyster fisheries are not known to interact with protected species.

Stock Assessment

51 The stock assessment for the Foveaux Strait dredge oyster fishery has been based on estimates of absolute abundance of dredge oysters from surveys, usually carried out every two years. These allow estimates of the total number of oysters to be made and the risk of different harvest levels to be predicted. As the surveys span the period 1960 to 2009 they also allow changes in the abundance of oysters over the whole fishery area to be mapped.

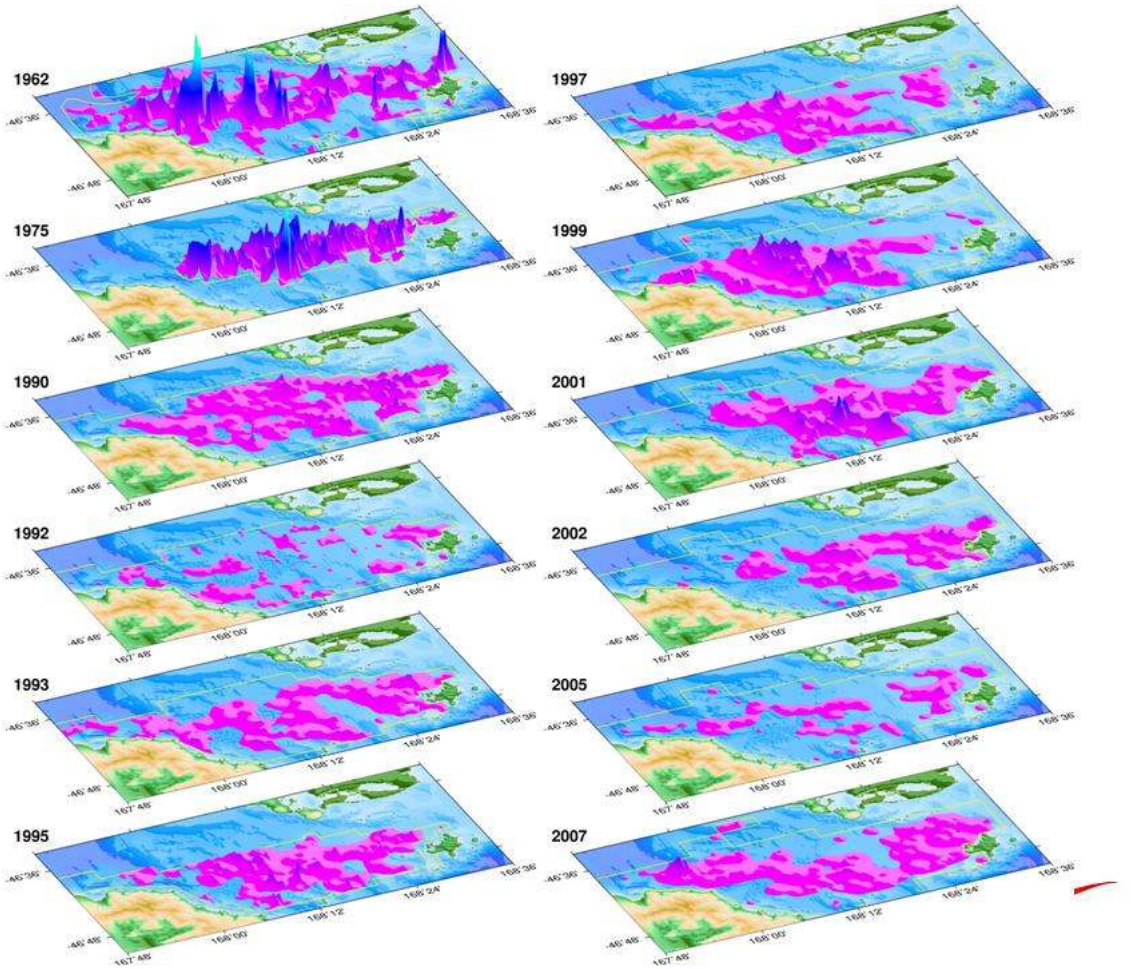
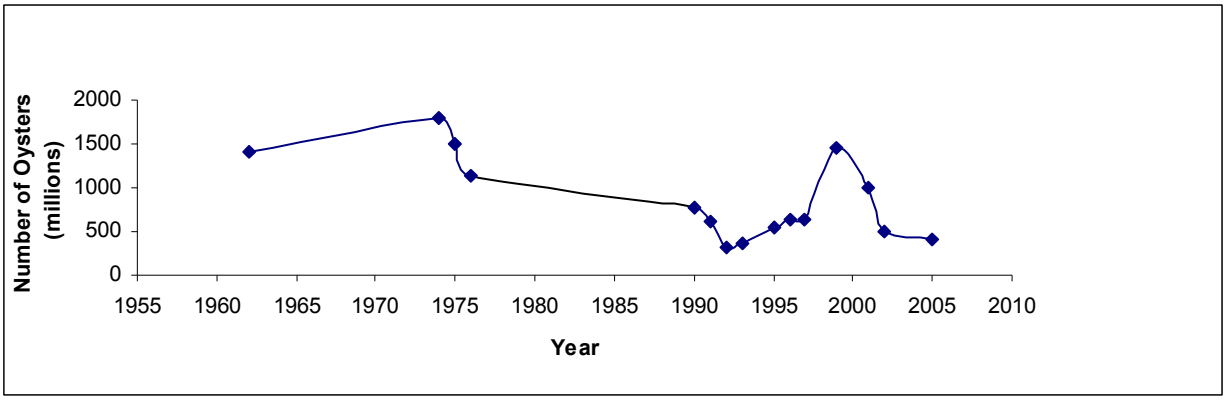


Figure 4: Foveaux Strait dredge oyster abundance from surveys 1962 to 2007.

52 While localized patches can be heavily fished, the dramatic changes in dredge oyster abundance and distribution shown in Figure 5 are a direct result of episodic mortality from *Bonamia* during 1986-1992 and 1999-2002. *Bonamia* was probably also responsible for observed mass mortality of oysters in the early 1960s. Between 2000 and 2003, around 1 billion legal-sized oysters are estimated to have died from *Bonamia.* During *Bonamia* epizootics, oyster density in the main beds is dramatically reduced and commercial densities of oysters confined to peripheral parts of the fishery.

Figure 5: Foveaux Strait dredge oyster total population estimates[4].

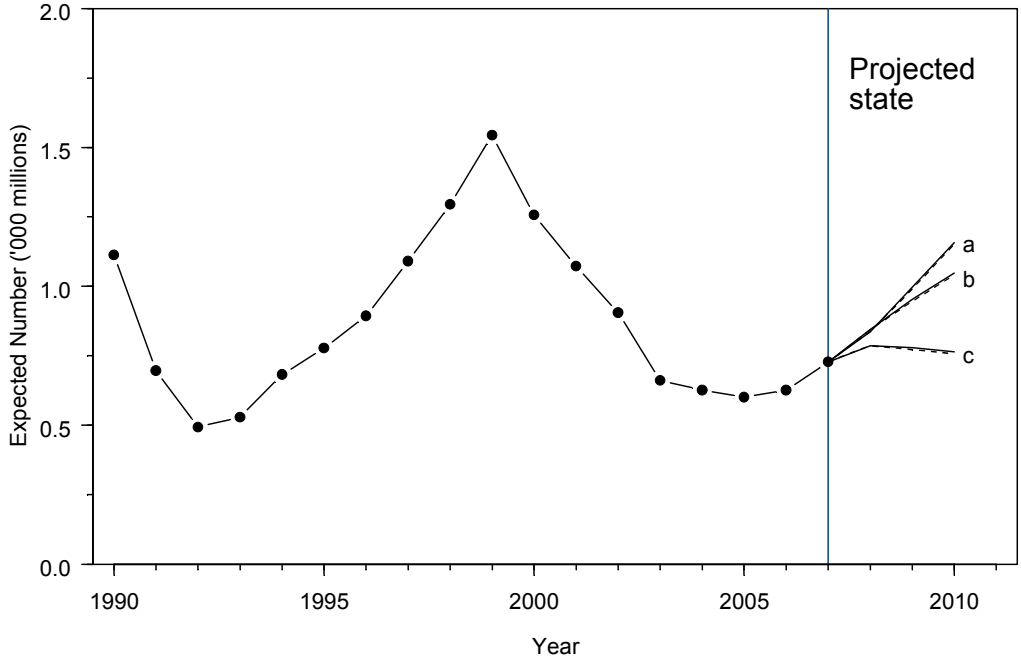


Before the 2004 OYU 5 stock assessment, the Foveaux Strait oyster fishery was managed by current annual yield (CAY, Method 1, see Sullivan et al., 2005) based on survey estimates of the population in designated commercial fishery areas. Since 2004, the TACC has been based on estimates of recruit size stock abundance from the Foveaux Strait oyster stock assessment model (Dunn, 2007) and projections of future recruit size stock abundance under different catch limits and heightened mortality from B. exitiosa.

53 A recently developed length-based assessment model is used to estimate projected stock abundance. This model uses all available biological, fishery and survey information on Foveaux Strait dredge oysters to predict future stock levels under a range of disease mortality and fishing scenarios (Figure 6). Under all scenarios the stock is predicted to increase over the next two to three years due to high levels of pre-recruit oysters, but medium term recovery depends on the level of ongoing mortality from *Bonamia.* The model is being further developed to determine if it can operate at finer spatial scales of an oyster bed and to include an epidemiological model for *Bonamia*.

[4] Population estimates are not necessarily comparable due to differences in scale and methodology of surveys. Later surveys have generally been more comprehensive and have covered a greater area (refer Plenary for details).

Figure 6: Model showing projected stock abundance for 2006-2008, with catch of nil (solid line) and 15 million oysters (dashed line), under assumptions of (a) no *Bonamia* disease mortality, (b) disease mortality of 0.20 y-1, and (c) disease mortality of 0.40 y-1



54 Based on the above assessment, the Plenary has concluded that the Foveaux Strait dredge oyster stock is likely to be below the level that would produce the maximum sustainable yield, and that uncertainty exists in levels of future recruitment and continued *Bonamia* mortality. However, projections from the Foveaux Strait dredge oyster assessment model indicate that current catch levels are unlikely to have any significant impact on future stock levels. Instead, future disease mortality will determine future stock status.

Further Information on the Stock Assessment for Foveaux Strait dredge oysters and on the influence of *Bonamia* can be found at: www.fish.govt.nz under 'Status of our Stocks".

Section 2: Social, Cultural and Economic Information

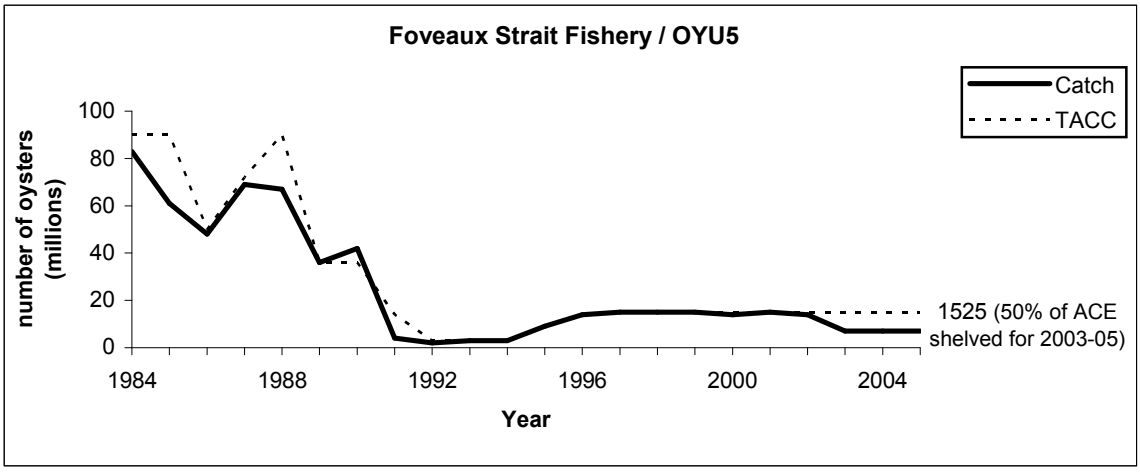
Key Economic Information and Issues

- Catches have been relatively small in recent years.
- *Bonamia* has killed around 1 billion dredge oysters in the fishery over the past four years, resulting in lost commercial customary and recreational fishing opportunities.
- During periods of low oyster density, dredge oyster catch is primarily limited by the viable catch-rate.
- Recreational and customary catch of dredge oysters is likely to be less than commercial catch. Dredge oysters are a locally important recreational and customary fishery.

Commercial Fishery

55 Catches have been relatively small in recent years. Dredge oyster catch and the Total Allowable Commercial Catch (TACC) is set out below.

Figure 7: Reported dredge oyster catch and TACC for Foveaux Strait dredge oysters.



56 The TACC is 14.95 million oysters[5]. The TAC is 20.3 million oysters. Separate allowances for customary and recreational catch have not been specified, however, customary and recreational fishers agreed when the TACC was set in 1998 that this TACC was appropriate.

57 During periods of low oyster density, catch is primarily determined by catch-rate rather than TACC. Given recent declining catch rates, 50% of Annual Catch Entitlement (ACE) has been shelved by quota holders since 2003.

58 20% of Foveaux Strait dredge oyster quota was allocated to Te Ohu Kai Moana when these stocks entered the QMS. This quota is still held by Te Ohu Kai Moana, but the ACE is managed and fished by Ngai Tahu Seafood Products.

59 Around one-quarter of the 16 current quota holders are 'specialists', owning and fishing

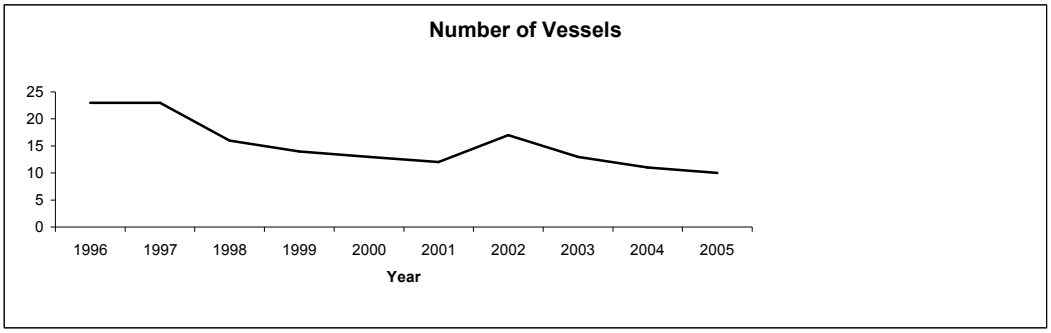
[5] Unchanged since 1998

primarily OYU5 quota. Other quota holders also own significant parcels of other QMS stocks.

Commercial Fleet

60 Dredge oysters are an inshore fishery. Vessels must be powerful enough to tow and retrieve heavy dredges (up to 530 kg). The commercial fleet rationalised after QMS introduction in 1998 as, pre-QMS, catch allocations were tied to individual boats. Whereas 23 boats were licensed to fish prior to the QMS, 11 to 17 vessels of around 20 m in length have fished since QMS introduction. The number of vessels taking dredge oysters over the past eight years is shown in the following figure.

Figure 8: Number of vessels taking oysters in the Foveaux Strait dredge oyster fishery



61 Vessels used in the fishery often convert to trawling in the southern mixed trawl fishery outside the oyster season (March to August). Others may sometimes target other stocks, or work as recreational charter boats in the Stewart Island/Fiordland area. Other vessels may tie up for the remainder of the year. Vessels are not usually used to fish other dredge oyster stocks (for example the Nelson dredge oyster fishery), given the small size of these fisheries and the different gear used.

Product Characteristics

62 Dredge oysters are currently sold domestically and require little processing. They are shucked and sold fresh. Six processors currently process oysters from the fishery. Apart from a small amount of product processed in Christchurch, all oysters are processed locally in Invercargill or Bluff.

63 In the past, small amounts (particularly second grade oysters) have been frozen for sale (usually for cooking) during the off-season.

64 Live dredge oysters have sometimes been sold to marine farmers for holding and re-sale during the off-season.

65 Until 2005, the shell was used for small-scale lime and grit production, now the majority of shell is returned to sea to enhance the fishery.

66 Up until the late 1990s the export of dredge oysters was prohibited by a regulatory ban. The ban was related to high levels of cadmium in dredge oysters and government policies aimed at encouraging higher domestic consumption of fish and shellfish. Despite the ban being lifted in 1998 dredge oysters are still not exported, due to recent low catch levels and high domestic demand.

67 Commercial oyster catch is now relatively small compared to catches before 1990 (see

Figure 7), and this coupled with high domestic demand means prices are believed to have increased since 1990. Reliable information on pre 1990 port prices is required to confirm this. Port prices for dredge oysters since QMS introduction have been around $0.50 per oyster and dredge oysters retail at around $1.5 per oyster. Based on these estimates and current catches, the port value of the New Zealand dredge oyster fishery is around $5 million and the retail value is around $15 million.[6]

68 The "Bluff" oyster is marketed as a seasonal product and prices are sometimes higher early in the season (March-April)[7]. Dredge oysters are a luxury, seasonal, product and market price is determined by availability and by quality of the oysters.

Fishing Methods

69 Dredge oysters are taken exclusively by dredge in the commercial fishery. Other methods such as UBA[8] are not considered commercially viable due to the depth at which most commercial beds are found, the difficult diving conditions and the low catch rate per diver (compared to dredging).

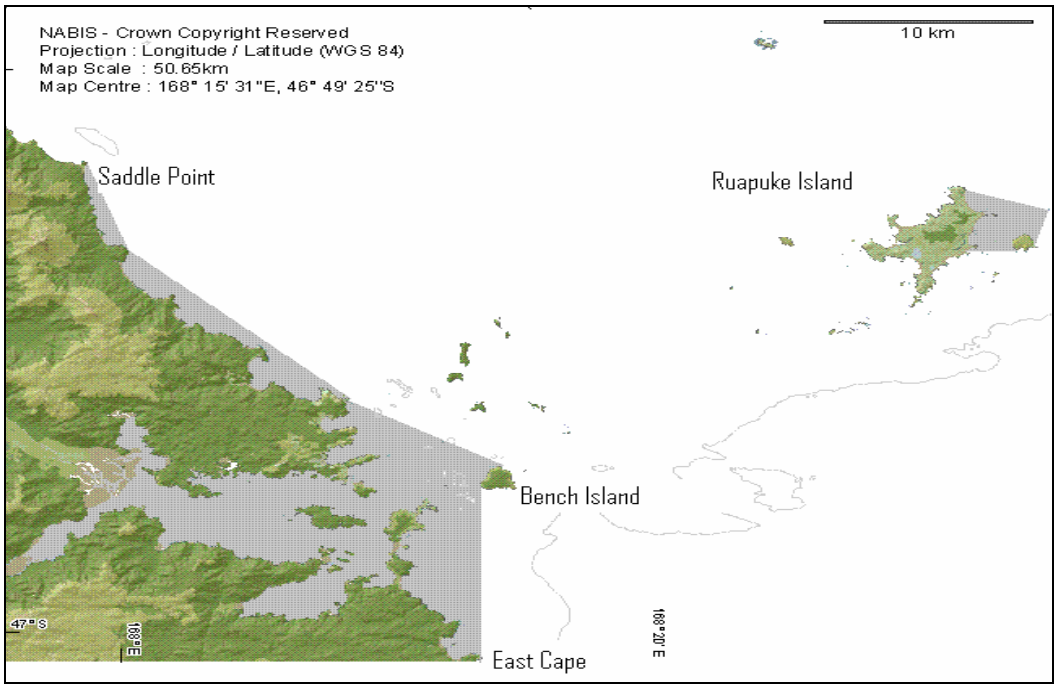
Further information on the QMS can be found at www.fish.govt.nz/information/quotams.html Information on the commercial fishery for Foveaux Strait dredge oysters can be found in the *Bluff Oyster Management Company Limited's Fisheries Plan – Foveaux Strait Dredge Oysters (OYU5). [27 July 2005]* and at www.fish.govt.nz/sustainability/research/assessment/plenary/index.html

Recreational Fishery

70 Dredge oysters are taken by dredging or by diving (usually using UBA) in the fishery. Recreational fishers occasionally hand-gather intertidal dredge oysters. Most recreational fishing occurs along the inshore northern coast of Stewart Island. Commercial fishing is not allowed in this area (see Figure 9), however, commercial or charter vessels sometimes used to take recreational catches using 'commercial' sized dredges as there was no upper limit on recreational dredge size[9]. Under the proof of concept fisheries plan this was changed in 2007. There is now a 1m limit on the length of the bit bar for dredging in these areas.

[6] It is noteworthy that the potential port value of the 1 billion oysters killed during the most recent *Bonamia* epizootic is approximately $500 million ($1-1.5 billion retail).
[7] Helicopters are sometimes used to fly oysters directly to Wellington and Auckland on the first day of the season and the fishery is the basis for a commercially important festival.
[8] Underwater Breathing Apparatus
[9] All dredging is prohibited within Paterson Inlet

Figure 9: Non-commercial areas (shaded) within the Foveaux Strait dredge oyster fishery.



71 The two surveys of recreational catch conducted by MFish in recent years have not reliably quantified oyster catch because of the small number of local respondents who reported catches of oysters in their diaries.

72 The Southland Recreational Marine Fishers Association estimated the annual recreational catch of oysters in Foveaux Strait in 1995 to be about 390 sacks (equivalent to 312 000 oysters). Fisheries Officers believe this estimate has increased significantly since then due to technological improvements in recreational vessels, which mean day trips across Foveaux Strait are now feasible, and due to an increase in the number of charter vessels. In 2002, Fisheries Officers reported 70–100 recreational vessels fishing from Bluff and smaller numbers from Riverton and Colac Bay. Most of these vessels are fitted with GPS and capable of fishing Foveaux Strait, with four recreational fishers on board.

73 Recreational fishers may take 50 oysters per day during the open season. Most vessels carry a dredge regardless of whether they are diving to get around the primary taker rule, enabling all onboard to take their 50 oyster entitlement. However, since 2005, divers can take the entitlement for up to two safety people on board the vessel. It is common to find all recreational fishers return home with their bag of 50 oysters (or 100 oysters for two days entitlement if overnight). Since 2005, shucking of oysters has also been permitted at sea, but these must be counted within the daily limit.

74 The charter boat fleet at Stewart Island, Bluff and Riverton targets oysters during the oyster season. In 2002, 17 of these vessels included oyster dredging and oyster diving trips as part of their winter programme. Included in the charter fleet are three commercial oyster dredge vessels which can take 15–20 persons out for the day, each returning with 50 oysters. There are also increasing numbers of ex-commercial fishing vessels in private ownership both at Bluff and Stewart Island (conservative estimate at least 12 vessels). The largest vessels can carry 8–12 fishers and divers.

75 Crew on commercial fishing vessels also take a recreational bag limit of dredge oysters. A

typical crew compliment is 5 or 6, therefore, each commercial vessel's crew takes up to 250 oysters each day. This recreational catch must be reported on the statutory reporting forms for commercial fishers (CELRs). On average, 0.15 million oysters per year have been reported as being taken by crew as recreational catch since 2000.

76 Given the uncertainty around recreational catch, it is difficult to make an estimate of total recreational catch. It appears that total catch is likely to be significantly less than 1 million oysters. The main factor currently affecting recreational oyster fishing is mortality from *Bonamia* which has reduced the numbers of oysters along favoured recreational areas near the north coast of Stewart Island, as well as throughout the Strait. Recreational fishers dredging and diving for oysters are finding it more difficult to catch their daily limit. As effort and catch in the recreational fishery is relatively low compared to the commercial fishery, it is expected that recreational catch will increase if the fishery improves.

Customary Fishery

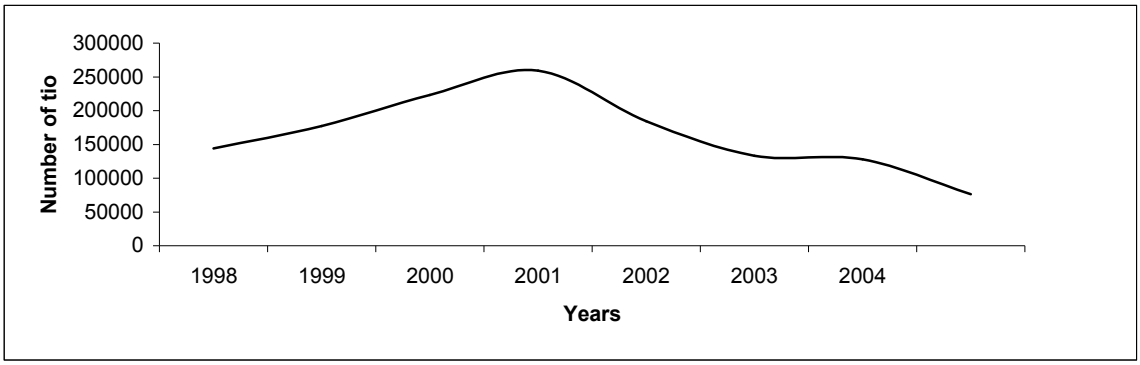
77 Dredge oysters (tio) are a locally important customary food. They have been part of the seasonal staple diet for Ngai Tahu/ Ngati Mamoe in the deep south. The presence of oysters on the menu contributes to enhancing the mana of the marae and the Iwi, in that the tangata whenua are able to provide the best food for their visitors.

78 Customary catch of tio in Foveaux Strait is taken mainly utilising commercial vessels under customary authorisations. The management of the customary oyster fishery rests with the Awarua Runanga in whose takiwa the oyster beds are located. Tangata tiaki are individuals who may be nominated by whanau or the local runanga, approved by Te Runanga o Ngai Tahu and appointed by the Minister of Fisheries to manage customary fisheries for specific areas. Awarua tangata tiaki work collectively with their Runanga and have developed a set of criteria and rules by which they manage the fishery and provide quarterly reports to Te Runanga o Ngai Tahu. Customary fishing does not normally take place between 31 August and mid-November while oysters are spawning.

79 Reporting of Maori customary harvest is specified in the Fisheries (South Island Customary Fisheries) Regulations 1999. Te Runanga o Ngai Tahu administers reporting of customary catch of Foveaux Strait dredge oysters to MFish quarterly.

80 Reported catches for Foveaux Strait dredge oysters have ranged from 0.26 to 0.08 million oysters since customary reporting has been in place (1998). As for commercial and recreational fishers, customary catch has reduced since the 2000-2003 bonamia epizootic. During the 2005 season, there was a noticeable decrease in the number of authorisations applied for and issued (see Figure 10).

Figure 10: Customary tio (dredge oyster) harvest for Foveaux Strait dredge oysters.



Section 3: Management and Services

Key Management Information and Services:

- The fishery is in the QMS (OYU5).
- The Total Allowable Catch (TAC) is set under s13 as number of dredge oysters.
- MFish management objectives implicitly include mitigating the impacts of dredging, however these objectives are not currently clearly specified.

Quota Management System

81 All commercial fishers must have a fishing permit.

82 The Foveaux Strait dredge oyster fishery (OYU5) was introduced into the QMS in 1998. The Quota Management Area is smaller than the standard Fisheries Management Area (Figure 1) reflecting the discrete distribution and historical extent of the Foveaux oyster beds[10].

83 The fishing year runs from 1 October to 30 September.

84 A Total Allowable Catch (TAC) and TACC has been set since 1998 and 1996, respectively[11]. The TAC is set under s13 requiring that the Foveaux Strait dredge oyster fishery be managed at, or above, a level that maximises sustainable yield, and is currently 20.3 million oysters

85 The TAC and TACC are set in numbers of oysters; this is the only New Zealand fishery not managed on the basis of weight. The unit of measure is number of oysters to align reporting with the measured unit at point of sale (individual oyster or dozens).

ACE and Deemed Values

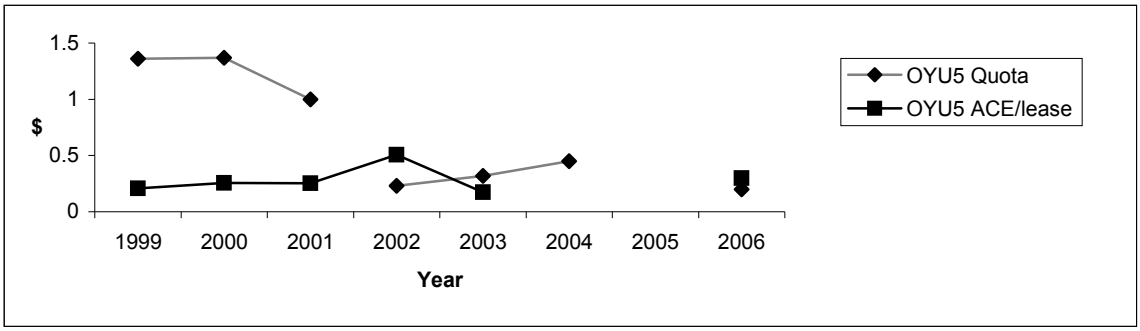
86 Deemed values are set at a level that encourages all reported catch to be balanced with ACE. In order to encourage ACE balancing at the level of the individual fisher deemed values are ramped by 20% for every 20% increment in excess of the catch over ACE held. The current Interim

[10] Oysters in areas outside OYU5 entered the QMS on 1 October 2005 with low/nominal TACCs.
[11] Prior to this the Foveaux Strait Dredge Oyster fishery was managed as a controlled fishery under the Fisheries Act 1983 with limited entry and individual catch allocations

Deemed Value is $0.3 per oyster and the Annual Deemed Value is $0.6 per oyster. Catch is almost completely covered by ACE in OYU5 and little catch is subject to deemed values.

87 The lack of recent quota prices the short period the fishery has been in the QMS and the unreliability of trade data means no overall trend in ACE or quota trade prices is discernible.

Figure 11: Quota and ACE/lease trade prices for OYU5[12].



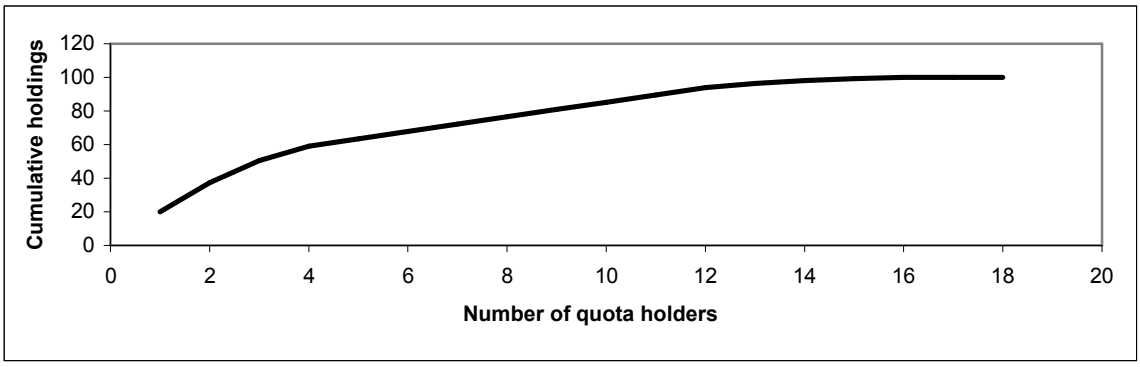
88 A minimum ACE holding (s 74) of 29,000 oysters applies to the fishery.

Aggregation Limits

89 With some exceptions (for example Crown and quota holdings allocated as a result of catch history), no person can hold quota shares for OYU5 equivalent or greater than 35% of the combined TACC for all dredge oyster stocks. Given that OYU5 is managed by numbers of oysters and other oyster fisheries by greenweight, the Act deems 980 oysters to be equivalent to 100 kg for calculating oyster aggregation limits.

90 The maximum current individual holding in OYU5 is 20%. Three firms hold around 50% of quota. Remaining shares are dispersed in relatively small parcels (Figure 12). Ownership is stable, with the many firms being in the fishery for 20 years or more. Around 25% of total quota holdings have changed hands since 2003. The Crown holds no quota for OYU5. This ownership pattern is similar to those of inshore finfisheries such as butterfish, gurnard and tarakihi.

Figure 12: Cumulative ITQ holdings in OYU 5.



[12] ACE prices are per oyster for OYU5. Quota prices are per oyster for OYU5 for 1999 to 2001 (10 oysters~1 kg). Quota prices after 2002 are per share (of 100 million).

Input Controls and Technical Measures

91 Since QMS introduction all dredge oysters taken for commercial purposes must be reported and landed, with the exception of undersize oysters which must be returned to sea. This rule is problematic due to the large number of juvenile "wings" (>thumbnail size oysters) and spat (<thumbnail size oysters) adhering to parent (legal size) dredge oysters.

92 Wings can generally be removed during culching, but smaller oysters are left on the shells given the difficulty in removing them and the assumption (backed up by recent experiments) that they would not survive removal.

93 Up until the mid 1990s all commercial and non-commercial South Island dredge oyster fisheries operated under a regulated 1 March to 31 August season. However, the commercial OYU5 season was shortened as a response to *Bonamia* in 1996 and ran from the 4th Sunday in March until 31 August. While there are sustainability reasons for setting an oyster season to avoid disturbance during spat settlement, some animals are unsaleable when brooding larvae over the summer period, therefore there is also a strong economic component. Under the proof of concept plan for the fishery the start date was realigned to 1 March (the same as the recreational start date).

94 The OYU5 commercial fishery is also regulated by:

- closed areas around the inshore parts of Foveaux Strait (Riverton to Waipapa Point), eastern Ruapuke Island, and Stewart Island (Saddle Point to East Cape). These areas were originally put in place for, respectively, pollution, research and recreational fishing purposes.

- minimum legal oyster size (58mm) in place to allow oysters to spawn prior to being taken.

- restrictions on the size of oyster dredges (2 x 3.35m wide dredges per vessel). These dredges are larger than elsewhere and were approved in the 1960s due to the difficult working conditions in Foveaux Strait[13].

95 The recreational fishery is regulated by a daily bag limit of 50 dredge oysters, the 1 March to 31 August seasonal closure that applies to most dredge oyster stocks, and by a minimum legal size (58mm). Under the proof of concept fisheries plan, a 1m limit on the length of the bit bar for dredging in 'non commercial' areas was introduced.

96 Commercial vessels and recreational charter vessels usually use commercial size dredges to take recreational catch when outside these areas.

97 The customary tio fishery is regulated by tangata tiaki. The Minister of Fisheries appoints tangata tiaki under the Fisheries (South Island Customary Fishing) Regulations 1998. Tangata tiaki issue authorisations to take tio for non-commercial purposes (not for sale). Tangata tiaki are not bound by the normal rules for taking tio (e.g., daily bag limits), but have policies and processes in place for issuing authorisations. Authorisations are only issued for certain types of function, and are not issued between 31 August and mid-November while oysters are spawning, except under very special circumstances.

[13] Elsewhere 1 dredge up to 2.5 m or 2 dredges up to 1.4 m wise may be used per vessel.

Monitoring Services

98 There are no conversion factors currently applicable to any oyster fishery. The number of dredge oysters accidentally lost, discarded, consumed and landed whole (green) is the reportable number.

99 Monitoring of commercial catch is based on fishery-dependent reporting. Fishers must complete CELRS and MHRs, which are reconciled with LFRRs submitted by processors. There are specific statistical reporting areas for OYU5 (see Figure 1). OYU5 statistical reporting areas no longer coincide with the distribution of dredge oyster beds and under the proof of concept fisheries plan all fishers now operate a logbook system based on 1nm grids. This allows finer scale reporting and monitoring of benthic communities and bycatch.

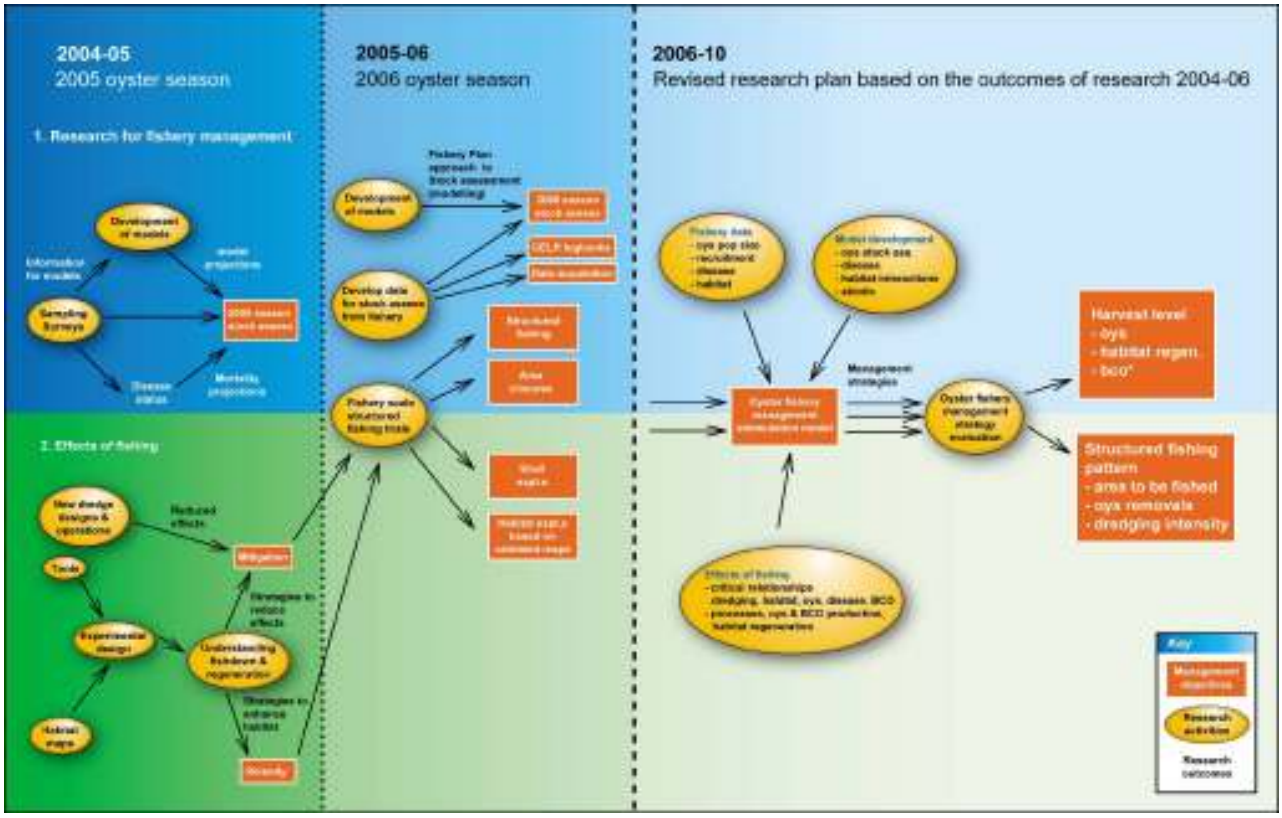
100 Species taken as bycatch must also be reported. New national non-fish bycatch reporting forms are being implemented across all fisheries. However, these do not provide the tailored information for the oyster fishery provided by logbooks and bycatch-monitoring during oyster surveys. Implications of the national reporting framework, and the prospect of waiving these for the oyster fishery are being discussed.

101 There is no observer coverage in oyster fisheries.

102 Tangata tiaki are required to provide MFish with collated information on the amount, species and location of fish, shellfish or aquatic life taken under customary authorisations. Awarua Runanga represents customary interests for tio and sends, quarterly, summarised reports to Te Runanga o Ngai Tahu (Iwi Authority) to be collated and forwarded to MFish, detailing customary harvest.

Research Services

103 The research strategy for the fishery is set out in the Foveaux Strait Dredge Oyster Strategic Research Plan 2005-2010. An overview of this plan and information on past research on dredge oysters is included below. Under the proof of concept fisheries plan this plan is currently being updated.



104 Current MFish programmed research on dredge oysters is provided in the following table:

Table 2: Oyster research activities

Research Project	Description	Project cost ($)
OYS2005- 0?	Benthic Impacts Assessment	$?
OYS2005-01	Foveaux Strait oyster stock assessment	$?
OYS2004-01	Foveaux Strait oyster stock assessment	$91,260.65

105 OYS2004-01 contained the following objectives:

- To carry out a biomass and *Bonamia* survey.
- To develop the OYU5 length-based model to more accurately model *Bonamia* mortality and allow assessment at a fine spatial scale.
- To sample commercial catch for catch-at-length data.
- To characterise larval settlement.

106 ZBD report (Benthic Impacts Assessment) has the following objectives:

- To assess the distribution, vulnerability to disturbance, and ecological importance of habitats in Foveaux Strait, and describe the spatial distribution of the Foveaux Strait oyster fishery relative to those habitats.

107 OYS2005-01 contains the following objectives:

- To determine the status of *Bonamia* infection, and rebuilding of the oyster populations in Foveaux Strait.
- To continue development of the epidemiological model for Bonamia in the oyster populations.
- To continue development of the spatially explicit stock assessment model for dredge oysters.
- To oversee sampling of the size structure of the commercial catch by the Bluff Oyster Management Company.
- To oversee and assist in a Bluff Oyster Management Company spat settlement monitoring programme.

108 Some of these objectives are linked to other research funding streams, in particular, to a case study of ecosystem management in the Foveaux Strait area. The study was jointly funded by FRST and the fishing industry and aimed to provide information on the interaction between oyster dredging and changes to benthic habitat, oyster and blue cod production and mortality from *Bonamia.* Funding is no longer available from FRST.

109 Under the proof of concept fisheries plan the Bluff Oyster Management Company has successfully sought funding from Seafood Innovations Limited (in conjunction with SeaFIC) to undertake research to increase productivity of the fishery and revenue. This programme has four key objectives: develop new dredge designs and fishing procedure, investigate drivers of oyster production in the fishery, develop and test enhancement method, and and build the capacity of industry staff to record and use information for better fishing strategies and management of the fishery.

Further Information on the QMS can be found at www.fish.govt.nz/information/quotams.html. Further information on research in the Foveaux Strait dredge oyster fishery (OYU5) can be found in the *Foveaux Strait Oyster Strategic Research Plan 2005-2010*. [MFish (draft) NZ Fisheries Assessment Report 2004/xx].

Education Services

110 MFish provides education services for the non-commercial sectors. These services include:

- Development and distribution of educational products such as signs and brochures that promote information on rules and guidelines for measuring and handling fish
- Provision of information about rules and offending through: the interaction of fishery officers and honorary fishery officers with fishers; communications with, or advertising in, the media; the MFish website.

111 Awareness of rules and compliance is also influenced by the consultation process MFish uses to progress proposed changes to fishing rules.

112 MFish education services do not, on the whole, specifically target oyster fishers, although,

fishery officers do prepare a Compliance Information Sheet and brief fishers and processors on requirements prior to the start of each oyster season. Fisheries advisors also facilitate and attend meetings on oyster management issues.

113 The quota registry service provider 'Fishserve' outlines commercial fishers high-level obligations including the requirement to acquire a fishing permit and ACE.

Enforcement Services

Specific enforcement activities

114 MFish provides enforcement services in the recreational, customary, commercial and black-market poaching sectors. The services include:

- Compliance monitoring
- Offence detection
- Investigation of potential offending
- Prosecution of offending
- Development and maintenance of systems to support these services.

115 At a national level, enforcement services are a capability directed at each sector and, within that, types of offending, rather than particular fisheries. There are approximately *??* compliance FTEs allocated to inshore fisheries in the Southland compliance region.

116 There is a reasonably high level of enforcement service provided to all three sectors (commercial/recreational/customary) given that the commercial oyster fleet is small, easily accessible and fishing is confined to Foveaux Strait. District effort focuses on recordkeeping (Commercial sector only), size compliance and recreational daily take limits. All commercial vessels and local Licensed Fish Receiver premises can be expected to be inspected at least once or twice each season. Recreational enforcement is conducted through sea-borne patrols with other shore-based emphasis on fine weekends.

Cost Recovery

117 Cost recovery allocation for the OYU5 fishery for the 2004-05 fishing year is provided in Table 3.

118 Registry services and compliance costs consume most of the MFish departmental costs for OYU5. Research costs include committed research and research charged across fisheries. There are no current observer or Department of Conservation costs associated with dredge dredge oysters.

Table 3:Cost recovery information for OYU5 (2004-05)

Stock	Registry Services ($)	Commercial rules enforced ($)	Decision processes ($)	OYU5 Research ($)	Generic Research ($)	Total ($)
OYU 5	60 717	78 774	4 205	94 770	340	238 806

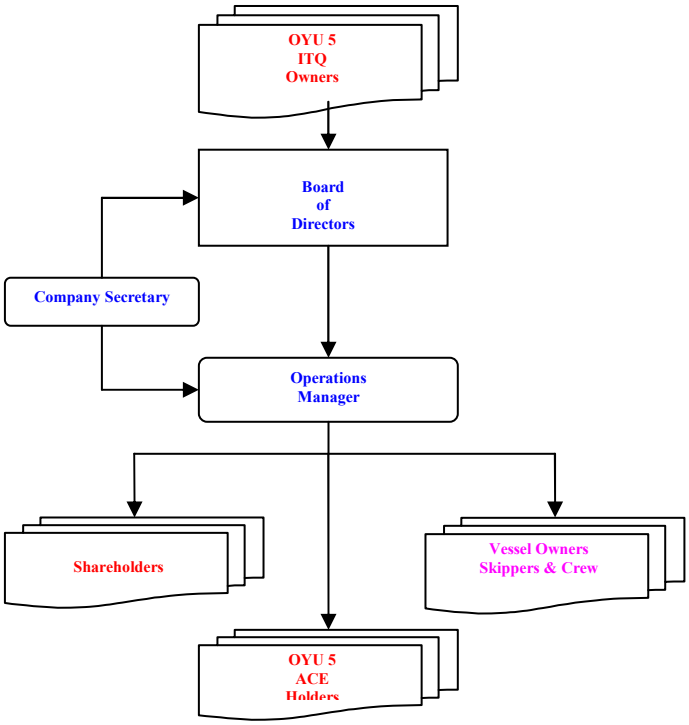
Stakeholder Organisations

119 Pan-fishery organisations such as SeaFIC, New Zealand Recreational Fishing Council represent commercial and recreational oyster fishers.

120 NGOs such as Forest and Bird sometimes provide submissions on the fishery.

121 OYU5 quota holders are organised into a management company (the Bluff Oyster Management Company Limited). The company represents all quota holders and has the following structure:

Figure 13: Bluff Oyster Management Company Structure



122 The management of the customary oyster fishery rests with the Awarua Runanga in whose takiwa the oyster beds are located. Awarua tangata tiaki work collectively with their Runanga and have developed a set of criteria and rules by which they manage the fishery and provide quarterly reports to Te Runanga o Ngai Tahu.

Further Information on the structure of Te Runanga o Ngai Tahu can be found in the Te Runanga o Ngai Tahu Act

123 The Southland Marine Recreational Fishers Association and diving clubs represent recreational interests for the Foveaux Strait dredge oyster fishery.

Stakeholder Management Services

124 Enhancement projects have been developed on a voluntary basis by quota holders, primarily

involving the return to sea of oyster shell and pilot-scale reseeding work. Most voluntary effort is focused on structuring fishing to support fishery-scale research on management of *Bonamia* and dredging impacts. Shell enhancement to form reefs, changes to dredge design and directed fishing at small spatial scales are included as fishery-scale trials.

125 The Bluff Oyster Management Company completed a draft Fisheries Plan for the Foveaux Strait dredge oyster fishery which sets out quota holder's objectives, a governance structure and a set of management measures for the commercial fishery. The agreements form the basis for greater self-regulation of the commercial fishery, including: seasonal catch setting and ACE transfer arrangements, a logbook programme, coordinated fine-scale fishing arrangements, area closures, along with work on enhancement and reducing the effects of fishing. The plan contains management, compliance, communication and environmental strategies, and has been incorporated into the proof of concept fisheries plan.

126 Awarua tangata tiaki work collectively with their Runanga and have developed a set of criteria and rules by which they manage the fishery and provide quarterly reports to Te Runanga o Ngai Tahu. For example, authorisations are not permitted during the spring spawning season except under very special circumstances.

Further Information on the draft Fisheries Plan can be found in the *Bluff Oyster Management Company Limited's Fisheries Plan – Foveaux Strait Dredge Oysters (OYU5) [27 July 2005]*.

Individual Actions

127 Individual stakeholders occasionally undertake individual actions that contribute to the management of the Foveaux Strait dredge oyster fishery, for example, by returning shell to form reefs.

Performance

Performance against management objectives

128 Reported catch has seldom exceeded the TACC and there is no evidence of significant under-reporting of catch.

Compliance with rules

129 Main offences in the fishery are; taking less than legal size dredge oysters (all sectors), taking in excess of the bag limit (recreational sector), and illegal sale (all sectors). There have been prosecutions under all these categories in recent years. Compliance with closed area, gear and other restrictions is considered to be high.

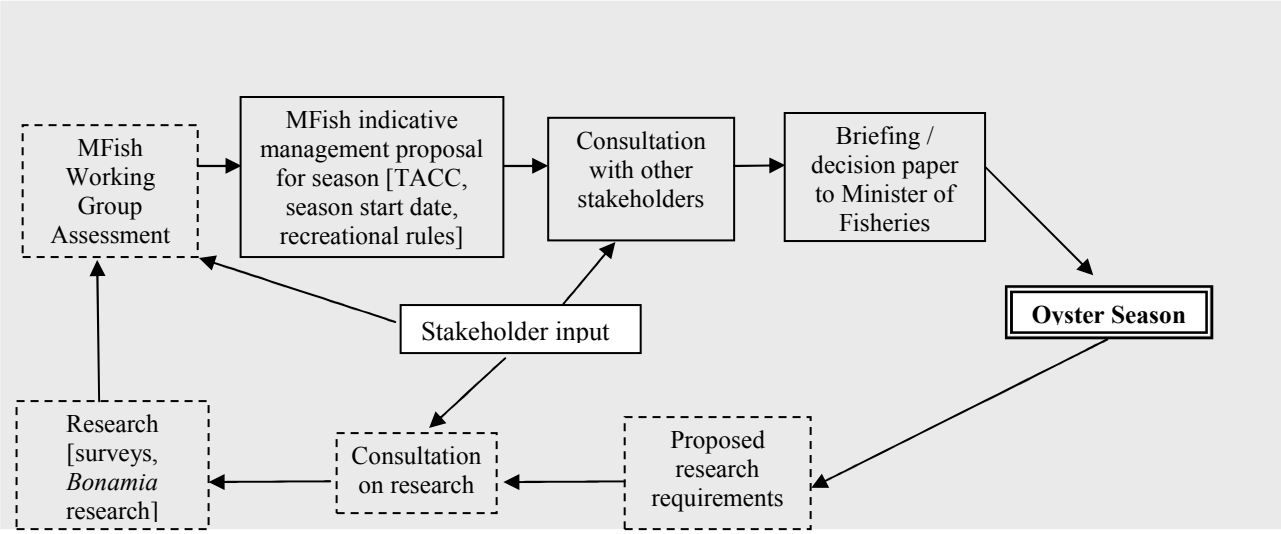
130 Incentives to offend include dredge oyster's high value/delicacy status, the ready domestic market, the durability of oysters and ease of access to the fishery due to the commercial fleet. Compliance with the minimum legal size rule in the fishery is problematic due to the large number of juvenile ("wings") and spat adhering to parent (legal size) dredge oysters. Regulations include these as undersized oysters, however, in practice it is difficult to ensure no spat or wings are landed.

Planning and decision-making

131 The figure below sets out a simplified annual cycle for current decision making for Foveaux Strait dredge oyster management measures (e.g. TACC or season start date), prior to development

of the proof of concept plan. The level of consultation and the nature of advice papers varied depending on whether a statutory change was required. There were also stakeholder-led processes which fed into this cycle, for example, hui, and Bluff Oyster Management Committee board meetings.

Figure 14: Previous annual decision making in the Foveaux Strait dredge oyster fishery.

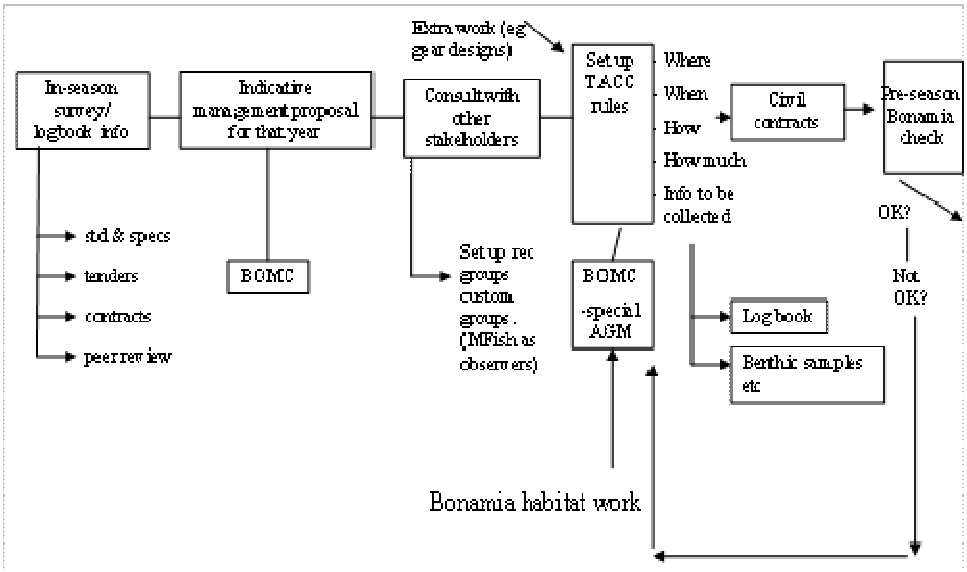


132 Key shortcomings of this decision making cycle included:

- There is limited stakeholder representation at the research and assessment working groups that feed into management decisions. Bluff Oyster Management Company and sometimes customary representatives attend.
- The short time between results of surveys (February) and start of the season (March) means consideration of management options is curtailed.
- There is no transparent plan, decision rules or triggers for management intervention.

133 To address these shortcomings, under the proof of concept fisheries plan the following decision cycle was developed:

Figure 15: Annual decision making in the Foveaux Strait dredge oyster fishery under proof of concept plan.



134 Regular meetings of the Fisheries Plan Advisory Group and workshops involving wider interests in the fishery now occur regularly. A newsletter is also published quarterly.