

**The effects of commercial sea-surface activity in  
Milford Sound: An initial scoping and  
information gathering report**

**Prepared for Environment Southland**

**Paul Sirota  
Department of Geography  
University of Otago  
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## Summary

The major attraction that draws visitors to experience Milford Sound is the natural and seemingly unspoilt character of a coastal marine wildlife association combined with a native wilderness landscape. Through the increasingly rare combination of these elements Milford Sound has become iconic to tourism in New Zealand. As a tourist destination, Milford Sound is relatively accessible and is also considered to be safe, while at the same time spectacular. It is these additional features that may explain the general demographic and types of tourists that tend to visit the destination at present. Wildlife that inhabits Milford Sound and the other fiords in the Fiordland Coastal Marine Area (FCMA) is becoming an increasingly major draw-card for international tourism in the area. Dolphins that visit, or are resident within the fiords, are probably the second major attraction after the outstanding scenery of the FCMA. Research conducted from within the University of Otago, some of which is now beginning to be published in peer reviewed journals, indicates that increases in commercial and tourist activity in the area are likely to bring the associated wildlife and marine biota under increasing pressure. A general decline in the population of some aquatic species has already been noted, as well as signs of pressure on some marine mammals. The current state of the ecology of Milford Sound can be attributed to current and historical commercial and recreational activity within the area.

The perceptions regarding natural character and landscape values of the area may also be deleteriously affected by any further increase in motorised commercial vessel activity in Milford Sound. Perceptions of natural landscape and wilderness values are attenuated when synergies are formed between commercial tourist vessels, air traffic, high road usage and large influxes of visitors within a confined area. Research concerning the sustainability of tourism in Milford Sound has shown that from an academic perspective, at present, unsustainable indicators appear to out-weigh those of sustainable indicators for the destination. The current carrying capacity for Milford Sound appears to have been reached, if not slightly exceeded. It is recommended that a full and integrated Cumulative Effects Assessment (CEA) be conducted for Milford Sound. The CEA should include cross-boundary jurisdictional activities and therefore address synergies between the variety of activities currently practiced within the fiord and surrounding area. Utilising a multi-method approach, the CEA should address the combined effects of aircraft, road usage, visitor numbers and commercial and recreational sea-surface activities on landscape and natural character perceptions of visitors.

## **1.0 Introduction**

This report is an initial scoping study regarding the possible effects associated with any increases in commercial boating activity in Milford Sound located within the FCMA. Some of the information within this report is unpublished postgraduate research from the University of Otago that has relevance to issues involving commercial boating in Milford Sound and the wider FCMA. Other research available from the internet and from peer-reviewed publications is included where appropriate.

Sustainability is one of the major goals and also one of the major challenges facing future management of the developing tourist industry in New Zealand at present. Milford Sound is often referred to as one of the jewels in the crown of New Zealand tourism, and as such it is appropriate that the management of such a treasure takes steps to ensure that this jewel does not become tarnished. In contrast, Milford Sound has also been described as ‘the sacrificial lamb to the tourist dollar’ in some of the ‘grey literature’ that has been surveyed during the course of this research. An obvious tension is therefore identified in the current perception of Milford Sound as a scenic and natural wilderness area. Resolution of these contrasting perceptions will affect the future management and possible outcomes for Milford Sound.

Each subsection has the reviewed literature associated with the subject matter included at the end of the section. This format is adopted for ease in identification of the cited literature for each subsection. A full bibliographic reference section is included at the end of the report. Reference sections of each work cited in this report have not been duplicated due to redundancy, but it should be noted that an extensive body of information may be accessed through these references.

### **1.1 Annotated bibliography:**

The annotated bibliography is intended to act as a resource for an investigation by Environment Southland (ES) involving possible effects associated with increases in commercial sea-surface activity in Milford Sound. This section addresses a variety of topics, both biophysical and social, that are relevant to commercial boating activity in the FCMA. The Department of Conservation (D.o.C) already retains much of the ecological information regarding marine flora and fauna of the FCMA in a Southland Marine Database, therefore the focus of this report is to identify any gaps or new, or as yet unpublished, research relevant to Milford Sound. Any research that will help ascertain perceptions of the natural character and landscape values associated with Milford Sound, or how these may change due to an increase in commercial boating activity in the fiord, is also included.

### **2.0 Ecology of Milford Sound:**

ES in conjunction with D.o.C already have a body of information regarding the ecology of FCMA and Fiordland National Park used for compliance monitoring (Environmental Compliance Monitoring Report, 2001/2002, Southland Marine Database). The research reviewed in this section should be used in conjunction with information already held by D.o.C.

## 2.1 Marine Mammals

### 2.1.1 Dolphins:

Research on bottlenose dolphins (*Tursiops* spp.) has been conducted in Milford Sound and Doubtful Sound. The dolphins that visit Milford Sound appear to be directly affected by the presence of high numbers of tourist boats operating in the fiord. Residence times of bottlenose dolphins within Milford Sound appear to be shortening as a response to an increase in vessel numbers. Dolphins that do visit Milford Sound appear to stay near the entrance and occupy the zones less frequented by vessels (Lusseau, 2005). However, a recent reconnaissance excursion on one of the larger commercial tourist vessels showed that in calmer conditions the tourist boats cover the entire fiord perimeter leaving few areas of the fiord free of boating activity. High speeds are attained in areas not regulated by speed restrictions within the fiord by recreational and charter vessels used for fishing or those used for the crayfish industry. High speed vessels also have the potential to harm dolphins due to collisions, especially if dolphins are trying to avoid tourist vessels. The general evidence presented below indicates that the bottlenose dolphin populations of both Milford Sound and Doubtful Sound require ongoing monitoring so as to ensure a sustainable population in both fiords. Ecological monitoring of the dolphins is needed along with compliance monitoring of tourist boat operators to the Voluntary Code of Practice (COP) and Code of Conduct for Marine Mammal Watching issued by D.o.C.

Interviews conducted with Doubtful Sound tourist boat operators by Fairbairn (2003), indicated that operators in Doubtful Sound occasionally pursue dolphin pods within the fiord in order to allow clients to observe them. The interviews revealed that self-regulation does not appear to be favoured by all of the operators in Doubtful Sound. The Code of Conduct for Marine Mammal Watching appears to be accepted in theory but not necessarily adhered to by all operators. Operators appear to alert each other as to the location of the pods within the fiord. This results in operators deviating from the agreed route for vessels within the fiord in order to intercept the pods. This practice appears to gain greater client satisfaction on the respective tourist boats.

Fairbairn, N. (2003) *Bottlenose Dolphin Tourism in Doubtful Sound: An analysis of Sustainable Tourism Management in Doubtful Sound*, unpublished Post Graduate Diploma in Tourism dissertation, Department of Tourism, University of Otago, New Zealand.

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Statistical analysis of residency times for bottlenose dolphins (*Tursiops* spp.), in Milford Sound by Lusseau (2005), has indicated that commercial sea-surface activities have an effect on the time spent by pods of dolphins in Milford Sound. These conclusions are resultant from a study between Dec. 1999 and Feb. 2002. During times of intense tourist traffic, visiting dolphins tend to stay near the entrance to the fiord out of the reach of the tourist boats. It appears that dolphins tend to spend less time in Milford Sound when traffic is heavy. Cetaceans (whales and dolphins), move away from boats when interactions become intrusive or too lengthy, possibly due to acoustic disturbance or risk of personal injury.

During the period of the study by Lusseau, four individuals from a population between 45 and 55 dolphins had propeller marks from collisions with boats. Two of the four had collided with boats over the study period, one of which (a two week old calf) disappeared after being hit and is presumed dead. Horizontal avoidance strategies by dolphins become ineffective when boat traffic is high, as these strategies generally just tend to bring the dolphins into contact with another boat. It is considered that this may lead to abandonment of the fiord by the dolphins. Avoidance of vessels could have long-term implications for the demography of the dolphin population in the FCMA.

Lusseau, D. (2005) Residency pattern of bottlenose dolphins *Tursiops* spp. in Milford Sound, New Zealand, is related to boat traffic. *Marine Ecology Progress Series* Vol. 295, pp. 265-272.

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Research by both Lusseau authors indicates that dolphins are reliant on in-fiord fish species as well as pelagic fish species. Tourist operators involved in commercial sea-surface activity appear to be placing the dolphin population under pressure. Diesel engines that propel larger tourist vessels operating within Milford Sound transmit significant noise and vibration into the water column. In areas where the fiord narrows, such as near the entrance where dolphins are more commonly observed, noise may also be reflected between the walls of the fiord. Significant noise volumes may hinder the ability for dolphins to communicate in synchronised diving efforts for in-fiord species.

Marine mammals are generally believed to have a major impact on the structure and function of marine communities. The study by the second Lusseau author, during 2002, found that bottlenose dolphins in Doubtful Sound are dependent on in-fiord species, especially demersal species and those associated with the shallow reef zone along the rock walls. Some ephemeral pelagic species do however subsidise their diet during the summer months. This species of dolphin is therefore particularly vulnerable to changes in the availability of local food sources.

The present dolphin population, having not significantly varied in size for the past 12 years, indicate that the dolphin population is at carrying capacity with its environment. Breeding of dolphins has been linked to periods of sufficient resources being available to support pregnant and lactating females. Changes to the availability of prey fishes, either through direct competition with fisheries, or through environmental change, could have detrimental effects on the viability of the bottlenose dolphin population as well as other predators relying on production generated inside the fiord.

Lusseau, S. (2002) *Diet of bottlenose dolphins in Doubtful Sound, New Zealand; Evidence from stable carbon and nitrogen isotope analysis*, unpublished Master of Science dissertation, Marine Science , University of Otago, New Zealand.

Lusseau, D. (2004). The state of the scenic cruise industry in Doubtful Sound in relation to a key natural resource: bottlenose dolphins. *In: Nature-based tourism in peripheral Areas: Development or disaster? (M. Hall and S. Boyd eds.)* Channelview Publications.

Lusseau, D. and Higham, J.E.S. (2004) Managing the impacts of dolphin-based tourism through the definition of critical habitats: the case of bottlenose dolphins in Doubtful Sound, New Zealand. *Tourism Management* 25: 657-667.

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Research by Orchiston (2004) is considered more closely within the section regarding operator perceptions of tourist and other operator activity. However, in relation to the effects of tourist operations regarding dolphins, the study indicated that operators recognised that tourist operations are likely to significantly impact the dolphins in Doubtful Sound. Operators are also aware of potential impacts of tourism on marine species. Forty percent of the operators interviewed agreed that there will be increasing disturbance of marine mammals over the next five to ten years. Interviews with operators also indicated that a number of unpermitted operators have been observed behaving inappropriately around dolphins by other operators.

Orchiston, C. (2004) *Marine tourism in New Zealand: Operator profile and environmental management*, unpublished Masters dissertation, Tourism Department, University of Otago, New Zealand.

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A study by Schneider (1999) on bottlenose dolphins in Doubtful Sound highlights the scientific importance of Fiordland for studying the bottlenose dolphins at the southern limit of their habitat range. The fiords are an excellent place to locate and follow dolphins due to the long narrow geomorphology of the aquatic portion of the fiords. This enables large amounts of data to be generated for discrete populations.

A comparative study between these populations and that of tropical populations has significant value. Dolphins resident in the fiords have larger body morphology as an adaptation to the environment within the fiords. The fiord environment is colder than that of more tropical populations due to the influxes of freshwater. The ability to conduct comparative studies concerning the effects of tourism on dolphins between the Milford Sound population and Doubtful Sound populations is also recognised by this study. This research may act as a resource of baseline data for future comparisons, if the tourism industry continues to grow, especially in commercial vessel tourism for dolphin watching.

Schneider, K. (1999) Behaviour and Ecology of Bottlenose Dolphins in Doubtful Sound, Fiordland, New Zealand, *unpublished PhD. dissertation, Marine Science Department, University of Otago, New Zealand.*

### **2.1.2 Fur Seals**

The population of New Zealand Fur Seals commonly visited by the tourist cruise boats are disturbed by tourists coughing, making seal noises or hissing or shouting at them. The hissing from venting scuba tanks also disturbs members of the colony which have been observed diving into the water as a response to these noises (*pers. comm.* Tawaki Diving, Te Anau).

The effect of tourism on marine mammals in New Zealand has been a focus of a research paper by Constantine (1999) for D.o.C. The report outlines research into tourist contact with most marine mammals seen in New Zealand. The research paper supports the information and advice given by the personal communications with the commercial and recreational diving operators that frequent Milford Sound. The reference section of this study is a good resource for more in-depth enquiry into this topic. The study recognises that more information is still required for many species.

### **2.1.2 Whales**

Whales occasionally visit Milford Sound. An instance of a Southern Right Whale visiting Milford Sound is reported in an interview with a D.o.C staff member in Fairbairn (2003). The interview relates one of the tour boat companies operating in the fiord alerted D.o.C and offered a boat and staff to help with retrieval of a biopsy from the whale. The interviewee relates that other operators however quickly deviated from their tours to allow clients to observe the whale, creating a potential shipping hazard and probably breaching marine mammal regulations. The incident is reported to have been followed up by D.o.C staff by telephone calls made to tour boat operating companies and talking with them about the incident. Telephone calls were also followed up with letters containing educational information about whales. This incident highlights the potential for pressure to be placed on larger marine mammals, such as whales that choose to enter Milford Sound. Opportunities to view large cetaceans in close proximity are few due to the decline in the global whale populations. The rarity of large cetacean encounters in Milford Sound, and therefore excitement value for tour boat clientele is apparent. Although some operators may be very responsible in their association with the marine mammals that enter or live in Milford Sound, the excitement value opportunity for tourist clientele will be hard for most tourist operators to ignore when other rare incidents of this nature occur. Whale watching is becoming a popular tourist attraction in New Zealand. The potential for disturbance of any whales entering Milford Sound is considerable considering current levels of commercial vessel traffic. More complete references are available from D.o.C and from the research by Constantine (1999).

Constantine, R. (1999) Effects of tourism on marine mammals in New Zealand. *SCIENCE FOR CONSERVATION*: 106 Department of Conservation, Wellington, New Zealand

Fairbairn, N. (2003) *Bottlenose Dolphin Tourism in Doubtful Sound: An analysis of Sustainable Tourism Management in Doubtful Sound*, unpublished Post Graduate Diploma in Tourism dissertation, Department of Tourism, University of Otago, New Zealand.

## **3.0 Other Marine Biota**

### **3.1 Black Coral (*Antipathes fiordensis*):**

The study by Kai (2000) recognises that low light levels, lack of wave action, and reduced competition provide a unique aspect to the environment of the FCMA aquatic environment. These attributes allow normally deepwater organisms such as



antipatharians, gorgonians, hydrocorals and brachiopods to occur at much shallower depths in Fiordland than in other parts of the world. Therefore, Fiordland provides opportunities to study biology and ecology of plants and animals generally inaccessible elsewhere. *Antipathes fiordensis* (black coral), occurs between 5m and 35m depth in Fiordland which is significantly shallower compared to other antipatharians. Fiordland has the largest black coral population in the world which grows slower than its tropical counterparts. Factors that affect its mortality include landslides from surrounding steep mountains, phytoplankton blooms that may smother colonies and predators such as ascidians (sea squirts). Sea-squirts are a present threat in New Zealand coastal waters that may be spread by transitory and international vessels in New Zealand.

Kai, T. (2000) *Reproductive and larval biology of Black Coral, (Antipathes fiordensis)*. unpublished Master of Science dissertation, Marine Science Department, University of Otago, New Zealand.

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The oceanography of Milford Sound plays an important role in the marine ecology of the fiord. Aspects of the physical and chemical oceanography of Milford Sound, on a seasonal basis, were conducted by Hanning (1998). This Master of Science thesis involves an investigation into the salinity and nutrient levels (including oxygen concentrations) in Deep Water Basin between autumn 1995 and winter 1997. The Low Salinity Layer (LSL) of Stirling Basin and Deep Water basins was sampled and found phosphate and nitrogen levels to be low, but silicate levels were high. The upper part of the Intermediate Water Layer (IWL between 5 and 100m) in Stirling Basin was found to be depleted of nutrients in winter, presumably due to the phytoplankton uptake. Anoxic (complete depletion of oxygen levels) conditions were found at the bottom of Deep Water Basin (50m), below a deep pycnocline. High phosphate, silicate and very low nitrate levels were found during conditions of low oxygen concentrations in the Bottom Water Layer (BWL).

Biological investigations in Deep Water Basin, along with other evidence, have suggested that the periodic development of low oxygen conditions has only been a recent occurrence in this basin. Divers have reported the existence of black coral skeletons larger than 30cm in length, but no live coral colonies. These dead colonies had grown up for up to 50 years prior to death. Black coral colonies are sensitive to changes in oxygen concentrations and the presence of hydrogen sulphide and would be unlikely to survive in conditions of low oxygen concentration.

Conditions at present in Deep Water Basin have been contributed to by the permanent alteration of the course of the Cleddau River in 1960's due to construction of the airstrip in Milford Sound. The effect of the Cleddau River, now permanently emptying into Deep Water Basin, results in more water flowing over the sill that separates Deep Water and Stirling basins. This can result in decreased replacement of the Bottom Water Layer by decreasing the density of in-flowing sea-water. This is due to mixing of the fresh and seawater layers over the sill.

Biological processes in Deep Water Basin are sensitive to oxygen concentrations and the presence of hydrogen sulphide during anoxic conditions. Deep Water basin provides a unique opportunity to examine the effects of low oxygen concentrations and the presence of measurable quantities of hydrogen sulphide on benthic organisms

such as black coral. Microbiological association changes and identification of bacterial species, due to the conditions now present in Deep Water Basin, may also be investigated in this unique marine environment, at *diveable depths*. Any further alteration of the hydrography of Deep Water Basin or Fresh Water Basin could alter the conditions within the water layers and affect marine biota. The fiord hydrography may be altered by development projects, such as for construction of breakwaters.

Hanning, P. (1998) *Aspects of the physical and chemical oceanography of Milford Sound*. , unpublished Master of Science dissertation, Marine Science, University of Otago, New Zealand.

### **3.2 Sea Urchin *Evenchinus chloroticus* and Sea Star *Coscinasterias muricata***

New Zealand's fourteen deep water fiords possess complex physical hydrographic features and strong environmental gradients that may serve to isolate the marine organisms that occupy them. At a macro-geographic scale, restricted gene flow between North and South Island was observed for both species. At a meso-geographic scale, significant population structure was found at short distances within fiords, among fiords and between fiords and open coast for both species. Several isolating mechanisms were identified that were common or specific to each species. Historical colonisation events and subsequent restriction of larval dispersal due to fiordic hydrography have caused significant genetic differentiation among populations.

The results of the study by Perrin (2002) have significant consequences for fiord conservation and management planning. In terms of management of the *E. chloroticus* fishery and conservation in general, the results of this study provides evidence of different stocks around New Zealand and among the fiords which should be taken into account in fishing practice. Discrete management procedures are therefore more appropriate than considering populations around New Zealand as one unique stock. The conservation value of some fiords that have unique genetically structured populations, compared with other fiords and open coast populations is therefore enhanced. Each of these populations should therefore be treated as a distinct management unit, rather than attempting to manage the Fiordland region as a whole, as is the case at present. This study highlights the important genetic diversity around New Zealand and the particular marine environment present in the fiords.

Perrin, C. (2002) *The effects of fiord hydrography and environment on the population genetic structures of the sea urchin *Evenchinus chloroticus* and the sea star *Coscinasterias muricata* in New Zealand*. Unpublished Ph.D. thesis, Departments of Marine Science and Zoology, University of Otago, New Zealand.

### **3.3 New Zealand Rock Lobster, Crayfish**

A decline in numbers of crayfish has been noted in Milford Sound over the years. Few crayfish pots are now placed in Milford Sound although pots are stored near Deep Water Basin. The bag limit has been decreased from 6 per diver per day, to 3 per day, with no accumulation (*pers. comm.* Dive Otago and Tawaki Diving). Lowering of pots down the fiord walls may potentially harm coral species resident on the fiord

walls. The commercial vessels used by the crayfish and charter fishing operators departing from, and returning to, Deep Water Basin tend to be considerably faster than commercial tour boats. These vessels have been observed to accelerate rapidly down the centre of the Milford Sound (where there is no speed restriction) on their way to open water outside Milford Sound. High speeds have the potential to lead to collisions with dolphins that may be using horizontal avoidance strategies to avoid the tourist boats.

### **3.4 Fish**

Presently, commercial fishing in Milford Sound is extremely restricted. Recreational fishing is usually practised outside of the fiord (Dive Otago). Commercial and other popular fishing species have become far less abundant within Milford Sound resulting in reduced catches of some species and closure for fishing in other cases. Guardians for Fiordland's Fisheries and Marine Environment Inc. (Guardians) and D.o.C are likely to hold the best current information on fish populations and other baseline data (if any) for fish species in Milford Sound. The information regarding blue cod and terakihi is derived from data available from internet sources. The members of Guardians for Fiordland are comprised of, among others, well-known researchers from the academic community.

#### **3.4.1 Blue Cod**

A decline in fish numbers has led to Milford Sound being closed to fishing for blue cod. The Guardians of Fiordland's Fisheries believe that Milford Sound, one of two access points for fishers visiting Fiordland, no longer supports a blue cod fishery of the quality formerly offered. Doubtful Sound is the second access point, and there are concerns that increasing recreational pressure will lead to the depletion of blue cod in the Sound and its associated waterways (NIWA, 2006, accessed 12-02-06).

#### **3.4.2 Terakihi**

Tarakihi eggs were present in Milford and Dusky Sounds during March 1972. In Milford Sound, egg numbers were lowest at the head and highest near the western end of Stirling Basin and beyond the entrance to the sound. The study by Robertson (1978), found that the general pattern of distribution in Milford Sound was somewhat irregular. In Dusky Sound, approximately 185 km to the south of Milford Sound, numbers of tarakihi eggs taken at a depth of 3-5 m were not as high as in Milford. The effect on terakihi spawning and subsequent contribution to the adult population due to increases in commercial boat activity at the western end of Stirling Basin is unknown.

No further information was collated pertaining to Milford Sound from the University of Otago. D.o.C may have more detailed information on fish species in the FCMA.

### **3.5 Penguins and other Bird spp.**

Currently, Fiordland Crested Penguins (Tawaki) have an estimated population of 200-300 birds in Milford Sound. These birds tend to nest up in the vegetation surrounding the fiord (*pers. comm.* Tawaki Diving, Te Anau). No research has been conducted on these birds in Milford Sound, but some research has been conducted at Break Sea

Island by D.o.C. Fiordland Crested Penguins are considered to be in a precarious position with regard to conservation (*pers. comm.* Dr. Lloyd Davies, Zoology Department, University of Otago) The effects of any increase in commercial sea-surface activities are unknown and therefore this species may require monitoring or become the subject of further research. Little blue penguins are also resident in Milford Sound but no research was discovered within the University of Otago. No other penguin species in Milford Sound have been the subject of research identified in literature.

Other native bird species resident in Milford Sound are managed by D.o.C. The information regarding these species will be available from D.o.C.

### 3.6 Insects

Sand-flies are virtually omnipresent in the littoral (shoreline) environments of Milford Sound and the FCMA. No information has been found regarding the possibility of disease transmission due to multiple biting events by sand-flies. If international tourist numbers in the future were to increase at Milford Sound, mosquitoes or sand-flies may present a vector for transmission when biting multiple visitors. No information regarding Milford Sound was discovered when consulting the Department of Zoology, the D.o.C. may have more information regarding insect populations in Milford Sound.

## 4.0 Perceptions from Stakeholders and Visitors

### 4.1 Perceptions of local stakeholders

Research concerning the perceptions of five tourist boat operators in Fiordland was conducted by Orchiston (2004). The results of the study indicated a change in the percentage of visitors drawn to the main attractions offered by the commercial tourist boat operators between 1995 and 2004.

#### Attractions for visitors from 1995 – 2002 (%)

	1995	2002
Marine reserves	4.7	20.3* (x 5)
Penguins	18	22.7
Sea birds	42	43.6
Dolphins	22	48.3*(doubled)
Whales	6.8	9.9
Fish	33	48

#### Top Five Key Attractions 2004; (%)

Coastal Scenery-	62.2
Dolphins-	48.3
Fish-	47
Sea birds-	44
Islands-	41
Seals-	26

The perception of commercial tourist boat operators in Fiordland from operator surveys, is that too many marine operators are working in the area. Operators are concerned about excessive competition in Fiordland with potential for numbers to increase excessively in the future.

The scenery is seen as the foremost attraction with dolphins as an aside (a popular secondary attraction). Hence, while a small proportion of operators have a Marine Mammal Watching Permit (probably only in Doubtful Sound), most claim to be observing scenery with dolphins as an attractive aside. This is due to encounters with dolphins occurring in only 75% of excursions which would leave 25% dissatisfied customers if they were to advertise dolphin encounters as the primary focus of the cruise. Fiordland operators (n=5), all stated they had guiding concessions from DoC. however, none had Marine Mammal Watching Permits. Operators are aware of potential impacts of tourism on marine species, with 40% agreeing that there will be increasing disturbance of marine mammals over the next five to ten years.

That the industry is becoming over-regulated, is also seen as a problem by operators. Interviews in this study indicated that Fiordland operators have continued to be strongly disapproving of self-regulation since 1996. A number of unpermitted operators have been observed behaving inappropriately around dolphins by other operators. There is evidence from the study of social tension between operators in Fiordland with respect to unpermitted operators. However, the regulatory environment for operator behaviour is less strictly controlled by regulations, but is strongly influenced by the behaviour of fellow operators, which can be a cause for social tensions between local operators. "Hence, there is ill-feeling between operators and little trust in self-regulation" (cited in Lusseau (2004). Lusseau and Higham (2003), have highlighted that a 'site specific management regime would best suit Doubtful Sound in the form of a multi-layered marine mammal sanctuary structure designed to provide dolphins with undisturbed water in which to rest and feed'.

Orchiston, C. (2004) *Marine tourism in New Zealand: Operator profile and environmental management*, unpublished Masters dissertation, Tourism Department, University of Otago, New Zealand.

## 4.2 Visitor Perceptions

Perceptions of *crowding* and the *naturalness* and *character of the landscape* is, among other attributes, subjective to the demographic and cultural background of each visitor to the environment. Several studies have been conducted on the perception of wilderness and the strength of feeling concerning the intrinsic values associated with natural areas such as that of Milford Sound and other tourist destinations. Milford Sound, and more definitively, Mitre Peak, has been the subject of a significant proportion of the cultural output, such as imagery in the form of photographs and paintings that depicts New Zealand's outstanding scenery and wilderness values. During the period of this research, not one of these images contained either a tourist boat or light aircraft.

Some unpublished postgraduate research has been conducted within the University of Otago. Relevant studies are summarised in this section along with other published peer-reviewed research.

Crowding in Milford Sound was surveyed in 1994 by O'Neill (1994) but is likely to have changed since this period. The results of the study were drawn from responses from 290 visitors.

32.2% stated they would have preferred to see less other visitors.

61.3% stated they would have preferred to see about as many other visitors as they did.

Most common feature of 3 best was;

Scenery- 60.2%

Boat trip- 26.8%

Waterfalls- 13%

Seals- 10.2%

Most common feature of 3 worst was;

Sandflies- 23.7%

Crowds/Queues- 14.7%

Weather- 12%

In February 1992

71.4% of visitors to Milford Sound surveyed thought it wasn't crowded

18.6% thought there were too many other visitors

60.7% of visitors surveyed did not find any areas crowded

32.1% said they did find some areas crowded. Of these; 34.5% found the ticketing/wharf area to be crowded which was 22% of all respondents. 29.8% found the boats to be crowded which is 19.7% of all respondents.

Overall 56.5% felt that overall the visit to Milford Sound was crowded to some degree and of these 26.2% -slightly crowded

28.1%- moderately crowded

2.2%- extremely crowded

O'Neill (1994) stated that these statistics fall into the high-normal range from comparisons with other literature. 20% of all respondents surveyed indicated that the most common pollution perceived was that of noise pollution. O'Neill (1994) concludes that the Social Carrying Capacity was not being exceeded at that time but was tending in that direction.

These quantified responses may be useful for historical comparisons. The percentage values for perceptions of crowding, demographics of visitors and visiting frequency and possibly other variables, could be compared with more contemporary statistics. These statistics may be accessed from tourist boat visitor surveys so as to quantify change, if any. An independent survey that replicates this study could be made, or information from any current surveys that had relevant information could possibly be used.

O'Neill, D. (1994) *Socially Sustainable Tourism Development*, unpublished Masters dissertation, Tourism Department, University of Otago, New Zealand.

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Another method for gauging the *perception of visitors to wilderness areas* is that of tolerance to specific environmental scenarios and situations. Research concerning wilderness perceptions including classifications of environmental purism among visitors and other users of wilderness areas has been undertaken by Higham et al. (2000). Previous studies have shown that mechanised traffic is widely considered to

erode wilderness values (Kearsley, 1982). The published research by Higham Kearsley and Kliskey (accessed 18-01-06) noted that it is quite possible that increasing waterborne traffic in the fiords of Fiordland National Park may threaten the wilderness status of this area. Aspects of visitor perception of wilderness values together with methodologies for surveys of visitors are included in the published and unpublished references listed below. Many other references to wilderness perceptions from international visitors and other users are held within the reference sections of these papers. These references constitute an important resource for development of a study involving landscape and naturalness perceptions with regard to any increase in commercial tourist boating in Milford Sound.

Higham, J. and . Kearsley, G. and Kliskey, A.(2000) Wilderness Perception Scaling in New Zealand: An Analysis of Wilderness Perceptions Held by Users, Nonusers and International Visitors. *USDA Forest Service Proceedings RMRS-P-15-VOL-2*.

Higham, J. (1996) *Wilderness Perceptions of International Visitors to New Zealand. The perceptual approach to the management of international tourists visiting wilderness areas within New Zealand's Conservation Estate*. Unpublished Ph.D. thesis. University of Otago, Dunedin, New Zealand.

Higham, J.E.S.; Kearsley, G. (1994) Wilderness Perception and its implications for the management of the impacts of international tourism on natural areas in New Zealand. In *Tourism Downunder: A Tourism Research Conference*, 6-9 December, 1994 (pp.505-529). Palmerston North: Department of Management Systems, Massey University.

Higham, J. and . Kearsley, G. and Kliskey, A.(2006) Multiple wilderness recreation management: Sustaining wilderness values-maximising wilderness experiences. <http://www.doc.govt.nz/Publications/004~Science-and-Research/Miscellaneous/PDF/WildernessE.pdf> accessed 18-01-06

Kearsley, G. (1982) Visitor Survey of Fiordland National Park. *Lands and Survey Department*. Wellington, New Zealand

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The *environmental value* placed by different consumptive and non-consumptive marine tourist user groups in the South Island has been the focus of research by Dawson (2004). Consumptive marine tourists such as sea-fishing tourists and non-consumptive such as sea-kayaking tourists were classed as distinct user groups that have different environmental values and demographics.

The general demographic profile of consumptive tourists, such as sea-fishers, was male, full-time employed and had an extrinsic/anthropocentric view of the environment. Generally results indicated a low formal education. Consumptive recreational past times tended to be environmentally insensitive and included; fishing in rivers, lakes and beaches, jet boating, 4WD driving, hunting.

The general demographic profile of non-consumptive tourists, such as sea-kayakers, was female, unemployed or part-time workers, and retained an intrinsic/ecocentric view of the environment. Generally resulted indicated higher levels of formal education. Non-consumptive recreational past times are usually environmentally sensitive and include; sailing, surfing, tramping, wildlife viewing, canoeing etc.

Sea-fishers tend to take short trips with lots of people whereas sea-kayakers tend to take longer trips with fewer people. Perceptions of an environmentally acceptable level of sea-surface activity will vary markedly between user groups and stakeholders in Milford Sound. These values may be based on shared characteristics by some user groups and stakeholders.

Dawson, J. (2003) *Environmental values of consumptive and non-consumptive marine tourists in South Island, New Zealand*, unpublished Master of Tourism dissertation, Tourism Department., University of Otago, New Zealand.

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Visitor *perceptions of landscape character and naturalness* may be gauged by a number of methodologies. A valuable and comprehensive review paper by Swaffield and Foster (2000), discusses and critiques some of the methodologies employed in assessing community perceptions and landscape values in wilderness areas of New Zealand. Although this paper focuses mainly on the perceptions of the South Island high country of New Zealand, many generic issues regarding evaluation of perceptions by different user-dependent and user-independent groups are addressed. Five broad categories of approach to landscape evaluation are:

- expert-based
- psychophysical
- cognitive
- socio-cultural
- experiential/phenomenological

Each of these methodologies is described and considered by this review, along with some examples of benchmark studies where each type of methodology has been applied in New Zealand. Credibility, dependability and utility were identified as the key criteria for evaluating approaches and methods for the investigation of community perceptions of landscape.

*Credibility* refers to the extent to which a particular approach or methods authentically represents community perceptions of landscape values.

*Dependability* is the extent to which users can be confident that the landscape values that are reported are not biased by the researchers own interests or prejudices.

*Utility* involves the extent to which the method can be easily and economically applied.

These criteria should be supplemented by *insight, sensibility* and *reliability*. The utility and applicability of each type of methodology outlined above is considered by this report with respect to several specific criteria including the provision of contextual understanding for policy formation.

To avoidance redundancy from reproduction of the contents of the review, each type of methodology will not be fully described here. The review notes however, that there is a trend towards hybrid multi-method studies, in which several methods, or even more than one overall approach is combined to strengthen the validity and integrity of the results. Multi-method studies are increasingly common when investigating complex social issues and appear to be the most effective way to address the demands of landscape perception. Although multi-method approaches are more robust



methodologically, they are often significantly more expensive than the use of a single method, and hence lower the utility of the multi-method approach.

The review recognises that very little research has been published that specifically identifies the community perceptions of landscape values in wilderness areas of New Zealand, especially in Southland. The choice of approach that is taken in evaluating the landscape and natural character of an area must depend on the purpose of the study, and the methods that are selected will be according to the best practice in the disciplines concerned with that approach. From an academic perspective, best practice involves the use of strategies and methods in peer-reviewed published literature. A comprehensive reference section accompanies this review and will act as a valuable resource when deciding on the approach taken for the development of policy in the future integrated management of Milford Sound and the FCMA.

Swaffield, S. and Foster, R.(2000) Community perceptions of landscape values in the South Island high country: A literature review of current knowledge and evaluation of survey methods. *Science for Conservation 159*, Department of Conservation, Wellington, New Zealand.

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Other countries have also had to deal with the complex issues that surround tourism operations within wilderness areas. Glacier Bay National Park, Alaska, is one example of a managed wilderness area that has recently commissioned research to be conducted into the many potential impacts that may occur due to increasing the number of cruise ships and visitors that enter the park. The work commissioned concerns both biophysical and social impacts and contains appendices outlining current literature on visitor perceptions within wilderness areas. The example below is taken from Appendix F. of Glacier Bay National Park Science Advisory Board: Final Report (2005). This report may be used as a resource in considering the effects of increases in commercial boating activity in Milford Sound from both a biophysical perspective and with regards to associated social impacts. The report also contains an extensive reference section of relevant literature for planning and management of natural wilderness areas.

**Park Planning and Management.** From the Conclusion: *Monitoring wilderness character and managers' success in meeting stewardship objectives are important. Monitoring of setting attributes that are subject to managerial control and related to desired wilderness experiences seems to provide a better basis for assessment than measures of the wilderness experience itself or of visitors' evaluations of the experience. However, our ability to select good indicators of the setting will clearly increase as we learn more about the nature of human experience in wilderness and how that experience varies with setting attributes. In addition, visitor evaluations and opinions about appropriate setting attributes, along with those of other stakeholders, need to be considered when setting management objectives.*

This highly useful article on the relationship between biophysical, social and managerial conditions and the visitor experience offers a relevant discussion that can be very helpful in framing management questions for Glacier Bay. The major relevant finding of this article is the importance of identifying good indicators to monitor visitor experience and setting attributes. The author presents a conceptual model of the relationship between setting attributes, the personal characteristics of visitors, their experiences, and their evaluation of those experiences (Clausen, 2005).

Cole, D. N. (2004). "Wilderness Experiences - What Should We Be Managing For?" *International Journal of Wilderness* 10(3): 25-27.

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Recent literature regarding landscape values of host communities in other countries revealed a variety of methodologies in use currently in assessing the values associated with landscapes. An experiential methodology is used in an empirical study of the landscape experiences by inhabitants of the Cariboo region of British Columbia by Dakin (2003). A locally responsive (place-based) assessment of values of the landscape was undertaken in which local inhabitants took part in participant-directed landscape imaging. The study highlighted the overlapping experiences of the inhabitants of Cariboo through both individual and shared feelings and attachments emphasizing a sense of place. In a generalized conclusion Dakin (2003) states that describing, characterizing and appreciating landscapes, including aesthetic dimensions, requires a place-based perspective and a broadened notion of both valuation and who can make such valuations. Such a methodology is seen as integral to effective and satisfying approaches for dealing with environmental concerns and resource development issues.

Dakin, S.(2003) There's more to landscape than meets the eye: towards inclusive landscape assessment in resource and environmental management. *Canadian Geographer* 47 (2): 185-200.

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#### **4.2.1 Visitor perceptions from web based travel logs (blogs)**

Travel blogs (web logs) are an increasingly utilised method for international travellers to convey their experiences of international tourist destinations to the rest of the world. As an open forum, travel blogs allow for the frank exchanges of ideas and perceptions among international travellers, and are also used as a resource for travellers to choose potential destinations.

Monitoring some of the more frequently visited websites will help to give up to date information as to the perceptions of visitors to Milford Sound. Policy 61.2.10 of the Regional Coastal Plan requires monitoring of surface water activities and their effects. Monitoring travel blogs and other travel information publications, such as 'Lonely Planet' may assist in the implementation of this policy. At present the general impression of Milford Sound as a destination appears to be favourable. Most entries rate the scenery values and naturalness of Milford Sound and the associated scenic route very highly. These entries support the impressions given by operator surveys such as those by Fairbairn (2003), and Orchiston (2004) that the majority of tourists still come for the outstanding scenery values of Fiordland and more concisely that of Milford Sound or Doubtful Sound as an accessible point from which to view it.

Most negative comments are in regard to the sand-flies associated with the littoral environment. At this stage only a few blogs monitored have drawn attention to overcrowding issues. Most of these cite the perception that Doubtful Sound is a better option than that of Milford Sound, due to being quieter and not having the same concentration of large tourist vessels.

Many travel blogs are written by those visitors that would be described by the Regional Coastal Plan 16.1 as ‘backcountry comfort seekers’, ‘overnighters’ and ‘day visitors’. Often visitors who take kayak tours are motivated by a desire to see dolphins in close personal proximity. It appears that these travel blogs inspire other visitors to seek similar experiences and therefore will be potentially viewed as a marketing tool.

It should be noted however that motivations of the authors of travel blogs may tend to be weighted toward more favourable comments as a method of demonstrating that the authors have a enviable lifestyle that takes them to exotic locations. In other words, a method by which they can show-off or give the impression of having a privileged lifestyle. Therefore, travel blogs may provide a useful tool for monitoring present perceptions of tourist destinations but should be used in conjunction with other survey methods. Analysis of travel blog entries by utilising qualitative methods and software may also prove useful.

There are many websites that contain travel blogs. Using a search engine, (Google Blog Search) to search the most popular websites allows the searches to be refined using key words e.g. “Milford Sound” and “overcrowding” so as to ascertain popular perceptions regarding specific themes. The most visited websites include;

<a href="http://www.travelblog.org">http://www.travelblog.org</a>	accessed 23-01-02 through to 15-02-06
<a href="http://blogs.bootsnall.com">http://blogs.bootsnall.com</a>	accessed 23-01-02 through to 15-02-06
<a href="http://www.travelpod.com">http://www.travelpod.com</a>	accessed 23-01-02 through to 15-02-06
<a href="http://www.travellerspoint.com">http://www.travellerspoint.com</a>	accessed 23-01-02 through to 15-02-06
<a href="http://www.travelpost.com">http://www.travelpost.com</a>	accessed 23-01-02 through to 15-02-06
<a href="http://realtravel.com">http://realtravel.com</a>	accessed 23-01-02 through to 15-02-06

Each of these websites contains hundreds of entries concerning tourism in New Zealand with references to Milford Sound and Doubtful Sound as popular destinations. Each of the larger and most visited websites shown above are not totally dedicated to travel blogs, but are also used as a resource by travellers who wish to arrange their travel plans. The websites are therefore linked to accommodation and other travel providers and are utilised by advertisers.

### **4.3 Maori perspective**

The perspective of Oraka Aparima and Kai Tahu must be included in any management of Milford Sound so as to give effect to the principles regarding the Treaty of Waitangi, and as a statutory obligation under the Resource Management Act 1991 (RMA). Landscape values of Milford Sound and the FCMA will be important for the local runaka and associated iwi. Meaningful consultation should be conducted with representative members of both Oraka Aparima Runaka and Kai Tahu to identify any such values. As no consultation has been conducted with either of these organisations it is considered to be outside the scope of this report to speak for the perspective of the iwi concerned.

Sir Tipene O'Regan is Upoko Rununga o Awarua and has a longstanding involvement with the area (Milford Dart media release, 20-12-2005). It has been noted however, that Sir Tipene O'Regan is a director on the board of the companies that are proposing both the gondola project (Ngai Tahu Holdings) and the recently announced tunnel project (Milford Dart Ltd.) to form a faster link between Queenstown and Milford Sound. As Maori tend to work as a collective, consultation regarding any development and management of Milford Sound is required.

## 5.0 Commercial Tourist Cruise Vessels

### 5.1 International Cruise Ships

Large international cruise ships visit Milford Sound on a regular basis. These cruise ships in conjunction with local tourist boat cruises therefore constitute another form of commercial boating activity in Milford Sound. The potential for deleterious effects to the ecology and regarding the perception of the wilderness and landscape values attached to the visitor experience of Milford Sound exists.

A comprehensive report concerning the potential environmental effects associated with international cruise ships has been prepared by the Parliamentary Commissioner for the Environment (PCE, 2003). This report addresses many of the deleterious environmental impacts that may occur due to visitation by international cruise vessels. Fiordland National Park including Milford Sound is recognised as an area of high potential risk for possible negative ecological impacts from international cruise ships.

The PCE (2003) report contains an image of smoke discharging from stacks of an international cruise vessel trapped under an inversion layer in Milford Sound (Fig 2.1, pg.12, sourced from ES Compliance Monitoring Report, 2002). The existence of a deed of agreement between the cruise industry and Environment Southland is reported by PCE (2003). It would be redundant therefore to duplicate the information already compiled by these reports.

Negative perceptions of landscape and natural character of wilderness may be affected by similar events in Milford Sound in conjunction with other commercial sea-surface activity or aircraft traffic. Many of these aspects have also been identified in the Glacier Bay National Park, Final Report (2005) consideration of increasing numbers of cruise ships.

Some of the more deleterious impacts identified include;

**Visual impact:** The visual impact of large international cruise boats that enter Milford Sound has not been assessed in literature.

**Invasive Biological Species:** Potential for biological invasion by exotic aquatic species. In Milford Sound freshwater species such as *didymo* may also pose a threat due to the freshwater layer within the fiord.

**Smoke from exhaust funnels:** Key Informant interviews with an Adventure Tourist Operator in Riddell (2003) mentions that some tourists found the exhaust fumes and smoke from the large international cruise ships was unsightly when trapped within low lying cloud or fog within Milford Sound. Currently there is no restriction on emissions to air by international cruise boats such as those that visit Milford Sound.

**Ballast and Effluent:** Where effluent is discharged from large international cruise boats is unknown at this time.

**Fuel spills:** It is expected that fuel spills are dealt with in the same manner as for any other fuel spill in Milford Sound. Environment Southland has the capacity to deal with a small diesel spill from a fishing vessel but for anything larger, the MSA is responsible (PCE, 2003).

**Noise:** The noise generated by engines or fog horns of large international cruise boats has not been noted in any literature.

Parliamentary Commissioner for the Environment. 2003. *Just cruising? Environmental effects of cruise ships*. Wellington: Parliamentary Commissioner for the Environment.

## 5.2 Possible Inputs from tourist boats to water:

**Fuel/oil spills:** Tier 1 Oil Spill response Plan for Milford Sound.

**Cleaning Agents :** Are boats cleaned at moorings? Are chemical agents used on decks or glass windows? Are defouling agents used to keep hulls of the boats free of biological accumulation i.e. barnacles. If so what impacts are these chemicals having on marine biota?

**Biological pests** attached to hulls of vessels that have operated outside of Milford Sound. Also may spread *Undaria pinnatifida*. Is the spread of *Lagarosiphon* or *Didymosphenia geminata* a possibility due to the fresh water layer in the fiords?

**Litter from Boats:** Litter from boats is often wind-borne i.e. foam or paper cups, hats/caps, wrappers, tissues/handkerchiefs, plastic wet-weather clothing. All of these have been collected by smaller vessels used by diving operators in the fiord, with up to 45 baseball caps retrieved each season (*pers. comm.* Tawaki Diving).

Stochastic littering events will increase with an increase in sea-surface activity or an increase with the number of visitors on the vessels presently operating in the fiord. Although littering may be unintentional, wrappers, pieces of clothing and other personal effects will inevitably be dropped or entrained by the wind and be subsequently deposited in the fiord waters during cruises. Even rubbish bins with lids placed on board vessels or in car parks will occasionally have items blown out of them by the wind whilst visitors are trying to deposit rubbish into them during windy days. Litter of this description will inevitably float or be deposited on the sea-bed of the fiord.

**Human waste:** Effluent from tour boats in Doubtful Sound is currently discharged into open water outside fiord, or inside the fiord by some operators 'when the conditions are rough' (Fairbairn, 2003). The potential for transmission of pathogens into the freshwater layer of Milford Sound due to vomiting may also exist.

**Waste food:** from boats has been reported to be dumped near the entrance to Milford Sound (*pers. comm.* Former tour boat service manager).

**Human Effects,** i.e. making noises at seals, dolphins, penguins has been observed by tourists onboard cruise boats. This has been indicated within literature to disturb these species.

## 5.3 Inputs to water from Wharf and Terminal

### Wharf

Maintenance; i.e. Dredging of the swinging basin or channel may increase turbidity in the fiord and affect marine biota such as black coral.

Visual aspects of the terminal and other associated infrastructure have the potential to affect visitor perceptions of the landscape and natural character of Milford Sound. Visitor perceptions will need to be monitored before any further development of these facilities is undertaken

### **Terminal**

Runoff from car parks i.e. Oil leaks into car parks from coaches may affect water quality in the fiord

Effluent from Toilets

Litter from Coaches

## **6.0 Different patterns of usage caused by construction of a Tunnel, Gondola or other method of fast tracking tourists from Queenstown to Milford Sound.**

Recently, different methods of fast tracking tourist visitors from Queenstown to Milford Sound have been proposed. Should any of these proposals be accepted, the increase in visitors to the area will have biophysical, social and economic impacts on Milford Sound. Effects of these proposals will also be felt in the surrounding townships that service visitors enroute to the area at present. Some research has been conducted and published already by Dermer (2002), regarding the gondola proposal. Recently however, legislation has been passed recently that specifically prevents gondolas being constructed in national parks. A tunnel linking Queenstown to the Hollyford Valley was also proposed in December 2005. As the tunnel proposal is relatively recent, only Press releases regarding the site of the tunnel and limited design information from the company proposing its construction are available. Economic impacts on the host community that services Milford Sound and the surrounding environs should be managed with an integrated approach recognising the cross boundary effects of some activities.

Although both of these proposals are land based, an integrated management approach is needed to ascertain different patterns of usage that may occur in Milford Sound. These will include an increase of visitors wishing to take boat cruises on the fiord. At present, boat cruises on the fiord already operate in the morning before the present large influx of tourists at midday, and in the afternoon when most coaches have departed for the return journey to Queenstown. Increases in visitor cruising numbers both in the morning and afternoon will increase pressure on the infrastructure of Milford Sound. Greater visitor numbers throughout the day may influence perceptions of crowding and detract from the wilderness value and landscape character of the destination. Any deleterious change in perceptions of landscape and natural character of Milford Sound may cause visitors to make alternative choices in destination.

Increases in the numbers of visitors on boat cruises may also cause an increase to disturbance of wildlife in Milford Sound including marine mammals, penguins and other biota, as already reported.

Dermer, K. (2002) The Milford Gondola: Should it proceed? *New Zealand Journal of Outdoor Education*. *Ko Tane Mahuta Pupuke*. pp. 24-32

A Press release by the Mayor of Southland, Fran Cardno highlights economic concerns the neighbouring townships that are presently on the coach route from Queenstown to Milford Sound, along with other environmental disadvantages. The statement from Mayor Cardno voices concerns from the many stakeholders in the tourism industry in Southland. Economic disadvantages would be placed on the townships that service visitors on the coach route to Milford Sound at present. These include the townships of Mossburn, Five Rivers, Te Anau and the Knobs Flat public amenities that are maintained by Southland District Council and D.o.C.

“The tunnel would sideline the natural beauty of the Eglinton Valley, where the Department of Conservation had just spent \$800,000 upgrading the Mirror Lakes walkway”, Mrs Cardno said. The trip to Milford Sound should be enjoyed as an environmental journey, and promoted along with scenic journeys through the Catlins and on the Southern Scenic Route. The tunnel would spoil the quiet Hollyford Valley and add pressure on the avalanche-prone Homer Tunnel section of the highway, she said. It would also bring economic damage to supply-stop towns such as Kingston, Athol and Mossburn. The real answer was for people to stay in Te Anau, two hours from Milford Sound. "All (the tunnel) means is that people can get back to Queenstown earlier so they can leave New Zealand earlier. This is not the kind of tourism we want" (Stuff.co.nz., *accessed 02-01-06*).

The themes related to the comment by Mayor Cardno have been encountered in many of the interviews conducted during the course of this study regarding the issues surrounding increases in the commercial boating activity in Milford Sound.

<http://stuff.co.nz/stuff/print/0,1478,3518333a34,00.html>. *accessed 02-01-06*

<http://stuff.co.nz/stuff/0,2106,3520362a34,00.html>. *accessed 02-01-06*

## **7.0 Cumulative Effects Assessment (CEA) for Milford Sound**

One of the recommendations of this report involves commissioning of an effective cumulative effects assessment for Milford Sound. Problems that may inhibit an effective CEA have been the focus of research by Dicey (2004). This study highlights inter-organizational relationships and networks that need to be developed in order to have a more fully integrated CEA in which all stakeholders are involved.

At play in the less positive relationships between government agencies were motivations relating to power (asymmetry) and necessity. The condition of necessity is particularly evident in relation to the legislative context within which the government agencies sit. The legislative context has resulted in the overlapping and adjacent responsibility for resources and geographical areas. These, combined with the different goals of the organisation have resulted in tension and, often recourse to conflict-based mechanisms. This has not resulted in a management of the Fiordland Coastal Marine Area (FCMA) that is supported by all (or possibly any) of the organisations. The relationship between D.o.C. and Environment Southland appears

to be moving toward a common interpretive scheme between the two agencies, in that they wish to establish a joint understanding of the values associated with Fiordland.

Dacey (2004) asserts that collaborative processes are highlighted by the Guardians. Their more inclusive, communicative approach has gained more widespread support for their proposed management strategy. In the same way a CEA would be likely to benefit from a more collaborative approach. Lack of collaboration in the past has meant that organisations have been seeking different outcomes and has led to organisations expending resources on defending their different approaches. It has also meant that information gathering and sharing has not been as effective as it could have been. The current non-collaborative approach will negatively impact a CEA. Differences between goals will lead to disagreements regarding the purpose and focus of a CEA.

Continued lack of input into a CEA in terms of resources, information, decisions on substantive matters such as the methodological approach will result in lack of ownership and support for the results of the study. This will also mean that current inefficiencies (e.g. Hearings for most sea surface consent applications, and Environment Court appeals for some activities) resulting from disputed management strategies will be likely to continue. Hence the non-collaborative relationships that exist between organisations will hinder an effective CEA and should be changed.

To undertake an effective CEA by following Gray's (1989) collaborative process the organisations should;

- **Recognise the benefits** involved from working together.
- **Establish a working group** with representatives from each organisation as well as from stakeholder groups such as aircraft operators, fishermen and trampers.
- Identify and engage an **effective facilitator or leader** for the working group.
- This working group should be as **inclusive** as possible, acknowledging the problems that can arise later in the process if all stakeholders are not involved throughout.
- **Ground rules** should be set by the working group members, **and conflict resolution strategy** should be built in to the process.
- **Differences in resource** levels between organisations and stakeholder groups should be acknowledged and the working group should decide how this is to be addressed (e.g., use of a facilitating organisation approach).
- The group should work together to **set the goals and the focus of the CEA**, including the identification of the resources requiring the most attention, and the scope of the CEA.
- All organisations and stakeholders should participate in **information sharing**.
- The group should decide on the **methodological approaches** to be used in the CEA.

The results of the study by Dacey (2004), show that a CEA of the activities occurring in the FCMA will be a valuable tool to better inform and improve management.

Several changes need to be made in the way organisations currently address cumulative effects. Organisations need to realise the necessity for understanding cumulative effects in Fiordland for the development of effective management given



the many small scale activities occurring in the region. A move away from a presumption in favour of project-based CEAs will be necessary as these are unsuitable as a means of adequately addressing cumulative effects in FCMA. This is due to the resources and expertise demanded by such an assessment and the small scale of most of the activities.

A regional-programmatic CEA of the FCMA will provide valuable knowledge and result in a more justifiable management strategy. Any attempt to conduct a CEA should involve recognition of the potential influence of organisational relationships on the assessment. Badly managed relationships can compromise the robustness of the CEA, whereas in contrast, effective relationships can result in a more comprehensive and widely supported CEA. In the short term a CEA will require a commitment to a collaborative process as well as significant amounts of time, energy and resources. However, if a collaborative approach is adopted these initial burdens will be shared, and the long-term benefits will be enjoyed by all. The long-term benefits include a more justifiable management approach that has a greater widespread community and governmental support. More importantly, a collaborative CEA will result in greater knowledge and understanding of the natural environment and the effect that human activities has upon it.

Dacey, S. (2004) *Prospects for Cumulative Effects Assessment in the Fiordland Coastal Marine Area: An Inter-Organizational Perspective*, unpublished Master of Regional and Resource Planning dissertation, Geography Department, University of Otago, New Zealand.

Gray, B. (1989) *Collaborating: Finding Common Ground for Multi-party Problems*. Jossey-Bass Inc. San Francisco, USA.

## 8.0 Sustainable Tourism in Milford Sound

Sustainable tourism appears to be an elusive goal that virtually all countries involved in the tourist industry are now striving for. Research concerning issues relating to sustainability in tourism, focussed directly on Milford Sound, has been conducted by Riddell (2003). This study was completed in Dec. 2003, and was based on interviews with Key Informants (KI) which included a comprehensive cross-section of stakeholders in tourism in Milford Sound. Some of the key issues found from the study include;

- Unsustainable indicators, as identified by stakeholders in the area, outweigh sustainable indicators at Milford Sound. These indicators reflect the balance of Sustainable Tourism Development perspectives, as outlined by known academics.

**Unsustainable indicators** identified in the study include;

that current management is seen to be overbearing, price dumping of tourism product occurs, some negativity in visitor perceptions or expectations have been noted, a loss of the initial target groups for tourism (i.e. New Zealand tourists), stress on infrastructure, some actual and potential antagonisms from operators, issues regarding the complex functionality of the Milford community, a lack of cross-sectoral co-operation, a perception that there is a growing lack of safety at Milford,

some of the needs of Milford Sounds tourism stakeholders are not being fully addressed resulting in decreasing interest in further investment.

**Sustainable indicators** that were identified include;

The tourism influx i.e. significant numbers of tourists keep returning to point of interest, there is a policy/management plan underway, that locals are taking up some of the leadership roles.

- Safety of the wharf is an issue due to congestion. Boats are often seen to “exchange paint”. Currently, increased movement due to overnight vessels dropping off passengers and mooring elsewhere is perceived as a risk.
- Reliance on carrying capacity should be viewed with caution as it has a potential to stagnate development, but should be used with other tools such as a speed limits on state highway 94 or setting limits to growth of facilities at Milford Sound. This may lead to longer journey times and may increase incentives to stay at Te Anau as a stop-over for accommodation, or perhaps to stay at Milford Sound.

To ensure that decision making is seen to be fair to all interested parties –all of the major players should be included as well as an external mediator.

There is potential for issues to escalate in significance and create a domino effect with other interrelated component tourist operators i.e. accommodation providers, marketing, transport operators all involved in getting tourists to Milford Sound.

State Highway 94 is seen as an autobahn by some overseas tourists and one-lane bridges are also bottle-necks.

Some recommendations generated from the study include;

- A call for co-ordination of management of Milford Sound.
- Recommend a policy specific document for Milford Sound for strategic planning but the KI’s are adamant that this should not be based on the DoC Draft Management Plan- rather KI’s wish to see all aspects of Milford Sound tourism addressed, not just the environmental issues, although these are acknowledged to be most crucial.
- KI’s adamant that DoC alone should not have preferred position in managing Milford Sound, as they are seen to neglect the economic values associated with the destination.
- KI’s wish to see local level management take place with assistance from external advisors so that all needs; social, cultural, environmental and economic can be addressed.
- Using the Guardians of Fiordland Fisheries document as an example of good planning in practise.
- Investment in a tourism monitoring system and in visitor management policies must be made. Monitoring of progress should be carried out to ensure that requirements of policy specific document are met.
- Suggested strategies by stakeholders pertain to how tourists reach Milford Sound i.e.; carrying capacity, peak time changes, departure changes, various access options, policy, and changes to marketing, have been suggested in the past to help alleviate areas of congestion, but do not constitute a solution for

Milford Sound as a whole. However, these do not address the problem with fragmented decision making.

- That carrying capacity is seen as a blunt instrument when applied to perceptions of operators and stakeholders-as well as tourist perceptions.

## 9.0 Recommendations

The following recommendations are made by this author based upon the collation of research material and initial scoping of issues surrounding any possible increases in commercial boating activity in Milford Sound. These recommendations are included as a service, as they do not constitute part of the Envirolink brief from Bronwyn Graham (Environment Southland) in that the brief involves; informal verbal communication, collating research material and a literature survey. They are included to provide options that may be considered.

1. A comprehensive Cumulative Effects Assessment (CEA) should be conducted for Milford Sound. This CEA should be one that recognises synergies between the tourist industry operations and the ecology of Milford Sound. The CEA should involve an integrated approach, as suggested by Dicey (2004). The CEA should also include social and cultural perspectives with regard to tourist operations and the intrinsic values associated with Milford Sound as a wilderness environment. and as the face of 'clean green New Zealand' in the international tourist arena.
2. A moratorium could be placed on Milford Sound with respect to any increases in commercial surface water activities. The period of the moratorium could be used for monitoring of visitor perceptions or conducting research over a period of, for example 2 years, although planning of information gathering may set a more appropriate time. This could also allow time for baseline data of important species within the fiord to be gathered, such as population sizes, and to examine trends in wildlife occupation and/or social behaviour. The information could be used to ascertain the sustainability of current levels of activity and perhaps help set boundaries for levels of activity in the wider context of Fiordland.
3. A database of ecological knowledge that would include baseline data associated with Milford Sound could be constructed. Administration and management of such a database could allow for the addition of information regarding baseline data of the local ecology, as research is completed. Access to the database by the public would allow for transparency and easier identification of avenues for future research.
4. As Milford Sound is an iconic destination of tourism in New Zealand and one of the most recognised faces of New Zealand internationally, a survey of social perceptions of the current level of commercial boating activity in Milford Sound needs to be undertaken. Survey information should be acquired from a variety of sources so as to ensure thoroughness and impartiality. The survey should include scenarios that address the tolerance of the host community (Southland residents, and associated iwi and perhaps even the national interest), stakeholders and visitors to various levels of increase in commercial boating activity. However, the survey information should also address perceptions that would involve a decrease in the level of commercial

sea-surface activity, if it was determined that a decrease in commercial activity was significantly advantageous to the ecology and intrinsic values associated with Milford Sound.

5. Applying a carrying capacity to Milford Sound is problematic as the social carrying capacity of Milford Sound will be surpassed well before the physical carrying capacity is reached. Recent research by Riddell (2003), has shown that unsustainable indicators presently outweigh those of sustainable indicators for tourism in Milford Sound. Although application of a measurable carrying capacity is problematic it is recommended that no further increase in commercial tourist boat activity is developed. The current level of use should be either retained, and coupled with thorough monitoring
6. Monitoring systems could be installed that can be remotely activated, leading to savings in compliance monitoring costs, i.e. webcams could be accessed by Regulating Authorities, for observation of a variety of conditions in each of the fiords. Movement detectors activated by large objects can be monitored by 'event activated software' for relatively modest capital and maintenance outlay. The information gathered may also be used for a variety of observational, scientific and general amenity purposes, e.g. for enquiries about conditions in each of the fiords, or who or how many are present operating in the fiord on a daily basis. This would help with monitoring numbers and frequency along with a variety of other information that may improve visitor security for the higher usage areas of the National Park. Sites would need to be placed in strategic positions that would be protected from, or inaccessible to, tampering or vandalism.
7. Infrastructure at Milford Sound (berthage at Fresh Water Basin and Deep Water Basin, along with associated infrastructure on land) is currently under stress from the quantity of tourist buses and tourists that arrive at approximately midday to board cruise boats at Fresh Water Basin. If patterns of usage were to change due to the introduction of a tunnel or some other method of fast tracking tourists from Queenstown to Milford Sound, what would the likely impacts be to water quality within Milford Sound? Can the existing toilets and sewage system cope with the increased demand that would accompany increased tourist numbers? An investigation into the sustained peak capacity of the sewage facilities at Milford Sound needs to be considered. Milford Lodge (Backpackers) currently caters for many of the visitors that wish to stay in Milford Sound. The lodge is located directly adjacent to the Cleddau River that flows into Deep Water Basin where the sewage outlet is currently located. The cumulative effects of effluent from the lodge and the sewage outlet need to be investigated. High rates of faecal coliforms were found within 600m of the sewage outfall when monitored on 17th Jan 2001 (ES Compliance report for 2001-2002) where it was noted that these counts were "*probably due to a higher amount of contaminants in the effluent that day*". Future changes in the patterns of usage that may accompany increases in commercial boat activities may result in an increase in coastal water contamination. Capacity of the effluent disposal system may need reconsideration as well as the location from where the control sample is taken.

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