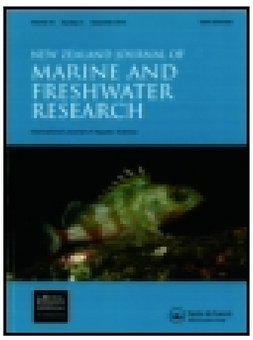

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Conservation status of New Zealand marine mammals (suborders Cetacea and Pinnipedia), 2009

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The conservation status of New Zealand (NZ) marine mammals (suborders Cetacea and Pinnipedia) is reappraised using the 2008 version of the NZ Threat Classification System. The list comprises 56 taxa (named species or subspecies, and as yet unnamed forms or types) in the following categories: Threatened—eight taxa (five Nationally Critical and three Nationally Endangered); Vagrant—six taxa; Migrant—20 taxa; and Data Deficient—13 taxa. A further nine taxa are listed as Not Threatened. Relative to the previous listing, the threat status of two species worsened: the NZ sea lion (*Phocarctos hookeri*) was uplisted to Nationally Critical and the bottlenose dolphin (*Tursiops truncatus*) was uplisted to Nationally Endangered. No species was considered to have an improved status. With the uplisting of the NZ sea lion and the continued listing of the Hector's dolphin (*Cephalorhynchus hectori hectori*) as Endangered and Maui's dolphin (*C. hectori maui*) as Nationally Critical, all three endemic NZ marine mammals are now considered threatened with extinction. We considered future research or management actions that would allow the downlisting of the eight taxa currently listed as Threatened.

Keywords: New Zealand; threatened marine mammals; pinniped; cetacean; conservation status

Introduction

Several threat classification systems exist for categorising the risk of extinction for New Zealand (NZ) species (e.g. IUCN 2001; Molloy et al. 2002). The most recent threat classification assessments of NZ marine mammals were conducted in 2002 and 2005 (Hitchmough 2002; Hitchmough et al. 2007) using the then newly developed NZ Threat Classification System (Molloy et al. 2002). That classification system was reviewed in 2007, following extensive consultation on users' views of the merits and shortcomings of the system as originally outlined by Molloy et al. (2002). This process proposed several new threat categories, and redefined some existing categories (Fig. 1; Townsend et al. 2008). This refined system is a uniquely NZ-based assessment tool, which has been used to assess the conservation status of vascular plants and birds (Miskelly et al. 2008; de Lange et al. 2009). Since many NZ species are naturally very restricted in distribution, the IUCN criteria have sometimes exaggerated their threat status. While this has not been the case for marine mammals, listing using the NZ system allows comparability with other NZ taxa (Molloy et al. 2002). The system is intended to complement, not compete with, the

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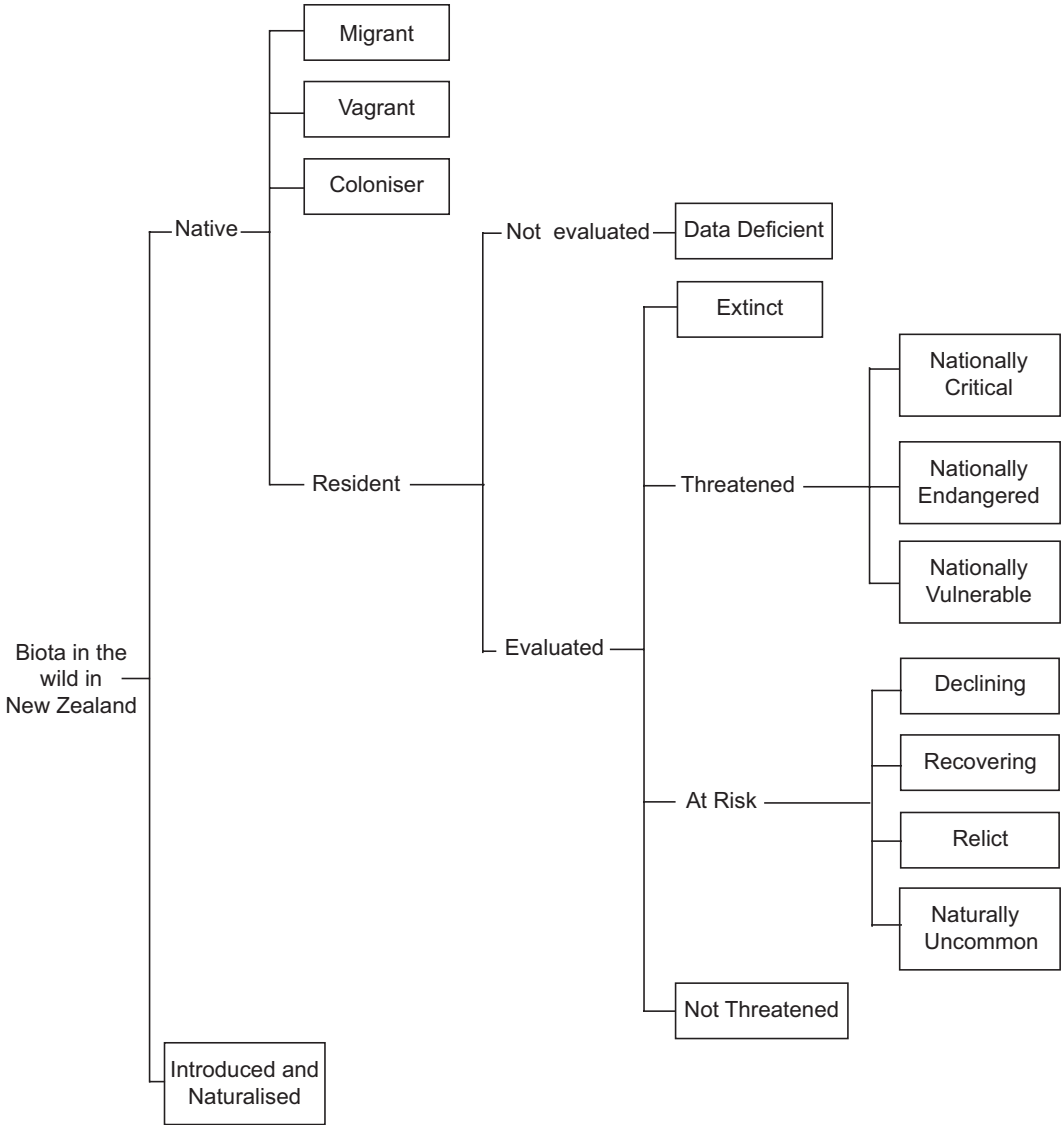

Fig. 1 New Zealand threat classification system (after Townsend et al. 2008). Reproduced with permission of the Department of Conservation.

IUCN Red Lists of threatened species. That is, for native taxa within NZ, the NZ system will provide finer detail of threat status than that provided by the globally applied IUCN Red List system (Townsend et al. 2008).

This system very explicitly does not address global status. The global (IUCN) status for all species is recorded alongside the NZ status. Non-endemic taxa are clearly identified by either the SO (Secure Overseas) or TO (Threatened Overseas) qualifiers. Some globally secure species have very small and therefore vulnerable resident NZ populations. The loss of these would reduce NZ's biodiversity, while having little impact on their global status. Listing them in threatened categories in the NZ system, with the qualifier SO, identifies this set of circumstances very clearly.

As part of the implementation of the revised NZ Threat Classification System by the Department of Conservation (DOC), we undertook a comprehensive re-evaluation of the threat status of NZ marine mammals in May 2009. The authors of this paper are the Expert Panel as defined by Townsend et al. (2008) for marine mammals. This paper reports the results of this assessment. This new list updates and supersedes all previous NZ marine mammal threat classification listings for NZ (Molloy & Davis 1992, 1994; Hitchmough

2002; Hitchmough et al. 2007) and remains valid from the date of publication until the next list is published.

Methods

All marine mammal taxa recorded from the NZ Exclusive Economic Zone (EEZ) since 1800 were considered. This included migrant and vagrant marine mammals that also occur naturally outside the EEZ, where they may or may not be considered threatened. For non-endemic taxa, the listing we provide is based on the status of the NZ population only. The global conservation status for each NZ marine mammal species that does not breed here (or also breeds elsewhere) is also listed, based on threat rankings assigned by the International Union for the Conservation of Nature (http://cms.iucn.org/about/work/programmes/species/red_list/). The taxonomy of NZ marine mammals follows that of the *Encyclopaedia of Marine Mammals*, second edition (Perrin et al. 2009), except where noted.

Data for re-evaluation of the conservation status of NZ marine mammals included those used for the previous listing (Hitchmough et al. 2007), public submissions and expert opinion. Submissions were solicited from the scientists interested in NZ marine mammals via the DOC website (http://www.doc.govt.nz/), and these were collated and reviewed by the authors in May–June 2009.

Taxa were placed in risk categories based on the criteria outlined in Townsend et al. (2008), with input from submissions, expert panel knowledge and referral to recent publications. Where there was doubt, provisional assessments of taxa were referred to relevant specialists for their advice. The threat categories used (Table 1) are among those defined in Townsend et al. (2008) (Fig. 1), namely:

1. *Threatened* (including Nationally Critical [NC], Nationally Endangered [NE], and Nationally Vulnerable [NV])
2. *Not Threatened* [NT]
3. *Data Deficient*
4. *Migrant*
5. *Vagrant*

Summarised criteria for these categories are provided in the footnote to Table 1. Although there are other classification levels (Fig. 1), no NZ marine mammals are listed in these categories. Information used for the NZ listings presented here is held by DOC and is available to those wishing to undertake an independent IUCN threat assessment.

The four main parameters used to assign threat ranking were total population size, population trend, geographical range, and whether the taxon has been directly or indirectly affected by humans (Townsend et al. 2008). Ongoing or predicted population trends were assessed over 10 years or three generations, whichever was longer. For taxa that had not been studied in sufficient demographic detail, we defined one generation to be twice the minimum age of first breeding by females.

Results and discussion

Using museum specimens, genetic samples and reliable sighting records, we found evidence of 56 marine mammal taxa within the NZ EEZ: 41 recognised species of cetaceans, with a further two recognised subspecies, three recently described 'types' of killer whales (*Orcinus* spp.), an unknown or unidentified species of 'bottlenose dolphin' (*Tursiops* sp.) from the Kermadec Islands, and nine species of pinnipeds. New information allowed for the addition of six taxa to the previous cetacean listing: the Fraser's dolphin (*Lagenodelphis hosei*), the ginko-toothed beaked whale (*Mesoplodon ginkgodens*), the unknown or unidentified species of 'bottlenose dolphin' observed around the Kermadec Islands, and the three as yet unnamed species or subspecies of killer whales (Types B, C and D, as well as the Type A included in the previous listing). The 'offshore' bottlenose dolphin was removed from the listing, as we no longer regard it as taxonomically distinct from inshore populations (Tezanos-Pinto et al. 2009). Of the 56 taxa, we ranked eight taxa (14.3%) as Threatened (comprising five Nationally Critical and three Nationally Endangered), 26 taxa as either Vagrant (six) or Migrant (20), and 13 taxa as Data Deficient.

Table 1 Threat rankings for New Zealand marine mammals.

Scientific name	Common name	Criteria[a]	Qualifier[b]	IUCN threat classification	Genetic samples	Museum specimens
Nationally Critical						
Balaenoptera edeni/brydei sp.	Bryde's whale	A(1)	SO	Data Deficient	Y	Y
Cephalorhynchus hectori maui	Maui's dolphin	A(1)	CD	Critically Endangered	Y	Y
Mirounga leonina	Southern elephant seal	A(1)	RR, SO	Least Concern	Y	Y
Orcinus orca Type A	Killer whale	A(1)	DP, SO, St, Sp	Data Deficient	Y	Y
Phocarctos hookeri	New Zealand sea lion	C	RR	Vulnerable	Y	Y
Nationally Endangered						
Cephalorhynchus hectori hectori	Hector's dolphin	C (1/1)	CD	Endangered	Y	Y
Eubalaena australis	Southern right whale	B (1/1)	RR, SO	Least Concern	Y	Y
Tursiops truncatus	Bottlenose dolphin	A (1/1)	DE, SP, SO	Data Deficient	Y	Y
Data deficient						
Caperea marginata	Pygmy right whale		SO	Data Deficient	Y	Y
Hyperoodon planifrons	Southern bottlenose whale		SO	Least Concern	Y	Y
Kogia breviceps	Pygmy sperm whale		SO	Data Deficient	Y	Y
Lagenorhynchus cruciger	Hourglass dolphin		SO	Least Concern	N	Y
Mesoplodon bowdoini	Andrews' beaked whale		SO	Data Deficient	Y	Y
Mesoplodon densirostris	Dense-beaked whale		SO	Data Deficient	Y	Y
Mesoplodon grayi	Gray's beaked whale		SO	Data Deficient	Y	Y
Mesoplodon hectori	Hector's beaked whale		SO	Data Deficient	Y	Y
Mesoplodon layardii	Strap-toothed whale		SO	Data Deficient	Y	Y
Mesoplodon traversii	Spade-toothed whale		SO	Data Deficient	Y	Y
Tasmacetus shepherdi	Shepherd's beaked whale		SO	Data Deficient	Y	Y
Tursiops sp. (Kermadecs)	'Bottlenose dolphin' (Kermadec Islands)		SO	Data Deficient	N	N
Ziphius cavirostris	Cuvier's beaked whale		SO	Least Concern	Y	Y
Not threatened						
Arctocephalus forsteri	New Zealand fur seal		Inc, SO	Least Concern	Y	Y
Balaenoptera acutorostrata	Dwarf minke whale		DP, SO	Data Deficient	Y	Y
Balaenoptera bonaerensis	Antarctic minke whale		DP,SO	Data Deficient	Y	Y
Delphinus delphis	Common dolphin		DP, SO (some stocks TO)	Least Concern	Y	Y
Globicephala melas	Long-finned pilot whale		DP, SO	Data Deficient	Y	Y

Table 1 (*Continued*)

Scientific name	Common name	Criteria[a]	Qualifier[b]	IUCN threat classification	Genetic samples	Museum specimens
Lagenorhynchus obscurus	Dusky dolphin		SO	Data Deficient	Y	Y
Lissodelphis peronii	Southern right whale dolphin		DP, SO	Data Deficient	Y	Y
Physeter macrocephalus	Sperm whale		DP, SO	Vulnerable	Y	Y
Pseudorca crassidens	False killer whale		DP, SO	Data Deficient	Y	Y
Migrant						
Balaenoptera borealis	Sei whale		TO	Endangered	Y	Y
Balaenoptera musculus brevicauda	Pygmy blue whale		TO	Endangered	Y	Y
Balaenoptera musculus intermedia	Southern/Antarctic blue whale		TO	Endangered	Y	Y
Balaenoptera physalus	Fin whale		TO	Endangered	N	Y
Globicephala macrorhynchus	Short-finned pilot whale		SO	Data Deficient	Y	Y
Megaptera novaeangliae	Humpback whale		SO	Endangered	Y	Y
Vagrant						
Arctocephalus gazella	Antarctic fur seal		SO	Least Concern	Y	Y
Arctocephalus tropicalis	Subantarctic fur seal		SO	Least Concern	Y	Y
Berardius arnouxi	Arnoux's beaked whale		SO	Data Deficient	Y	Y
Grampus griseus	Risso's dolphin		SO	Least Concern	Y	Y
Hydrurga leptonyx	Leopard seal		SO	Least Concern	Y	Y
Kogia sima	Dwarf sperm whale		SO	Data Deficient	Y	Y
Lagenodelphis hosei	Fraser's dolphin		SO	Least Concern	Y	N
Leptonychotes weddellii	Weddell seal		SO	Least Concern	N	Y
Lobodon carcinophagus	Crabeater seal		SO	Least Concern	N	Y
Mesoplodon ginkgodens	Ginkgo-toothed whale		SO	Data Deficient	Y	Y
Mesoplodon peruvianus	Lesser/pygmy beaked whale		SO	Data Deficient	Y	Y
Ommatophoca rossi	Ross seal		SO	Least Concern	N	Y
Orcinus orca Type B	Killer whale		DP, SO	Data Deficient	N	N
Orcinus orca Type C	Killer whale		DP, SO	Data Deficient	N	N
Orcinus orca Type D	Killer whale		DP, SO	Data Deficient	N	N
Peponocephala electra	Melon-headed whale		SO	Least Concern	Y	Y
Phocoena dioptrica	Spectacled porpoise		SO	Data Deficient	Y	Y
Stenella attenuata	Pantropical spotted dolphin		SO	Least Concern	Y	Y
Stenella coeruleoalba	Striped dolphin		SO	Least Concern	Y	Y
Steno bredanensis	Rough-toothed dolphin		SO	Least Concern	Y	Y

Table 1 (*Continued*)

Taxa are grouped by threat category, then alphabetically by scientific name. The Criteria column provides a code for population size and trend for each taxon, justifying placement in that threat category (see Townsend et al. 2008 for more detail). For non-endemic taxa identified as 'Threatened Overseas', we provide the IUCN threat ranking (IUCN 2006): EN, Endangered; LC, Least Concern (at species level, where the subspecies is threatened); VU, Vulnerable. Explanations of IUCN codes can be found in IUCN (2001, 2006). Those species assessed as Near Threatened (NT) by IUCN are also identified. Genetic samples are archived at the University of Auckland Cetacean Tissue collection, curated by R. Constantine and C.S. Baker. Museum specimens are held at Museum of New Zealand Te Papa Tongarewa (MONZ), curated by A. van Helden.

[a]*Criteria for New Zealand threat rankings used:*

Only criteria for New Zealand threat rankings which were triggered by marine mammal taxa (other categories and criteria exist but were not triggered by any member of this group) were used in Table 1. The full set of criteria can be found in Townsend et al. (2008) and at http://www.doc.govt.nz/upload/documents/science-and-technical/sap244.pdf.

Nationally Critical: A, <250 mature individuals (natural or unnatural); any trend; C, any population size, $>70\%$ population decline over 10 years or three generations, whichever is longer.

Nationally Endangered: A (1/1), 250–1000 mature individuals (natural or unnatural), 10–50% population decline; B (1/1), 250–1000 mature individuals (unnatural), stable; C (1/1), 1000–5000 mature individuals, 50–70% population decline.

Migrant: Taxa that predictably and cyclically visit New Zealand as part of their normal life cycle (a minimum of 15 individuals known or presumed to visit per year), but do not breed here.

Vagrant: Taxa that are found unexpectedly in New Zealand and whose presence in this region is naturally transitory, or migratory species with fewer than 15 individuals known or presumed to visit per year.

Data deficient: Information is so lacking that an assessment is not possible,

Not threatened: Taxa that are assessed and do not fit any of the other categories.

[b]*Definitions of qualifiers used for marine mammals. A full list of available qualifiers with definitions can be found in Townsend et al. (2008):*

CD, Conservation Dependent; The taxon is likely to move to a higher threat category if current management ceases.

DP, Data Poor; Confidence in the listing is low because poor data is available for assessment.

De, Designated; A taxon that does not fit within the criteria provided, and which the Expert Panel has designated to the most appropriate listing without full application of the criteria.

Inc, Increasing; There is an ongoing or predicted increase of $>10\%$ in the total population, taken over the next 10 years or three generations, whichever is longer.

OL, One Location; Found at one location (geographically or ecologically distinct area) of less than 1000 km^2 (100,000 ha), in which a single event (e.g. a predator irruption) could easily affect all individuals of the taxon, e.g. L'Esperance Rock groundsel (*Senecio lautus* var. *esperensis*) and Open Bay Island leech (*Hirudobdella antipodum*). Taxa with restricted distributions but where it is unlikely that all sub-populations would be threatened by a single event (e.g. because water gaps within an archipelago are larger than known rodent swimming distances) should be qualified as 'Range Restricted' (RR). 'OL' can apply to all 'Threatened' and 'At Risk' taxa, regardless of whether their restricted distribution is natural or human-induced.

RR, Range Restricted; Taxa confined to specific substrates, habitats or geographic areas of less than 1000 (100,000 ha); this is assessed by taking into account the area of occupied habitat of all sub-populations (and summing the areas of habitat if there is more than one sub-population), e.g. Chatham Island forget-me-not (*Myosotidium hortensia*) and Auckland Island snipe (*Coenocorypha aucklandica aucklandica*). This qualifier can apply to all 'Threatened' and 'At Risk' taxa regardless of whether their restricted distribution is natural or human-induced, but is redundant if a taxon is confined to 'One Location' (OL).

SO, Secure Overseas; The taxon is secure in other parts of its natural range outside New Zealand.

Sp, Sparse; Taxa that occur within typically small and widely scattered populations.

St, Stable; The total population is stable ($\pm 10\%$), taken over the last 10 years or three generations, whichever is longer.

TO, Threatened Overseas. The taxon is threatened in those parts of its natural range outside New Zealand.

A further nine taxa were listed as Not Threatened.

Changes in status

The threat status of two species has worsened since the previous listing: the NZ sea lion was uplisted to Nationally Critical and the bottlenose dolphin was uplisted to Nationally Endangered. With the uplisting of the NZ sea lion and the continued listing of the Hector's dolphin (*Cephalorhynchus hectori hectori*) as Endangered and Maui's dolphin (*C. hectori maui*) as Nationally Critical, all three NZ endemic marine mammal taxa are now considered threatened. The change in status of the NZ sea lion was the result of a real decline in abundance, whereas the change for bottlenose dolphin was primarily because of improved knowledge (e.g. estimates of abundance and records of mortality), as well as evidence of a likely decline in some regions. No taxon improved in threat status.

Nationally Critical taxa

Four of the five taxa assessed as Nationally Critical were retained from the 2005 listing: Bryde's whale (*Balaenoptera edeni/brydei*), Maui's dolphin, southern elephant seal (*Mirounga leonina*) and killer whale. These are considered Nationally Critical because of their small population sizes in the NZ EEZ—estimated to be fewer than 250 mature individuals. The fifth taxon, the NZ sea lion, was uplisted from Range Restricted to Nationally Critical because of a recent, but severe, trend of declining abundance. There is particular concern for the endemic Maui's dolphin and NZ sea lion, as the other three species are listed as secure overseas.

Maui's dolphin

Genetic and morphological evidence, as well as geographical isolation, support the proposal to recognise the North Island population of Hector's dolphin as a distinct subspecies, the Maui's dolphin (Baker et al. 2002). Maui's dolphins are now confined to the western coast of the North Island, north of Taranaki and south of Bayly's Beach. The population is estimated to number only 111 individuals (95% CI 48–252) based on recent aerial surveys (Slooten et al. 2006). In 2004, a protected area was created along the northwest coast of the North Island to reduce the threat from entanglement in fishing gear (Ministry of Fisheries, www.fish.govt.nz or www.fish.govt.nz/en-nz/Environmental/Hectors+Dolphins/default.htm). However, the effectiveness of these protection measures is uncertain, as trend information is unavailable and there is ongoing, non-fisheries-related mortality, as evidenced from the recovery of beachcast carcasses (New Zealand Whale and Dolphin Stranding Database, Department of Conservation 2009, http://www.doc.govt.nz/upload/documents/conservation/native-animals/marine-mammals/mauis-dolphin-database.pdf). Overall, the conservation status of Maui's dolphin is considered dire (Dawson et al. 2001), and the subspecies is listed as Critically Endangered by the IUCN and remains as Nationally Critical in this listing. Survival and potential recovery of the Maui's dolphin is considered Conservation Dependent.

New Zealand sea lion

The NZ sea lion has a small population for a sea lion (estimated to be <3000 mature individuals; Chilvers unpublished data) and has shown a 50% decline in pup production at the main breeding area, the Auckland Islands (Enderby, Dundas and Figure of Eight Islands), in the last 11 years (Chilvers et al. 2007; Chilvers 2009). This decline extrapolates to be well over the 70% decline per three generations threshold for the Nationally Critical—criterion C listing. The decline of the NZ sea lion is thought to be aggravated by fishery-related mortality and resource competition (Chilvers 2008), and mortality as a result of three bacterial epizootics, which have occurred since 1998 (Wilkinson et al. 2006; Castinel et al. 2007). Based on the recent rate of decline, we propose that the endemic NZ sea lion be uplisted from the former Range Restricted category to Nationally Critical with a Range Restricted qualifier.

Bryde's whale

Recent analysis of mtDNA control region sequences (Wiseman 2008) indicates that the NZ population of Bryde's whales is consistent with the description of the so-called *B. brydei*/common pelagic form, as characterised by Yoshida & Kato (1999) and Wada et al. (2003). However, following current taxonomy (Perrin et al. 2009), we have retained the species name *B. edeni*. Bryde's whales are present year-round in the inner Hauraki Gulf, with increased sightings in winter months. Bryde's whales are also reported along the eastern coast of Northland and Great Barrier Island (Aotea Island), and the northeast coast of the Bay of Plenty. Up until early 2009, a total of 74 individual whales had been recognised from natural markings of the dorsal fin (Behrens 2009). Records of sighting from 1996 to 2009 were summarised by Wiseman (2008) and Behrens (2009), and are held at the University of Auckland (R. Constantine, curator). Some individuals have been resighted regularly over multiple years, including reproductive females accompanied by young calves. Several capture–recapture models have been used to estimate abundance using individual identification sighting records (Wiseman 2008). The most appropriate closed population model provided an estimate of $n = 159$ (CV = 0.35) for the years 2003–06. In comparison, an open population type estimator provided an abundance estimate of only $n = 46$ (CV = 0.08). These estimates indicate a potentially small subpopulation of regular users of the Gulf, although it is considered unlikely that this subpopulation is totally isolated from a larger (but unknown) population in the region. No information is available on long-range or seasonal movements of individuals using NZ coastal waters. Bryde's whales in the Hauraki Gulf are subject to a high level of mortality, as evidenced by records of beachcast, ship strikes or entanglement. From 1989 to 2008, there were 38 recorded mortalities; 23 died of unknown cause (although data were not collected from most of these carcasses), two died from entanglement in mussel farm spat lines and 13 were judged to have died 'probably or possibly due to vessel strike' when evaluated under criteria used by the International Whaling Commission Scientific Committee (Behrens 2009). Given the small size of the resident or semi-resident population, the Bryde's whale listing was maintained as Nationally Critical, with qualification that the species is considered Secure Overseas.

Southern elephant seals

Southern elephant seals have an estimated total NZ population size of 250–260 individuals (McMahon et al. 2005) and consequently are listed as Nationally Critical. As breeding in NZ is almost completely confined to small areas of the Antipodes and Campbell Islands, the species is also listed as Range Restricted. The abundance estimate is down from an estimate of about 420 in the 1990s, and the Australasian population of southern elephant seals has been shown to be declining rapidly and the worldwide population has been contracting in range. However, the IUCN lists southern elephant seals as a species of Least Concern and there has been no new evidence or information since the last listing. Therefore, the southern elephant seal is also qualified as Secure Overseas.

Killer whales, 'Type A'

The taxonomy of killer whales is currently under revision and is here updated given the best available information (e.g. Pitman & Ensor 2003; Jefferson et al. 2007; LeDuc et al. 2008). At present, four 'forms' or 'types' have been described as provisional taxa, referred to as Types A, B, C and D. Type A is considered the common form worldwide, and may be further subdivided into a relatively nearshore 'resident' form, and a more offshore migratory form. Type A is thought to be the most regularly sighted form around NZ and is estimated to number 117 individuals (95% CI 64–167) based on a catalogue of individual identification photographs (Visser 2000). Limited genetic information is available for a small number of NZ specimens but is not sufficient to clarify this taxonomic position further (Hoelzel et al. 2002). The population of Type A killer whale is listed here as Nationally Critical given

its small population size, and is further qualified to be Sparse and Secure Overseas. The species is also considered Data Poor and, although no quantitative information is available on trends, the population of Type A is considered Stable. Killer whale Types B, C and D are known only from the Southern Hemisphere and are thought to be most common in the Southern Ocean around the Antarctic. Photographs provide evidence of the occasional sighting of two of the Antarctic forms of killer whales (Types B and C) in NZ waters (photographs by I. Visser, as reviewed by R. Pitman, personal communication), and there is a 1955 stranding record from Paraparaumu thought to represent Type D (R. Pitman and A. van Helden, personal communication). These three forms were considered Vagrant in the NZ listing.

Nationally Endangered

Of the three taxa assessed as Nationally Endangered, two were retained from the 2005 listing: Hector's dolphin and southern right whale (*Eubalaena australis*). The bottlenose dolphin was uplisted from Range Restricted to Nationally Endangered based on new evidence of low abundance and concern over potential decline in two populations with known ranges.

Hector's dolphin

Hector's dolphins are distributed discontinuously around the South Island of NZ, with genetically isolated, regional subpopulations along each of the east, west and south coastlines (Hamner 2008; Pichler et al. 1998; Pichler 2002). Aerial-based sighting surveys provide a combined population estimate of 7873 individuals (CV = 16%) for the entire South Island subspecies (Slooten et al. 2004; Slooten 2007a). However, Slooten (2007a) used a population viability analysis to estimate past and future population sizes, incorporating current abundance estimates, life history parameters, and an estimated bycatch rate in commercial gillnets (per dolphin, per km of gillnet, per year). The model predicts (extrapolates backwards in time) that the total population size in 2007 ($n = 7873$) represented only 27% of the population size in 1970, prior to a major expansion of commercial gillnetting. Consequently, based on this predicted rate of decline over the last 30–45 years (three generations), the subspecies meets the NZ criteria for Nationally Endangered and the IUCN criteria for Endangered. We further noted concern about the genetic isolation among the three regional populations (Pichler 2002; Hamner 2008), particularly the South Coast population, which could justify taxonomic recognition (subspecies or Evolutionarily Significant Unit) in future listings. Although we also considered the limitation of the population viability analyses and the uncertainties of the backward extrapolations, as reviewed by Middleton et al. (2007) with response from Slooten (2007b), we followed the required precautionary approach in retaining the Nationally Endangered listing for the subspecies. The decline is locally addressed by a marine mammal sanctuary around Banks Peninsula and the current listing is thus qualified as Conservation Dependent.

Southern right whale

Southern right whales were once abundant throughout the NZ EEZ but are now found primarily along the northeast coast (Port Ross) of the Auckland Islands during winter breeding months (Patenaude et al. 1998). The Auckland Island (subantarctic) population was estimated to number fewer than 1000 mature individuals, based on capture–recapture analysis of naturally marked individuals during the years 1995–1998 (Patenaude 2002). Right whales are observed infrequently around the NZ mainland but are regarded as stragglers/colonists from the remnant subantarctic population. Right whales were also observed regularly (but in low numbers) during winter months around Campbell Island/Motu Ihupuku, but this region has not been surveyed for the last 10 years. No trend in abundance is yet available for the NZ right whale population. Given the small size of the NZ subantarctic population and its history of intense exploitation, the Nationally Endangered listing was retained for the southern right whale. Because of their dependence or preference for breeding and calving in Port

Ross, the Range Restricted qualification was given. The southern right whale was recently downlisted to Least Concern by the IUCN based on a degree of recovery from former whaling, and so is qualified here as Secure Overseas.

Bottlenose dolphin

Bottlenose dolphins are found in three geographically discontinuous coastal subpopulations around NZ: northeast coast of Northland (mostly Coromandel to Doubtless Bay, including Bay of Islands, but occasionally ranging from Tauranga to Manukau); Marlborough Sounds to Westport and occasionally Cloudy Bay; and Fiordland (Doubtful Sound, Milford Sound and Dusky–Breaksea Sounds to the south, and Jackson Bay to the north). Recent genetic analyses have shown that these three populations are differentiated with regards to mtDNA diversity, indicating little or no interchange or maternal gene flow (Tezanos-Pinto et al. 2009). However, it is also likely that these coastal populations have some historical relationship with non-coastal (offshore or pelagic) populations of bottlenose dolphins, which are observed more widely but less frequently around NZ. The abundance of each population has been estimated using capture–recapture analyses based on sighting records of naturally marked individuals or from the total number of individuals in photo-identification catalogues. The northeast coast population was estimated to include 424 (95% CI 417–487) adult dolphins, based on photographs collected largely in the Bay of Islands from 1996 to 1999 (Constantine 2002); the Marlborough Sounds population is considered semi-resident and is estimated to include 211 (95% CI 195–232) individuals, and an unknown number of transients (Merriman 2007; Merriman et al. 2009); and Fiordland is estimated to include a total of 205 dolphins, based on surveys of several of the sounds (Currey et al. 2009). A high rate of calf mortality in Doubtful Sound (Fiordland) has been attributed to the impact of tourism, behavioural changes in response to boats, environmental change as a result of the release of freshwater from hydroelectric generation (tail-race effect) or possible fisheries effects (Currey et al. 2009). More research (currently underway) is needed to understand the mechanisms behind this apparently high calf mortality and the subsequent population decline. In the Bay of Islands (Northland), open-population capture–recapture models indicate a decline in apparent abundance across the period 1996–99 to 2003–05 (Tezanos-Pinto 2009). This decline has been attributed to a change in habitat use, high calf mortality, adult mortality among former 'frequent users' of the Bay or a combination of all three (Tezanos-Pinto 2009). Based on the small region and total abundance, and the evidence of apparent local decline in two populations, we decided that bottlenose dolphins should be uplisted from Range Restricted to Nationally Endangered, with the qualification of Secure Overseas, given their worldwide distribution, and Sparse, given the apparently natural distribution of the three NZ populations. This listing has also been qualified with Designated, because there are good population estimates for the inshore subpopulations (a total census population of about 900–1000, with fewer than 1000 mature individuals to date), but information on mortality and declines, while concerning, is too recent for a long-term trend to be inferred with confidence. The size and trend of the offshore subpopulation is unknown.

Data Deficient

We considered 13 taxa to be Data Deficient. Eight of these taxa are beaked whales, a group that is poorly described worldwide (Dalebout et al. 2004). One of the species thought to be found in the NZ EEZ, the spade-toothed whale (*Mesoplodon traversii*), has been described only from fragmentary skeletal remains, so the physical appearance of the species remains unknown (van Helden et al. 2002). In some regions of the world, the stranding and mortality of beaked whales have been attributed to SONAR from Naval exercises (Schrope 2002). At the date of listing, we were not aware of this as a likely cause of strandings or mortality around NZ. However, we noted the high value of strandings as a source of new information on beaked whales and encouraged the continued effort to collect and document specimens by the

Museum of New Zealand Te Papa Tongarewa and DOC.

Four of the species considered Data Deficient have no known threats: pygmy right whale (*Caperea marginata*), southern bottlenose whale (*Hyperoodon planifrons*), pygmy sperm whale (*Kogia breviceps*) and hourglass dolphin (*Lagenorhynchus cruciger*). Two of these (the southern bottlenose whale and pygmy sperm whale) are widely distributed in the Southern Hemisphere, and the southern bottlenose whale is considered abundant in the Southern Ocean. The 'bottlenose dolphins' sighted near the Kermadec Islands have been reported as being different in appearance from other *Tursiops truncatus* in NZ waters (C. Duffy, personal communication). Genetic samples or specimens from strandings or bycatch are needed to clarify the taxonomy of this population, relative to the two currently recognised species of bottlenose, *T. truncatus* and *T. aduncus* (Perrin et al. 2007).

Other concerns

We received and considered five submissions concerning known anthropogenic threats to the common dolphin in NZ waters. These include disturbance from tourism (Stockin et al. 2008), exposure to pollutants (Stockin et al. 2007) and mortality from incidental fisheries entanglement (Stockin & Orams 2009). While recognising that the fisheries-related mortality required improved reporting and monitoring, we are not aware of evidence showing a population decline because of the known levels of mortality. Consequently, we considered the listing of Not Threatened most appropriate for this species.

Patterns of extinction, threat and rarity

There are no known extinctions of marine mammals in NZ's historical records. The three endemic marine mammal species of NZ are all listed as either Nationally Critical or Nationally Endangered. The most significant direct threats to NZ marine mammals are fisheries interactions, including bycatch during active fishing and entanglement in lost gear. Indirect threats include resource competition and habitat modification, vessel strike, and epizootic outbreaks of presumed bacterial infections. For the Maui's dolphin, the extremely small population size is threatened by demographic stochasticity and loss of evolutionary potential through genetic drift or inbreeding. For the NZ sea lion, the limited breeding range (i.e. number of pupping beaches) is considered a risk factor in the listing of the IUCN.

Actions to improve the chance of downlisting priority species

As part of the review, we considered future research or management actions that would allow the downlisting of eight priority taxa (i.e. an improved conservation trajectory) in future reviews. This list is not intended to be exhaustive but only to serve as a guide to the key issues reflected in the current listing.

Maui's dolphin

The future status of the Maui's dolphin is considered dependent on the elimination of all known sources of anthropogenic mortality. However, any increase in abundance is also likely to be dependent on stochastic demographic and genetic forces, given their small population size.

New Zealand sea lion

The current listing is based on the reported trend in decline of abundance. Effective conservation action to reverse this trend is dependent on a better understanding of the causes of the current decline. Although bycatch and disease events were known sources of mortality, the Expert Group considered that other (unknown) causes could still be a factor in the current decline.

Bryde's whale

The listing is based on the estimated population size alone and is unlikely to change unless a new population estimate reports a change in population size. However, the current level of vessel strike mortality could pose a threat to the

apparent resident population. An improved understanding of population connectivity and abundance is needed to evaluate the impact of vessel strikes on trends in abundance.

Killer whale 'Type A'

The listing is based on the population size alone. There is no known threat or evidence of decline. The species can only be downlisted if abundance is shown to be >250 mature individuals. An improved estimate of abundance is considered desirable to confirm or modify the present listing.

Southern elephant seal

The listing is based on the population size alone, but there is a substantial well-documented historical decline (Taylor & Taylor 1989). Although there is a high abundance outside NZ, the NZ population is a small overflow of an Australasian population based mainly on Macquarie Island, which is declining (Hindell 1991). Changes to the environment associated with climate change are considered the likely cause of decline and, consequently, there is little chance of mitigation/downlisting in the near future.

Hector's dolphin

The future status is considered dependent on the outcome of a current court case, challenging planned fisheries restrictions. If restrictions are upheld, they are considered sufficient to halt the presumed current decline of the Hector's dolphin related to bycatch. Where restrictions are not upheld, the past trend will likely continue.

Southern right whale

The listing is based on abundance estimate from 1995 to 1998 and the probability of a decline from Soviet whaling during the early 1960s (within three generations) (Tormosov et al. 1998). Listing could be modified if a positive trend in population growth can be established by comparing abundance estimates, based on capture–recapture analyses of genotype or photo-identification records for 1995–2008 surveys with the recently completed 2006–09 surveys.

Bottlenose dolphin

The current listing is based on the small size of three isolated coastal subpopulations and the reported decline or probability of decline in two regional populations. Continued photo-identification studies are needed to confirm estimates of local decline and improve estimates of population connectivity (i.e. local decline might reflect habitat use, not mortality). The causes of the apparently high rates of calf mortality reported in Bay of Islands and Doubtful Sound require further investigation, and necropsies should be performed on all carcasses found beachcast or dead and floating, particularly neonates or calves.

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