

The Management Of Whale And Dolphin Watching Kaikoura, New Zealand

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Abstract

Commercial whale and dolphin watching began at Kaikoura in 1988 and is now a popular tourist activity. Considerable interest has been expressed by others eager to enter the industry. Aspects of the biology and behaviour of cetaceans, however, makes them vulnerable to disturbance and the need for adequate control of the industry was realised soon after marine mammal watching began to expand. Regulations were introduced, establishing a permit system and a set of operating conditions governing the behaviour of people, boats and aircraft in the vicinity of marine mammals.

The operating conditions are based on the known biology and behaviour of marine mammals, and characteristics of the tourist operations. In particular, they regulate approach speeds and distances, and orientation of approach. The conditions aim to protect cetaceans from the day to day effects of marine mammal watching. They have been recently reviewed following research into the impact of commercial operations. The assessment of long-term cumulative impacts remains a challenge for future research.

Introduction

Whale and dolphin watching is a rapidly expanding tourist industry in New Zealand. Such ventures offer people the opportunity to view marine mammals in the wild. The benefit for conservation is raising public awareness about marine mammals in their natural environment. Tourist operations, however, have the potential to disturb marine mammals, and the need for adequate control over the activities of boats and aircraft is generally accepted.

This paper discusses the management of whale and dolphin watching at Kaikoura, New Zealand, with particular emphasis on the development of regulations controlling the activities of tourist operations.

Background

Whale and dolphin watching in New Zealand began in early 1988 at Kaikoura, a small coastal township on the South Island's east coast (Figure 1). From a tentative beginning involving two people, a single boat, and an uncertain clientele base, the industry quickly expanded and diversified.

There are now two closely affiliated 'whale watch' companies based at Kaikoura, each with two boats. They offer up to four trips per day per boat, depending on demand, time of year and sea conditions. Sperm whales (*Physeter macrocephalus*) are the focus of these whale watch trips, though several other marine mammal species are observed when time and opportunity permits. Dusky dolphins (*Lagenorhynchus obscurus*), Hector's dolphins (*Cephalorhynchus hectori*), as well as New Zealand fur seals (*Arctocephalus forsteri*) are regularly approached by the four whale watch boats. Other species that are seen along the Kaikoura coast include Orca's, Pilot whales, Humpback whales, and occasionally Southern Right, Minke, Sei, and Fin whales, and Southern Right Whale dolphins.

Several other companies have also set up in Kaikoura offering tourists alternatives to 'traditional' whale watching. Swimming with dusky dolphins and seals is now very popular, especially with younger tourists. Three boats regularly offer trips of this nature from November to April when dusky dolphins are abundant (pods in excess of 1,000 individuals are not uncommon) and sea temperatures are the warmest.

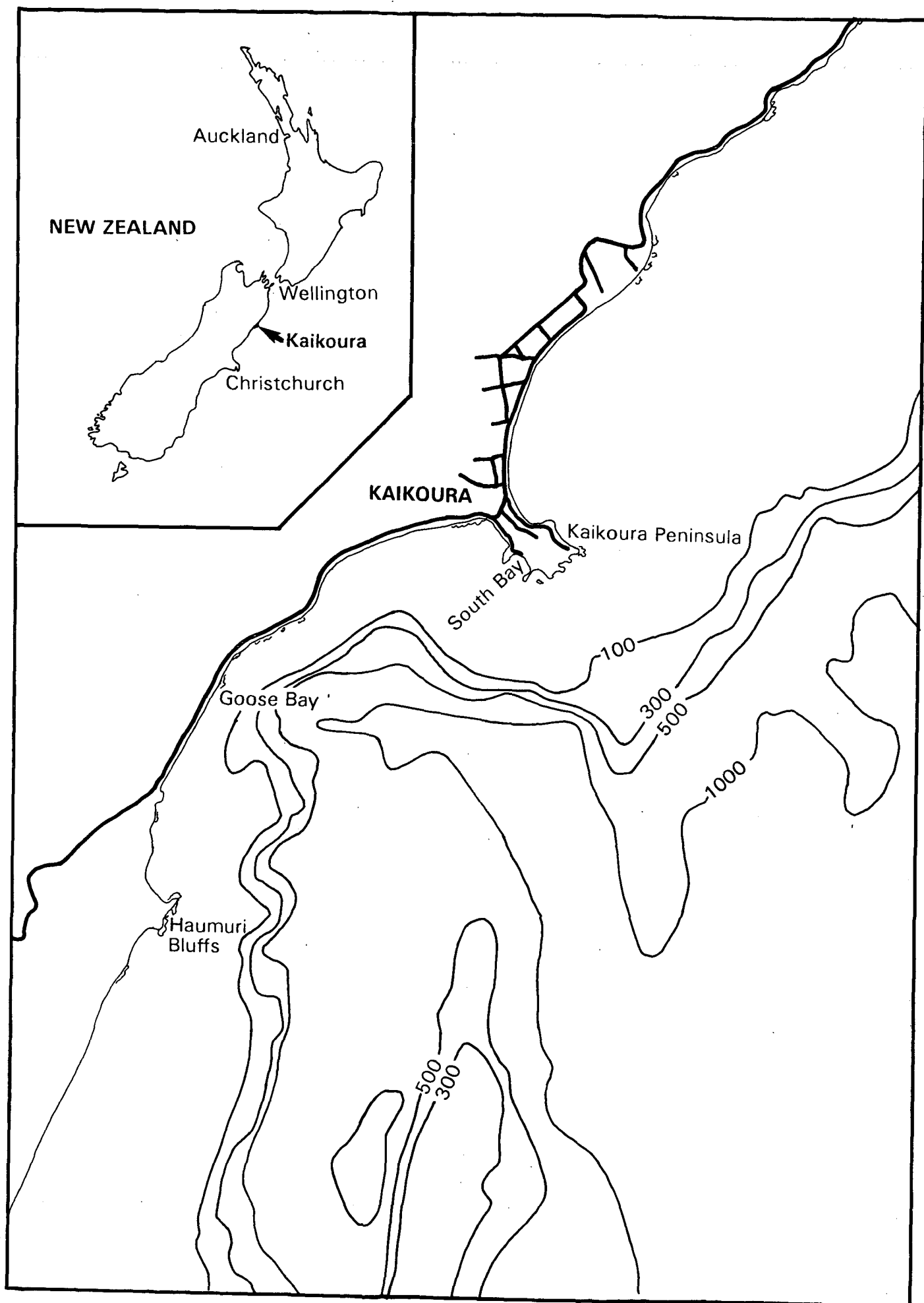


Figure 1 Bathymetric contours in the vicinity of Kaikoura

Four operations offer scenic flights to view whales and dolphins along the Kaikoura Coast. These provide a totally different view of the marine mammals and are an alternative for those with limited time or who are less inclined to brave the open sea. Fixed-wing aircraft or helicopters are available.

Boats operated from Kaikoura are typically fast and highly manoeuvrable, ranging from 6 to 13 metres in length. The exposed and changeable nature of the Kaikoura coast, coupled with the need to trailer the vessels each night, dictates the use of such vessels. Aircraft are similarly small in size.

The success of marine mammal watching at Kaikoura has resulted in considerable interest by others eager to enter the industry. It has also prompted several other operators to set up around New Zealand, ranging from Fiordland in the south to the Bay of Islands in the north. These operators concentrate principally on dolphins. Seals are also watched, although to a lesser extent, and whales are targeted when the opportunity arises. Regular sightings of Bryde's whales (*Balaenoptera edeni*) in the Bay of Islands recently may mark the beginning of a new centre for whale watching in New Zealand. Interestingly, this is the species that supports a rapidly growing whale watching industry in Japan. Kaikoura remains the 'marine mammal watching capital' of New Zealand, despite these other initiatives around New Zealand. Kaikoura will probably retain this title, given its geographic location on a major tourist route, the variety of species found along this coast and the high probability of successful encounters.

There are two principal reasons for the abundance and variety of marine mammals observed along the Kaikoura coast. The convergence of offshore currents in the vicinity of Kaikoura maintains a relatively constant upwelling of nutrient rich waters, supporting a rich and abundant coastal ecosystem. It is not surprising, therefore, that Kaikoura has long been a significant fishing port. It is this same productivity that makes the Kaikoura coast such an attractive place for marine mammals.

The bathymetry of the Kaikoura coast provides further insight into why so many marine mammals are observed in this area. Around New Zealand the continental shelf is typically found well offshore. Immediately south of Kaikoura Peninsula, however, the Hikurangi Trench moves close into shore and depths of 800 to 1,000 metres are found within one kilometre of the rocky coast (Figure 1). Whales and dolphins which feed along the edge of the continental shelf are, therefore, readily accessible to the marine mammal watching fleet.

The Role Of The Department Of Conservation

All marine mammals around New Zealand are fully protected under the Marine Mammals Protection Act 1978. The Department of Conservation administers this Act and is the Government agency responsible for marine mammal welfare in New Zealand.

When marine mammal watching began in New Zealand, it was realised that regular and repeated approaches to whales and dolphins could have a detrimental impact on them. In 1990, regulations were introduced specifically for the control and management of marine mammal watching. These were reviewed in 1992.

The Marine Mammals Protection Act and its regulations are specifically for the protection of marine mammals. The regulations do not address other issues relating to marine mammal watching, notably the promotion of tourism, tourism quality control, people safety and the commercial viability of tourist operations. Consequently, unlike some other resource management agencies that can have conflicting responsibilities, the Department of Conservation is not required to balance commercial development against the protection of marine mammals. Neither is it embroiled in issues that are peripheral to the issue of marine mammal protection.

Regulations

The Marine Mammal Protection Regulations 1992 aim to protect marine mammals from the day to day effects of marine mammal watching. They take cognisance of the known biology and behaviour of marine mammals and have been developed through a lengthy process of consultation with commercial operators and specialists in the fields of marine mammal biology and acoustic science. The Department of Conservation has also commissioned research to investigate the impact of tourist operations and this has been used to test the effectiveness of the regulations. Copies of these regulations are available on request from the author.

The regulations provide two principal mechanisms for managing the level and type of activity around marine mammals. Firstly, they establish a permit system for commercial marine mammal watching. This system allows for commercial effort to be controlled through restrictions on the number of operations and the amount and type of activity undertaken by each commercial operator. Secondly, they list operating conditions for commercial operators, or anyone else, when in the vicinity of marine mammals. These are a minimum set of conditions and are applicable for all encounters with marine mammals. They are divided into those applying generally to all marine mammals and those specific to whales and to dolphins and seals. This division into very broad categories partially recognises the fact that different marine mammal species respond differently to human encounters.

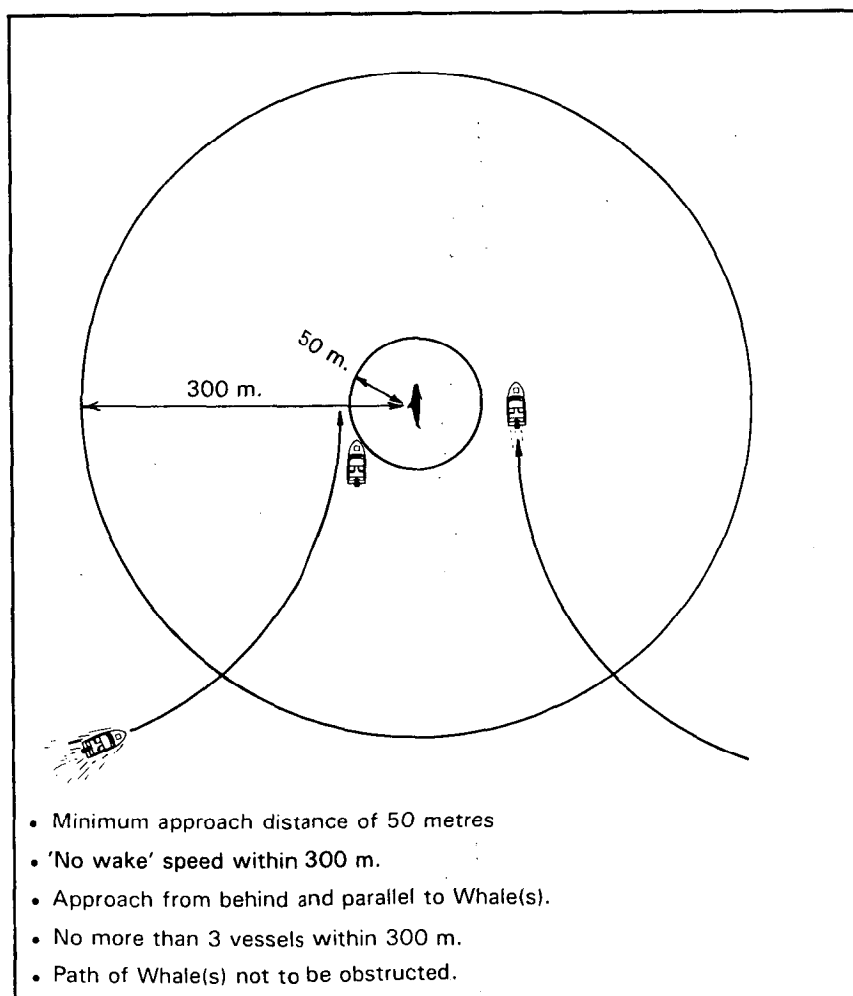


Figure 2 Regulations governing vessel operation around whales.

Most of the operating conditions in the Marine Mammal Protection Regulations pertain to approach speeds and distances, and orientation of approach. As shown in Figure 2, vessels are required to approach a whale from a direction that is parallel to, and slightly to the rear of, the whale. No more than three vessels are allowed within 300 metres of a whale and vessels are required to travel at a 'no-wake' speed inside this distance. A minimum approach distance of 50 metres has also been set and vessels are required to keep out of the path of any whale. Most of these rules were introduced with sperm whales in mind, but they apply equally to all whales in New Zealand waters.

The need for particular care in the vicinity of large whales accompanied by their young has also been recognised in the regulations. Although sperm whale calves are not encountered at Kaikoura, large baleen whales with calves are occasionally seen. In such circumstances, the minimum approach distance is 200 metres.

Similar rules apply to dolphins as to whales, the major difference being that there is no minimum approach distance for dolphins and vessels can depart at greater speeds to allow the dolphins to be out-distanced (Figure 3). Vessels are also restricted from cutting through and dispersing pods of dolphins.

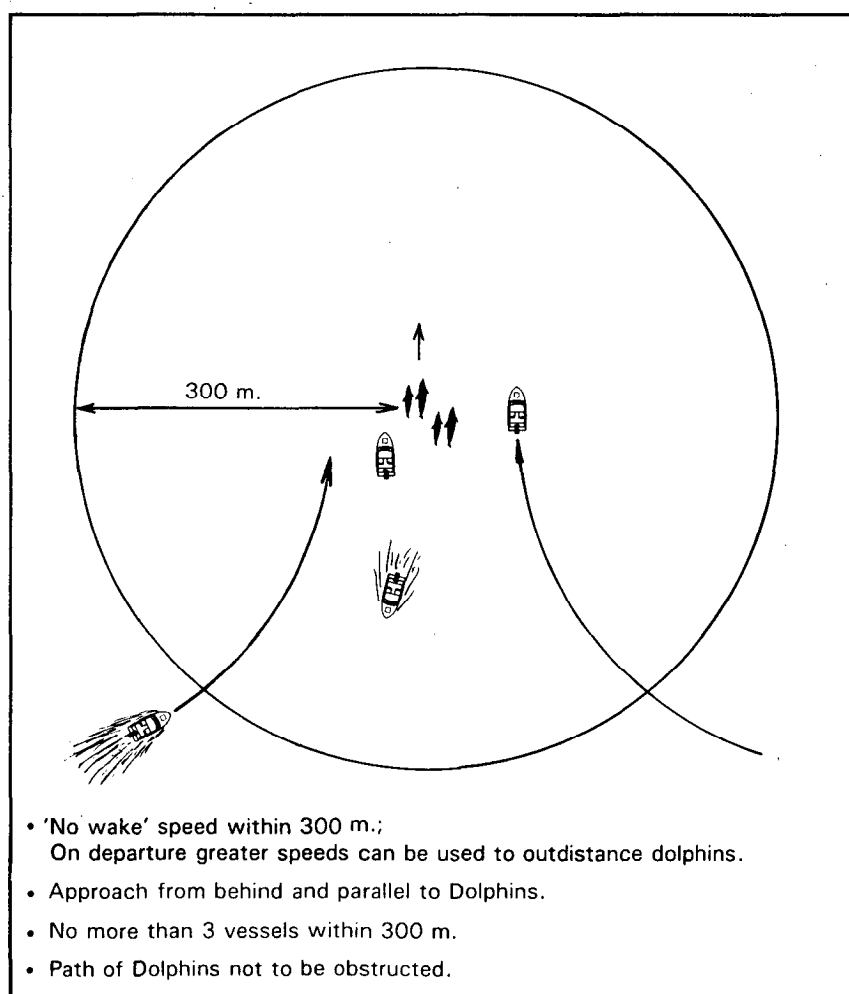


Figure 3 Regulations governing vessel operation around dolphins.

Aircraft are not permitted to overfly marine mammals, but are required to maintain a minimum horizontal approach distance of 150 metres (Figure 4). In reality, aircraft circle at a much wider distance for reasons of air safety and passenger comfort.

Species Specific Regulations

As more is learnt about the responses of different marine mammals to close observation, it may be possible to fine tune the regulations to be more species specific. The current regulations, for example, require contact to be abandoned if a sperm whale abruptly changes its orientation or starts to make short dives of one to five minutes duration without showing its tail flukes. Such behaviour has been identified as a sign of distress for sperm whales. The short dives, in particular, are believed to be an evasive response.

However, while species specific regulations have a number of apparent advantages and are possible in theory, their practicability may be limited. They may make the regulations confusing and unwieldy, and, therefore, less effective. Further, species specific regulations will probably be unworkable for most recreational viewers who cannot positively identify one species from another. General restrictions that apply to readily identifiable groups of marine mammals and that err on the conservative are probably the only practical solution. These protective measures can be reinforced where necessary through specific conditions on commercial permits.

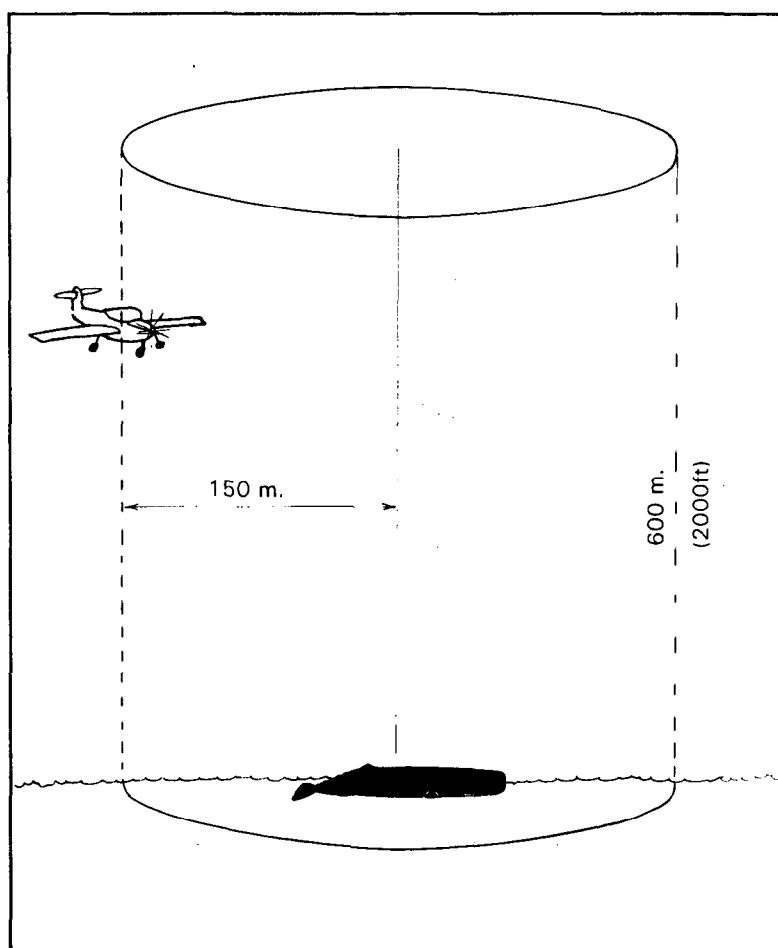


Figure 4 Aircraft approach distances to marine mammals

Sperm Whales

Sperm whales are present all year round at Kaikoura, though their distribution and abundance varies seasonally. There also appears to be two distinct categories of whales; a group of 'resident' individuals along the edge of the continental shelf which seem more

tolerant of whale watching vessels, and a more dispersed group ('non-resident' whales) thought to be passing through the area. The whales are almost exclusively young males, ranging between 12 and 16 metres. Females and larger bulls are only rare visitors to Kaikoura.

The whales are undoubtedly attracted to the Kaikoura coast because of the rich food resources of the area. Squid forms their staple diet, though sharks, ling and other deep water fishes are also taken. Groper, in particular, appears to be an important component of the sperm whale diet at Kaikoura, with whales moving closer to shore over autumn and winter when spawning groper are migrating along the edge of the continental shelf.

Sperm whales spend much of their time below the surface feeding. They dive to depths of 600 to 1,600 metres, though occasionally to depths in excess of 2,000 metres. Dive times vary, with an average of 40 to 45 minutes. Time spent on the surface is also variable, with an average of about 9.5 minutes (Gordon *et al.* 1992; MacGibbon 1991).

This period on the surface is a critical time for sperm whales. The whales show little movement on the surface, being intent on resting and recharging oxygen reserves in preparation for the next dive. Any disruption to this rest period is likely to have a direct bearing on the depth and duration of the next dive, and, therefore, feeding success.

One of the Department's first research priorities was to undertake a comprehensive review of the international literature on whale responses to anthropogenic sounds. This review (Reeves 1992) confirmed that most overseas studies have focused on baleen whales and some small toothed whales and that very little information is available on sperm whales.

Two field investigations were commissioned by the Department of Conservation to assess the impact of marine mammal watching on sperm whales at Kaikoura. In 1990, a post graduate student from Canterbury University spent several months monitoring sperm whale surface behaviour in the presence and absence of whale watch boats (MacGibbon 1991). A further study was undertaken in 1992 by a team of researchers from Oxford University led by Dr Jonathan Gordon (Gordon *et al.* 1992). The latter study investigated surface behaviour as well as underwater acoustic behaviour. Gordon *et al.* (1992) confirmed MacGibbon's earlier findings with respect to the surface response of sperm whales to whale watch boats. Responses are highly variable between individuals. On average, however, whales spend shorter periods on the surface and have shorter ventilation intervals when boats are around. Ventilation rates also appear to be more variable when boats are present.

Gordon *et al.* (1992) also found that the acoustic behaviour of sperm whales immediately after diving was significantly different when boats were present, although, overall, sperm whale vocalisations appeared to be unaffected by the presence or absence of boats.

Some very obvious signs of whales being disturbed by whale watch boats were observed, notably whales diving without 'fluking-up' (Figure 5) (MacGibbon 1991; Gordon *et al.* 1992). As noted earlier, such shallow dives are thought to be evasive manoeuvres and generally occurred when boats failed to follow the regulations.

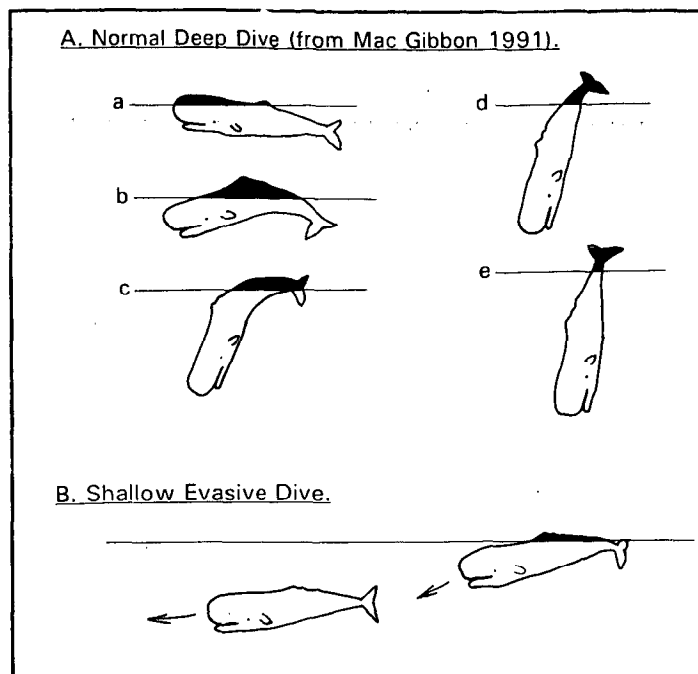


Figure 5 Submergence of sperm whales.

The sperm whale research to date has only been able to answer some of the questions relating to the impact of whale watching vessels at Kaikoura. It has demonstrated that whale watching causes some changes in the surface behaviour of sperm whales. Provided the regulations are adhered to, the impacts seem to be relatively undramatic (Gordon *et al.* 1992), suggesting the current regulations are providing sperm whales with a reasonable degree of protection from whale watching vessels. However, as noted by Gordon *et al.* (1992), it may be premature to assume that these effects have little biological significance particularly in the long term.

The research has not investigated cumulative impacts in the longer-term. It is very difficult to determine the long-term effects of a disturbance on population viability in the best of circumstances. For sperm whales which are long lived, highly dispersed, and spend much of their lives hundreds of metres below the surface of the ocean, the problem is accentuated. Long-term monitoring of whales at Kaikoura may provide some insight, but such a programme would be very costly and potentially unrewarding. In the meantime, the effect of whale watching on the long-term biological fitness of sperm whales remains a matter of judgement.

In view of the uncertainties about the long-term impacts of whale watching, the Department has continued to adopt a very precautionary approach to the issue of increased whale watching effort at Kaikoura. No further permits have been granted since 1989, despite numerous applications, nor have the existing operators been allowed to increase their number of trips. The possibility of issuing one further whale watching permit at Kaikoura is currently being reconsidered by the Department in light of the research completed in 1992.

Dolphins

Research on the impacts of marine mammal watching has focused on sperm whales at Kaikoura. There has been no comparable research on any other cetaceans in New Zealand, though Otago University is soon to commence a study on dusky dolphin watching at Kaikoura.

A workshop was convened in Kaikoura in February 1992 to discuss the impact of dolphin watching and provide direction for management. Professor Bernd Würsig of Texas A & M University attended the workshop and provided valuable input on the biology and

behaviour of dusky dolphins at Kaikoura and elsewhere in the world. The major conclusion reached at the workshop is that dusky dolphin behaviour and social structure makes them vulnerable to disturbance on the surface. While dusky dolphins are seen close to shore during the day, sometimes feeding on mackerel, most feeding is done at night in deeper water off-shore. Activity during the day appears to be more social with resting, playing and sexual behaviour being very important facets of normal daytime behaviour. Dusky dolphins alternate between the various behaviour phases during the day, being most receptive to human interaction during their periods of play. At other times, notably when they are resting or feeding, they are reluctant to interact with boats or people in the water. Nursery pods (groups with mothers and young calves) are a special case as they usually react very negatively to the presence of boats.

The regulations pertaining to dolphins are general restrictions that apply equally to all species and at all times. Although it would be desirable to differentiate between the various behavioural phases of dolphins in the regulations, this has not been possible in the absence of good workable definitions for these phases. Similarly, a workable definition of 'nursery pod' has not been found. A voluntary code of conduct which has been adopted by a commercial operators offers a partial solution to this problem.

The regulations do not distinguish between the different species of dolphin. They were nevertheless written primarily to deal with dusky dolphin watching and are not always adequate for other species. In such circumstances it has been necessary to supplement the regulations by way of conditions on commercial permits. For example, commercial swimming with Hector's dolphins has only been allowed at Banks Peninsula where there are reasonable numbers of dolphins. Elsewhere Hector's dolphins are generally found in small scattered family groups which are territorial and usually wary of people in the water, and commercial swimming has not been permitted. In the Bay of Islands, bottlenose dolphins occur in relatively small pods (average 8-20 individuals) and only one commercial vessel is permitted to approach a pod at a time.

Underwater Noise

The Royal New Zealand Navy has provided technical advice to the Department of Conservation on the issue of underwater noise from tourist operations (Defence Scientific Establishment 1992, Trial Analysis Unit 1992 a, b).

Background noise is an important consideration. The ocean is not a quiet place; waves, rain, storms, biological processes, seismic events and coastal shipping contribute towards a surprisingly high level of ambient noise, averaging around 60 decibels in New Zealand waters and well over 70 decibels in north-eastern Pacific waters. Noise generated from tourist boats and aircraft is not expected to be too dissimilar to the levels that cetaceans normally have to cope with (Figure 6) (Defence Scientific Establishment 1992).

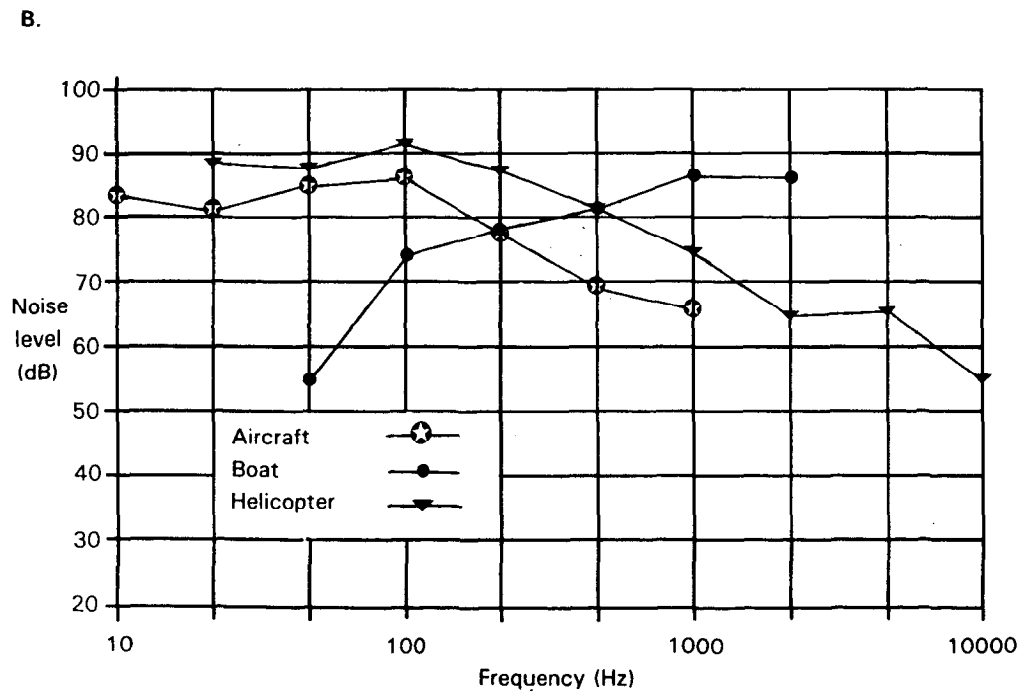
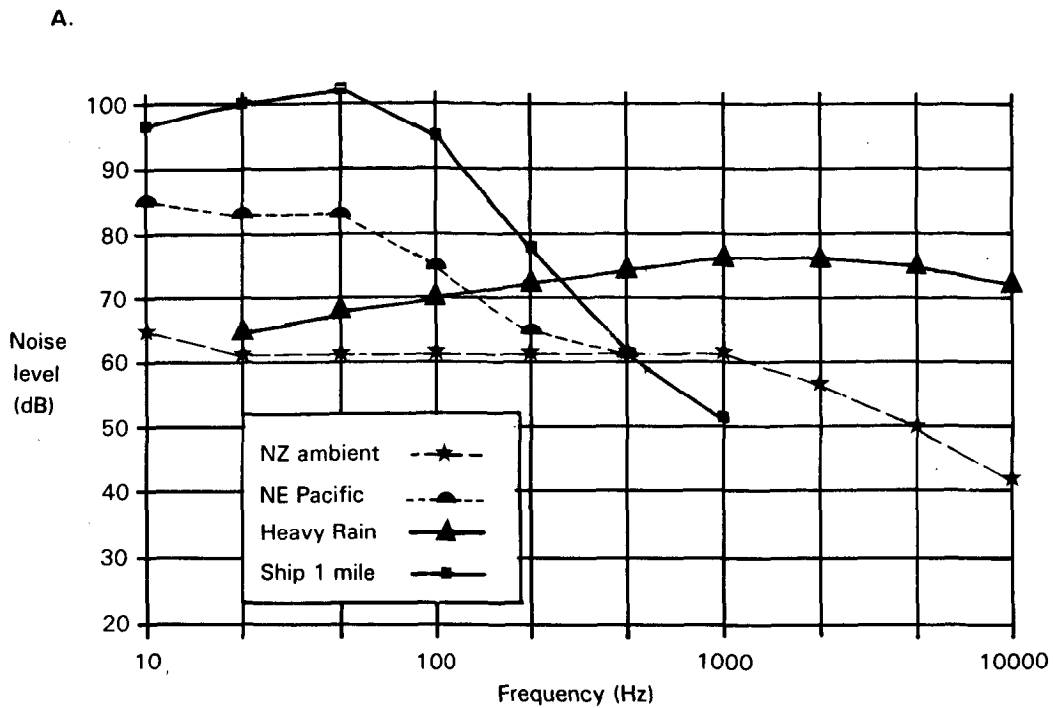


Figure 6 Underwater noise A. Background levels 75 m. below the surface;
 B. From tourist operations (aircraft 75 m. overhead and boats 75 m. away) measured 1 m. below the surface
 (source: Defence Scientific Establishment, 1992).

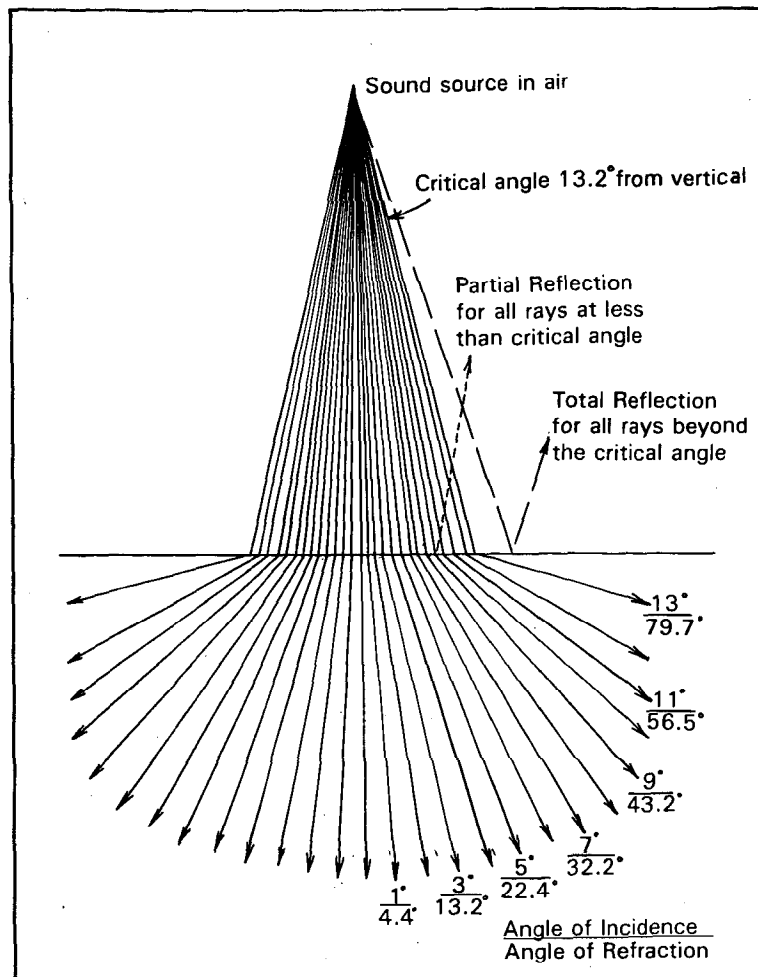


Figure 7 Sound transmission from air to water.
(source Defence Scientific Establishment,
Auckland, New Zealand.)

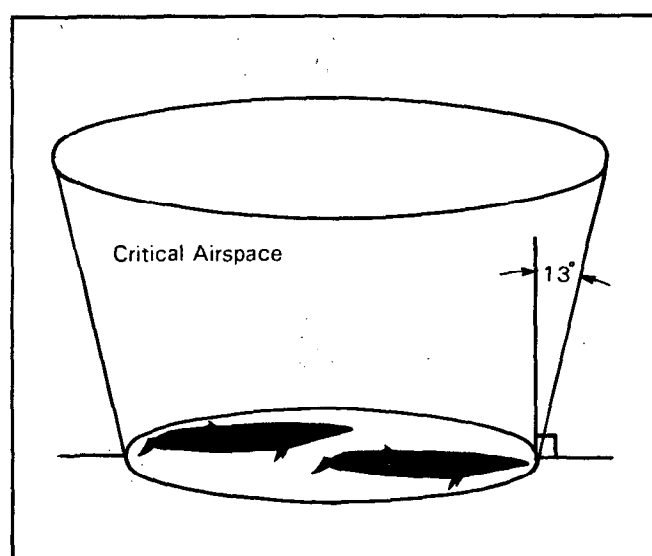


Figure 8
Airspace over marine mammals which aircraft should avoid.
(Adapted from Defence Scientific Establishment, 1992.)

One of the most significant conclusions reached by the Navy's acoustic specialists relates to the transmission of noise from air to water. Noise arrives at the sea's surface radiating out from its source (Figure 7). Inside an angle of approximately 130° sound penetrates the water with some reflection from the surface. Refraction at the air-water interface disperses the sound as shown in Figure 7. Beyond 130° , however, sound is mostly reflected from the sea's surface and sound transmission into water is considerably reduced. Although sea conditions will influence sound transmission into water, the model described above shows that aircraft noise should not generally be a problem for whales and dolphins provided aircraft keep clear of an envelope shaped like an inverted 130° cone above the animals (Figure 8). In other words, aircraft should not fly directly over marine mammals, but rather circle them at a distance. This model, with built-in safety margins, has been used to determine the minimum aircraft approach distances in the regulations.

Figure 7 also demonstrates that marine mammals will probably not be able to hear an aircraft approaching until it is suddenly overhead. Sudden noises can startle cetaceans, reinforcing the need for aircraft not to fly directly over pods of dolphins or whales.

Sudden noise is similarly a concern with respect to the operation of vessels in the vicinity of cetaceans. Noise can travel considerable distances underwater and whales and dolphins will be aware of an approaching boat from a long distance away. Sudden noise changes through boats abruptly altering course or speed are known to startle sperm whales at Kaikoura. Even placing motors in and out of gear can elicit a negative reaction. Accordingly, the regulations prohibit vessels from making sudden or repeated changes in speed or direction.

Compliance

Compliance with the regulations is clearly in the commercial operators' long-term interests; they do not wish to 'kill the goose that lays the golden eggs'.

There is, nevertheless, a need to monitor operators to ensure the regulations are being adhered to. The Department has its own vessel based at Kaikoura which is available for enforcement duties. This is a relatively costly option, however, and its usefulness is probably limited in practical terms. The Department's approach to date has been to randomly place staff incognito on boats and aircraft. This has proven to be a reasonably cheap and effective means of monitoring operators' compliance with the regulations.

Compliance by recreational viewers is a much more difficult problem to address. An upsurge in interest in marine mammals by recreational boaties and other casual visitors to the coast has quickly followed in the wake of the success of commercial marine mammal watching. Marine mammals are found all around New Zealand and are regularly encountered by recreational boaties. Most people, however, have little idea about how they should be behaving around marine mammals. Most boaties would consider high speed manoeuvres through pods of dolphins to be totally acceptable and appropriate.

Uncontrolled recreational viewing probably presents a greater threat to marine mammals in some areas than commercial operations. Although some on-water enforcement will always be possible, in view of the large, diverse and unorganised nature of the target audience, public education is probably the only practicable compliance option for the Department to adopt with respect to recreational viewing of marine mammals.

Conclusion

Management of marine mammal watching at Kaikoura, and the associated development of the Marine Mammals Protection Regulations 1992, have highlighted the value of quality information, either in the form of expert advice or specifically targeted research. The regulations have evolved through a long process of consultation, research and review. As further research is undertaken and more is learnt about the interactions of humans and marine mammals, further fine tuning of the regulations will undoubtedly occur.

The operating conditions outlined in the regulations help protect cetaceans from the short-term, day-to-day effects of marine mammal watching. Many questions remain unanswered, however, about the long-term effects of marine mammal watching at Kaikoura. The assessment of longer-term, cumulative impacts remains a challenge for the future.

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