Department of Environment
and Heritage Protection

Marine wildlife stranding and mortality database annual reports 2008-2011

II. Cetaceans and Pinnipeds

Queensland Government

...strong environmental management
supporting sustainable economic development

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Cover photograph:

Immature male humpback whale (*Megaptera novaeangliae*) (W2143) stranded at the Gold Coast on 31 May 2009. Photo: StrandNet (https://www.derm.qld.gov.au/strandnet/application [accessed: March 2012]).

20 August 2012

Foreword

The Department of Environment and Heritage Protection (EHP) monitors cetacean and pinniped mortality along the Queensland coast via StrandNet, the marine wildlife strandings and mortality database. StrandNet records injured, moribund and dead marine wildlife in Queensland from reports received by the Department of National Parks, Recreation, Sport and Racing (NPRSR), EHP, the Great Barrier Reef Marine Park Authority (GBRMPA) and the Department of Agriculture, Fisheries and Forestry (DAFF), in addition to those received directly from the public and rehabilitation facilities. This annual report has been published as part of EHP's Conservation Technical and Data Report series. Any request to access these data for research purposes should be made in writing to the StrandNet Coordinator, email: strand.data@derm.qld.gov.au.

Contents

List of acronyms and abbreviations

AZWH	Australia Zoo Wildlife Hospital
COD	Cause of Death
Cwlth	Commonwealth
DAFF	Department of Agriculture, Fisheries and Forestry
DEEDI	Department of Employment, Economic Development and Innovation
DERM	Department of Environment and Heritage Protection
DPA	Dugong Protection Area
ECIFFF	East Coast Inshore Fin Fish Fishery
EHP	Department of Environment and Heritage Protection
GBRMPA	Great Barrier Reef Marine Park Authority
IUCN	International Union for Conservation of Nature
IWC	International Whaling Commission
JCU	James Cook University
NPRSR	Department of National Parks, Recreation, Sport and Racing
Qld	Queensland
QPWS	Queensland Parks and Wildlife Service
SCP	Queensland Shark Control Program
SOCI	Species of Conservation Interest
UQ	University of Queensland

Summary

This report summarises cetacean and pinniped strandings and mortalities in Queensland waters from 2008 to 2011. The total number of confirmed cases of stranded or dead cetaceans or pinnipeds was 74 in 2008, 69 in 2009, 62 in 2010 and 85 in 2011.

The region south of 25ºS (south of Woodgate, near Hervey Bay) to the New South Wales border represents approximately 7 per cent of Queensland's mainland coast, but had the overwhelming majority of records for cetaceans and pinnipeds for the reporting period (81 per cent of cetacean records in 2008, 91 per cent in 2009, 72 per cent in 2010 and 77 per cent in 2011).

Six pinnipeds were recorded between 2008 and 2011, including five mortalities. The cause of death was attributed to natural causes in one individual and ingestion of a fishing hook in another, but was unidentified in the remaining cases.

In 2008, short-beaked common dolphins (*Delphinus delphis*), bottlenose dolphins (*Tursiops* spp.) and humpback whales (*Megaptera novaeangliae*) accounted for 56 per cent of cetacean records. Six species of whales and four species of dolphins were recorded. One seal was recorded (fur seal, *Arctocephalus forsteri*).

In 2009, *D. delphis*, *Tursiops* spp. and *M. novaeangliae* again were the main species reported and together accounted for 57 per cent of records. Seven species of whales and four species of dolphins were recorded. Three *A. forsteri* were recorded.

In 2010, *D. delphis*, *Tursiops* spp. and *M. novaeangliae* accounted for 65 per cent of all cetacean strandings. Four species of whales and seven species of dolphins were recorded. One *A. forsteri* was recorded.

In 2011, *D. delphis*, *Tursiops* spp. and *M. novaeangliae* accounted for 52 per cent of all cetacean strandings. Six species of whale and seven species of dolphins were recorded. One *A. forsteri* was recorded

Overall, 230 mortalities of cetaceans and pinnipeds were recorded between 2008 and 2011. The cause of death was identifiable in 44 per cent (103) of these cases. The Queensland Shark Control Program (SCP) was the main identified anthropogenic cause of mortality, and overall, accounted for 73 per cent of mortalities where a cause of death was identifiable.

Introduction

A diverse range of marine mammals are found in Queensland waters, including cetaceans (dolphins and whales), pinnipeds (seals) and one sirenian (the dugong). All native marine mammals in Queensland are protected by the *Nature Conservation Act 1992* (Qld). The subantarctic fur seal, *Arctocephalus tropicalis*; the humpback whale, *Megaptera novaeangliae* and the dugong, *Dugong dugon* are currently listed as vulnerable by the Nature Conservation (Wildlife) Regulation 2006 (Qld) under the *Nature Conservation Act 1992* (Qld). Indo-Pacific humpback dolphin, *Sousa chinensis* and the Australian snubfin, *Orcaella heinsohni* are listed as near-threatened by the Nature Conservation (Wildlife) Regulation 2006 (Qld) under the *Nature Conservation Act 1992* (Qld). The Nature Conservation (Whales and Dolphins) Conservation Plan 1997 (Qld) was implemented to safeguard the continuing recovery of the eastern Australian humpback whale population, and to improve conservation management of dolphins in Queensland waters.

Within State and Commonwealth waters, the *Marine Parks Act 2004* (Qld) and the *Great Barrier Reef Marine Park Act 1975* (Cwlth) provide the capacity to protect marine wildlife. State marine parks include the Moreton Bay Marine Park, the Great Sandy Marine Park and the Great Barrier Reef Coast Marine Park. Marine wildlife in Queensland is also protected by a series of management arrangements specific for the East Coast Inshore Fin Fish Fishery (ECIFFF), and the two-tiered Dugong Protection Area (DPA) system. DPAs were declared under the *Fisheries Act 1994* (Qld) by the Fisheries Amendment Regulation (No. 11) 1997 (Qld), which provides restrictions on the type, size and locations of nets, and has requirements for net attendance.

Monitoring the incidence of marine mammals that are sick, injured or dead provides a measure of the effectiveness of the above legislation for maintaining sustainable marine mammal populations. StrandNet is the database where these data are recorded for Queensland waters. This report presents a summary of cetaceans and pinniped strandings and mortality data recorded between 2008 and 2011. Dugong records for this time period are discussed elsewhere (Greenland and Limpus 2010; Biddle *et al.* 2011; Meager *et al.* in review).

Methods

StrandNet is an Oracle database which summarises all records of sick, injured or dead marine wildlife reported to the Department of Environment and Heritage Protection (EHP). EHP has managed StrandNet since March 2012, when the Department of Environment and Resource Management (DERM) was divided into five new departments. The previous departmental names are used in the current report, because the data were collected prior to the restructure.

The term ‘stranding’ is here used to include sick, injured or dead dugongs that were washed ashore or encountered at sea; in addition to dugongs which were entangled in fishing nets/synthetic debris or rescued from a situation where they would have died had they not been rescued (Geraci and Loundsbury 1993).

Between 2008 and 2011, most cetacean and pinniped strandings were reported by staff from DERM or the Great Barrier Reef Marine Park Authority (GBRMPA). Other records were received directly from the public, including records reported via the state-wide stranding telephone hotline (1300 264 625). Records from the Queensland Shark Control Program (SCP) were received from the Department of Employment, Economic Development and Innovation (DEEDI, now the Department of Agriculture, Fisheries and Forestry). Officers from DERM, GBRMPA or DEEDI inspected carcasses that were accessible.

Records were lodged in StrandNet by registered users via a web-based interface and each stranding record was assigned a unique identification number, prefixed by ‘W’ for marine mammals, unless the animal had been assigned a pre-existing tag number. A record that could not be confirmed as a cetacean or pinniped, or where there was insufficient evidence to establish whether the stranding occurred at the time and location reported, was entered into StrandNet as an unconfirmed record (coded as ‘???’). Additional details that were recorded include the coordinates, location details and date of the report; the sex, life-history stage, size and condition of the animal, and the fate of the animal or carcass. Where available, photos were attached to the record.

Records were then verified by a regional Stranding Coordinator. This process was overseen by the state-wide Stranding Coordinator to ensure that records were accurate, complete and consistent. The cause of death was established by trained staff examining the carcass and/or photographic records, or by necropsy. Only carcasses that were readily accessible to DERM staff and that were not showing signs of advanced decomposition were necropsied, either by a regional veterinary surgeon, at the University of Queensland (UQ) or James Cook University (JCU). Necropsy reports were then uploaded to StrandNet. For those marine mammals not adequately examined, the cause of death was recorded as unknown.

It is recognised that StrandNet represents only a proportion of stranded cetaceans and pinnipeds occurring in Queensland. The number of carcasses or debilitated animals that reach the shoreline depends on factors such as currents, wind and carcass buoyancy, and losses to scavengers (Peltier *et al.* 2012). This also means that a carcass or debilitated animal may drift substantial distances before stranding.

Although StrandNet has systematically recorded marine mammal strandings from Cairns to the Queensland–New South Wales border since 1996, coverage is less comprehensive in sparsely populated areas of the Gulf of Carpentaria, Torres Strait and eastern Cape York Peninsula. It is also acknowledged that fisheries bycatch records in StrandNet may be incomplete. Marine mammals can be unintentionally caught as bycatch in nets or other gear associated with fisheries activities. Since 2002, it has been a Commonwealth and State obligation for commercial fishers to report interactions with all protected species including marine mammals in their Species of Conservation Interest (SOCI) logbook. Where available, bycatch records in the Fisheries Queensland annual fisheries updates (http://www.daff.qld.gov.au/28_10916.htm) were checked against records in StrandNet.

As a member of the International Whaling Commission (IWC), Australia is required to provide an annual scientific progress report summarising all activities in relation to cetaceans in Australian waters. These reports have been submitted to the IWC Scientific Committee separately for all four years between 2008 and 2011.

Results

Overall trends in the number, species composition and distribution of strandings between 2008 and 2011

Except where otherwise mentioned, this report focuses on stranded, dead or injured cetaceans and pinnipeds that have been confirmed in the field by a trained person and later verified by an expert. Where the occurrence of a carcass or event is unconfirmed, the record is entered into the database and coded as 'unconfirmed'.

The total number of stranded cetaceans and pinnipeds during the reporting period (2008-11) ranged between 62 in 2010 to 85 in 2011. A comparison of the previous ten years of annual data in the Queensland Strandings Program (Figure 1) shows that the number of cetacean and pinniped strandings in 2011 was similar to the number in 2007.

In total, 19 species of cetaceans and one species of pinniped were recorded between 2008 and 2011 (Table 1). The number of species recorded per year was similar between years (2008: 10 species; 2009: 12 species; 2010: 12 species; 2011: 13 species). Humpback whales (*M. novaeangliae*), short-beaked common dolphins (*D. delphis*) and bottlenose dolphins (*Tursiops* spp.) together accounted for over half the total number of confirmed records in each year (2008: 55 per cent, 2009: 57 per cent, 2010: 65 per cent; 2011: 52 per cent). Four species were only recorded once during the reporting period (*Balaenoptera musculus*, *Mesoplodon layardii*, *Grampus griseus* and *Ziphius cavirostris*) and another six species had less than five records between 2008 and 2011 (Table 1).

Queensland Shark Control Program (SCP): 2008-2011

The Shark Control Program (SCP) was the main cause of mortality to cetaceans in Queensland throughout the reporting period (Table 6). No pinnipeds were caught in the SCP between 2008 and 2011. Long-term trends of cetacean bycatch (1992-2011) were analysed in the subset of data south of 26ºS latitude, because SCP gear deployment in this region has been consistent since 1992 (Sumpton *et al.* 2011). A significant positive increase in annual cetacean bycatch rates was evident in this sector of the SCP (Figure 2), although more detailed analysis accounting for catch per-unit -effort and potential autocorrelation would be required to confirm the rate of this increase. In terms of the species composition of SCP gear interactions, bycatch was dominated by *D. delphis* and *Tursiops* spp. during 2008 (79 per cent of bycatch) and 2010 (91 per cent of bycatch). *D. delphis* and *Tursiops* spp. represented around half of all bycatch in 2009 (52 per cent) and 2011 (52 per cent) (Figure 3). *M. novaeangliae* were each year throughout the reporting period, ranging from one (2008 and 2010) to four catches during 2009.

2008

Number and distribution of strandings

There was a total of 76 stranded, dead or injured marine mammals (excluding dugongs) recorded in Queensland for the year 2008 (Table 1, Figure 5), including two unconfirmed reports (which are not further analysed). Ten species were recorded (47 of the 74 records were identified to the species level) (Table 1). Excluding unconfirmed cases, there were 73 records of cetaceans and one pinniped record. Of the 73 confirmed records for cetaceans, there were 49 dolphins and 24 whales. Whales were grouped into baleen (n = 19, Figure 11) and toothed whales (n = 5, Figure 15).

The geographical distribution of recorded cetacean and pinniped strandings during 2008 in Queensland is summarised by Table 2:

- 81 per cent (60 of 74 records) occurred from 24°S to 28°S in southern Queensland, i.e. Hervey Bay, Sunshine Coast, Moreton Bay and Gold Coast areas.
- 19 per cent (14 of 74 records) within the Great Barrier Reef Marine Coast Marine Park (10°S to 23°S).

Causes of strandings and mortality

Of 74 confirmed stranding records in 2008:

- 26 were alive and either left to natural processes or released.
- In 18 of these cases, seven whales, and 11 dolphins; a likely reason for the stranding was established (Table 7).
- 48 carcasses (all cetaceans) were potentially suitable for necropsy (D1-D3, Table 11).
- The likely cause of death (confirmed or suspected) was established in 28 cases, 89 per cent (n = 25) of these mortalities were caused by the SCP.
- Ten carcasses were examined in detail, four had full necropsies and tissue samples were taken were taken from the other six.

Strandings and mortality from natural causes

Three deaths and three strandings were attributable to natural causes.

M. novaeangliae (humpback whale)

- W2070, W2071; 12/09/2008; Moon Point, Hervey Bay; adult sized of undetermined sex; two whales beach washed alive on sand bank. Both swam away on high tide.

B. acutorostrata (minke whale)

- W2061: 27/08/2008; Wathumba Creek, Hervey Bay; sub-adult of undetermined sex; beach washed alive on sand bank. Whale released by a group of sea kayakers.

D. delphis (short-beaked common dolphin)

- W2011: 4/01/2008; North Stradbroke Island, Moreton Bay; new born male; beach washed. Dead. Most likely still-born with cause of death meningitis contracted in-utero (Dr David Blyde, veterinarian, Sea World).

S. chinensis (Indo-Pacific humpback dolphin)

- W2028: 8/3/2008; Bustard Bay, 1770; new-born male; beach washed alive and sent to Sea World but died five days later. Cause of death bronchopneumonia and secondary meningitis (Dr David Blyde, veterinarian, Sea World).
- W2043: 11/07/2008; Eimeo Creek, Mackay; adult female; found floating dead. Cause of death most likely severe, diffuse, acute necrotising hepatitis (Dr Scott, veterinary examiner, Mackay Veterinary Hospital 08-333).

Anthropogenic causes of strandings and mortality

Excluding the (SCP, discussed below), there were no recorded anthropogenic mortalities of cetaceans or pinnipeds in 2008. However, human activities (excluding the SCP) were implicated in the live strandings of eight cetaceans (Table 7).

Entanglement in fishing gear, or ropes or nets

- *M. novaeangliae* (humpback whale): W2118: 26/06/2008; Gold Coast; whale entangled in rope. Released from rope by Sea World.
- *Tursiops* spp. (bottlenose dolphin): W2109: 15/12/2008; Mirage marina, Gold Coast; calf with fishing line around tail and dorsal fin, removed by Sea World.

Unidentified dolphin: W2036: 5/05/2008; Fisherman Island, Moreton Bay; fishing line entangled and cutting into tail. Left *in situ* (swam away)

Boat strike/propeller damage:

- *M. novaeangliae* (humpback whale). W2067: 8/09/2008; Clump Point, Mission Beach; whale struck by a 9 m vessel. Left *in situ (*swam away)
- Unidentified whales. W2054: 16/08/2008; Off Hayman Island; hit by a large commercial vessel. A lot of blood was seen in the water. Animal left *in situ*. W2055 and W2056: 17 August 2008. Off northern tip of Fraser Island; 11.5m yacht hit a mother and calf. Left *in situ* (swam away)
- W2085: 7/10/2008; Fairway Buoy off Gladstone; MSQ pilot boat hit a whale. Boat was damaged but the fate of the whale was unknown.

Queensland Shark Control Program (SCP):

- Eight cetaceans were caught but released alive: one *M. novaeangliae,* four *D. delphis,* one *Tursiop*s spp., and two *O. heinsohni.*
- 28 died as a result of interactions with SCP gear: 15 *D. delphis*, six *Tursiops* spp., three pygmy killer whales (*Feresa attenuata*) and one *O. heinsohni.*

Sex and life-history stage of stranded cetaceans and pinnipeds

Of the 74 confirmed records:

- 20 were females (three immature, 17 adults)
- 12 were males (five immature, five adults and two calves)
- the sex of the remaining cetaceans and pinniped was not determined

Rescued, natural escape and/or rehabilitated animals

26 cetaceans and one pinniped were released or escaped unaided (Table 7). This included:

- One fur seal, *Arctocephalus forsteri*

- One *B. acutorostrata*
- Five *M. novaeangliae*
- Five unidentified whales
- Three *Tursiops* spp.
- Two *O. heinsohni*
- Five unidentified dolphins
- Four *D. delphis*
- No cetaceans or pinnipeds were recorded as having been rehabilitated during 2008.

Marine parks and Dugong Protection Areas (DPAs) [1]

Dugong Protection Areas (DPA)

- One blue whale, *B. musculus* (W2088). Cause of death unconfirmed. Cleveland-Bowling Green Region DPA B.
- Two *M. novaeangliae* (W2070, W2071). Cause of death unknown. Hervey Bay-Great Sandy Region DPA A.

Moreton Bay Marine Park

- Two unidentified dolphins (W2036, W21133). Cause of death unknown.
- One *D. delphis*. W2011. Died of natural causes (disease).
- One *S. chinensis*. W2076. Cause of death unknown.

Great Sandy Marine Park

- 16 cetacean strandings occurred in the Great Sandy Marine Park:
- One *B. acutorostrata* (released alive).
- Two *D. delphis* both in the SCP at Rainbow Beach.
- Four M*. novaeangliae*. Cause of death unidentified.
- Four *Tursiops* spp, including two caught in the SCP at Rainbow Beach.
- One short-finned pilot whale, *Globicephala macrorhynchus*. Cause of death unidentified.
- Four unidentified dolphins. Three were released alive.

Great Barrier Reef Coast Marine Park or Great Barrier Reef Marine Park

- Ten cases. One *B. musculus,* two *M. novaeangliae,* two *S. chinensis*, one *Pseudorca crassidens* (false-killer whale), one unidentified dolphin and three unidentified whales.
- Two were left to natural processes after interactions with vessels (*M. novaeangliae* W2067, unidentified whale W2054).
- The cause of death was identified to be natural causes in two cases (disease in *S. chinensis* W2043 and pneumonia in *S. chinensis* W2028).

2009

Number and distribution of strandings

There was a total of 71 stranded, dead or injured marine mammals (excluding dugongs) recorded in Queensland for the year 2009, of which 69 records were confirmed (Table 8, Figure 5). Of the 69 confirmed records there were 28 whales, 38 dolphins and three pinnipeds. Two of the confirmed records were re-sightings of previously reported dolphins. Two dolphin records were unconfirmed. 18 baleen whales, ten toothed whales, 38 dolphins and 3 pinnipeds were recorded.

The geographical distribution of cetacean and pinniped strandings recorded during 2009 is summarised by Table 3.

- 91 per cent (63 of 69 records) within south Queensland (24ºS–28ºS) in the Hervey Bay, Sunshine Coast, Moreton Bay and Gold Coast areas.
- 9 per cent (6 of 69 records) within the Great Barrier Reef Marine Coast Marine Park (10ºS–23ºS).

Causes of strandings and mortality

Of 69 confirmed stranding records in 2009:

[1] Note, marine parks and Dugong Protected Areas overlap either partially or completely in some regions.

- 14 were alive and either left to natural processes or released.
    - In ten of these cases, four whales, and six dolphins (including two re-sightings), a likely reason for the stranding was established (Table 8).
- 47 carcasses (all cetaceans) were potentially suitable for necropsy (D1-D3, Table 12)
    - The likely cause of death (confirmed or suspected) was established in 24 cases, mortalities from the SCP accounted for 58 per cent of these cases (n = 14).
    - Nine carcasses were examined in detail, six had full necropsies at Sea World or Australia Zoo Wildlife Hospital. Tissue samples were taken from five, and skeletal material was examined in one case.

Strandings and mortalities from natural causes

Four cetaceans and one pinniped were recorded to have died of natural causes in 2009. No strandings of live animals were confirmed to be due to natural causes.

Tursiops spp.

- W2216. *T. truncatus*. 4/10/2009. North Stradbroke Island. Died of morbillivirus infection (described in detail by Stone *et al.* 2012).
- W2141: *Tursiops* spp. 4/06/2009. Bribie Island. Died of pneumonia. (Dr Lacasse, Australia Zoo Wildlife Hospital).

Unidentified dolphin

- W2181: 19/08/2009; Moreton Bay. A recently born animal with the umbilical cord still attached.

P. crassidens

- W2228: 29/12/2009; Mudjimba, Sunshine Coast. Weaned immature, live but subsequently died. Multiple wounds over body. Death attributed to unknown illness by Australia Zoo Wildlife Hospital staff.

A. forsteri

- W228128. 1/11/2009. Kings Beach, Caloundra. Died on an unidentified disease (necropsy undertaken by the Australia Zoo Wildlife Hospital).

Anthropogenic causes of strandings and mortality

Excluding the SCP, there were five records of anthropogenic mortalities in 2009 (four cetaceans and one pinniped). There were two records of anthropogenic injuries in 2009, these were repeated sightings of the same dolphin.

Entanglement

- *M. novaeangliae*: W2143. 31/05/2009. Angler Beach, Gold Coast. Weaned immature with past entanglement injuries that damaged the tail flukes. Died the day after first recorded.

Fisheries-related injuries:

- Unidentified dolphin: W2174. Teewah. 27/07/2009. Tangled in fishing line. Damage to rostrum. Died.
- *Tursiops* spp. W2114. Two records. Recorded at Horseshoe Bay, Moreton Bay on 16/01/2009 and then again at Manly boat harbour on 19/02/2009. Tangled in fishing line. Taken to Sea World for rehabilitation, released on 7/07/2009 near Peel Island. Recaptured again on 15/07/2009 and retained in care at Sea World under an Exhibitor's Licence.
- *A. forsteri*. W2193. 1/07/2009. South Stradbroke Island. Ingested a fishing hook. Euthanised at Sea World

Interactions with vessels

- Unidentified dolphin: W2186. Moreton Bay. 2/09/2009. Suspected propeller injuries. No necropsy performed. D4 carcass (refer to Table 8 for explanation of carcass condition).

Unidentified anthropogenic cause

- *T. truncatus* W2195. Fraser Island. 10/08/2009. Presumed anthropogenic cause based on net or rope marks. No necropsy performed.

Sex and life-history stage of stranded cetaceans and pinnipeds

Of the 69 confirmed records:

- 13 were females (eight adults, three immature, one calf and one undescribed)

- 14 were males (eight adults and six immature)
- the sex of the remaining cetaceans and pinniped was not determined.

Rescued, natural escape and/or rehabilitated animals

13 cetaceans were rescued, rehabilitated or escaped unaided in 2009 (Table 3). This included

- One *B. acutorostrata*
- Five *M. novaeangliae*
- Five *Tursiops* spp.
- One unidentified dolphin
- One *D. delphis*
- One pinniped (*A. forsteri*, W2194) was rescued and taken to Sea World for rehabilitation. It was deemed as unsuitable for release and was kept at Sea World.

Marine parks and Dugong Protection Areas (DPAs)

Dugong Protection Area (DPA)

- One *M. novaeangliae* (W2178). Cause of death unknown. Cleveland-Bowling Green Region DPA A.

Moreton Bay Marine Park

- Four *M. novaeangliae*. Cause of death unidentified
- Six *Tursiops* spp. One of these died of morbillivirus (W2216, details above)
- Two *A. forsteri.* One death due to natural causes. One died of unidentified causes.
- One unidentified dolphin. Died of unidentified causes.

Great Sandy Marine Park

16 cetacean strandings occurred in the Great Sandy Marine Park:

- Two *B. acutorostrata* (one released alive)
- Two *D. delphis* both in the SCP at Rainbow Beach.
- Four *M. novaeangliae*. Cause of death unidentified.
- One melon-headed whale (*Peponocephala electra*). Cause of death unidentified.
- One *G. macrorhynchus*. Cause of death unidentified.
- Two *S. chinensis*. Cause of death unidentified.
- Three *Tursiops* spp. including one dolphin (W2168) which was hooked twice in the SCP drumline at Rainbow Beach.
- One *T. truncatus* W2195 (full details above). Presumed anthropogenic cause based on net or rope marks.

Great Barrier Reef Coast Marine Park or Great Barrier Reef Marine Park.

- Two *M. novaeangliae*. Cause of death unidentified.

2010

Number and distribution of strandings

There was a total of 68 stranded, dead or injured marine mammals (excluding dugongs) reported in Queensland for the year 2010, of which 62 records were confirmed (Table 9, Figure 7). Three dolphin and three whale reports were unconfirmed. Of the 62 confirmed records, there were 14 whales, 47 dolphins and one pinniped. Eight of the whales were baleen whales (Figure 13) and six were toothed whales (Figure 17).

The geographical distribution of recorded cetacean and pinniped strandings during 2010 is summarised by Table 4

- 72 per cent (42 of 62 reports) were in south Queensland (24°S–28°S) in the Hervey Bay, Sunshine Coast, Moreton Bay and Gold Coast areas.
- 26 per cent (16 of 62 reports) were within the Great Barrier Reef Marine Coast Marine Park (10°S –23°S).One report was received for the Gulf of Carpentaria.

Causes of strandings and mortality

Of 62 confirmed stranding records in 2010:

- Four were alive and either left to natural processes or were released.
    - The cause of stranding was known in one of these cases (Table 8): one *M. novaeangliae* was caught in

the SCP.

- 49 carcasses (all cetaceans) were potentially suitable for necropsy (D1-D3,Table 13).
    - The likely cause of death (confirmed or suspected) was established in 24 cases, mortalities from the SCP accounted for 88 per cent of these cases (n = 21).
    - Ten carcasses were examined in detail or necropsied (Table 8).

Of the ten carcasses that were necropsied/examined in detail:

- W2353. *M. layardii* (strap-toothed beaked whale). Cause of death: Not Conclusive. Examined by Duncan Limpus, DERM. Genetic samples taken.
- W2256. *Tursiops* spp. Cause of death: Natural mortality or impact. Examined by Wallace McFarland, QPWS.W2432. *T. truncatus.* Cause of Death: Morbillivirus. Necropsy by Dr David Blyde, Sea World. Samples were taken for histology.
- W2427. *D. delphis*. Cause of death: Not conclusive. Necropsy by Dr David Blyde, Sea World. Samples were taken for histology.
- W2271. *T. truncatus*. Cause of death: Not conclusive. Necropsy by Australia Zoo Wildlife Hospital (AZWH) (reference: AZWH25115).
- W2422. *T. aduncus.* Cause of death: Natural mortality or impact. Necropsy by AZWH (reference: AZWH31005).
- W2391. *T. aduncus.* Cause of death: Not conclusive. Necropsy by AZWH (AWH 28634). Histopathology samples taken and analysed by UQ.
- W2296. *O. heinsohni*. Cause of death: Not conclusive. Necropsy by James Cook University (JCU).
- W228115. *G. griseus* (Risso's dolphin). Cause of Death: Not conclusive. Skeletal material examined and kept by Queensland Museum.
- W2299 *M. novaeangliae*. Cause of death: Not conclusive. Carcass examined NPRSR staff. Histopathology samples of a lesion were exampled. Genetic samples taken.

Strandings and mortality from natural causes

Three cetaceans were reported to have died of natural causes in 2010. No strandings of live animals were confirmed to have been due to natural causes.

- *Tursiops* spp.
- *T. truncatus*. W2432. 28/03/2010. Fraser Island (described in Stone *et al.* 2012)
- *T. aduncus* W2422. 13/12/2010. Coolum. Sunshine Coast. Died of intestinal torsion (Dr Shaw, Australia Zoo Wildlife Hospital).
- *Tursiops* spp. W2256. 1/02/2010. South Mission Beach. Unidentified natural causes

Anthropogenic causes of strandings and mortality

Excluding the SCP, no anthropogenic mortalities or live strandings of cetaceans of pinnipeds were recoded in 2010 (Table 9).

Rescued, natural escape and/or rehabilitated animals

Four cetaceans (three *M. novaeangliae* and one *Tursiops* spp.) were rescued, rehabilitated, escaped unaided or were left to natural processes in 2010.

Marine parks and Dugong Protection Areas (DPAs)

Dugong Protection Areas

- One *M. novaeangliae.* Cause of death unidentified. Rodds Bay DPA B.
- Two *S. chinensis.* Cause of death unidentified. Hervey Bay-Great Sandy Region DPA A.

Moreton Bay Marine Park:

Six cetacean mortalities and one live cetacean that was left to natural processes:

- One *T. truncatus.* Cause of death unidentified.
- One *S. chinensis*. Cause of death unidentified.
- One pygmy sperm whale (*Kogia breviceps*). Cause of death unidentified
- One *Tursiops* spp. Cause of death unidentified.
- One *M. novaeangliae*. Cause of death unidentified.
- One *P. electra*. Cause of death unidentified.

- *Tursiops* spp. Left to natural processes (W2416). Reported to by a member of the public to have had debris stuck to its head but not found by Marine Park staff.

Great Sandy Marine Park

12 cetacean mortalities:

- Three *D. delphis* all in the SCP at Rainbow Beach.
- Two *M. novaeangliae*. Cause of death unidentified.
- One *P. electra.* Cause of death unidentified.
- One *M. layardii.* Cause of death unidentified.
- One spinner dolphin (*Stenella longirostris*). Cause of death unidentified
- Two *T. aduncus.* Cause of death unidentified
- Two *T. truncatus.* W 2432. Died of morbillivirus. Full details above. W2284. Cause of death unidentified.

Great Barrier Reef Coast Marine Park or Great Barrier Reef Marine Park

Seven cetacean mortalities and two live strandings:

- Two *M. novaeangliae*. Both released. Cause of stranding unknown.
- One *S. longirostris* Cause of death unidentified.
- One *G. macrorhynchus*. Cause of death unidentified.
- One *K. breviceps*. Cause of death unidentified.
- Two *O. heinsohni*. Cause of death unidentified.
- Two *S. chinensis*. Cause of death unidentified.

2011

Number and distribution of strandings

There was a total of 88 stranded, dead or injured marine mammals (excluding dugongs) reported in Queensland for the year 2011, of which 85 reports were confirmed (Table 10, Figure 8). Three dolphin reports were unconfirmed. Of the 85 confirmed records, there were 26 whales, 58 dolphins and one pinniped. 19 of the whales were baleen whales (Figure 14) and eight were toothed whales (Figure 18).

The geographical distribution of recorded cetacean and pinniped strandings during 2011 is summarised by Table 5:

- 75 per cent (64 of 85 records) were in southern Queensland (24ºS–28ºS)
- 25 per cent (21 of 85 records) were within the Great Barrier Reef region (10ºS –23ºS).

Causes of strandings and mortality

Of 85 confirmed stranding reports in 2011:

- 15 were alive and either left to natural processes or released.
    - The cause of stranding was known or suspected in 11 of these cases (Table 10):
        - five were caught in the SCP (four dolphins and one whale).
        - one *M. novaeangliae* (W228136) was observed to have been hit by a 21 tonne vessel in Moreton Bay, but a subsequent search failed to find the whale. Assumed to have survived. Details below.
        - three unidentified dolphins (W2508, W228178 and W228141) were observed with fishing line entangled around body, flukes or rostrum. Left to natural processes. Details below.
        - one unidentified dolphin (W228142) was observed with approximately two metres of rope entangled around the tail flukes. Left to natural processes. Details below
        - one *Tursiops* spp. (W2515) was reported by a member of the public to have been entangled in fishing line, with minor damage to tail and mouth from hooks and hard body lure. Left to natural processes. Details below
    - There was also a case of an unsuccessful release where a dolphin (Tursiops aduncus) was subsequently attacked by sharks (W228159).
- 66 carcasses (all cetaceans) were potentially suitable for necropsy (D1-D3,Table 14)
    - The likely cause of death (confirmed or suspected) was established in 26 cases, mortalities from the

SCP accounted for 58 per cent of these cases (n = 15)

- 15 carcasses were examined in detail: seven had full necropsies at Sea World, the University of Queensland or Australia Zoo Wildlife Hospital. Histopathology tissue samples were taken from seven carcasses. Skeletal material was examined in four carcasses

The cause of death was established in eight of these carcasses that were examined.

Strandings and mortality from natural causes

Ten cetaceans were reported to have died of natural causes in 2011 (Table 10). No strandings of live animals were confirmed to be due to natural causes.

G. macrorhynchus

- W2473. 21/04/2011. Wurtulla. Sunshine Coast. Euthanised by Australia Zoo Wildlife Hospital. Death attributed to disease.

Tursiops spp.

- *Tursiops* spp. W2506. 14/02/2011. Peregian, Sunshine Coast. Unidentified disease (Dr Peter McKinney, Australia Zoo Wildlife Hospital).
- *Tursiops* spp. W11090. 4/08/2011. Fraser Island. Unidentified disease (Dr Peter McKinney, Australia Zoo Wildlife Hospital). Poor condition, likely to have died from extended ill health.
- *Tursiops* spp. W11090. 4/08/2011. Fraser Island. Unidentified disease (Dr Peter McKinney, Australia Zoo Wildlife Hospital). Poor condition, likely to have died from extended ill health.
- *T. aduncus*. W11088. 16/07/2011. Fraser Island. Suspected to have died from an unidentified disease.
- *Tursiop*s spp. W11177. 7/08/2011. Town of 1770. Calf. Necropsy performed, X-rays taken, tissue samples analysed by UQ. Pneumonia was the cause of death (Dr McCauley, Gladstone Veterinary Clinic).
- *T. aduncus.* W228159. 16/11/2011. Tully Heads Beach. Stranded alive, antibiotics administered and released. Subsequently was attacked by sharks.

S. chinensis

- W11155. 16/11/2011. Moreton Bay. Necropsy indicated encephalitis as likely cause of death. A respiratory condition associated with an inflammatory response may have also contributed to the death.

M. novaeangliae

- W228106. 1/10/2011. Main Beach, North Stradbroke Island. Very poor condition, died of extended ill health.
- W228140. 17/10/2011. Eastern Beach, Moreton Island. Male calf that died of extended ill health. UQ pathology report indicated severe hyperplastic, ulcerated and necrotising dermatitis.

Anthropogenic causes of strandings and mortality

Excluding the SCP, three suspected anthropogenic mortalities and six anthropogenic strandings/ interactions of cetaceans were received in 2011 (Table 10).

O. heinsohni

- W2511 and W2512. 23/05/2011. Toolakea Beach, Halifax Bay. Townsville Region. Two badly decomposed carcasses found tied to a concrete block and a mangrove tree in a creek. No necropsies were performed.

Tursiops spp.

- W2515. 12/07/2011. North Reef, Noosa. Sunshine Coast. Fishing-line entanglement. Fishing hooks and lure in mouth. Reported by fishermen and left *in situ.*

Unidentified dolphin

- W228142. 7/07/2011. Offshore from Caloundra, Sunshine Coast. Dolphin had rope around tail. Left *in situ*.
- W228141. 1/10/2011. Moreton Bay Marine Park. Fishing-line entanglement. Left *in situ.*
- W228178. 20/12/2011. Moreton Bay Marine Park. Fishing-line entanglement. Left *in situ.*
- W2508. 6/01/2011. Calf. 19 km offshore from Maroochydore on the Sunshine Coast. Fishing-line entanglement. Left *in situ.*

M. novaeangliae

- W228136. 9/10/2011. Moreton Bay Marine Park. Interaction with a large passenger vessel. Blood in water reported by passengers of vessel after the impact. Helicopter unable to find injured animal.

Sex and life-history stage of stranded cetaceans and pinnipeds

Of the 85 confirmed reports:

- 17 were females (10 adults and seven were immature)
- 23 were males (14 adults, five calves and four immature)
- the sex of the remaining cetaceans and pinniped was not determined.

Rescued, natural escape and/or rehabilitated animals

16 cetaceans were rescued or escaped unaided in 2011 (Table 14). One of these was known not to have survived after release (W228159, discussed above):

- Five *M. novaeangliae*
- One *D. delphis*
- Two *T. aduncus*
- Two *Tursiops* spp.
- Five unidentified dolphins
- One unidentified whale.

No cetaceans or pinnipeds were recorded to have been rehabilitated during 2011.

Marine parks and Dugong Protection Areas (DPAs)

Dugong Protection Area (DPA)

- Two *S. chinensis*. One died of suspected anthropogenic causes (W2485, case history above). The other died of unidentified causes (W2484). Rodds Bay DPA B.
- Two *M. novaeangliae*. One animal escaped unaided in the Lucinda to Allingham–Halifax Bay DPA B (W11152). The cause of death was unidentified in the other whale, which was reported in the Hervey Bay-Great Sandy Region DPA A (W11123).
- One *Tursiops* spp. One died of suspected natural causes (W228106, *T. aduncus*, case history above) and was reported in the Lucinda to Allingham–Halifax Bay DPA B.

Moreton Bay Marine Park

16 cetacean strandings occurred in the Moreton Bay Marine Park:

- Four *S. chinensis*. Cause of death unidentified in three cases. The fourth died of natural causes (W11155, case history above)
- Four *M. novaeangliae*. Cause of death unidentified in one. Two died of extended ill health (W228139 and W228140, case histories above). One escaped after a large vessel impact (W228136, case history above).
- One *S. longirostris*. Cause of death unidentified.
- One *P. electra*. Cause of death unidentified.
- Three Tursiops spp. Cause of death unidentified.
- Three unidentified dolphins. Two were sighted alive with fishing-line entanglement (W228141 and W228178, case histories above). The cause of death was unidentified in the other case.

Great Sandy Marine Park

19 cetacean strandings occurred in the Great Sandy Marine Park:

- Five *M. novaeangliae*. One was caught in the SCP and released alive. Two escaped unaided. Two died of unknown causes but had poor condition.
- One *S. chinensis*. Cause of death unidentified.
- One *P. electra*. Cause of death unidentified.
- Two *S. attenuata*. Cause of death unidentified.
- One *Z. cavirostris*. Cause of death unidentified.
- Three *T. aduncus*. One released after being caught on a SCP drumline at Rainbow Beach.
- One *D. delphis*. Cause of death unidentified.
- Five *Tursiops* spp. One released after being caught on a SCP drumline at Rainbow Beach. Three died of unidentified causes. One died of unknown natural disease.

Great Barrier Reef Coast Marine Park or Great Barrier Reef Marine Park

12 cetacean strandings occurred in the Great Sandy Marine Park:

- Six *M. novaeangliae*. Cause of death unidentified in five cases. The sixth escaped alive unaided.

- One unidentified baleen whale. Cause of death unidentified.
- Two *S. chinensis*. One was caught in a SCP net.
- One *S. attenuata*. Cause of death unidentified.
- One *T. aduncus*. Died of suspected natural disease (W228106, case history above).
- One unidentified dolphin. Cause of death unidentified.

Cetaceans and pinnipeds of special conservation concern in Queensland

Sousa chinensis and *Orcaella heinsohni*

S. chinensis and *O. heinsohni* are listed as near threatened by the Nature Conservation (Wildlife) Regulation 2006 (Qld) under the *Nature Conservation Act 1992* (Qld). The Queensland populations of these species was assessed as vulnerable by EHP's Back on Track marine mammal expert panel, because of small and localised subpopulations, and are currently being considered for listing as 'vulnerable'. Both species are listed as 'migratory' under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth).

The cause of death was confirmed in five *S. chinensis* in the reporting period:

- entanglement in a SCP net at Bucasia Beach, the MacKay region (W228143, 2011)
- natural causes (encephalitis) in Moreton Bay (W11155, case history above, 2011)
- entanglement in a SCP net at Trinity Beach (W2418, 2010).
- natural causes (bronchopneumonia and secondary meningitis) (W2028, 2008, case history above)
- natural causes (most likely hepatitis(W2043, 2008, case history above).

S. chinensis strandings (n = 13) were elevated in 2011 compared to previous years (Figure 9; Figure 19), and accounted for 15.3 per cent of the total number of cetacean and pinniped records in 2011, compared to 10.1 per cent or lower between 2008 and 2010 (Table 1). Five of these 13 cases were in the Gladstone latitudinal region (23°S, Figure 9). One of these carcasses (W2485) was examined in detail by a local veterinarian and had histopathology examined at the University of Queensland, but the cause of death could not be identified. The case history is as follows:

- W2485. 3/06/2011. Port of Gladstone (between Turtle and Curtis Island). Adult male. Necropsy performed, histopathology samples sent to UQ. X-rays revealed possible fractures to the spine. Blunt-force trauma was suspected, but the possibility of autolysis or damage during removal could not be excluded. The cause of death therefore could not be identified.

Eleven *O. heinsohni* were recorded in the reporting period. Five of these were caught in the SCP, two of which were released alive (W2044 and W2112). Human activities were suspected to have caused the death of two *O. heinsohni* found tied to a mangrove tree and concrete block in the Townsville region in 2011 (W11510 and W11509, full details above).

Megaptera novaeangliae

Humpback whales, *M. novaeangliae* are listed as vulnerable by the Nature Conservation (Wildlife) Regulation 2006 (Qld) under the *Nature Conservation Act 1992* (Qld) and by the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth).

During the reporting period, 52 cases of *M. novaeangliae* were recorded in StrandNet, with a maximum annual total of 16 in 2009 and a minimum annual total of eight in 2010. Records ranged from Cape Bedford in northern Queensland to Coolangatta near the NSW border. Of the 52 *M. novaeangliae*, 34 were recorded to have died, and the remaining 18 either escaped naturally, were left to natural processes or were released. Eight cases of SCP entanglement, two collisions with vessels and two cases of entanglement (source unknown) were recorded in StrandNet for the reporting period (Tables 7 to 10, case histories above).

Discussion

Overall, the records of cetacean and pinnipeds in StrandNet were largely representative of the species composition in Queensland waters. Species that are resident or seasonally present in the region, such as common dolphins (*D. delphis*), bottlenose dolphins (*Tursiops* spp.) and humpback whales (*M. novaeangliae*) represented the majority of cetacean and pinniped records between 2008 and 2011. Species that occasionally visit Queensland waters, such as the fur seal (*A. forsteri*); and oceanic species, such as the strap-toothed whale (*M. layardii*) and the blue whale (*B. musculus*) were rarely reported.

In terms of the spatial distribution of strandings and mortalities, southern Queensland had a disproportionate number of cetacean and pinniped reports. The southern region of Queensland (south of Woodgate, or < 25ºS) represents approximately 7 per cent of the coastline, but the majority of reports for cetaceans and pinnipeds (81 per cent of cetacean reports in 2008, 91 per cent in 2009, 72 per cent in 2010 and 77 per cent in 2011). A similar trend has also been the case in previous annual stranding reports (e.g. Greenland and Limpus 2007; Greenland and Limpus 2008) and it is not the case for other marine wildlife reported to StrandNet (e.g. Biddle *et al.* 2011; Biddle and Limpus 2011). This suggests that the pattern is probably driven by the comparably high density of marine mammals in the region. Moreton Bay, for example, supports a relatively large and diverse assemblage of cetaceans including resident *T. aduncus* and *S. chinensis* populations, significant seasonal numbers of *M. novaeangliae* and 13 other seasonal or occasional visitors (Chilvers *et al.* 2005).

The annual stranding rate peaked at 85 in 2011, at a similar level to that observed in 2007. The high number of strandings in 2011 may have been linked to the extreme weather events in summer of 2010-2011. In support of this contention, three cetacean species known to be resident in inshore and estuarine areas in Queensland, *T. aduncus, S. chinensis* and *O. heinsohni* (Hale *et al.* 2000; Parra *et al.* 2006a) had elevated annual stranding rates in 2011 (both in terms of overall and relative numbers of strandings, Table 1). Whether these animals were impacted directly by floods and extreme weather events, or via impacts on prey species is unclear. The impact of freshwater flows on prey species of inshore dolphins, such fishes and crustaceans is well documented (e.g. Loneragan and Bunn 1999; Gillanders and Kingsford 2002). Few studies have addressed the direct effect of flooding and extreme weather events on dolphins or other cetaceans, but a recent study in northern New South Wales showed that Indo-Pacific bottlenose dolphins (*T. aduncus*) avoided estuaries in both flood and post-flood periods (Fury and Harrison 2011). The time until they returned depended on the length and the severity of the flood, but they were generally observed in waters with salinity levels above 29‰.

Queensland Shark Control Program (SCP)

The SCP was the major anthropogenic cause of mortality. The highest number of cetaceans caught in the SCP occurred in 2008, which was the most caught in a single year since 1996.

In southern Queensland (Gold Coast and Sunshine Coast), where the gear deployed by the SCP has largely remained unchanged since 1992 (Sumpton *et al.* 2011), there has been a trend of increasing bycatch of cetaceans from 1996 to 2010 (Figure 2, based on StrandNet data). Cetacean bycatch throughout this period has been mostly common (*D. delphis*) and bottlenose dolphins (*Tursiops* spp) (Figure 2), which are likely to be the most abundant dolphin species in the areas where SCP gear is deployed. Two species of bottlenose dolphins are found in southern Queensland, *T. aduncus* and *T. truncatus* (Hale 1998; Chilvers and Corkeron 2003). *T. truncatus* species are mostly encountered in offshore waters, whereas *T. aduncus* are mostly encountered in inshore and estuarine waters (Hale *et al.* 2000). Very little is known of the movements and population structure of *D. delphis* in Queensland, but recent research suggests local population structure at the scale of <1000 km along the New South Wales coast (Möller *et al.* 2010) and at a scale of >1500 km in southern Australian populations (Bilgmann *et al.* 2008

The reason why overall cetacean bycatch has increased over the long term is unclear without detailed studies of the abundance, movements, and behaviour of the main species caught towards the large-mesh nets and drumlines. Gear selectivity of the SCP has been examined elsewhere (Sumpton *et al.* 2011). Briefly, dolphin survival is higher on drumlines than on nets, and nets pose the greatest risk to dolphins, even if they are fitted with acoustic alarms (Sumpton *et al.* 2011). Since the study by Sumpton *et al.* (2011), new acoustic alarms have been installed.

In terms of Queensland cetacean populations of special conservation concern, two *S. chinensis* and three *O. heinsohni* were reported to have drowned in mesh nets in the SCP between 2008 and 2011. An additional two *O. heinsohni* were hooked on drumlines and were released alive. Eight cases of SCP entanglement of humpback whales were recorded in StrandNet in the same period. Humpback whales encounter nets used in the SCP because of the proximity of their migratory pathway to the coastline (Gribble *et al.* 1998).

Disease

Natural causes, such as disease, long-term illness and predation, represented the second-most frequent source of

mortality (after the SCP and of cases where the cause of death was identifiable). It is important to note that many natural causes of mortality are only identifiable after necropsies, histopathology and in some cases, serologic examination and other assays. For example, two cases of cetacean mortality (both *T. truncatus*) were attributed to morbillivirus during the reporting period, a disease that is only identifiable through serology (Stone *et al.* 2012).

One of the morbillivirus cases reported by Stone *et al.* (2011) and recorded in StrandNet was the first confirmed case of morbillivirus infection in a cetacean in Australian waters. Antibodies to cetacean morbillivirus (CMV) were later detected in 13 of 27 wild cetaceans sampled (stranded and non-stranded) and two of 13 captive cetaceans (Stone *et al.* 2012), but not all of these cases were reported to StrandNet. Stone *et al.* (2012) suggested that CMV has been present in Australian wild cetaceans since at least 1985.

Morbillivirus disease has emerged as a potent pathogen of pinnipeds and cetaceans overseas (e.g. Soto *et al.* 2011). At least eight mass-mortality events in wild pinniped and cetacean populations worldwide have been associated with morbillivirus infection (Stone *et al.* 2012 and references therein). This highlights the importance of collecting histopathology samples from deceased marine mammals.

Marine mammals are also vulnerable to toxoplasmosis infection, which may be considered an anthropogenic impact in Australia because cats are the only known definitive host (Bowater *et al.* 2003). This disease was not recorded by StrandNet during the reporting period.

Cetaceans and pinnipeds of special conservation concern

S. chinensis and *O. heinsohni* are currently listed as near threatened by the Nature Conservation (Wildlife) Regulation 2006 (Qld) under the *Nature Conservation Act 1992* (Qld), and were identified as priority species by the Action Plan for Australian Cetaceans (Bannister *et al* 1996).

Because of the localised and small sub-population sizes of both species in Queensland, it is thought that they can sustain only very low levels of anthropogenic mortality (Parra 2006; Parra *et al.* 2006b). Recently, it was estimated that there was a population of 150 (95 per cent confidence interval: 132.5-165.2) largely resident in the Great Sandy Straits region (Cagnazzi *et al.* 2011). The population of *S. chinensis* was estimated to be 119 animals (81-166) in Moreton Bay between 1985 and 1987 (Corkeron 1997). The only reliable published estimate of a local population of *O. heinsohni* is from Cleveland Bay, north-east Queensland, where the population was estimated to range from 64 individuals in 2001 to 76 in 2000 (Parra *et al.* 2002). These population sizes suggest that even low mortality rates may have important management implications.

Between 2008 and 2011, there were 11 records of *O. heinsohni* (one was released alive) spanning an area from Townsville to the Sunshine Coast. Thirty mortalities of *S. chinensis* were reported for the same period between Cairns and Moreton Bay. Two areas of particular concern for *S. chinensis* in 2011, were the Gladstone region and the Moreton Bay-southern Sunshine Coast region (between Bokarina on the Sunshine Coast and Brisbane River mouth in Moreton Bay, 65 km linear distance). In each region, five *S. chinensis* were recorded (including one that was released alive in each area).

Most records of humpback whales occurred in two general regions, from the NSW border to the northern end of Moreton Bay (21 of 52 records) and the Hervey Bay region (24°S to 25°S; 18 of 52 records). Significant numbers of humpback whales migrate visit Moreton Bay and Hervey Bay during annual migrations along eastern coast of Queensland (Corkeron *et al.* 1994; Chilvers *et al.* 2005). The east Australian population of humpback whales is currently recovering at around 10-11 per cent a year (Noad *et al.* 2008).

The subantarctic fur seal, *Artocephalus tropicalis,* is listed as vulnerable under the Nature Conservation (Wildlife) Regulation 2006 (Qld) under the *Nature Conservation Act 1992* (Qld), but was not recorded by StrandNet in the reporting period.

Other anthropogenic sources of mortality or injury

After the SCP, entanglement and fisheries-related impacts were the main cause of identifiable injury or mortality to cetaceans between 2008 and 2011, and contributed to the death of one of the two seals with an identifiable cause of death (Table 6). Fishing line and rope entanglement were the main types of entanglement recorded, and numerous cases of fishing-line entanglement of bottlenose dolphins in southern Queensland were reported. Even so, the annual rate of fisheries-related impacts to cetaceans and pinnipeds recorded in StrandNet between 2008 and 2011 was less than that recorded between 2006 and 2007 (Greenland and Limpus 2008, Table 6). There were seven incidents of vessel interactions with cetaceans recorded in StrandNet during the reporting period; and one of these was known to have resulted in a mortality. Most reports were of collisions between whales and medium to large vessels. Two of the whales involved in collisions were identified as humpbacks, and the other four were unidentified. Most occurred in 2008 (n=5), but why this was the case is unknown.

Overall, a third (32 per cent) of stranding records attributed to anthropogenic activities were not reported to have killed

the animal involved. However, post-release mortality, reduced growth, impaired reproductive performance or other stress-related impacts in these animals cannot be ruled out in these situations without longitudinal studies where individuals are studied over time. Monitoring and managing the potential impacts and the welfare implications of these non-lethal interactions could be the subject of further research.

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Table 1. Species composition of cetacean and pinniped stranding strandings in Queensland between 2008 and 2011.

Taxonomic group	Species	Common name	2008 (%)	2009 (%)	2010 (%)	2011 (%)
Baleen whale	*Balaenoptera acutorostrata*	Minke whale	1.4	2.9	0	0
Baleen whale	*Balaenoptera musculus*	blue whale	1.4	0	0	0
Baleen whale	*Balaenoptera spp.*	unidentified baleen whale	0	0	0	1.2
Baleen whale	*Megaptera novaeangliae*	humpback whale	13.5	23.2	12.9	21.2
Toothed whale	*Feresa attenuata*	pygmy killer whale	4.1	4.3	0	0
Toothed whale	*Globicephala macrorhynchus*	Short-finned pilot whale	1.4	2.9	0	1.2
Toothed whale	*Kogia breviceps*	pygmy sperm whale	0	0	3.2	1.2
Toothed whale	*Mesoplodon layardii*	strap-toothed whale	0	0	1.6	0
Toothed whale	*Peponocephala electra*	melonhead whale	0	2.9	3.2	3.5
Toothed whale	*Physeter macrocephalus*	sperm whale	0	2.9	0	0
Toothed whale	*Pseudorca crassidens*	false killer whale	1.4	1.4	0	0
Toothed whale	*Unidentified whale*	unidentified whale	9.5	0	1.6	1.2
Toothed whale	*Ziphius cavirostris*	Cuvier's beaked whale	0	0	0	1.2
Dolphin	*Delphinus delphis*	common dolphin	27.0	14.5	30.6	8.2
Dolphin	*Grampus griseus*	Risso's dolphin	0	0	1.6	0
Dolphin	*Orcaella heinsohni*	Australian snubfin dolphin	4.1	0	4.8	5.9
Dolphin	*Sousa chinensis*	Indo-Pacific humpback dolphin	9.5	10.1	4.8	15.3
Dolphin	*Stenella attenuata*	Pan-tropical spotted dolphin	0	0	0	3.5
Dolphin	*Stenella longirostris*	spinner dolphin	0	2.9	3.2	2.4
Dolphin	*Tursiops aduncus*	Indo-Pacific bottlenose dolphin	0	0	6.5	7.1
Dolphin	*Tursiops* spp.	bottlenose dolphin	14.9	15.9	4.8	12.9
Dolphin	*Tursiops truncatus*	common bottlenose dolphin	0	2.9	9.7	2.4
Dolphin	*Unidentified dolphin*	Unidentified dolphin	10.8	8.7	9.7	10.6
Seal	*Arctocephalus forsteri*	southern fur seal	1.4	4.3	1.6	1.2
Number of records			74	69	62	85
Number of species recorded			10	12	12	13

Table 2. Summary of cetacean and pinniped stranding reports by geographical location in Queensland, 2008. n=74 confirmed reports and 2 unconfirmed reports (?).

Species	GOC	Qld (east coast in 1° latitudinal blocks, see Figure 4 for geographical overview)																				Total
		9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
Baleen whales																						
Megaptera novaeangliae								1				1				1	2	2		2	1	10
Balaenoptera acutorostrata																	1					1
Balaenoptera musculus.												1										1
Unidentified					1								2+1?			1	2	1				7
Toothed whales																						
Globicephala macrorhynchus																	1					1
Pseudorca crassidens													1									1
Feresa attenuata																					3	3
Total whales					1			1				2	3+1?			2	6	3		2	4	24
Dolphins																						
Delphinus delphis																		1	7	6	6	20
Tursiops spp.													1					4	2	1	3	11
Orcaella heinsohni																			3			3
Sousa chinensis									1					1	1	1	1			2		7
Unidentified																	1	1	1	5+1?		8
Total dolphins									1				1	1	1	1	2	6	13	14 +1?	9	
Pinnipeds																						
Arctocephalus forsteri																	1					1
Total Seals																	1					1

Table 3. Summary of cetacean and pinniped stranding reports by geographical location in Queensland, 2009. n=69 confirmed reports and 2 unconfirmed reports (?).

Species	GOC	Qld (east coast in 1° latitude blocks, see Figure 4 for geographical overview)																				Total
		9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
Megaptera novaeangliae												1					4		2	4	5	16
Balaenoptera acutorostrata																	2					2
Globicephala macrorhynchus			1															1				2
Physeter macrocephalus									1													2
Feresa attenuata																				1	2	3
Pseudorca crassidens																			1			1
Peponocephala electra																		1		1		2
Total whales			1						1			1					6	2	4	6	7	28
Dolphins																						
Delphinus delphis																		2	3	3	2	10
Tursiops spp.																	1	2		6	1	11
Tursiops truncatus																		1		1		2
Sousa chinensis									1			1					1	1	2	1		7
Stenella longirostris																			1		1	2
Unidentified																1	1		2	2+2?		6+2?
Total dolphins									1			1				1	3	6	9	13+2?	4	38+2?
Pinnipeds																						
Arctocephalus forsteri																			1	2		3
Total Seals																						

Table 4. Summary of cetacean and pinniped stranding reports by geographical location in Queensland, 2010. n=62 confirmed reports and 6 unconfirmed reports (?).

Species	GOC	Qld (east coast in 1° latitudinal blocks, see Figure 4 for geographical overview)																			Total
		9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
Baleen whales																					
Megaptera novaeangliae														2		1		2		1+1?	2	8+1?
Toothed whales																					
Kogia breviceps															1					1		2
Mesoplodon layardii																	1					1
Peponocephala electra																		1		1		2
Unidentified												1?	1?					1				1+2?
Total whales												1?	1?	2	1	1	1	4		3+1?	2	14+3?
Dolphins																					
Delphinus delphis																		3	2	1	13	19
Tursiops spp.										1									1	1		3
Tursiops truncatus																		2	1	2	1	6
Tursiops aduncus																		1	3			4
Sousa chinensis									2											1		3
Stenella longirostris															1		1					2
Orcaella heinsohni												2				1						3
Grampus griseus								1+1?														1
Unidentified	1								1							1?	1	2		1+1?		6+3?
Total dolphins								1+1?	3	1		2			1	1+1?	2	8	7	6+1?	14	47 +3?
Pinnipeds																					
Arctocephalus forsteri																		1				1
Total Seals																		1				1

Table 5. Summary of cetacean and pinniped stranding reports by geographical location in Queensland, 2011. n=85 confirmed reports and 3 unconfirmed reports (?).

Species	GOC	Qld (east coast in 1° latitudinal blocks, see Figure 4 for geographical overview)																				Total
		9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
Baleen whales																						
Megaptera novaeangliae											2					2	4	4		6		18
Balaenoptera spp.						1																1
Toothed whales																						
Kogia breviceps														1								1
Ziphius cavirostris																	1					1
Peponocephala electra																		1	2			3
Globicephala macrorhynchus																			1			1
Unidentified																			1			1
Total whales						1					2			1		2	5	5	4	6		26
Dolphins																						
Delphinus delphis																			4		3	7
Tursiops spp.																	2	4	3	2		11
Tursiops truncatus																					2	2
Tursiops aduncus											2						1	2			1	6
Sousa chinensis													1	1		5	1		2	3		13
Stenella longirostris																			1	1		2
Orcaella heinsohni												2		1		1			1			5
Stenella attenuata															1			2				3
Unidentified												1				1?			4	4		8
Total dolphins											2	3	1	2	1	6+1?	4	8	15	10+2?	6	58+3?
Pinnipeds																						
Arctocephalus forsteri																		1				
Total Seals																		1				1

Table 6. Summary of cetacean and pinniped strandings by year and identified sources of mortality (suspected or confirmed) for Queensland, 2001-2011. Numbers in parentheses represent additional animals that were released alive.

Cause of stranding and mortality	Year										
	2001*	2002*	2003*	2004*	2005*	2006*	2007*	2008	2009	2010	2011
Natural causes											
Disease and ill health	3	2				4	3	3	4	1	9
Trapped by natural event		1				(1)	(3)				
Stingray barb	1										
Predation/ predator attack				2	1				(1)		1
Other	3								1	2	
Anthropogenic causes											
Disease			1								
Boat strike/ fractures			1	3	2	(2)	(3)	(5)	1		(1)
Netting/crabbing/ entanglement in ropes or fishing line	4	1(1)	(2)	3(3)	1	1(5)	(11)	(2)	2 (1)+(1^{r})		(5)
Non-permitted hunting											
Shark control program	10 (1)	8 (1)	14 (2)	12(7)	21 (9)	21 (6)	21 (4)	25 (8)	14 (7)+(1^{r})	21 (1)	15 (5)
Ingested foreign material/fishing hooks									1		
Research											
Undetermined	1	1			2(1)	3	3	(1)	1		2
Undetermined cause	19(4)	22(6)	15(1)	28(1)	25(5)	20(4)	31(8)	20(10)	31(3)	34(3)	43(4)
Total	41(5)	35(8)+2?	31(5)+2?	47(8)+8?	52(15)+3?	49(18)+6?	52(29)+2?	48(26) +2?	55(12)+2^{r}+3?	58(4)+6?	70(15) + 3?

*Data for 2001-2007 were taken from Greenland and Limpus (2008); ?, unconfirmed report; ^{r}, second sighting (included elsewhere).

Table 7. Summary of cetacean and pinniped strandings and mortality with identified sources of mortality for eastern Queensland, 2008. Numbers in parentheses represent additional animals that were released alive. Only confirmed sightings are included in this table.

Species	Natural causes	Human related				Unidentified causes
		Boat strike/ fractures	Fisheries-related activity and entanglement*	Shark Control Program	Other/presumed anthropogenic activities	
Baleen whales						
Megaptera novaeangliae		(1)	(1)	(1)		5(2)
Balaenoptera acutorostrata						(1)
Balaenoptera musculus						1
Unidentified		(4)				2
Toothed whales						
Globicephala macrorhynchus						1
Pseudorca crassidens						1
Feresa attenuata				3		
Total whales		(5)	(1)	3(1)		14(7)
Dolphins						
Delphinus delphis	1			15(4)		
Tursiops spp.			(1)	6(1)		2(1)
Orcaella heinsohni				1(2)		
Sousa chinensis	2					5
Unidentified			(1)			3(4)
Total dolphins	3		(3)	25(8)		10(5)
Pinnipeds						
Arctocephalus forsteri						(1)
Total Seals						*1*

?, unconfirmed report. * commercial netting, crabbing, entanglement in fishing line or ropes, or ingesting hooks.

Table 8. Summary of cetacean and pinniped strandings and mortality with identified sources of mortality for eastern Queensland, 2009. Numbers in parentheses represent additional animals that were released alive. Only confirmed sightings are included in this table.

Species	Natural causes	Human related				Unidentified causes
		Boat strike/ fractures	Fisheries-related activity and entanglement*	Shark control program	Other/presumed anthropogenic activities	
Baleen whales						
Megaptera novaeangliae			1	(4)		10(1)
Balaenoptera acutorostrata						1(1)
Unidentified						
Toothed whales						
Peponocephala electra						2
Globicephala macrorhynchus						2
Physeter macrocephalus						2
Pseudorca crassidens	1					
Feresa attenuata				3		
Total whales	1		1	3(4)		18(1)
Dolphins						
Delphinus delphis				9(1)		
Tursiops spp.	1		(1) +(1 ^{r})	(1) + (1 ^{r})		5(1)
Tursiops truncatus	1				1	
Orcaella heinsohni						
Stenella longirostris				2		
Sousa chinensis						7
Unidentified	2	1	1	(1)		2
Total dolphins	1	1	1(1) +(1 ^{r})	9(3)+(1^{r})	1	22
Pinnipeds						(1)
Arctocephalus forsteri	1		1			
Total seals	1		1			1

?, unconfirmed report, * commercial netting, crabbing, entanglement in fishing line or ropes, or ingesting hooks; ^{r} repeated sighting of an identified individual.

Table 9. Summary of cetacean and pinniped strandings and mortality with identified sources of mortality for eastern Queensland, 2010. Numbers in parentheses represent additional animals that were released alive. Only confirmed sightings are included in this table.

Species	Natural causes	Human related				Unidentified causes
		Boat strike/ fractures	Fisheries-related activity and entanglement *	Shark Control Program	Other/presumed anthropogenic activities	
Baleen whales						
Megaptera novaeangliae				(1)		5(2)
Unidentified						1
Toothed whales						
Peponocephala electra						2
Mesoplodon layardii						1
Kogia breviceps						2
Total whales				(1)		12(2)
Dolphins						
Delphinus delphis				18		1
Tursiops spp.	1					1(1)
Grampus griseus						1
Tursiops aduncus	1					3
Tursiops truncatus	1			2		3
Orcaella heinsohni						3
Stenella longirostris						2
Sousa chinensis				1		2
Unidentified						6
Total dolphins	3			21		22
Pinnipeds						
Arctocephalus forsteri						1
Total seals						1

?, unconfirmed report. * commercial netting, crabbing, entanglement in fishing line or ropes, or ingesting hooks.

Table 10. Summary of cetacean and pinniped strandings and mortality with identified sources of mortality for eastern Queensland, 2011. Numbers in parentheses represent additional animals that were released alive. Only confirmed sightings are included in this table.

Species	Natural causes	Human related				Unidentified causes
		Boat strike/ fractures	Fisheries-related activity and entanglement *	Shark Control Program	Other/presumed anthropogenic activities	
Baleen whales						
Megaptera novaeangliae	2	(1)		1(1)		10(3)
Balaenoptera spp.						1
Unidentified						
Toothed whales						
Kogia breviceps						1
Peponocephala electra						3
Globicephala macrorhynchus	1					
Ziphius cavirostris						1
Total whales	*3*	(1)		1(1)		16(3)
Dolphins						
Delphinus delphis				5(1)		1
Orcaella heinsohni				2	2	1
Sousa chinensis	1			1		11
Stenella attenuata						3
Stenella longirostris				1		1
Tursiops aduncus	2			1(1)		1
Tursiops spp.	3		(1)	(1)		6
Tursiops truncatus				2		
Unidentified			(4)	2(1)		2(1)
Total dolphins	*7*		(5)	14(4)	2	26(1)
Pinnipeds						
Arctocephalus forsteri						1
Total seals						*1*

?, unconfirmed report. * commercial netting, crabbing, entanglement in fishing line or ropes, or ingesting hooks.

Table 11. Summary of carcass condition of reported cetacean and pinniped strandings and mortality for Queensland, 2008.

Carcass Condition	Description	Species	Number recorded	Number examined*	Number to necropsy	Confirmed Cause
DZ	Moribund but rescued/escaped	*B. acutorostrata*	1	0	0	0
		M. novaeangliae	2	0	0	1
		D. delphis	4	0	0	4
		O. heinsohni	2	0	0	2
		Tursiops spp.	3	0	0	1
		Unknown dolphin	1	0	0	0
		Arctocephalus forsteri	1	0	0	0
D1	Alive but subsequently died	*B. musculus*	1	0	1	0
		S. chinensis	1	0	1	1
D2	Dead, carcass fresh – suitable for pathology or resembling a carcass fresh enough for eating	*M. novaeangliae*	2	0	0	0
		D. delphis	8	0	2	8
		O. heinsohni	1	0	0	1
		S. chinensis	3	0	2	1
		Tursiops spp	4	0	1	3
D3	Dead, carcass fair – decomposing but internal organs intact	*F. attenuata*	3	0	0	3
		G. macrorhynchus	1	0	0	0
		M. novaeangliae	1	0	0	0
		P. crassidens	1	0	0	0
		D. delphis	1	0	0	1
		Tursiops spp.	2	0	0	2
		Unknown dolphin	2	0	0	0
D4	Dead, carcass poor – advanced decomposition with internal organs falling apart	*M. novaeangliae*	2	0	0	0
		D. delphis	5	0	3	5
		S. chinensis	2	0	0	0
		Tursiops spp.	2	0	0	1
		Unknown	1	0	0	0
D5	Dead, mummified carcass with skin holding bones together	*S. chinensis*	1	0	0	0
D6	Dead, disarticulated bones – no soft tissue remaining	Unknown whale	1	0	0	0
D	Dead, not freshly dead, carcass condition not assessed	*D. delphis*	2	0	0	2
DL	Stranded but that escaped without assistance	*M. novaeangliae*	3	0	0	0
		Unknown whale	5	0	0	0
		Unknown dolphin	4	0	0	0
		Total	74	0	10	36

*Number examined refers to the carcasses inspected by trained staff. Note: Carcass conditions D1 to D4 are suitable for reliable assessment of external wounds such as from boat strike and propeller cuts. COD, cause of death.

Table 12. Summary of carcass condition of reported cetacean and pinniped strandings and mortality for Queensland, 2009.

Carcass Condition	Description	Species	Number recorded	Number examined*	Number to necropsy	Confirmed COD
DZ	Moribund but rescued/escaped	*M. novaeangliae*	5	0	0	4
		B. acutorostrata	1	0	0	0
		D. delphis	1	0	0	1
		Tursiops spp.	4	0	0	2
		Unidentified dolphin	1	0	0	1
D1	Alive but subsequently died	*B. acutorostrata*	1	0	0	0
		G. macrorhynchus	1	0	0	0
		M. novaeangliae	2	1	1	1
		P. crassidens	1	1	1	1
		S. chinensis	1	1	1	0
		T. truncatus	1	1	1	1
		A. forsteri	2	1	1	2
D2	Dead, carcass fresh – suitable for pathology or resembling a carcass fresh enough for eating	*F. attenuata*	3	0	0	3
		G. macrorhynchus	1	0	1	0
		M. novaeangliae	7	0	0	0
		P. electra	1	0	0	0
		D. delphis	3	0	0	3
		S. chinensis	3	0	1	0
		S. longirostris	1	0	0	1
		Tursiops spp.	3	0	2	1
		T. truncatus	1	0	0	1
		Unidentified dolphin	1	0	0	1
D3	Dead, carcass fair – decomposing but internal organs intact	*M. novaeangliae*	2	0	0	0
		P. electra	1	0	0	0
		D. delphis	6	0	0	6
		S. chinensis	1	0	0	0
		S. longirostris	1	0	0	1
		Tursiops spp.	2	0	0	0
		Unidentified dolphin	1	0	0	0
D4	Dead, carcass poor – advanced decomposition with internal organs falling apart	*P. macrocephalus*	2	0	0	0
		S. chinensis	2	0	0	0
		Tursiops spp.	1	0	0	0
		Unidentified dolphins	2	0	0	2
D5	Dead, mummified carcass with skin holding bones together	Unidentified dolphin	1	0	0	0
D6	Dead, disarticulated bones – no soft tissue remaining	-	-	-	-	-
D	Dead, not freshly dead, carcass condition not assessed	-		-	-	-
DL	Stranded but that escaped without assistance	Tursiops spp.	1	0	0	0
		Total	69	0	9	32

* Number examined refers to the carcasses inspected by trained staff. Note: Carcass conditions D1 to D4 are suitable for reliable assessment of external wounds such as from boat strike and propeller cuts. COD, cause of death.

Table 13. Summary of carcass condition of reported cetacean and pinniped strandings and mortality for Queensland, 2010.

Carcass Condition	Description	Species	Number recorded	Number examined	Number to necropsy	Confirmed COD
DZ	Moribund but rescued/escaped	*M. novaeangliae*	1	0	0	1
D1	Alive but subsequently died	*K. breviceps*	1	0	0	0
		M. novaeangliae	1	0	1	0
		T. aduncus	1	0	0	0
		Tursiops spp.	1	1	0	1
		Tursiops truncatus	1	0	1	1
		Unidentified dolphin	1	0	0	0
D2	Dead, carcass fresh – suitable for pathology or resembling a carcass fresh enough for eating	*K. breviceps*	1	0	0	0
		M. novaeangliae	3	0	0	0
		P. electra	1	0	0	0
		Unidentified whale	1	0	0	0
		D. delphis	10	0	1	9
		O. heinsohni	1	0	0	0
		S. chinensis	1	0	0	1
		S. longirostris	2	0	0	0
		T. aduncus	2	0	0	1
		T. truncatus	4	0	1	2
		Unidentified dolphin	1	0	1	0
					0	
D3	Dead, carcass fair – decomposing but internal organs intact	*M. layardii*	1	1	0	0
		P. electra	1	0	0	0
		D. delphis	8	0	0	8
		G. griseus	1	1	0	0
		O. heinsohni	1	0	1	0
		T. aduncus	1	0	1	0
		T. truncatus	1	0	0	0
		Unidentified dolphin	1	0	0	0
		A. forsteri	1	0	0	0
D4	Dead, carcass poor – advanced decomposition with internal organs falling apart	*M. novaeangliae*	1	0	0	0
		O. heinsohni	1	0	0	0
		S. chinensis	2	0	0	0
		Tursiops spp.	1	0	0	0
		Unidentified dolphins	2	0	0	0
D5	Dead, mummified carcass with skin holding bones together	Unidentified dolphin	1	0	0	0
D6	Dead, disarticulated bones – no soft tissue remaining	-				
D	Dead, not freshly dead, carcass condition not assessed	*D. delphis*	1	0	0	0
DL	Stranded but that escaped without assistance	*M. novaeangliae*	2	0	0	2
		Tursiops spp.	1	0	0	1
		Total	62	3	7	28

* Number examined refers to the carcasses inspected by trained staff. Note: Carcass conditions D1 to D4 are suitable for reliable assessment of external wounds such as from boat strike, propeller cuts, butchering. COD, cause of death.

Table 14. Summary of carcass condition of reported cetacean and pinniped strandings and mortality for Queensland, 2011.

Carcass Condition	Description	Species	Number recorded	Number examined*	Number to necropsy	Confirmed COD
DZ	Moribund but rescued/escaped	*M. novaeangliae*	2	0	0	2
		D. delphis.	1	0	0	1
		Tursiops spp.	1	0	0	1
		Unidentified dolphin	1	0	0	1
D1	Alive but subsequently died	*G. macrorhynchus*	1	0	1	1
		M. novaeangliae	4	0	2	2
		T. aduncus	1	0	0	1
D2	Dead, carcass fresh – suitable for pathology or resembling a carcass fresh enough for eating	*K. breviceps*	1	0	1	0
		M. novaeangliae	4	0	2	0
		P. electra	2	0	1	0
		D. delphis	4	0	0	3
		O. heinsohni	2	0	0	2
		S. chinensis	3	0	2	1
		S. attenuata	2	0	0	0
		S. longirostris	2	0	0	1
		T. aduncus	3	0	0	2
		Tursiops spp.	3	0	1	2
		T. truncatus	2	0	0	2
		Unidentified dolphin	4	0	1	2
		A. forsteri	1	0	0	0
D3	Dead, carcass fair – decomposing but internal organs intact	*M. novaeangliae*	2	0	0	0
		P. electra	1	0	0	0
		O. heinsohni	1	0	0	0
		S. chinensis	4	0	1	0
		S. attenuata	1	0	0	0
		Tursiops spp.	3	0	0	0
D4	Dead, carcass poor – advanced decomposition with internal organs falling apart	*Balaenoptera* spp.	1	0	0	0
		M. novaeangliae	2	0	0	0
		Z. cavirostris	1	0	0	0
		O. heinsohni	2	0	0	2
		S. chinensis	3	0	0	0
		Tursiops spp.	2	0	0	0
D5	Dead, mummified carcass with skin holding bones together	*D. delphis*	2	0	0	2
		S. chinensis	2	0	0	0
D6	Dead, disarticulated bones – no soft tissue remaining	-	-	-	-	-
D	Dead, not freshly dead, carcass condition not assessed	*S. chinensis*	1	0	0	1
		Tursiops spp.	1	0	1	1
DL	Stranded but that escaped without assistance	*M. novaeangliae*	3	0	0	3
		Unidentified whale	1	0	0	1
		T. aduncus	1	0	0	1
		Tursiops spp.	1	0	0	1
		Unidentified dolphins	4	0	0	4
		Total	85	0	15	42

*Number examined refers to the carcasses inspected by DERM, DEEDI and/or GBRMPA. Note: Carcass conditions D1 to D4 are suitable for reliable assessment of external wounds such as from boat strike and propeller cuts. COD, cause of death.

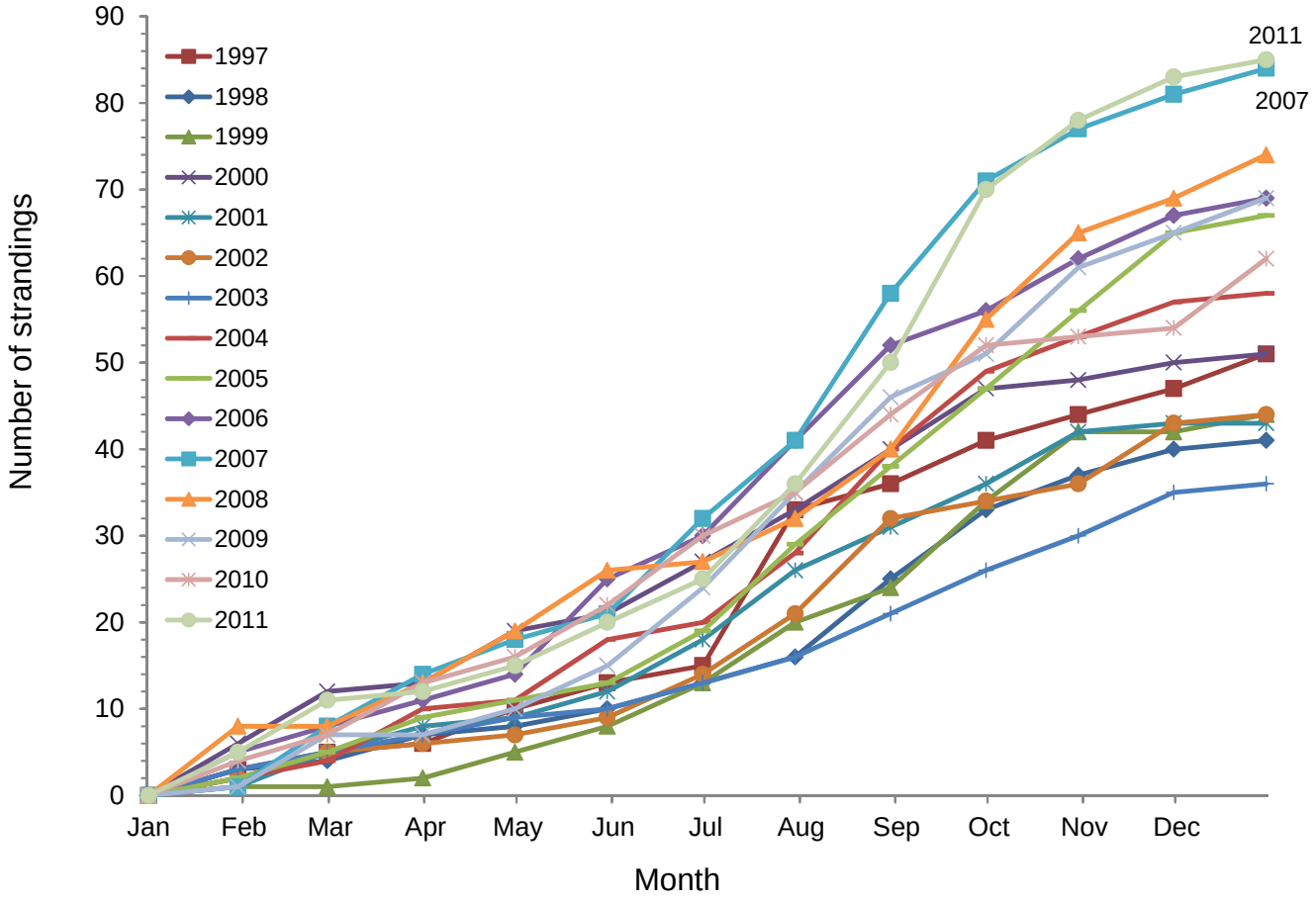


Figure 1 Cumulative cetacean and pinniped reported strandings in Queensland per month and year between 1997 and 2011.

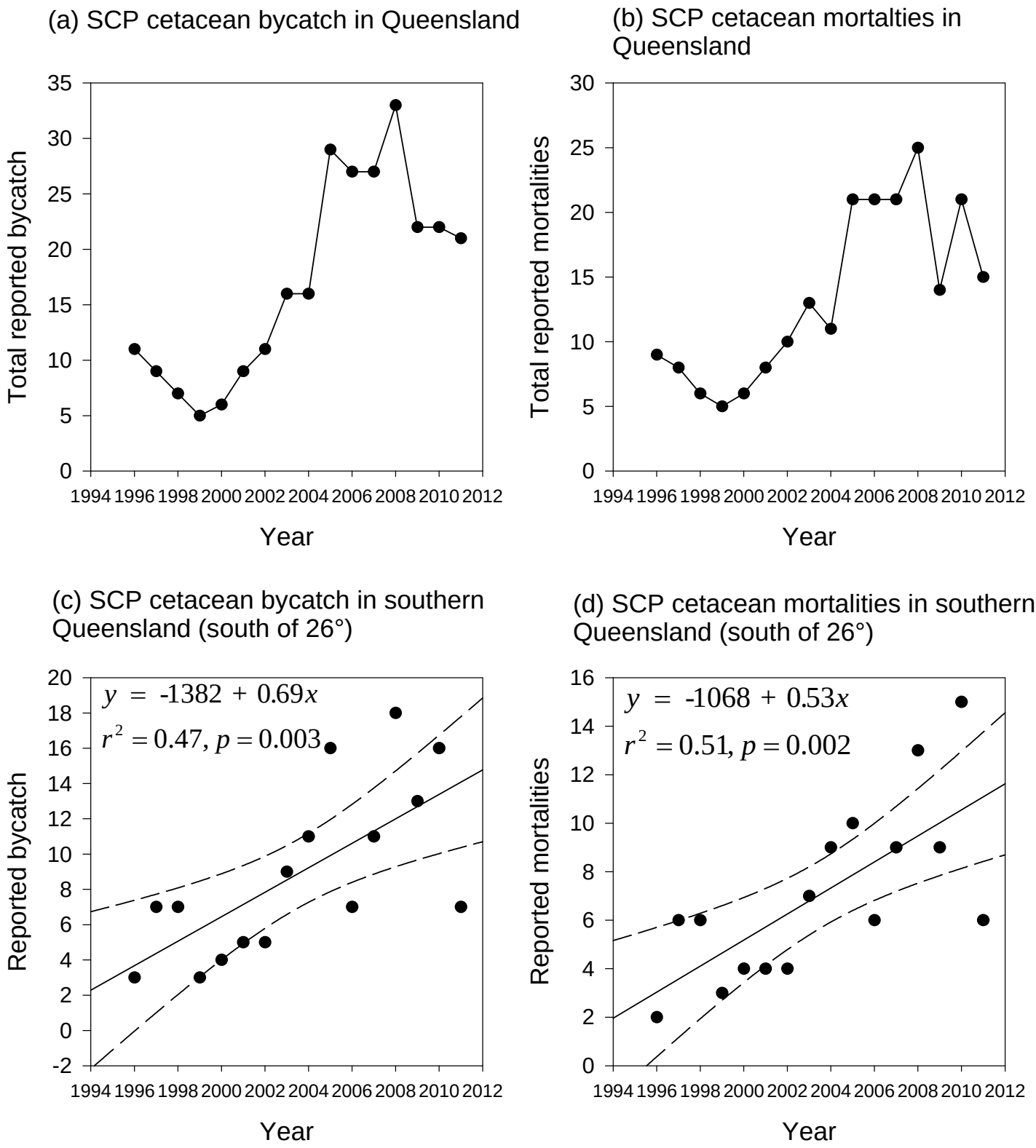


Figure 2. Cetacean bycatch in the Queensland Shark Control Program (SCP): (a) total for Qld, (b) mortalities of cetaceans in Qld, (c) total for southern region (south of 26°) where gear has not been changed since 1992 (Sumpton *et al.* 2012), and (d) mortalities in the southern SCP. The trend lines in (c) and (d) were fitted using ordinary-least squares regression, and the dashed lines represent 95 per cent confidence intervals.

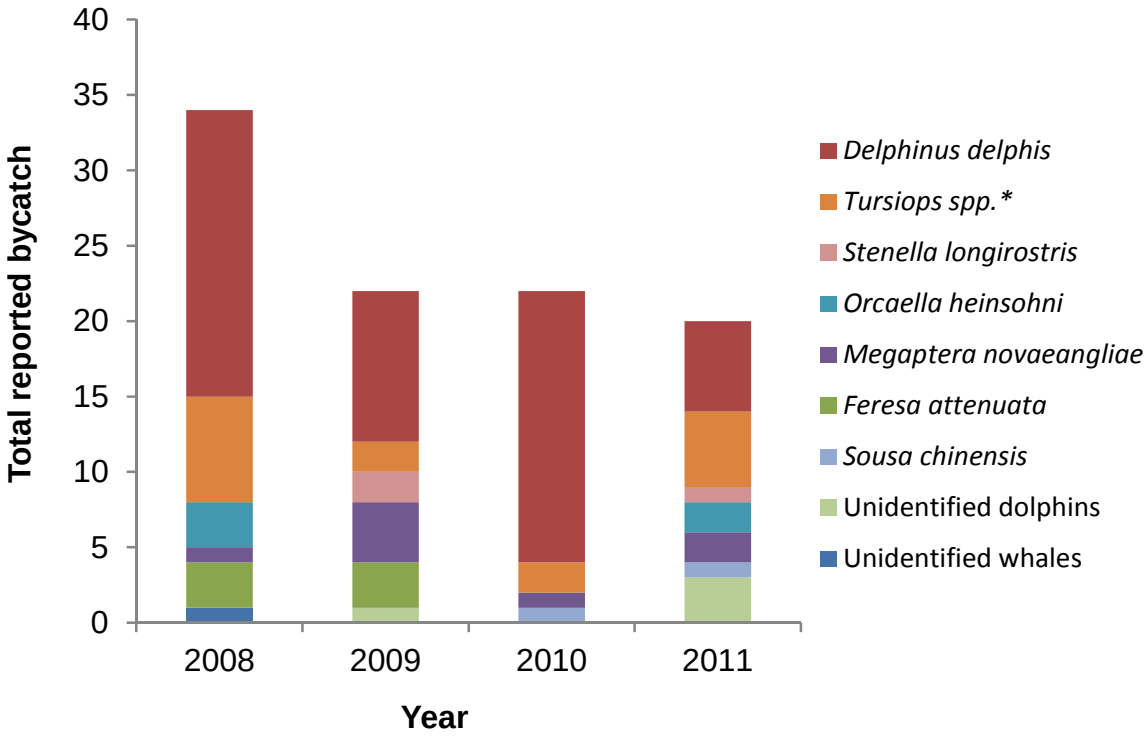


Figure 3. species composition of cetacean bycatch in the Queensland Shark Control Program between 2008 and 2011. All reported interactions are included. No pinnipeds were caught. *,*Tursiops truncatus* or *Tursiops aduncus*.

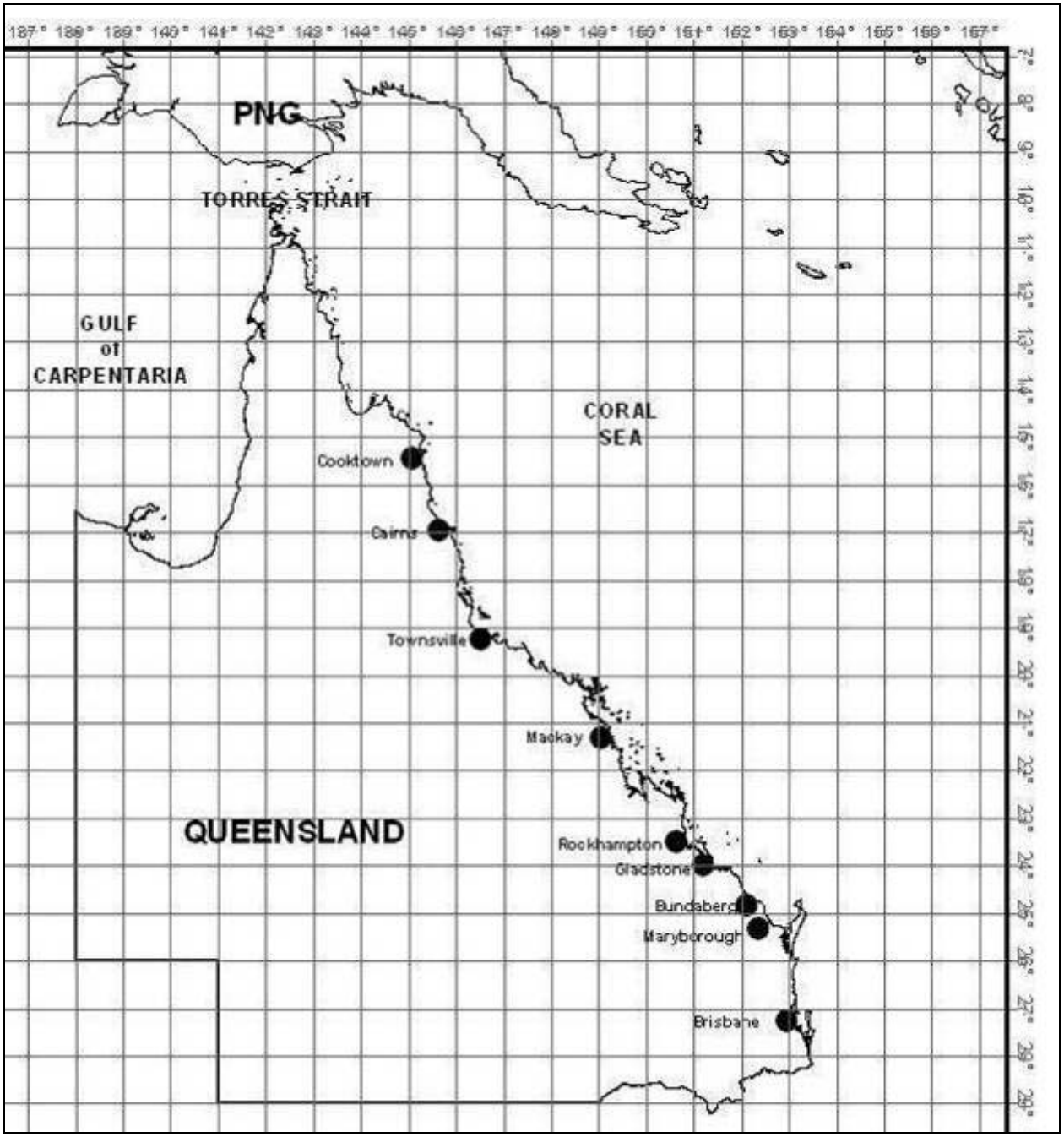


Figure 4. Queensland map showing latitudinal and longitudinal grids.

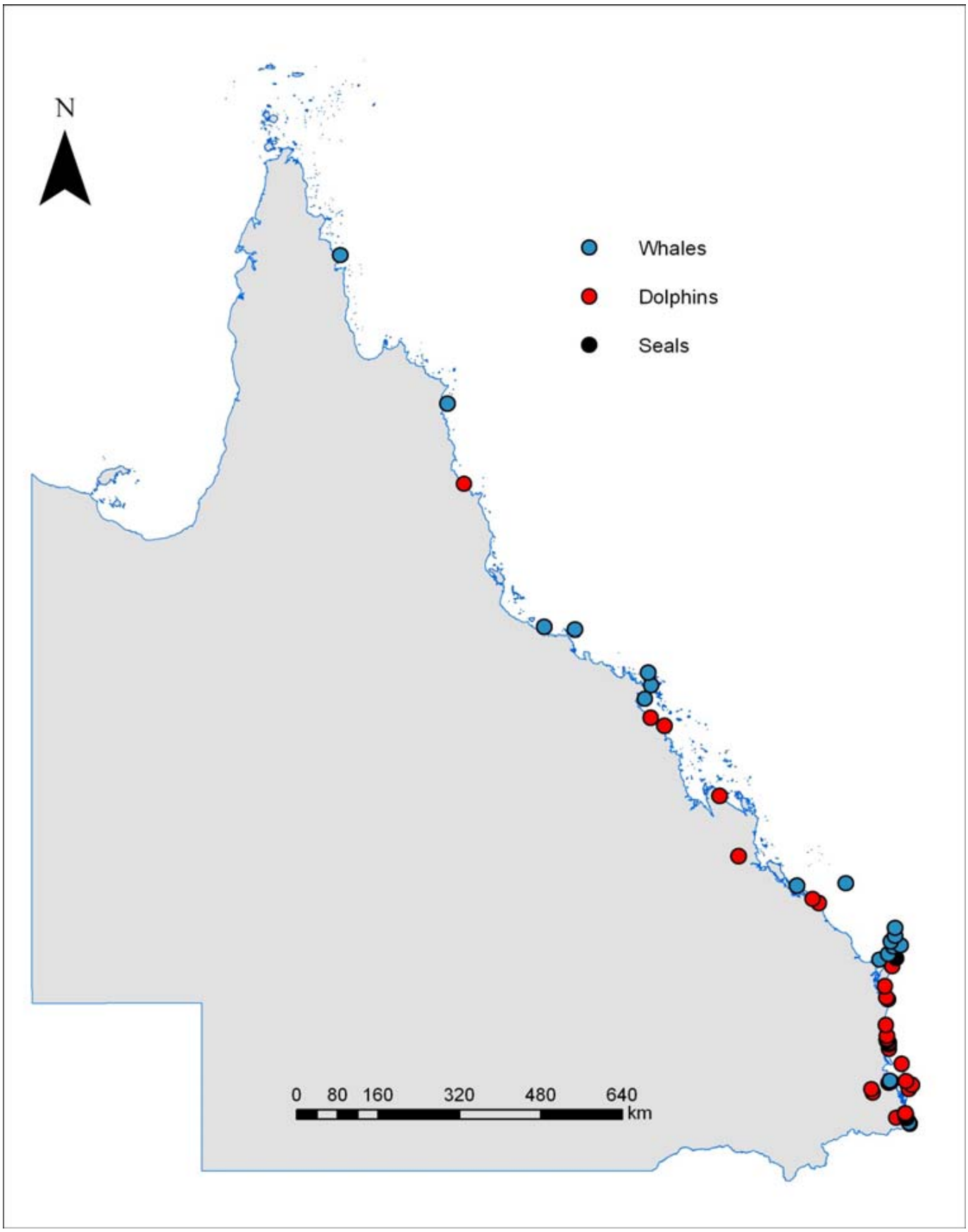


Figure 5. Distribution of strandings and mortality of all cetaceans and pinnipeds recorded for 2008 in the Queensland marine wildlife stranding and mortality database (n = 74).

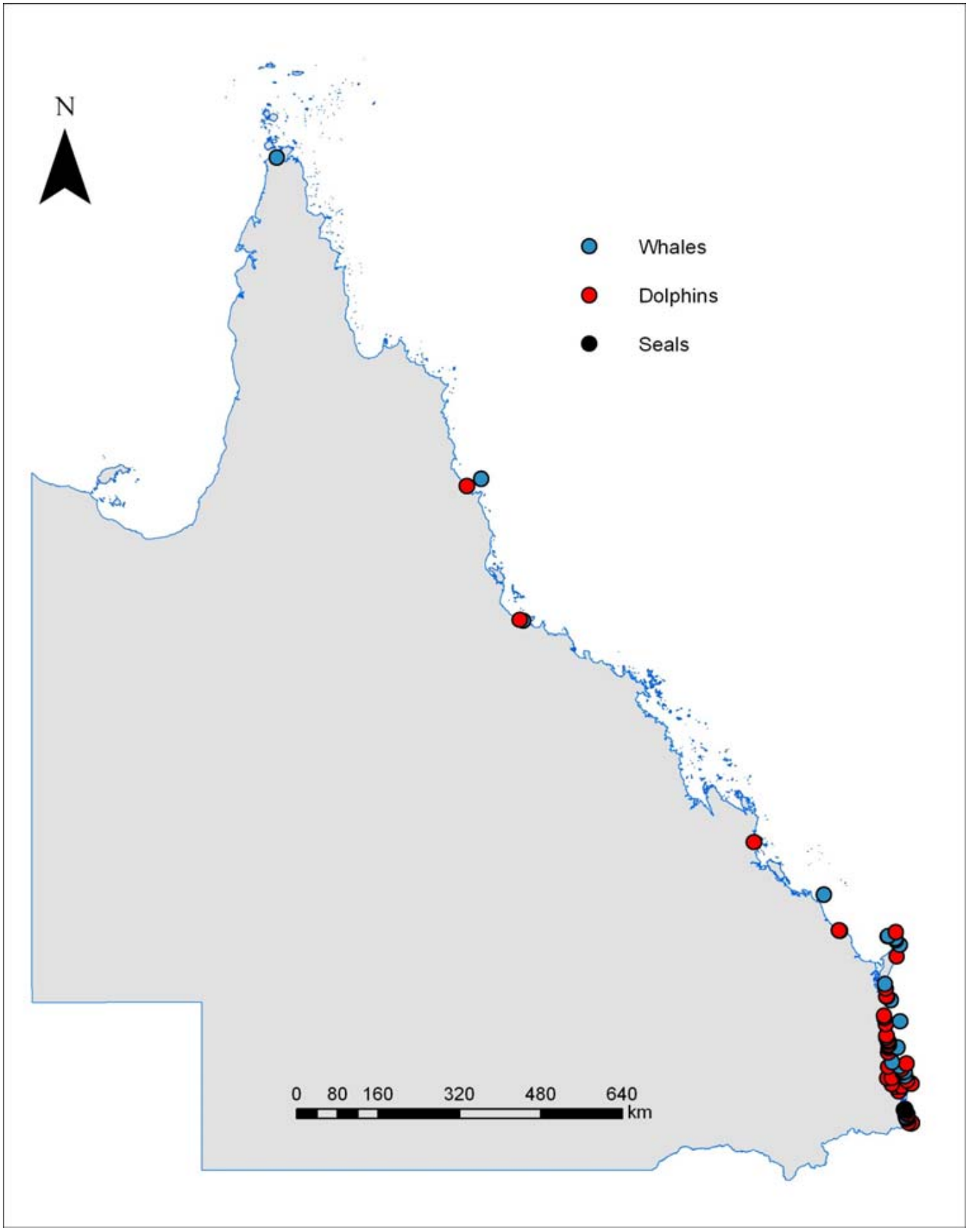


Figure 6. Distribution of strandings and mortality of all cetaceans and pinnipeds recorded for 2009 in the Queensland marine wildlife stranding and mortality database (n = 69).

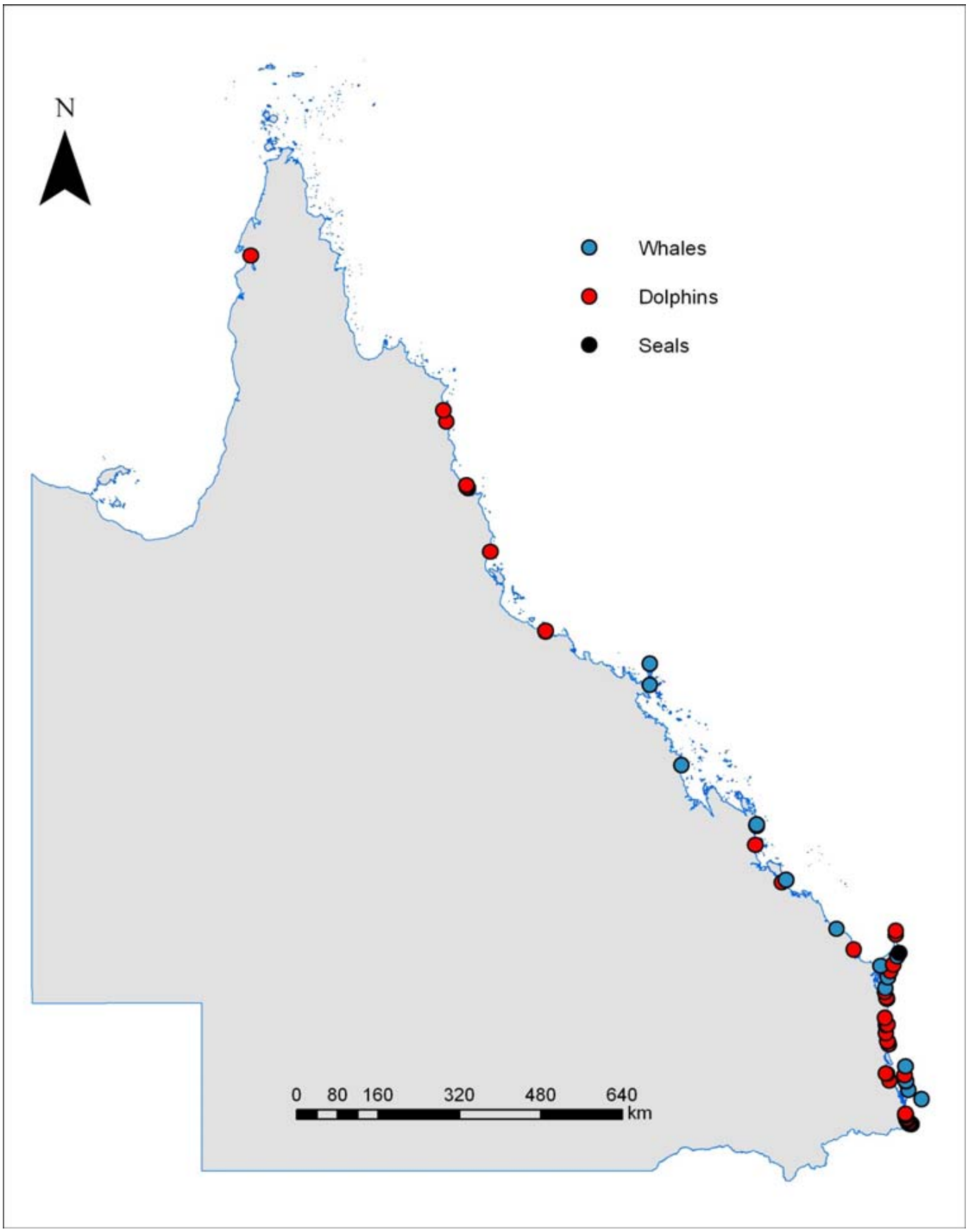


Figure 7. Distribution of strandings and mortality of all cetaceans and pinnipeds recorded for 2010 in the Queensland marine wildlife stranding and mortality database (n = 62).

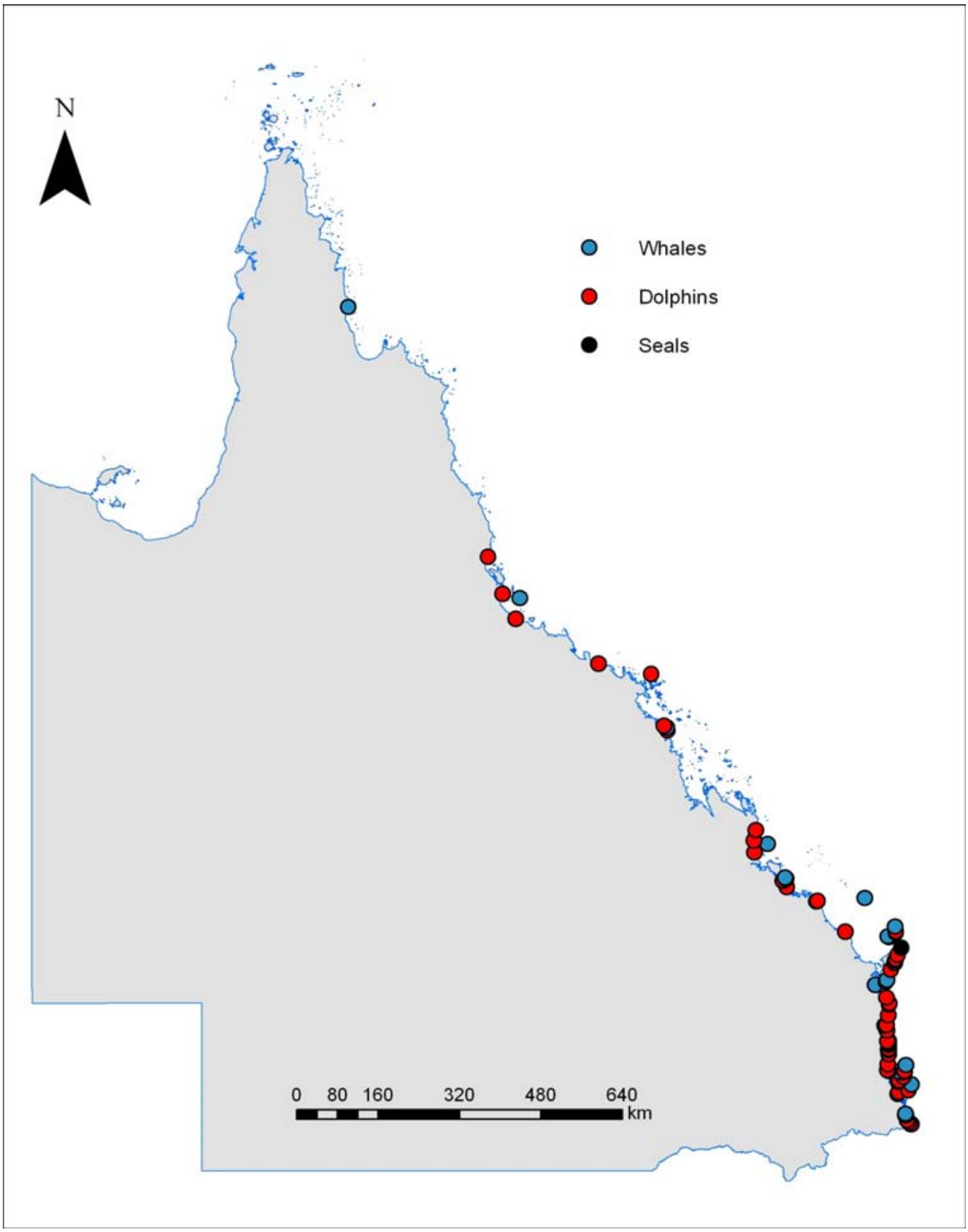


Figure 8. Distribution of strandings and mortality of all cetaceans and pinnipeds recorded for 2011 in the Queensland marine wildlife stranding and mortality database (n = 85).

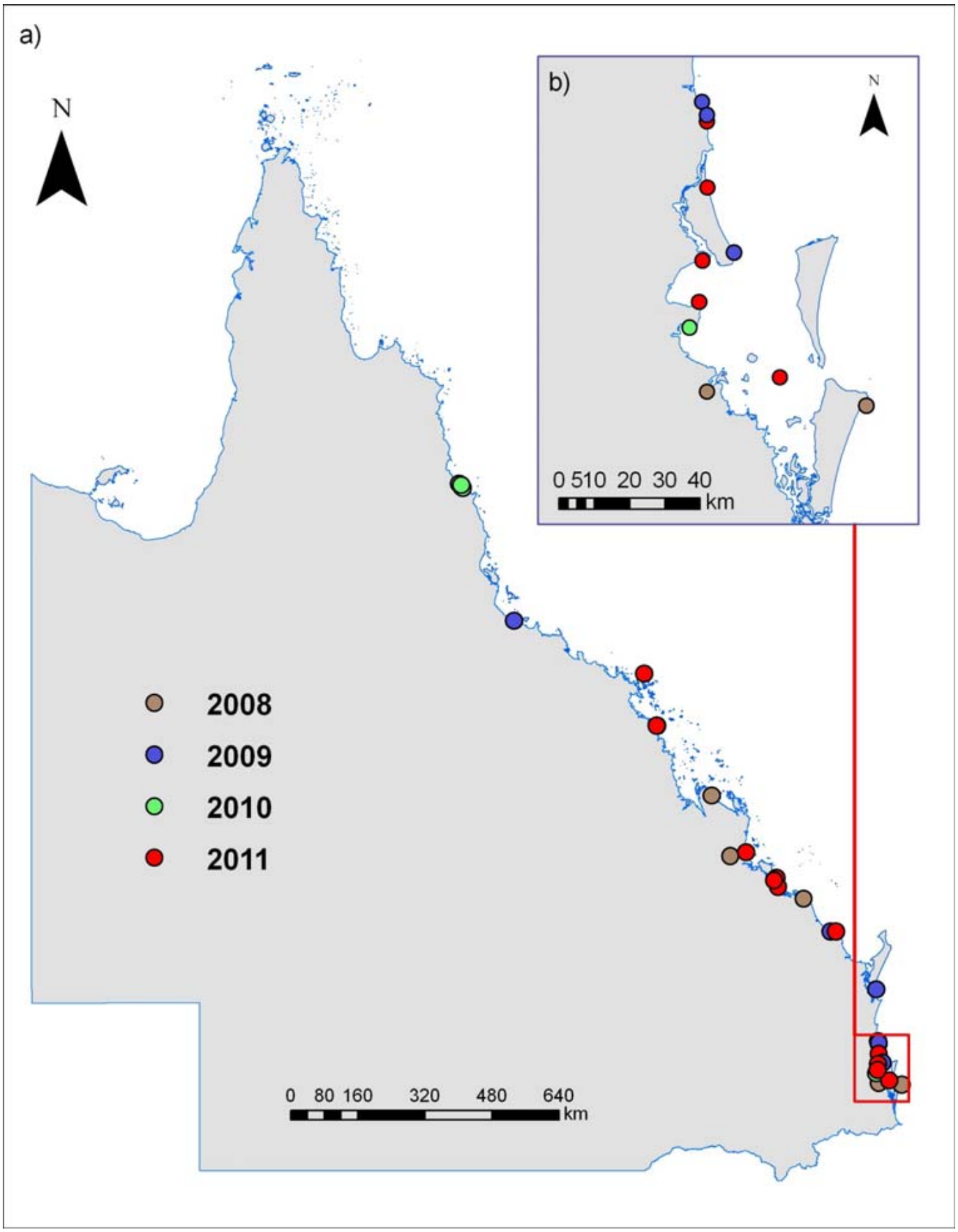


Figure 9. (a) Distribution of strandings of *Sousa chinensis* in the Queensland marine wildlife stranding and mortality database between 2008 and 2011 in (n = 30), (b) strandings of *S. chinensis* in northern Morton Bay and southern Sunshine Coast.

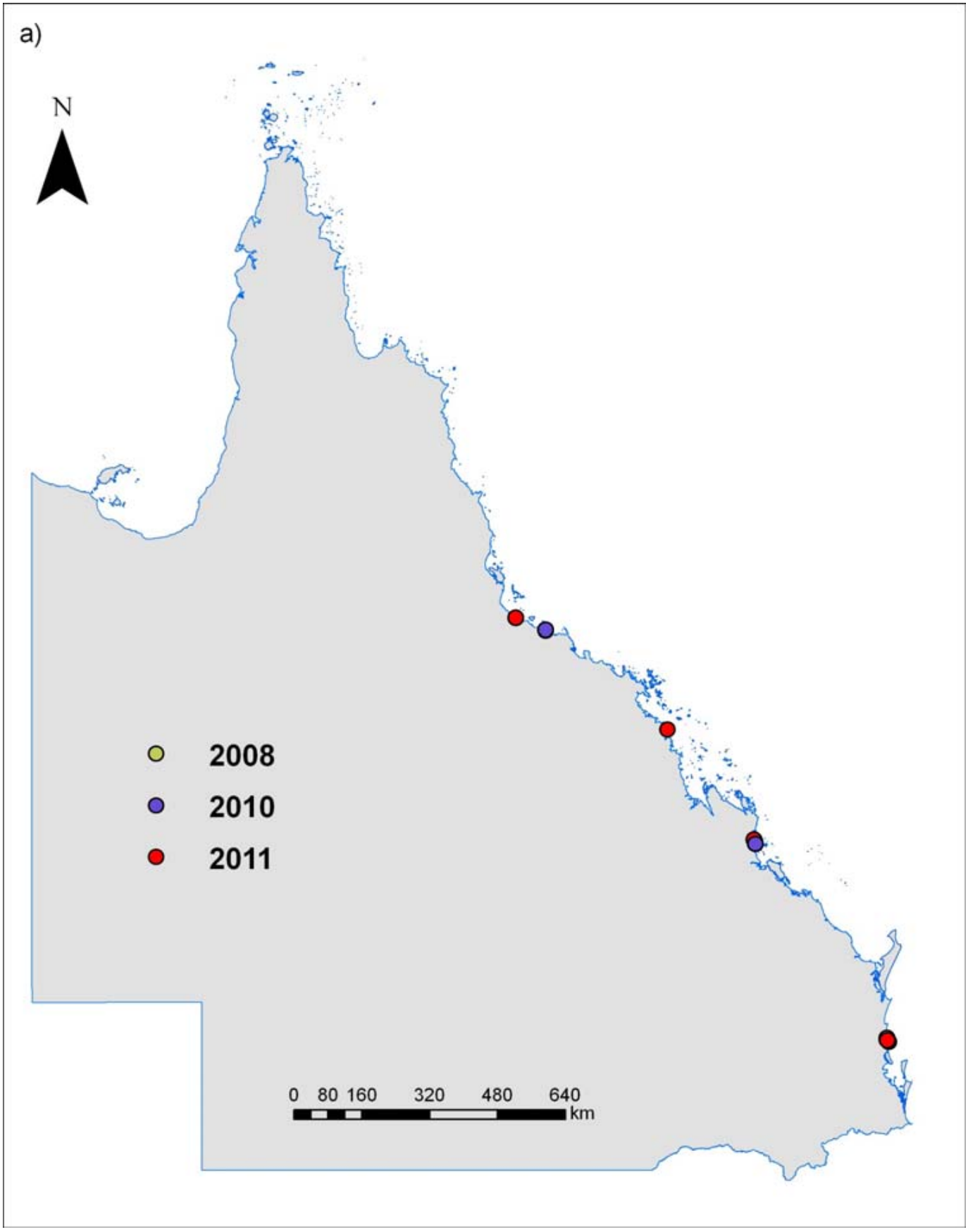


Figure 10. (a) Distribution of strandings of *Orcaella heinsohni* in the Queensland marine wildlife stranding and mortality database between 2008 and 2011 in (n = 11).

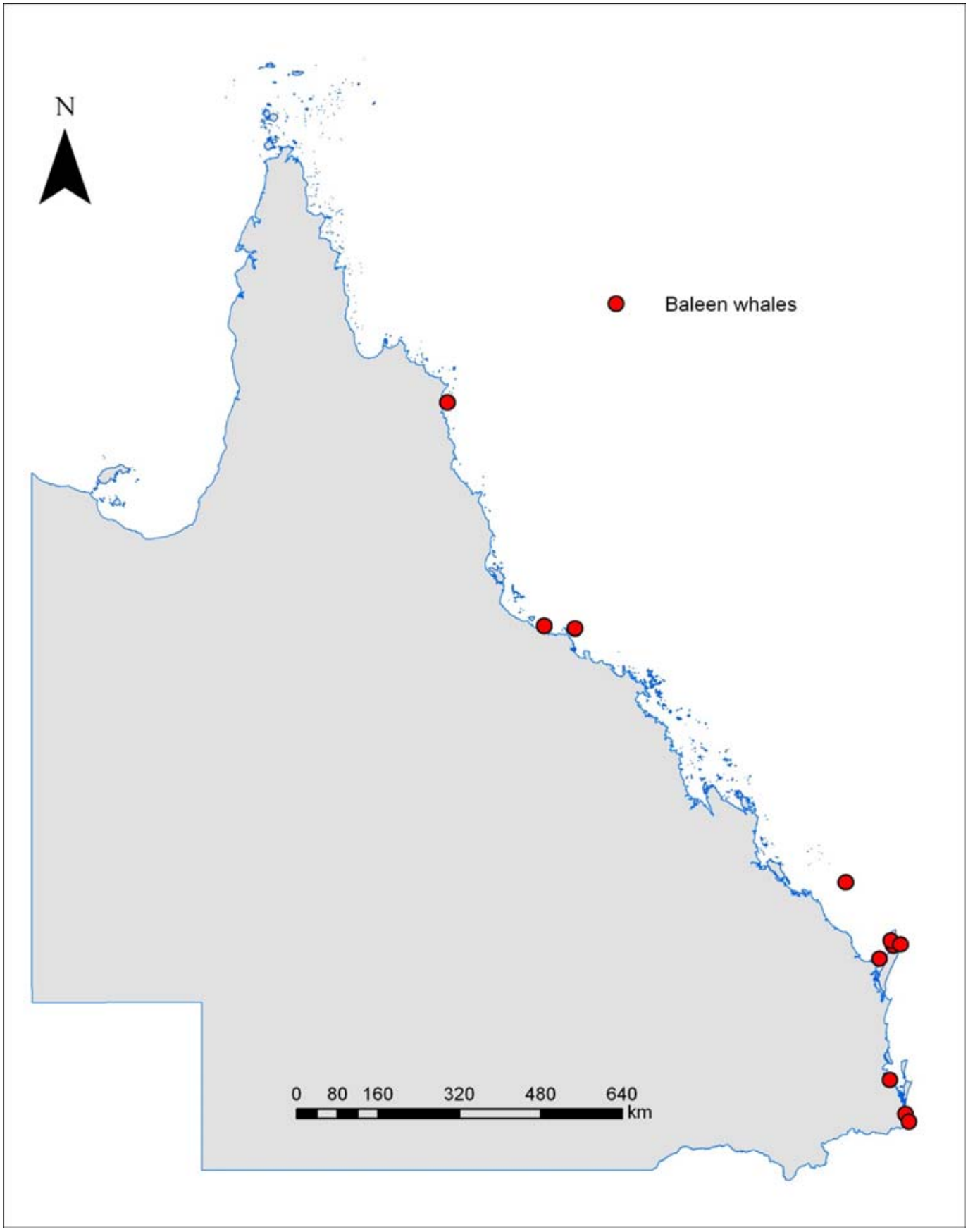


Figure 11. Distribution of strandings and mortality of baleen whales (Suborder Mysticeti) recorded for 2008 in the Queensland marine wildlife stranding and mortality database (n = 12).

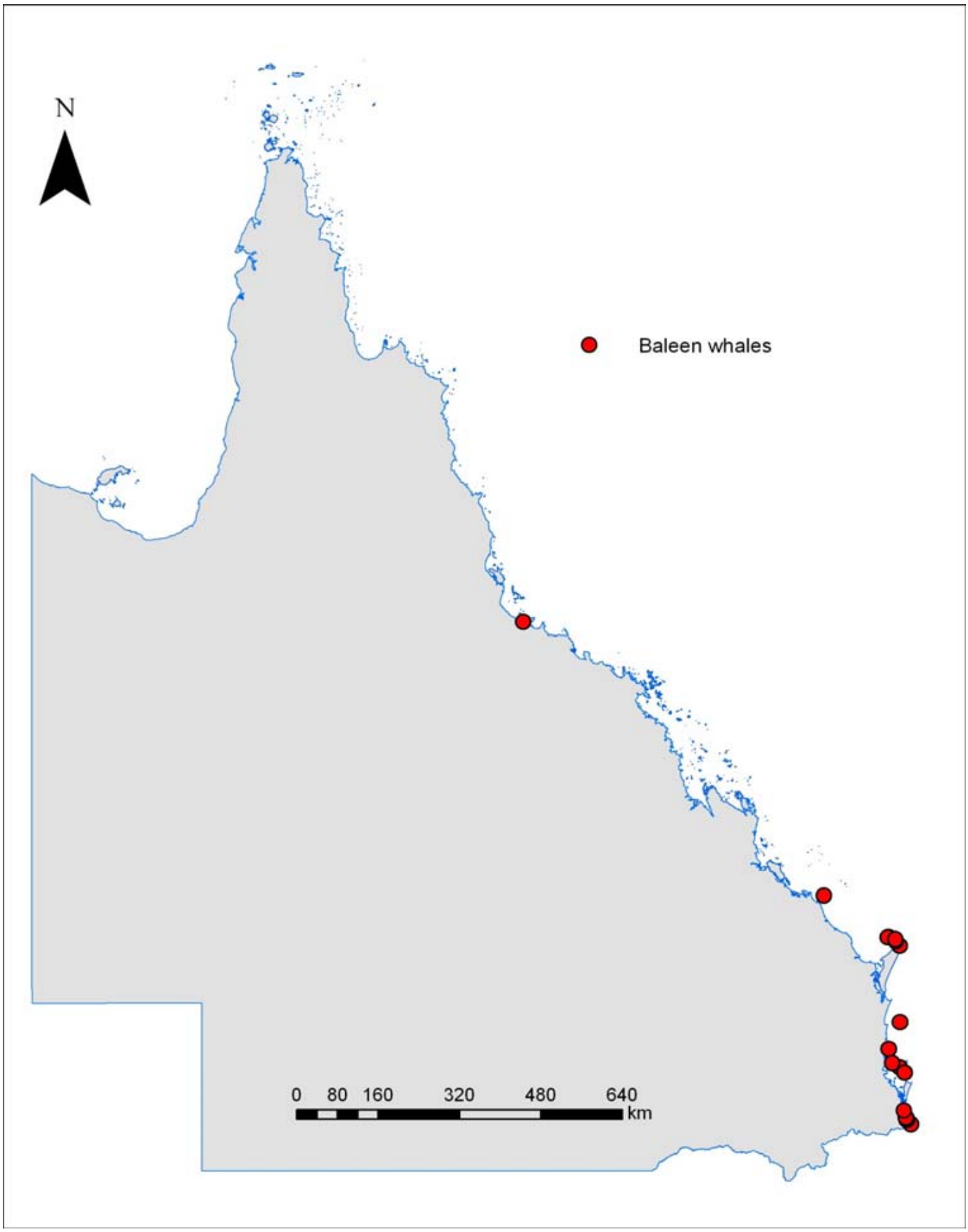


Figure 12. Distribution of strandings and mortality of baleen whales recorded for 2009 in the Queensland marine wildlife stranding and mortality database (n = 18).

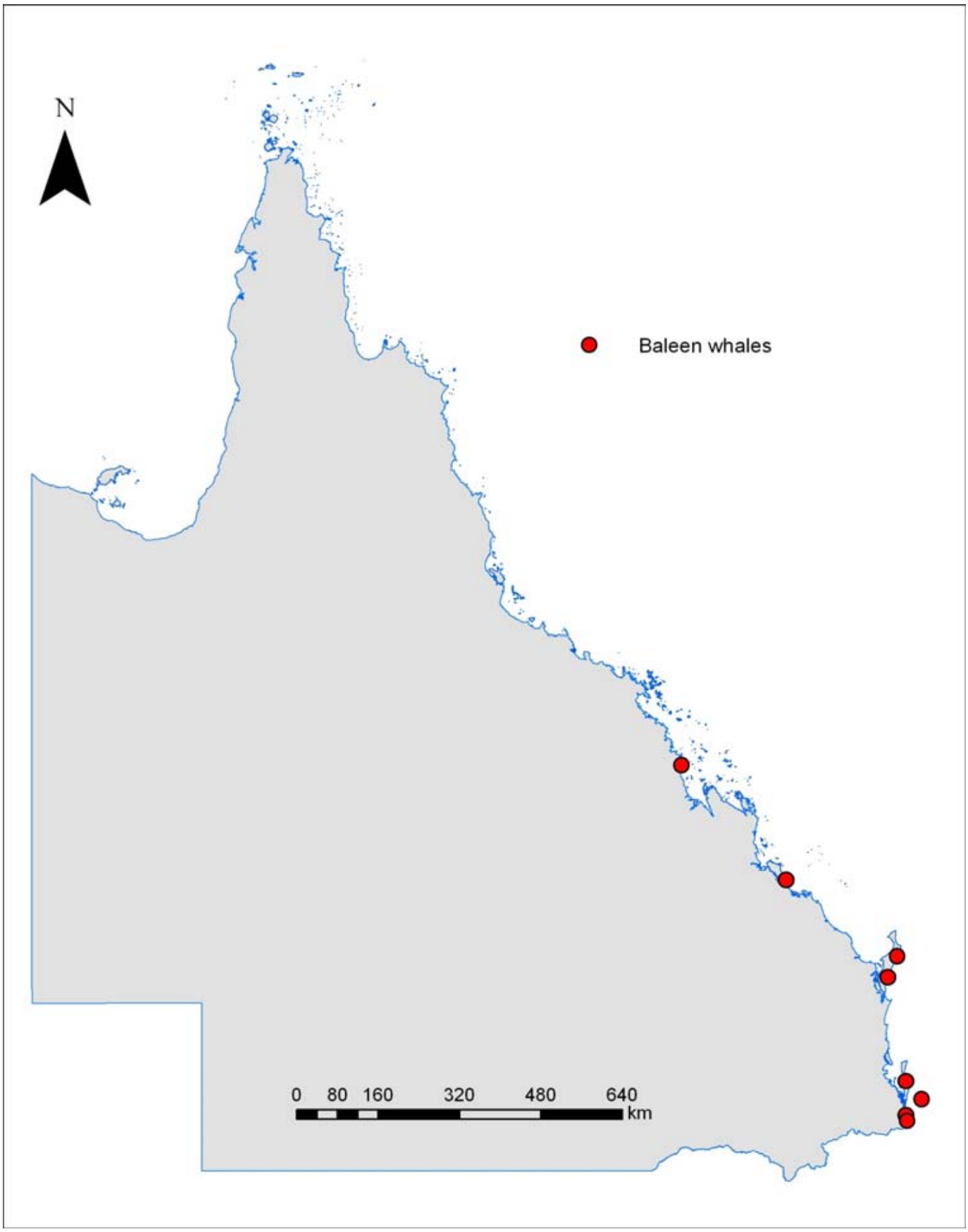


Figure 13. Distribution of strandings and mortality of baleen whales recorded for 2010 in the Queensland marine wildlife stranding and mortality database (n = 9).

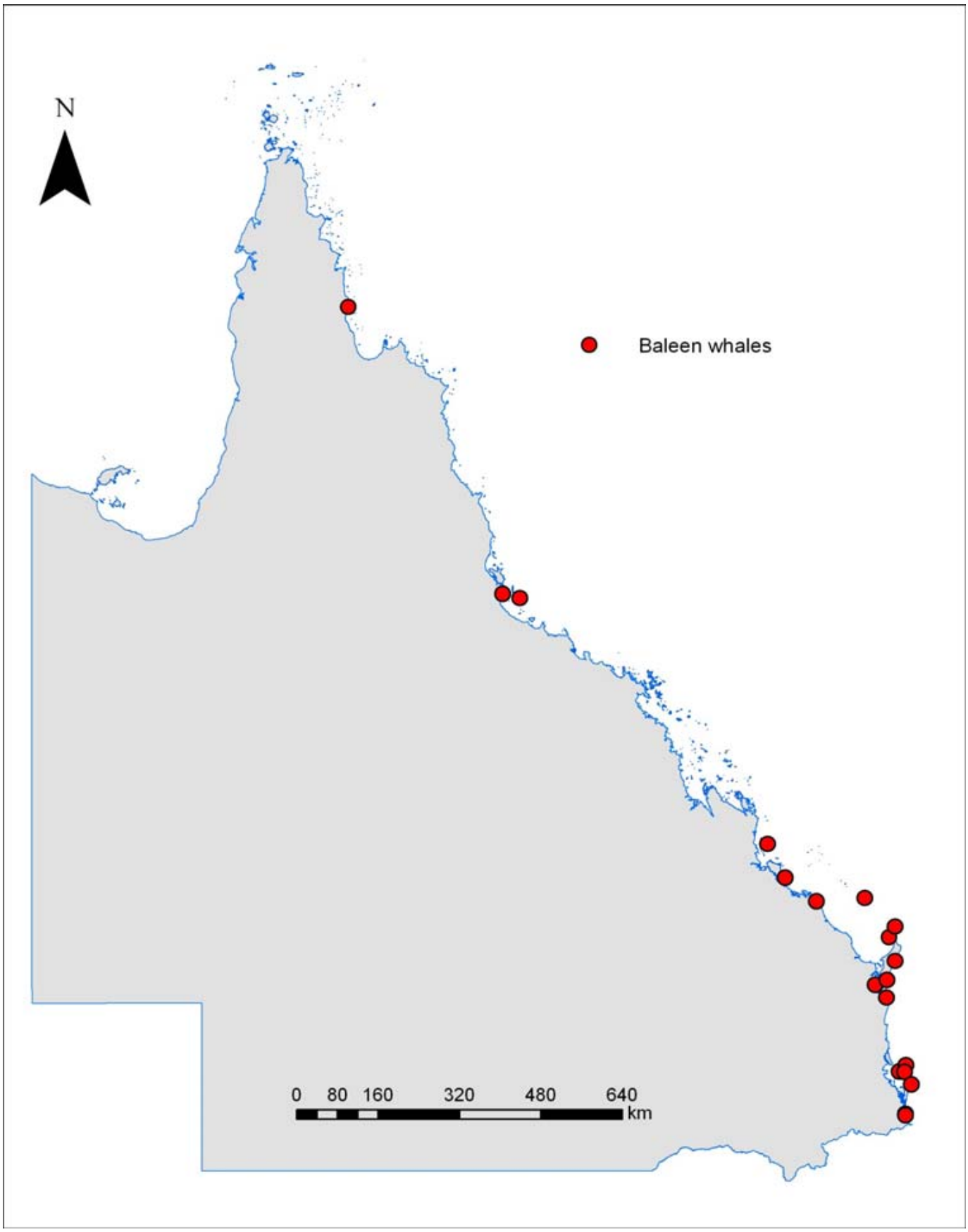


Figure 14. Distribution of strandings and mortality of baleen whales recorded for 2011 in the Queensland marine wildlife stranding and mortality database (n = 19).

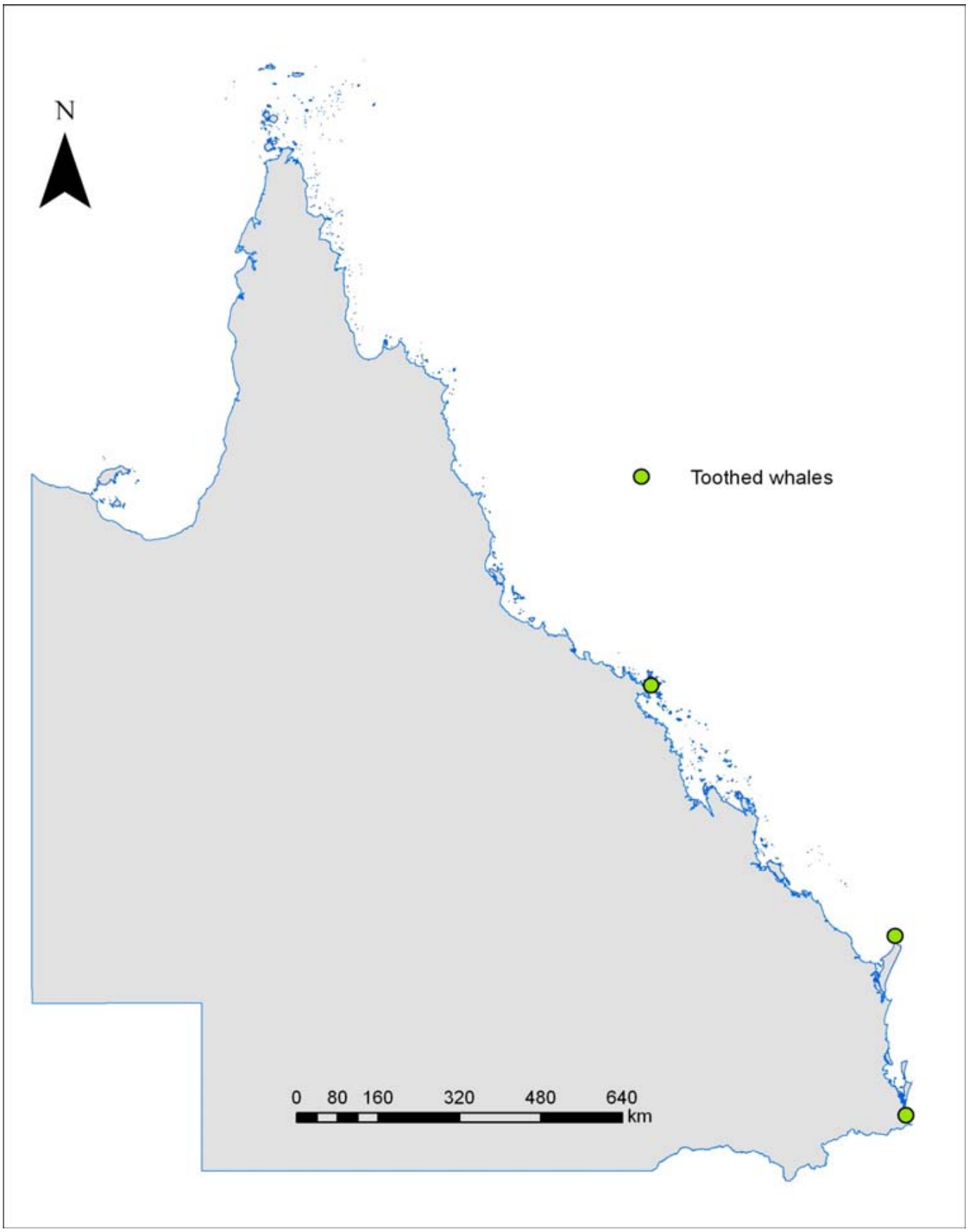


Figure 15. Distribution of strandings and mortality of toothed whales (Suborder Odontoceti, excluding dolphins) recorded for 2008 in the Queensland marine wildlife (n= 5)

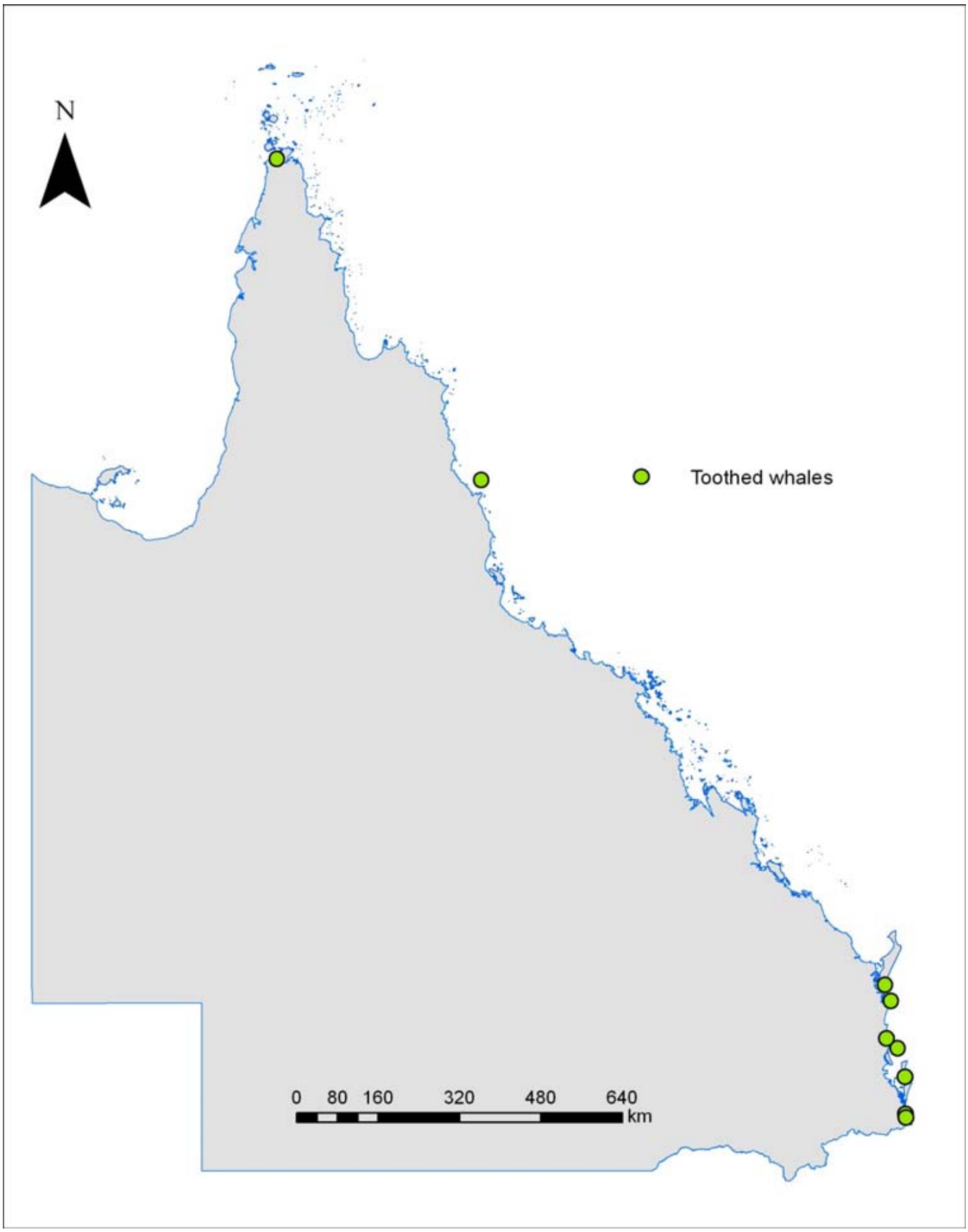


Figure 16. Distribution of strandings and mortality of toothed whales recorded for 2009 in the Queensland marine wildlife stranding and mortality database (n=10).

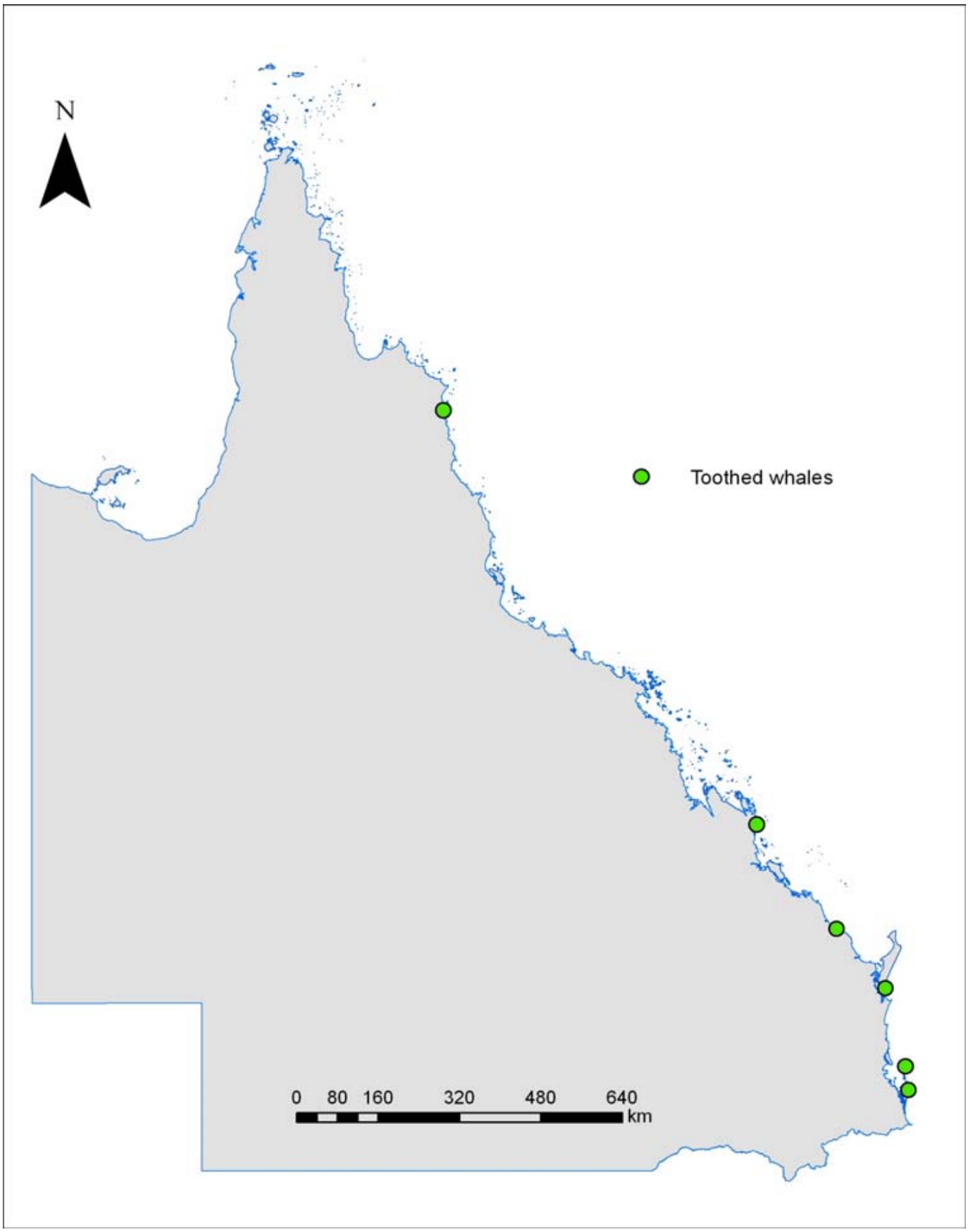


Figure 17. Distribution of strandings and mortality of toothed whales recorded for 2010 in the Queensland marine wildlife stranding and mortality database (n=6).

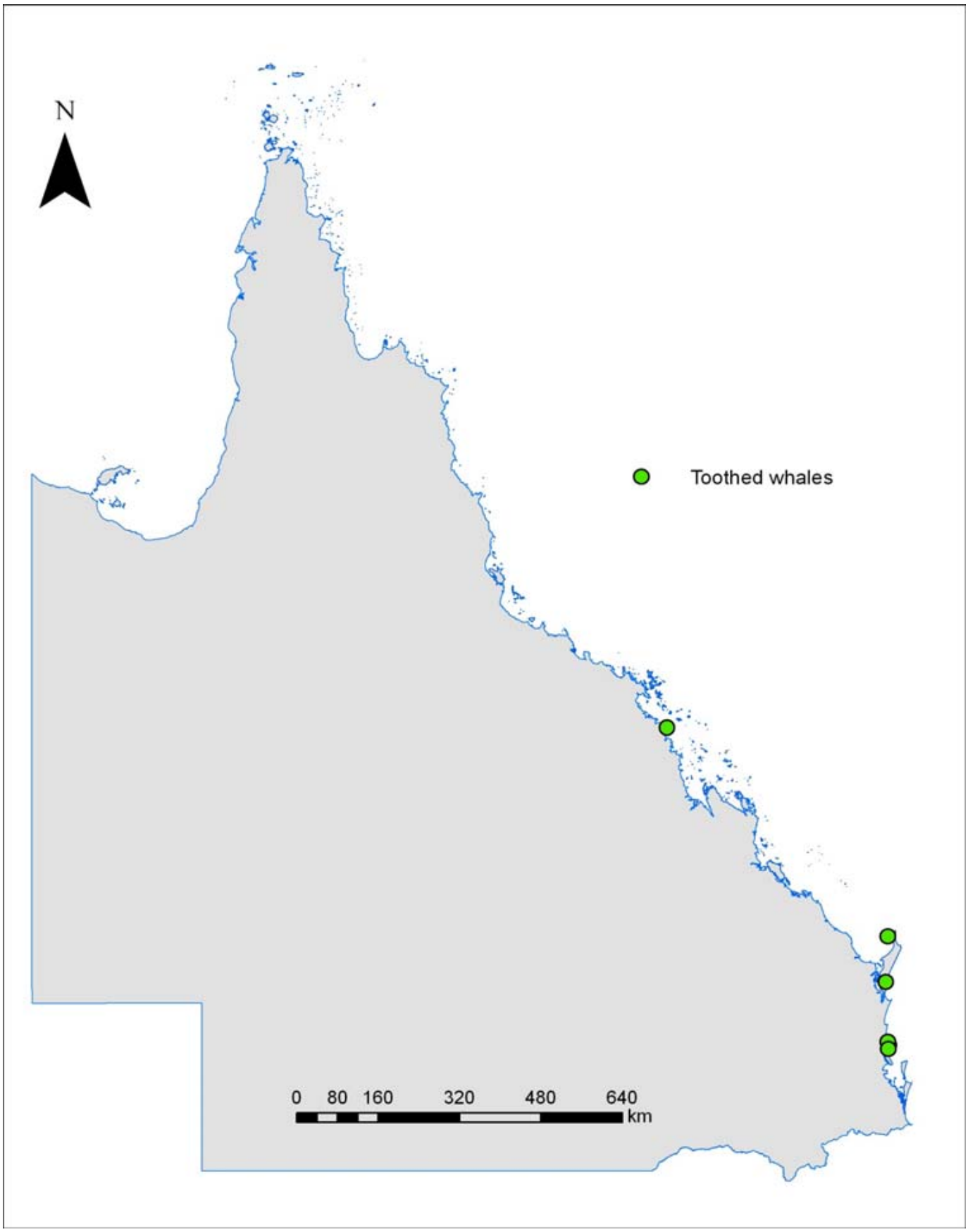


Figure 18. Distribution of strandings and mortality of toothed whales recorded for 2011 in the Queensland marine wildlife stranding and mortality database (n=8).

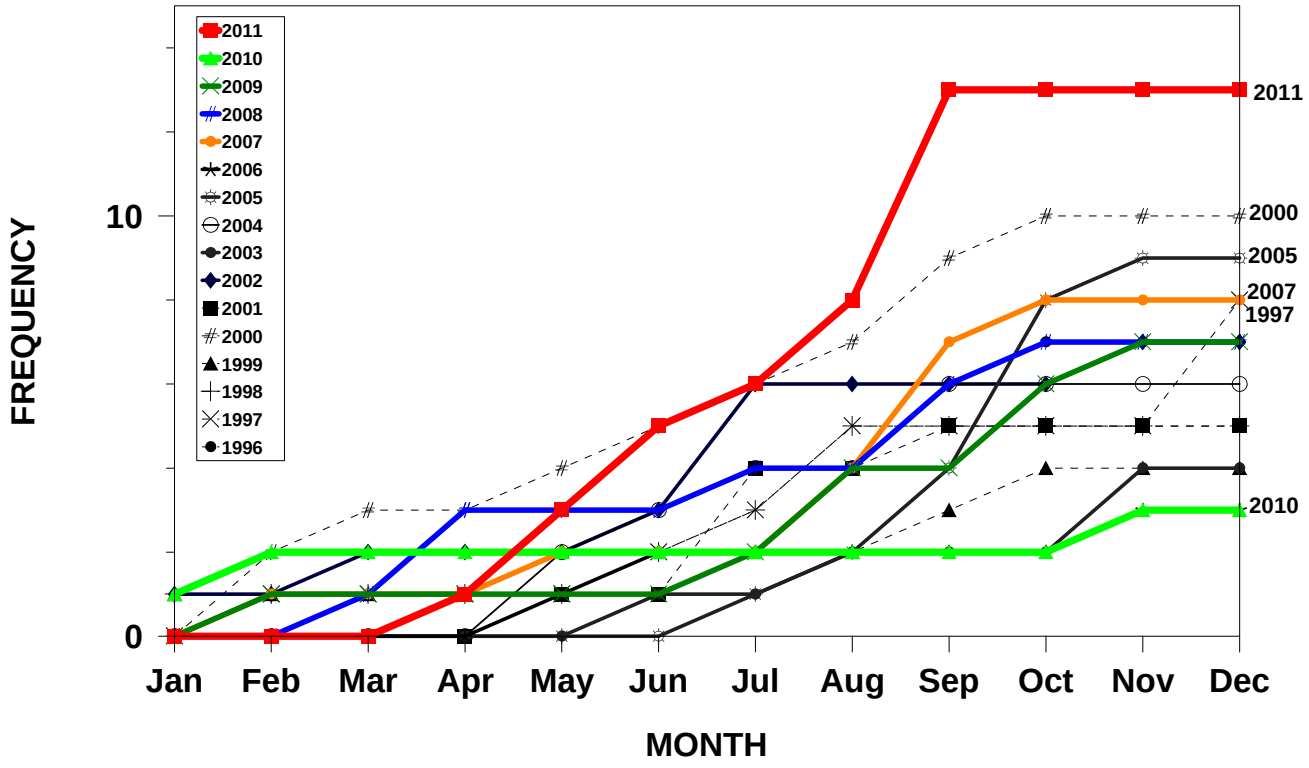


Figure 19. Monthly cumulative *Sousa chinensis* strandings and mortalities by year for Queensland, between 1996 and 2011. 'Frequency' represents the total number.

Appendix I: examples of stranded cetaceans and pinnipeds between 2008 and 2011.

All photos are courtesy of StrandNet: Environment and Heritage Protection. StrandNet. (https://www.derm.qld.gov.au/strandnet/application [accessed: March 2012]).

Seals

W2349 (*Arctocephalus forsteri*, New Zealand fur seal), ~5 NM, Fraser Island. 5/06/2010

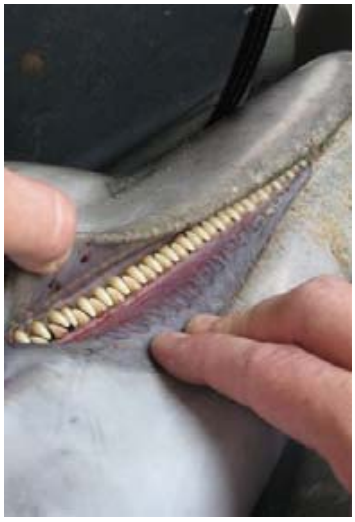
Cetaceans

W2138 Sperm whale (*Physeter macrocephalus*) ~5 NM offshore Pumicestone Passage 12 May 2009 and Kawana Beach 19 May 2009






W2139 Bottlenose dolphin (*Tursiops* spp.) western Moreton Island, 24 May 2009



W2141 Bottlenose dolphin (*Tursiops* spp.) Bribie Island, 4 June 2009






2143 Humpback whale (*Megaptera novaeangliae*) Gold Coast, 31 May 2009




W2144 Humpback whale (*Megaptera novaeangliae*) Bribie Island, 4 June 2009

W2145 Humpback whale (*Megaptera novaeangliae*) Fraser Island, 14 June 2009

W2146 Indo-Pacific humpback dolphin (*Sousa chinensis*) Mooloolaba Beach, 16 June 2009.




W2171 Bottlenose dolphin (*Tursiops* spp.) Moore Park, 22 July 2009






W2175 Indo-Pacific humpback dolphin (*Sousa chinensis*) Moore Park, 29 July 2009




W2178 Humpback whale (*Megaptera novaeangliae*) Bushland Beach, 13 August 2009


W2181 Unidentified dolphin Port of Brisbane, 19 August 2009

W2182 Bottlenose dolphin (*Tursiops* spp.) Ormiston, 20 August 2009






W2183 Minke whale (*Balaenoptera acutorostrata*) Fraser Island, 26 August 2009

W2189 Unidentified dolphin Fraser Island, 3 July 2009

W2195 Bottlenose dolphin (*Tursiops* spp.) Fraser Island, 10 August 2009

W2191 Indo-Pacific humpback dolphin (*Sousa chinensis*) Warana, Sunshine Coast, 14 July 2009

W2209 Indo-Pacific humpback dolphin (*Sousa chinensis*) Woorim Beach, 4 October 2009.

W2217 Humpback whale (*Megaptera novaeangliae*) eastern Moreton Island, 9 October 2009.

W2228 False killer whale (*Pseudorca crassidens*) Mudjimba, Sunshine Coast, 29 December 2009.

W2231 Sperm whale (*Physeter macrocephalus*) Oyster Reef, 3 December 2009

W2248 Indo-Pacific humpback dolphin (*Sousa chinensis*) Fraser Island, 21 November 2009

W11081 *Ziphius cavirostris* (Cuvier's beaked whale). Fraser Island. 24/07/2011

W2248 *Globicephala macrorhynchus* (Short-finned pilot whale). Wurtulla Beach. 21/04/2011