SENSITIVITY OF MARINE MAMMALS FOUND IN NORTHLAND WATERS TO AQUACULTURE ACTIVITIES

Report to the Department of Conservation, Northland Conservancy

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Contents

ABSTRACT

1268 sighting records of marine mammals around the Northland coast are examined in relation to possible detrimental impacts from proposed aquaculture developments. An attempt is made to identify any critical habitats for marine mammals and assess whether aquaculture will modify the behaviour of the animals significantly. The Bay of Islands and Whangarei Harbour produced the most localized and detailed sightings, and both areas are judged to be critical habitats. Other parts of the Northland coast have the potential to be critical habitats, but at present such a categorization is not supported by the data. Potential threats to marine mammals from aquaculture are reviewed and suggestions for mitigation are made in some instances. A need for further research is identified, particularly to identify critical marine mammal habitats and to quantify impacts from proposed developments.

Key words: Northland, marine mammals, oyster farms, mussel farms, finfish farms, threats.

1.0 INTRODUCTION

1.1 *Northland Marine Mammals*. Thirtyfive species of marine mammals are known from Northland waters (within the 12 n ml limit). This total includes 33 species of cetacean (whale or dolphin) and two species of seal (Appendix 1). The fauna is diverse and large. Some marine mammal species are resident or semi-resident and breed along the Northland coast, and others are transients, either migrating past the coast to distant locations, or moving inshore during certain seasons from normal offshore deep-water, or more tropical habitats. Most species feed on the continental shelf or in inlets and bays. The cetacean species most often encountered in inshore waters around Northland are Bryde's whales, bottlenose dolphins, common dolphins, and killer whales. Less common, but occasionally encountered, are pilot whales, false killer whales, and some of the large baleen whales. New Zealand fur seals are present in small numbers in Northland in a few coastal and offshore island locations, but apart from Kaipara Harbour and Matapia Island, 90 Mile Beach, no major haulout area or breeding colony has been established. The second species of seal reported in Northland waters is the Leopard seal, a rare straggler from cooler southern waters.

1.2 *Rationale for Report.* Man-made structures placed in the marine habitat can have a detrimental effect on species which depend on that habitat. Marine mammals, being air-breathing pelagic animals, are susceptible to interference from such structures (Paton *et al.,* 2003*)*. Negative interactions include fatal and non-fatal entanglement, habitat loss, and altered ecological parameters. In 2004, the Northland Regional Council (NRC) short-listed 19 areas, mainly around Northland's east coast, as potential Aquaculture Management Areas (Northland AMAs 2004; Maps 5-20). The Department of Conservation, which has a legislative mandate to protect marine mammals within the EEZ, has requested an evaluation of the sensitivity of marine mammals to the aquaculture sites and activities proposed by the NRC.

1126 sighting and stranding records (26,948 individuals) of marine mammals in the Northland region were examined in this evaluation. An attempt was made to identify critical marine mammal habitats based on recorded observations of essential biological parameters (e.g. feeding and nurturing of young) (Gregr and Trites, 2001), and to assess whether or not such areas and any animals living in them could be affected by proposed aquaculture developments.

2.0 MATERIALS AND METHODS

2.1 Datasets

1,126 records of 22 marine mammal species sighted around Northland were obtained from a number of sources (Appendix 2). Identifications were verified as well as possible by referring to the observer's experience in viewing marine mammals at sea or stranded.

Records with accurate location data and associated behavioural information were included in a Geographic Information System (GIS), produced by the Northland Conservancy expressly for this project. The GIS identified the location of sightings of different species, the date of occurrence, the behaviour of the animals, their numbers, whether calves or neonates were present, and the direction of movement. The resulting maps (Maps 1-4) and associated data enabled analysis of occurrences and behaviour of marine mammals to indicate areas which may be regarded as "critical habitat". Critical habitat is here defined as an area of coastal waters where marine mammals habitually come to feed, breed and nurse young, and socialize. Animals frequenting these areas were considered to be potentially most at risk from negative anthropogenic impacts.

Another layer in the GIS contained less accurate sighting locations, and were not used in the analysis, but were sufficient to confirm the general occurrence of species and their activities within the 12 n ml limit. Stranding data was also examined but not used, owing to the uncertainty of origin of many stranded animals.

An assessment was then made using a number of potential threat criteria explained below, of whether aquaculture activities might impact detrimentally on the critical habitats identified, and/or the species living therein.

Apart from marine mammal sighting records obtained from a few formal surveys (Appendix II), the data were often inconsistent in terms of information on a range of important biological parameters, and in some cases even locations were suspect due to the lack of GPS coordinates recorded at the time of sighting. Areas where dolphin and whale watching tourism operates, and where there is large amount of recreational boat traffic (e.g. Bay of Islands, Whangarei Harbour) produced many records, some of which may have been duplicates. Therefore, only one sighting of a species in a pod of a certain size in a particular area on a particular date was used in the analysis. The study examined each AMA proposal site and the species of marine mammals recorded from or near that site. Where marine mammals were regularly recorded as feeding or with young, the area was considered as a potential critical habitat.

2.2 Potential Threat Criteria

The potential negative effects of marine farming on marine mammals can be summarised as follows (Lloyd, 2003):

Entanglement in:	*farm structures* *spat catching structures* *litter from farms*
Ingestion of:	*litter from farms*
Changed prey abundance due to:	*phytoplankton depletion* *changes in benthos* *changes in macro-species* *harvest of natural spat fall*
Changed foraging success due to:	*farm structures*
Exclusion from habitat by:	*farm structures* *reduced foraging success* *reduced prey availability* *noise disturbance from boats*

There are only a few documented cases of interactions between cetaceans and aquaculture (Kemper *et al.*, 2003; Markowitz *et al.*, 2004; Watson-Capps & Mann, 2005). Except for entanglement in loose lines or collisions with gear, the other interactions are likely to be more subtle in nature and harder to quantify. There is considerable speculation about the impact on animals' behaviour of possible interactions, but without actual data proving they are significantly adverse, it is not possible to be absolutely sure how they will impact on marine mammals long term, if at all. An important aspect often overlooked in reviews of potential aquaculture effects, is the differences in design of various marine farms, and how marine mammals might interact differently with them. Knowledge of the likely frequency of occurrence of marine mammals in an area, their natural behaviour there, and of the particular farm structure, can, however, enable a practical assessment of risk of any particular farm development to marine mammals.

Of the 19 areas identified by the NRC for future aquaculture development, 10 are intertidal oyster farm proposals, 7 are longline mussel farms, and 2 are finfish farms (Maps 17-32). The potential threats listed above are considered here separately for intertidal, longline and finfish farms. Those threats deemed assessable on the basis of known interactions or existing data, are examined case by case in the Sensitivity Assessments (3.0) section in relation to information on habitats demonstrated by data in the GIS. Notes on mitigation of some threats are also included.

2.2.1 Intertidal Proposals

2.2.1.1 *Entanglement:* The principal and obvious risk of man-made structures in the marine environment is that of entanglement, and is known from observation in the case of large baleen whales, such as Bryde's whales and humpbacks which have become entangled or trapped in mussel spat lines or other loose ropes, and finfish cages. Large whales are not considered to be at risk with the intertidal proposals because the shallow Northland harbours are outside their normal habitat, and oyster farm structures would not enable entrapment by such a large animal.

Although dolphins are susceptible to entanglement in fishing nets, particularly set nets, there are no records of dolphins being caught in shellfish aquaculture gear, although it has been suggested that if the dolphins were attracted to food fishes that were in turn feeding on exposed shellfish, there would be potential for entanglement in loose ropes. Modern oyster farms should not have loose ropes on the boats servicing the oyster farm as they could present a problem if lost overboard. All ropes should be fastened to the vessel at one end, and a strict management practice of accounting for all ropes on work boat and barges should be maintained. With the BST system, wires holding oyster baskets are all under tension and should not therefore present dolphins or seals entering the farm with serious entanglement possibilities. Also, providing they are maintained correctly, baskets should not have exposed shellfish which could be an attractant to fish, and consequently, marine mammals. A report by the South Australian Government on environmental monitoring of extensive intertidal shellfish farms in that state found no dolphin or seal entanglement problems. Entanglement in intertidal oyster farm structures is thus considered a low risk for marine mammals, and that issue was not included in the sensitivity analysis.

2.2.1.2 *Ingestion of litter*. Enforcement of strict gear management and confined litter disposal on and around oyster farms is essential to mitigate against ingestion of litter by whales, dolphins, or seals. This farm management issue could not be assessed in the analysis.

2.2.1.3 *Changed prey abundance.* There is no evidence that changes to benthos or phytoplankton concentrations around oyster farms have any effect, negative or positive, on the prey of whales and dolphins or seals; consequently, this issue was not considered in the analysis.

2.2.1.4 *Changing foraging success.* There is no direct evidence of decreased use of a foraging area around oyster farms. However, if the area of the farm was a critical

habitat for foraging dolphins, there is potential for disruption from farm structures or changed ecology. Therefore, this aspect was considered in the analysis.

2.2.1.5 *Exclusion from habitat, due to farm structures.* Although there are reports of dolphins feeding, mating and playing within intertidal farms in South Australia, a study of the long term ranging patterns of bottlenose dolphins before and during pearl oyster farming operations in Western Australia (Primary Industries and Resources 2002)[6], showed that the dolphins decreased their use of the farm area after the farm was in place. As the same (or closely related) species of dolphin is commonly seen in harbours along the east coast of Northland, the potential for interaction with oyster farms was considered possible, and therefore the analysis focused on looking for critical inshore habitats for bottlenose dolphins, and any overlap with proposed oyster farms.

2.2.1.6 *Exclusion from habitat due to noise disturbance from boats.* Residential dolphins, (i.e. those with a small home range) such as Hector's dolphins, have not been driven from their home range in places where boat traffic is frequent and which also targets the dolphins for dolphin-watching tourist activity (e.g., Banks Peninsula). Although there would be some initial noise disturbance from construction activities around oyster farms, in the form of propeller movement, gearbox shifting, and winch operations, it is not the kind of noise which would produce acoustic and shock waves damaging to dolphins or whales, and any disturbance would be short-lived. Sporadic farm maintenance and harvesting throughout the year would also involve boat noise, but at a level and frequency that is unlikely to make marine mammals avoid the area permanently. It was considered, therefore, that sporadic boat noise around the proposed oyster farms would not be a serious threat to marine mammals, and it was not considered in the analysis.

2.2.2 Longline Mussel Farm Proposals

2.2.2.1 *Entanglement:* In the southern hemisphere, there is a single reported example of a large whale being fatally entangled in a mussel farm line: a Bryde's whale became tail-wrapped in a mussel spat line at Great Barrier Island in 1996 (Fig.1). As the proposed longline mussel farms in Northland are all in exposed coastal positions, there is the potential for entanglements by either Bryde's whales or migrating southern right whales and rorquals. The example above was, however, an entanglement in a lightly anchored, narrow diameter mussel spat line, not a mussel dropper line which is larger diameter, normally festooned with mussels to a width of about 40 cm, and tightly tensioned to a buried anchor block. There would be a greater chance of a whale becoming tangled in a loose spat line rather than a strongly tensioned dropper. There is, therefore, an opportunity for the development of a mitigation method by ensuring spat lines are not loose, but remain under tension, and perhaps have weak links so that in the event of an entanglement, the line would break in to several sections and not restrain the animal. It should also be mandatory for all longline mussel farms to have in place a contingency plan for the release of entangled cetaceans.

Because of their smaller body mass, and the tensioning of mussel lines, there is less chance of a dolphin or seal becoming entangled in longline farm structures. However, any loose lines around the farms would be a risk, and the same management regime

for ropes, as outlined above for intertidal farms, should apply. The potential for entanglement in mussel longline farms was assessed in the sensitivity analysis.

Fig.1. Bryde's whale drowned following entanglement on mussel spat line, Grt Barrier Id, 1996.

2.2.2.2 *Ingestion of litter*. As with the intertidal farm proposals, enforcement of strict gear management and confined litter disposal on and around mussel farms is essential to mitigate against ingestion of litter by whales, dolphins, or seals. This farm management issue could not be assessed in the analysis

2.2.2.3 *Changed prey abundance:* Whereas accumulated mussel shell could smother the seafloor and alter the benthic ecology considerably, and filter-feeding molluscs could reduce phytoplankton in a confined area, there is no evidence that such changes to benthos or phytoplankton concentrations, and the higher food chain, around mussel farms have any effect, negative or positive, on the prey of whales, dolphins or seals. Therefore this aspect was not considered in the analysis.

2.2.2.4 *Changing foraging success:* There is evidence from the study of dusky dolphins inhabiting areas of intense mussel farming in Marlborough, that where farm structures overlap with foraging areas, the dolphins were reluctant to enter the farm boundaries and did not forage there (Markowitz *et al.*, 2004). The analysis therefore considered this aspect, and critical foraging habitats were searched for.

2.2.2.5 *Exclusion from habitat, due to farm structures:* The reports on interaction between dusky dolphins and mussel farms in Marlborough (Markowitz, *et al.*, 2004) and that of bottlenose dolphins around pearl oyster farms in Western Australia (Watson-Capps & Mann, 2005), indicate that this could be a problem for cetaceans where the area used for the farm is part of a critical habitat. Therefore this aspect was considered in the analysis.

2.2.2.6 *Exclusion from habitat by noise disturbance from boats:* Although there would be some noise disturbance from construction activities around mussel farms, in the form of boat activity and machinery operation, and sporadic maintenance noise, it was considered, that, like the intertidal farms, and given normal boat traffic in the areas concerned, boat noise around the proposed longline mussel farms would not be a serious threat to marine mammals, and it was not therefore considered in the analysis.

2.2.3 Finfish Site Proposals

One finfish site (#2001) is on the open east coast just west of Flat Island, west of the Cavalli Islands, and the other (#3106) is in the middle reach of the Hokianga harbour (Map). It is anticipated that these farms will grow kingfish (*Seriola lalandi*) and snapper (*Chrysophrys auratus*).

2.2.3.1 *Entanglement*: Most of the entanglements associated with finfish farms involve seals, especially where salmon and tuna are farmed. The interactions involve attempts by the seals at direct predation of the farmed fish stock, and this has resulted in not only loss of stock, but also entanglement of the seals. It is regarded as a serious commercial problem where finfish farms are located close to seal haulouts in Australia. Fur seals are known to attack fish farms in New Zealand (Kemper, *et al.*, 2003), but there have been no reports of any marine mammal entanglements here. Nevertheless, with a growing NZ fur seal population, and its recent extension into Northland waters, there is potential for interaction with fish farms.

In Australia, entanglements in fish farms have been reported for common dolphins, bottlenose dolphins and large whales (Kemper, *et al.*, 2003). The main cause of entanglements for both seals and small cetaceans in Australia has been anti-predator nets, installed to prevent seals from attacking the farmed fish. These nets are large mesh (6-15 cm) and most entanglements have occurred in the larger meshed nets when they are loose and billowing, and not secured at the base. The animals become trapped between the anti-predator net and the main net. A humpback whale is known to have broken into a tuna feedlot cage in South Australia, but it was successfully released, and what was thought to be a southern right whale collided with a salmon cage in Tasmania and escaped (Pemberton, *et al.*, 1991).

There are several methods of mitigating against entanglement in fish farms by marine mammals: maintaining adequate tension on nets, enclosing anti-predator nets at the bottom, eliminating food wastage to discourage other prey species, and dolphins and seals from foraging near the farm, and reducing anti-predator net mesh size. Also, removal of unused holding pens or non-functioning nets from the farm eliminates part of the risk of entanglement.

As there is potential for seals and dolphins to become entangled in anti-predator nets, and for whales to collide with, or become trapped by, finfish farms, this aspect was considered in the analysis.

2.2.3.2 *Ingestion of litter:* As in the other farming methods, correct farm maintenance and eliminating loose ropes, packing, etc., should mitigate against litter ingestion.

2.2.3.3 *Changed prey:* The two proposed finfish farms are unlikely to effect the nature of marine mammals' prey significantly**.** Apart from excluding marine mammals from the farm itself, increased biodeposition from faecal and pseudo-faecal matter from captive fish may cause organic enrichment which may alter the species composition in the neighbourhood of the farm. On the other hand, over-feeding of finfish in captivity may encourage growth of marine mammal prey species adjacent to the farm, resulting in dolphins and seals spending more time in the locality**.** As more research is required to examine and understand these potential effects, and if they would be at all significant for marine mammals, the matter was not considered in the analysis.

2.2.3.4 *Changed foraging:* Fish farms located in critical marine mammal habitats have the potential to alter foraging behaviour. There could be some displacement of marine mammals that regularly use the same area for feeding. This aspect was examined in the analysis.

2.2.3.5 *Exclusion by structure:* Unlike shellfish farms, finfish enclosures exclude most pelagic animals. Therefore, it was important to examine the two finfish proposals to ascertain if they coincided with any critical marine mammal foraging or breeding habitat.

2.2.3.6 *Exclusion by noise:* The same conclusions were drawn for finfish farms as for longline and intertidal farms. Boat noise around farms should not be a significant factor in displacement of marine mammals.

3.0 SENSITIVITY ASSESSMENTS

3.1 Intertidal Farm Proposals

3.1.1 Parengarenga Harbour, #1014, 25 ha

There are few records of marine mammals from Parengarenga Harbour, possibly because of its isolation and lack of boat traffic. The record shows two sightings of Orca: one pod just inside the entrance and another outside in Great Exhibition Bay. There is no associated information on behaviour, but it is well known that, on their circumnavigation of Northland, Orca enter harbours in search of food (principally stingrays) (Visser, 2000). It can be assumed, therefore, that Parengarenga Harbour is visited from time to time by Orca, and that they most likely feed there. What distance into the harbour they may forage is not known, but there is no indication that the south arm of the harbour between Tiawhakangari Point and Kaipohue Island is a critical feeding habitat. While the Parengarenga Harbour is "data deficient" in terms of marine mammal sightings, it is a vary large shallow inlet with narrow channels, and, apart from the deeper entrance area east of Te Hapua, it may not be an ideal foraging area for aquatic mammals. In that case, an intertidal oyster farm in this area should not pose a significant threat in terms of reducing foraging success or excluding marine mammals from their habitat.

3.1.2 Houhora Harbour #1102, 15 ha

There are 5 records of Orca inside Houhora Harbour, but no other marine mammals have been reported there. The Orca pods varied in size from 5 to 10 individuals and on two occasions were observed feeding in the channel adjacent to the motor camp, and near Lamb Road. The proposed intertidal oyster farm on the eastern side of the harbour north of Green point is well away from the channel in shallow water (at high tide) and is further upstream from the areas where Orca have been previously seen. It is unlikely, therefore, to be a critical part of the whales' feeding habitat.

3.1.3 Mangonui Harbour #1601, 35 ha

The only marine mammals recorded from Mangonui Harbour are Orca, in the entrance channel near Godlfinch Point in 1996. Given the seaside location of Mangonui village and the amount of commercial and recreational boat traffic on the harbour, that scarcity of sightings indicates that it is unlikely the area is a critical or even semi-regular habitat for Orca or any other species of marine mammal. The proposed oyster farm on the sand flats adjacent to Hihi Road should not impact adversely on any marine mammals which may come in from Doubtless Bay from time to time .

3.1.4 Bay of Islands, Te Puna Inlet #2106, 25 ha

Four species of cetaceans are regularly observed in the Bay of Islands (Orca, bottlenose dolphins, common dolphins, and Bryde's whales), especially in summer months. Other species, such as blue whales, humpbacks and pilot whales, are reported occasionally. The sighting effort is considerably greater in this area than other parts of Northland due to whale and dolphin watching tourism activity and a large amount of recreational boat traffic. This has resulted in some hundreds of sightings in the record, which show the Bay of Islands to be widely occupied by some species, especially bottlenose dolphins, in all seasons. Yearly data over a period of 10 years also show that dolphins and larger whales are present every year in the Bay with young, and that it is a regular feeding area. It therefore meets the criteria for a "critical habitat" for at least bottlenose dolphins and probably the other common species there as well.

There is, therefore, a danger that large aquaculture developments in the Bay of Islands could result in displacement of animals from regularly used habitat, or alter their foraging pattern. Although the data show only three cetacean records for Te Puna Inlet (2 Orca pods and 1 Bottlenose pod), residents on Dudley Point overlooking the inlet who were interviewed by the writer, state that bottlenose dolphins are regularly seen moving up the western side of the inlet towards Dead Whale Reef, and down the eastern side on the way out (Dr W. Booth, *pers. comm.* October, 2005). Such a distribution is consistent with that for bottlenose dolphins in other inlets of the Bay of Islands, as observed by Constantine (1995), and as shown by the data. Of the Te Puna Orca records, 2 were of pods feeding, and one other was feeding with calves in attendance.

The proposed 25 ha oyster farm in the upper reaches of the Te Puna Inlet would be an addition to an already existing farm of 20 ha, and would effectively cover 45 ha of the inshore habitat. This may be significant if bottlenose dolphins in particular, use the area frequently, as can be inferred from the data. A survey should be conducted over 12 months to ascertain the frequency of bottlenose dolphin or Orca visits to that part of the inlet, and any interaction with the existing farm, prior to any further development.

3.1.5 Hokianga Harbour #3105, 25 ha

Orca have been reported 11 times in the Hokianga, from near the entrance, inland to the Mangunu reach. No calves or juveniles have been reported, but 3 pods were observed feeding in the area west of Kouto. One well-known bottlenose dolphin (*Opo*) was present near Opononi in 1955-56, but there are no other records of marine mammals for the Hokianga. It is, therefore, not possible to say it is a critical habitat given the state of knowledge of that harbour.

The proposed 25 ha oyster farm south of Te Karaka Point would represent a small loss of habitat to pelagic animals, but one that, because of its shallow water and intertidal situation, should not have a significantly adverse impact on any marine mammal using the Hokianga Harbour opportunistically.

3.1.6 Kaipara Harbour # 3517 4, ha; # 3519 84, ha; #3521, 10 ha; #3526 6.7 ha

Orca and bottlenose dolphins are recorded from the Pahi River, including a pod of 17 Orca adults with 3 calves. The cetaceans would have accessed the Pahi River via the Arapoa River which is the site of the 3 of the proposed intertidal oyster farms in that part of the Kaipara. Knowledge of Orca distributions is such that the species is known to regularly visit harbours in search of food on both side of Northland (Visser, 2000), but the same cannot yet be said about bottlenose dolphins, although it is known that on the east coast they range considerable distances north and south. The only other records of bottlenose from the Kaipara are one sighting of a pod in the southern arm (J. Dollimore, *pers, comm.* July 2005), and several strandings near Te Kopuru and in the Topuni River (NZWSBD). It is possible that bottlenose dolphins are much more common in the Kaipara harbour than the data show. But if they are only sporadic visitors to the Kaipara, aquaculture developments may not impact on them seriously. However, in the absence of good long term information, the Kaipara should be surveyed regularly, and current farm operators should be required to keep a log of all marine mammal sightings and interactions within and near their farm structures, so that a fuller picture can be built up.

3.1.7 Whangarei Harbour #3202, 2.5 ha

This proposed development is an extension to an existing farm in Parua Bay. Whangarei Harbour is frequently visited by Orcas (55 records), which have been reported both feeding and with calves there. There are 3 records within Parua Bay itself, in mid-bay. While Orcas are not permanent residents of Whangarei Harbour, their regular occurrence there, and use of the harbour for feeding, indicates that it is an important and possibly critical habitat for this species, and any aquaculture

developments should take this into account. The existing oyster farm is situated intertidally in the shallow eastern section of Parua Bay, and surveillance of that area should be undertaken on a regular basis to determine if Orca forage their or nearby regularly.

3.2 Longline Mussel Farm Proposals

3.2.1 North of Stanely Pt #1205, 11 ha; Motukahakaha Bay, #35 ha; Frear Bay, #1702 40 ha; Stephenson's Island, #1802, 58 ha; West of Flat Island, #2001, 70 ha; Taupiri Bay, 2501, 345 ha.

These six longline proposals are all in open coastal locations, where there are few records of marine mammals, but where certain species can be expected. None of these sites can be identified as a critical foraging area for marine mammals from the available data. However, Orcas, bottlenose dolphins, common dolphins, Bryde's whales, and occasional southern right whales and humpbacks can be expected in the areas at some stage. All of these species have been recorded on the east coast continental shelf adjacent to the proposed longline developments, and there is no reason not to expect them in inshore waters. For example, a highly endangered southern right whale, although relatively rare on the Northland coast, was sighted at the entrance to Whangaroa Harbour in 2005, not far from Motukahakaha Bay, Frear Bay and Stephenson's Island.

As described in section 2.3.2, the principal threat of longline farm structures to large whales is entanglement. Exclusion from foraging areas is also a concern with large longline farms (i.e #2501, 384 ha) in areas inhabited frequently by the smaller cetaceans. Entanglement mitigation has been discussed in 2.3.2, and these, combined with a contingency plan for release of entangled cetaceans should be mandatory for coastal longline farms.

3.2.2 Bay of Islands –Outer Rangihoua Bay #2303, 36 ha.

This longline proposal is in bottlenose dolphin habitat. While entanglement should not be a problem if correct rope management procedures are adhered to on the farm, the question of habitat exclusion could be if this part of the Bay of Islands is a critical part of the semi-resident bottlenose dolphin population's foraging area. There are many recurring records of bottlenose dolphins, as well as Orcas, common dolphins, and Bryde's whales in the waters adjacent to Rangihoua Bay, and further investigations will be required to determine to what extent these species use the proposed farm area. A 12 month survey of that part of the Bay of Islands would give a preliminary indication of its importance or otherwise.

3.3 Finfish Farm Proposals

3.3.1 Hokianga Harbour #3106, 10 ha; Off Te Ngaire #2002, 10 ha.

The proposed Hokianga Harbour finfish farm is located on the Rawene side of the Kouto Peninsula, and the Te Ngaire Bay site is between there and the Cavalli Islands.

Orcas and bottlenose dolphins are both recorded in or near those areas.

Most of the reported interactions between marine mammals and finfish farms involve seals, and research has focussed on mitigation (see 2.5.1). However, both long and short term effects of fish farms on the behaviour and ecology of marine mammals has not been researched.

The two proposed fin fish farms could create problems for dolphins in particular, if they used large-mesh anti-predator nets to deter fur seals from attacking the stock, as dolphins can entangle in such nets. However, anti-predator nets are unlikely to be used at present in the locations of these two farms because fur seals are rare in those areas. There are two small and remote non-breeding fur seal haulouts in Northland – one on Matapia Island, 90 Mile Beach, and another in the northern part of the Kaipara Harbour. Orcas have been recorded in the vicinity of both finfish farm areas, but these areas do not appear to be critical habitats for these or any other species of marine mammal.

4.0 CONCLUSIONS

Although there have been a large number of sightings of cetaceans in particular in Northland's coastal waters over the past 10 years, the data in reports generally did not provide sufficient detail to enable ready identification of many critical habitats for marine mammals. Only the Bay of Islands and Whangarei Harbour, where the sighting and reporting effort has been high, could be categorically identified as critical habitats. Given the nature of the inshore cetacean fauna, it would be surprising, nevertheless, if further critical habitats were not found, for example, at Cape Karikari. There is, therefore, an urgent need to survey the more isolated and remote parts of the coast, especially those where the marine environment is likely to be modified, for regular marine mammal presence. In the meantime, proposed developments in the Bay of Islands and Whangarei Harbour need to be very carefully examined, by on-site study, in relation to use of the areas by cetaceans.

Identifying and quantifying any long term impacts on marine mammals resulting from aquaculture development also requires much more detailed study. The areas proposed at present for aquaculture are small in the overall picture of the Northland coast, and being able to quantify any potential impacts on marine mammals with accuracy is fraught with uncertainty.

Of the potential impacts listed by Lloyd (2003), large whale entanglement, and disruption of small cetaceans' foraging success by exclusion from a regularly occupied habitat, are likely to be the most serious consequences of aquaculture development on the Northland coast. While the first threat can be mitigated against, the second cannot. Therefore, where there is potential for habitat exclusion in some areas, these areas need to be studied in detail and the threat quantified, so that modifications can be made to either the development or the plan for development.

The GIS did not identify and regular patterns of movement or coastal migration for any of the species of marine mammals. Therefore, any overall disruption to such

movements due to aquaculture development could not be assessed. It is known, however, that southern right whales occasionally move north close the coast in spring, and the possibility of individuals becoming trapped or entangled should be borne in mind by coastal farm operators, and a contingency plan be put in pace to deal with such an eventuality.

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7.0 Appendix 1

Marine Mammal Species known from Northland waters

(References: DoC Cetacean Sightings Database, New Zealand Whale Strandings Database; Baker, A.N. 1999 Whales and Dolphins of New Zealand and Australia. Victoria University Press 133 pp.)

Baleen Whales

Blue whale *Balaenoptera musculus*
Pygmy blue whale *Balaenoptera musculus brevicauda*
Fin whale *Balaenoptera physalis*
Sei whale *Balaenoptera borealis*
Bryde's whales *Balaenoptera edeni*
Minke whale *Balaenoptera bonaerensis*
Dwarf minke whale *Balaenoptera acutorostrata*
Humpback whale *Megaptera novaeangliae*
Southern right whale *Balaena glacialis australis*
Pygmy right whale *Caperea marginata*

Sperm whales
Sperm whale *Physeter macrocephalus*
Dwarf sperm whale *Kogia simus*
Pygmy sperm whale *Kogia breviceps*

Beaked whales
Gray's beaked whale *Mesoplodon grayi*
Strap-toothed whale *Mesoplodon layardii*
Andrew's beaked whale *Mesoplodon bowdoini*
Hector's beaked whale *Mesoplodon hectori*
Dense-beaked whale *Mesoplodon densirostris*
Goose-beaked whale *Ziphius cavirostris*
Bottlenose whale *Hyperoodon planifrons*
Arnoux's beaked whale *Berardius arnouxii*
Shepherd's beaked whale *Tasmacetus shepherdi*

Dolphins
Long-finned pilot whale *Globicephala melas*
Short-finned pilot whale *Globicephala macrorhynchus*
Killer whale *Orcinus orca*
False killer whale *Pseudorca crassidens*
Risso's dolphin *Grampus griseus*
Bottlenose dolphin *Tursiops truncatus*
Common dolphin *Delphinus delphis*
Striped dolphin *Stenella caeruleoalba*
Southern right whale dolphin *Lissodelphis peronii*
Maui's dolphin *Cephalorhynchus hectori maui*
Dusky dolphin *Lagenorhynchus obscurus*

Seals
NZ fur seal *Arctocephalus forsteri*
Leopard seal *Hydrurga leptonyx*

8.0 APPENDIX 2

Northland marine mammal sighting and stranding data sources:

Department of Conservation Cetacean Sightings Database
Department of Conservation NZ Whale Strandings Database
Department of Conservation Research Investigation 3225 – Aerial Survey east coast Northland, 1999-2003, Dr A. N. Baker.
The Orca Trust, records of Killer whales 1992 -2004, Dr I.S. Visser.
Auckland University Bottlenose Dolphin Research, Dr R. Constantine.
Dolphin Discovery Ltd, Paihia, records held by DoC.
Fuller's Ltd, Paihia, records held by DoC.
Ecocruz Tourism operator, Bay of Islands, held by company.

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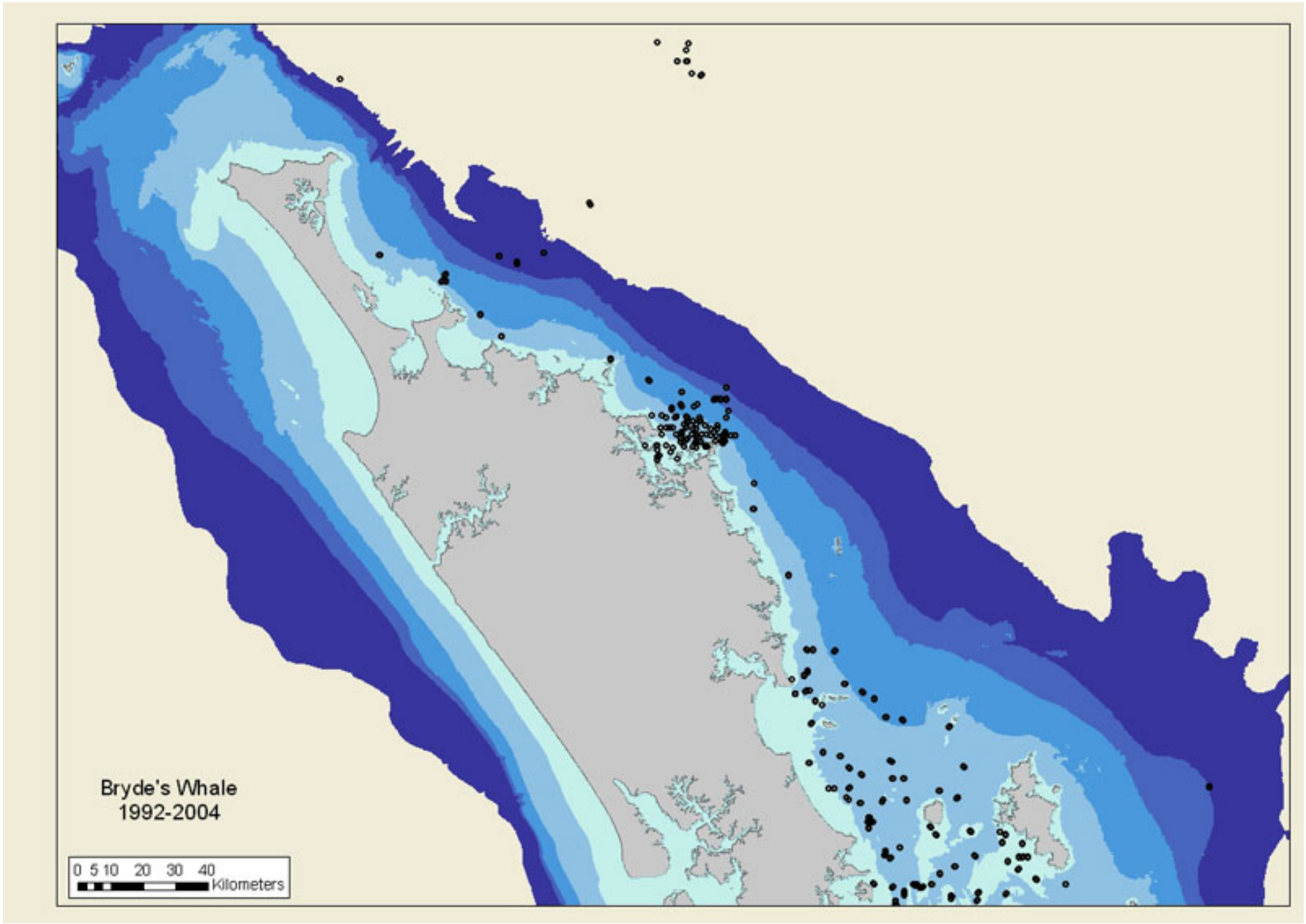
20 October 2005


Bryde's Whale
1992-2004
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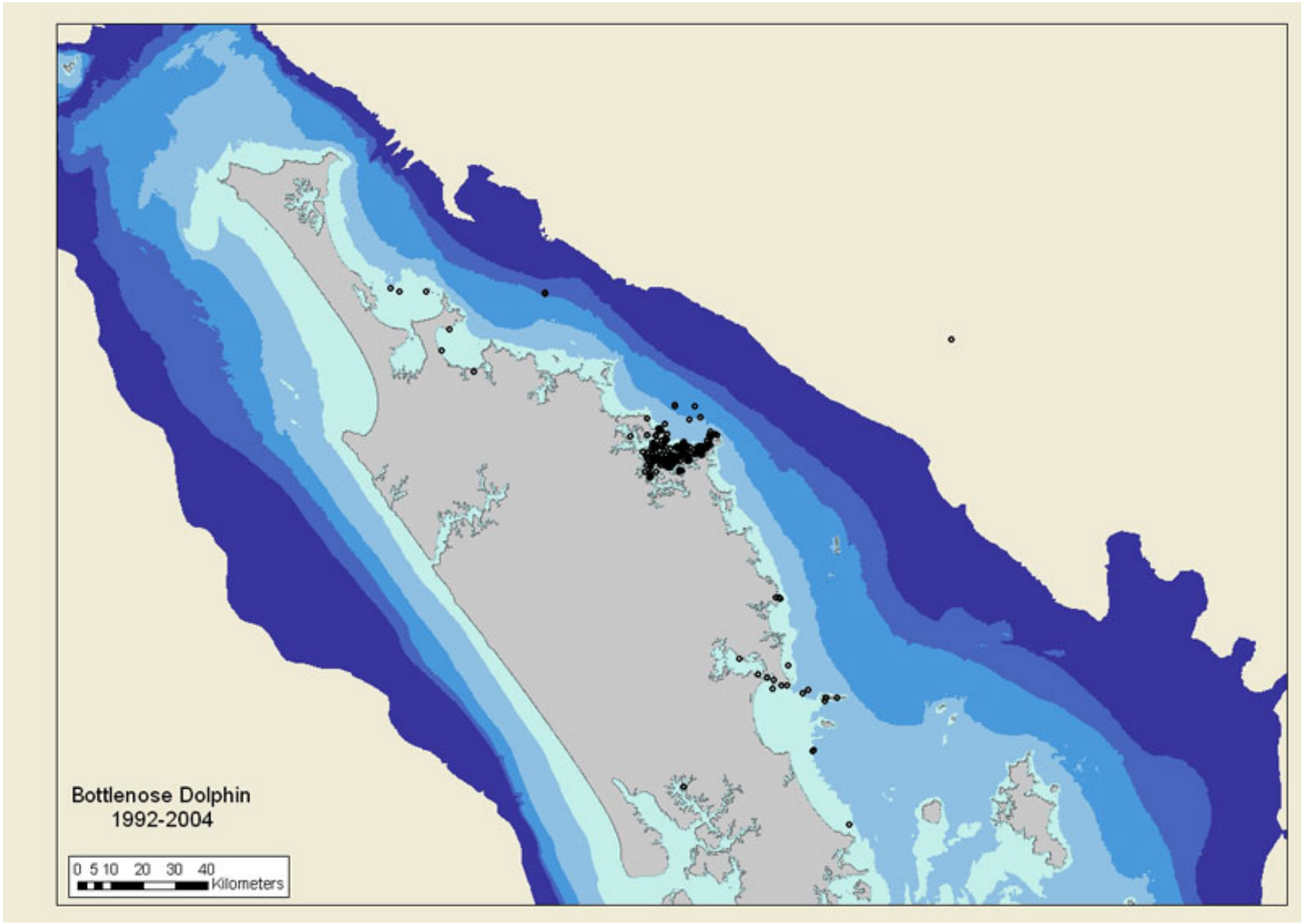
Kilometers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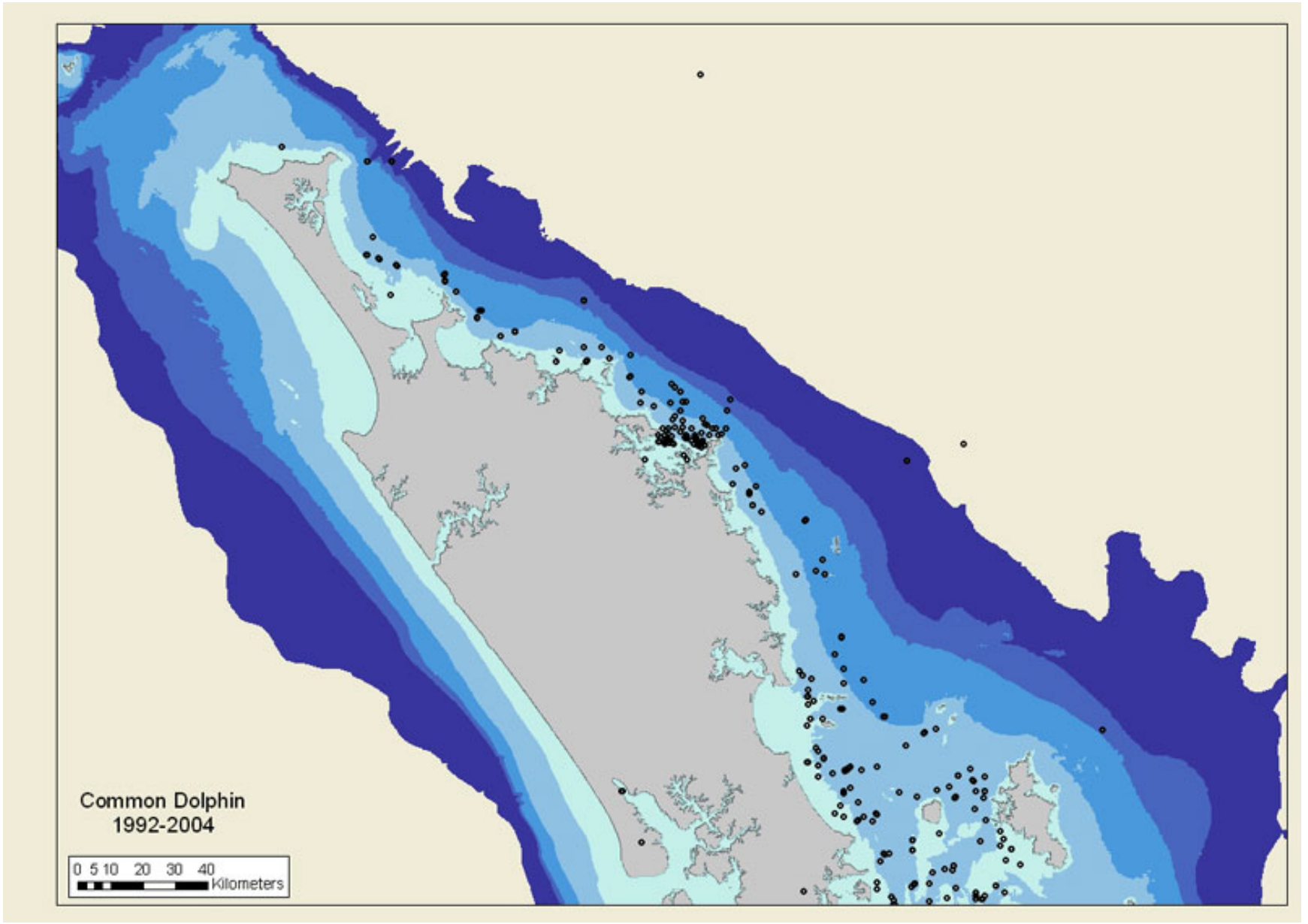
Common Dolphin
1992-2004
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Kilometers